

CHAPTER 1: A SQUARE AND A CUBE**Assessment Time 1.1**

1. a. 1000
Since, a number ending with odd number of zero can never be a perfect square.
So, 1000 can not be a perfect square.
 - b. 622
Since, a number ended with 2 can never be a perfect square.
So, 622 is not a perfect square.
 - c. 528
A number having 8 at the ones place is never a perfect square. So, 528 is not a perfect square.
 - d. 625
A number having 5 at the ones place is a perfect square.
So, 625 is a perfect square.
 - e. 916, not perfect square.
 - f. 40000
As 4000 is end with the even number of zeros. So, it is a perfect square.
 - g. 652
A number having 2 at the ones place is never a perfect square. So, 652 is not a perfect square.
 - h. 1373
A number having 3 at the ones place is never a perfect square. So, 1373 is not a perfect square.
2. a. 342
Since, 342 is ends with 2. So, the one place digit of it square should be end in 4.
 - b. 614
Since, 614 is ends with 4. So, the ones place digit of its square should be end in 6.
 - c. 819
Since, 819 is ends with 9. So, the ones place digit of its square should be ends in 1.
 - d. 163
Since, 163 is ends with 3. So, the ones place digit of its square would end with 9.
 - e. 161
Since, 161 is ends with 1. So, the ones place digit of its square would end with 1.
 - f. 285
Since, 285 is ends with 5. So, the ones place digit of its square would end with 5.
 - g. 616
Since, 616 is ends with 6. So, the ones place digit of its square would end with 6.
 - h. 987
Since, 987 is ends with 7. So, the ones place digit of its square would end with 9.

3. a. 225

$$\begin{array}{r|l} 5 & 225 \\ \hline 5 & 45 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$$\text{So, } 225 = \overline{3 \times 3} \times \overline{5 \times 5}$$

No, it is not a perfect square of even number.

b. 196

$$\begin{aligned} 196 &= \overline{2 \times 2} \times \overline{7 \times 7} \\ &= 2 \times 7 = 14 \end{aligned}$$

Yes, it is a perfect square of even number.

$$\begin{array}{r|l} 2 & 196 \\ \hline 2 & 98 \\ \hline 7 & 49 \\ \hline 7 & 7 \\ \hline & 1 \end{array}$$

c. 576

$$\begin{array}{r|l} 2 & 576 \\ \hline 2 & 288 \\ \hline 2 & 144 \\ \hline 2 & 72 \\ \hline 2 & 36 \\ \hline 2 & 18 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$$\begin{aligned} 576 &= \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{3 \times 3} \\ &= 2 \times 2 \times 2 \times 3 = 24 \end{aligned}$$

Yes, it is a perfect square of even number.

d. 1936

$$\begin{array}{r|l} 2 & 1936 \\ \hline 2 & 968 \\ \hline 2 & 484 \\ \hline 2 & 242 \\ \hline 11 & 121 \\ \hline 11 & 11 \\ \hline & 1 \end{array}$$

$$\begin{aligned} 1936 &= \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{11 \times 11} \\ &= 2 \times 2 \times 11 = 44 \end{aligned}$$

Yes, it is a perfect square of even number.

e. 1369

$$\begin{array}{r|l} 37 & 1369 \\ \hline 37 & 37 \\ \hline & 1 \end{array}$$

$$1369 = \overline{37 \times 37} = 37$$

No, it is not a perfect square of even number

f. 1089

$$\begin{array}{r|l} 3 & 1089 \\ \hline 3 & 363 \\ \hline 11 & 121 \\ \hline 11 & 11 \\ \hline & 1 \end{array}$$

$$\begin{aligned} 1089 &= \overline{3 \times 3} \times \overline{11 \times 11} \\ &= 3 \times 11 = 33 \end{aligned}$$

No, it is not a perfect square of even number.

g. 3364

$$\begin{array}{r|l} 2 & 3364 \\ \hline 2 & 1682 \\ \hline 29 & 841 \\ \hline 29 & 29 \\ \hline & 1 \end{array}$$

$$\begin{aligned} 3364 &= \overline{2 \times 2} \times \overline{29 \times 29} \\ &= 2 \times 29 = 58 \end{aligned}$$

Yes, it is a perfect square of even number.

h. 2704

$$\begin{array}{r|l} 2 & 2704 \\ \hline 2 & 1352 \\ \hline 2 & 676 \\ \hline 2 & 338 \\ \hline 13 & 169 \\ \hline 13 & 13 \\ \hline & 1 \end{array}$$

$$\begin{aligned} 2704 &= \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{13 \times 13} \\ &= 2 \times 2 \times 13 = 52 \end{aligned}$$

Yes, it is a perfect square of even number.

4. a. $625 = \overline{5 \times 5} \times \overline{5 \times 5}$

$$\begin{array}{r|l} 5 & 625 \\ \hline 5 & 125 \\ \hline 5 & 25 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$625 = 5 \times 5 = 25$

Yes it is a perfect square of odd number.

b. 1521

$$\begin{array}{r|l} 39 & 1521 \\ \hline 39 & 39 \\ \hline & 1 \end{array}$$

$1521 = 39 \times 39 = 39$

Yes, it is a perfect square of odd number.

c. 1600

$$\begin{array}{r|l} 2 & 1600 \\ \hline 2 & 800 \\ \hline 2 & 400 \\ \hline 2 & 200 \\ \hline 2 & 100 \\ \hline 2 & 50 \\ \hline 5 & 25 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$$1600 = \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{5 \times 5}$$

$$= 2 \times 2 \times 2 \times 5 = 40$$

No, it is not a perfect square of odd number.

d. $2116 = \overline{2 \times 2} \times \overline{23 \times 23}$

$$\begin{array}{r|l} 2 & 2116 \\ \hline 2 & 1058 \\ \hline 23 & 529 \\ \hline 23 & 23 \\ \hline & 1 \end{array}$$

$2116 = 2 \times 23 = 46$

No, it is not a perfect square of odd number.

e. 2304

$$\begin{array}{r|l} 2 & 2304 \\ \hline 2 & 1152 \\ \hline 2 & 576 \\ \hline 2 & 288 \\ \hline 2 & 144 \\ \hline 2 & 72 \\ \hline 2 & 36 \\ \hline 2 & 18 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$$2304 = \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{2 \times 2} \times \overline{3 \times 3}$$

$= 2 \times 2 \times 2 \times 2 \times 3 = 16 \times 3 = 48$

No, it is not a perfect square of odd number.

f. 2500

$$\begin{array}{r|l} 2 & 2500 \\ \hline 2 & 1250 \\ \hline 5 & 625 \\ \hline 5 & 125 \\ \hline 5 & 25 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$$2500 = \overline{2 \times 2} \times \overline{5 \times 5} \times \overline{5 \times 5}$$

$$= 2 \times 5 \times 5 = 50$$

No, it is not a perfect square of odd number.

g. 529

$$\begin{array}{r|l} 23 & 529 \\ \hline 23 & 23 \\ \hline & 1 \end{array}$$

$529 = \overline{23 \times 23} = 23$

Yes, it is a perfect square of odd number.

h. 361

$$\begin{array}{r|l} 19 & 361 \\ \hline 19 & 19 \\ \hline & 1 \end{array}$$

$361 = 19 \times 19 = 19$

Yes, it is a perfect square of odd number.

5. a. $55^2 - 54^2$
 $= 2 \times 54 + 1$
 $= 108 + 1$
 $= 109$
- b. $67^2 - 66^2$
 $= 2 \times 66 + 1$
 $= 132 + 1$
 $= 133$
- c. $72^2 - 71^2$
 $= 2 \times 71 + 1$
 $= 142 + 1 = 143$
- d. $89^2 - 88^2$
 $= 2 \times 88 + 1$
 $= 176 + 1$
 $= 177$
- e. $162^2 - 161^2$
 $= 2 \times 161 + 1$
 $= 322 + 1$
 $= 323$
- f. $252^2 - 251^2$
 $= 2 \times 251 + 1$
 $= 502 + 1 = 503$
6. a. $(34)^2$
 $= (30 + 4)^2$
 $= (30 + 4) \times (30 + 4)$
 $= 30(30 + 4) + 4(30 + 4)$
 $= 900 + 120 + 120 + 16 = 1156$
- b. 56^2
 $= (50 + 6)^2$
 $= (50 + 6) \times (50 + 6)$
 $= 50(50 + 6) + 6(50 + 6)$
 $= 2500 + 300 + 300 + 36 = 3136$
- c. 83^2
 $= (80 + 3)^2$
 $= (80 + 3) \times (80 + 3)$
 $= 80(80 + 3) + 3(80 + 3)$
 $= 6400 + 240 + 240 + 9 = 6889$
- d. 95^2
 $= (90 + 5)^2$
 $= (90 + 5) \times (90 + 5)$
 $= 90(90 + 5) + 5(90 + 5)$
 $= 7100 + 450 + 450 + 25$
 $= 9025$
- e. 87^2
 $= (80 + 7)^2$
 $= (80 + 7) \times (80 + 7)$
 $= 80(80 + 7) + 7(80 + 7)$
 $= 6400 + 560 + 560 + 49$
 $= 7569$
7. a. $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 = \text{Sum of first 8 odd numbers}$
 $= 8^2 = 8 \times 8 = 64$
- b. $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 = \text{Sum of first 10 odd numbers.}$
 $= 10^2 = 10 \times 10 = 100$
- c. $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 = \text{Sum of first 11 odd numbers.}$
 $= 11^2 = 11 \times 11 = 121$
- d. $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23 + 25 = \text{Sum of first 13 odd numbers.}$
 $= 13^2 = 13 \times 13 = 169$
8. a. $25 = 5^2 = \text{Sum of first five odd numbers.}$
 $= 1 + 3 + 5 + 7 + 9$
- b. $49 = 7^2 = \text{Sum of first 7 odd numbers}$
 $= 1 + 3 + 5 + 7 + 9 + 11 + 13$
- c. $121 = 11^2 = \text{Sum of first 11 odd numbers}$
 $= 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21$

- d. $225 = 15^2 = \text{Sum of first 15 odd numbers}$
 $= 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23 + 25 + 27 + 29$
- e. $576 = 24^2 = \text{Sum of first 24 odd numbers}$
 $= 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23 + 25 + 27 + 29 + 31$
 $+ 33 + 35 + 37 + 39 + 41 + 43 + 45 + 47$

9. a. 8 and 9

As we know that number between square of any two consecutive number is $2n$, where n is the smaller number.

So, numbers between square of 8 and $9 = 2 \times 8 = 16$

- b. 11 and 12

As we know that number between square of any two consecutive number is $2n$, where n is the smaller number.

So, numbers between square of 11 and $12 = 2 \times 11 = 22$

- c. 15 and 16

As we know that number between square of any two consecutive number is $2n$, where n is the smaller number.

So, numbers between square of 15 and $16 = 2 \times 15 = 30$

10. a. 8

Let $2a = 8$

So, $a = \frac{8}{2} = 4$

$a^2 - 1 = 4^2 - 1 = 16 - 1 = 15$

$a^2 + 1 = 4^2 + 1 = 16 + 1 = 17$

So, 15, 8, 17 is a Pythagoras triplet.

- b. $2a = 10$

$\therefore a = 5$

$a^2 - 1 = 5^2 - 1 = 25 - 1 = 24$

$a^2 + 1 = 5^2 + 1 = 25 + 1 = 26$

So, 24, 10, 26 is a Pythagoras triplet.

- c. $2a = 18$

$\therefore a = 9$

$a^2 - 1 = 9^2 - 1 = 81 - 1 = 80$

$a^2 + 1 = 9^2 + 1 = 81 + 1 = 82$

So, 80, 18, 82 is a Pythagoras triplet.

- d. $2a = 24$

$\therefore a = 12$

$a^2 - 1 = 12^2 - 1 = 144 - 1 = 143$

$a^2 + 1 = 12^2 + 1 = 144 + 1 = 145$

So, 143, 24, 145 is a Pythagoras triplet.

11. a. 625

$$\begin{array}{r|l} 5 & 625 \\ \hline 5 & 125 \\ \hline 5 & 25 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$$625 = \overline{5 \times 5} \times \overline{5 \times 5}$$

So, every prime number is in pair.

Hence, 625 is a perfect square.

- b. 1200

$$\begin{array}{r|l} 2 & 1200 \\ \hline 2 & 600 \\ \hline 2 & 300 \\ \hline 2 & 150 \\ \hline 3 & 75 \\ \hline 5 & 25 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$$1200 = \overline{2 \times 2} \times \overline{2 \times 2} \times 3 \times \overline{5 \times 5}$$

Since, 3 is not making pair.

Hence, 1200 is not a perfect square.

6 Key Math-8 (Brainbee)

c. 1849

$$\begin{array}{r|l} 43 & 1849 \\ 43 & 43 \\ \hline & 1 \end{array}$$

$$1849 = 43 \times 43$$

Since, prime number is making a pair.

Hence, It is a perfect square.

d. 2401

$$\begin{array}{r|l} 7 & 2401 \\ 7 & 343 \\ 7 & 49 \\ 7 & 7 \\ \hline & 1 \end{array}$$

$$2401 = 7 \times 7 \times 7 \times 7$$

So, every prime number is making pair.

Hence, it is a perfect square.

e. 1900

$$\begin{array}{r|l} 2 & 1900 \\ 2 & 950 \\ 5 & 475 \\ 5 & 95 \\ 19 & 19 \\ \hline & 1 \end{array}$$

$$1900 = 2 \times 2 \times 5 \times 5 \times 19$$

So, 19 is not making a pair.

Hence, 1900 is not a perfect square.

f. 5184

$$\begin{array}{r|l} 2 & 5184 \\ 2 & 2592 \\ 2 & 1296 \\ 2 & 648 \\ 2 & 324 \\ 2 & 162 \end{array} \quad \begin{array}{r|l} 3 & 81 \\ 3 & 27 \\ 3 & 9 \\ 3 & 3 \\ \hline & 1 \end{array}$$

$$5184 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$$

Since, every prime number is in pair.

So, 5184 is a perfect square.

12. c. $3^2 + 4^2 + x^2 = 13^2$

$$9 + 16 + x^2 = 169$$

$$x^2 = 169 - 25 = 144$$

$$x = 12$$

$$3^2 + 4^2 + 12^2 = 13^2$$

e. $4^2 + 5^2 + 20^2 = 21^2$

g. 5625

$$\begin{array}{r|l} 5 & 5625 \\ 5 & 1125 \\ 5 & 225 \\ 5 & 45 \\ 3 & 9 \\ 3 & 3 \\ \hline & 1 \end{array}$$

$$5625 = 5 \times 5 \times 5 \times 5 \times 3 \times 3$$

Since, every prime number is making a pair.

Hence, 5625 is a perfect square.

h. 9801

$$\begin{array}{r|l} 3 & 9801 \\ 3 & 3267 \\ 3 & 1089 \\ 3 & 363 \\ 11 & 121 \\ 11 & 11 \\ \hline & 1 \end{array}$$

$$9801 = 3 \times 3 \times 3 \times 3 \times 11 \times 11$$

Since, every prime number is making a pair.

Hence, 9801 is a perfect square.

d. $3^2 + 4^2 + ()^2 = 13^2$

Let the blank space be x

$$3^2 + 4^2 + x^2 = 13^2$$

$$9 + 16 + x = 169$$

$$x^2 = 169 - 25 = 144$$

$$x = \sqrt{144} = 12$$

f. $5^2 + 6^2 + 30^2 = 31^2$

Assessment Time 1.2

1. a. $64 - 1 = 63$, $63 - 3 = 60$, $60 - 5 = 55$, $55 - 7 = 48$,
 $48 - 9 = 39$, $39 - 11 = 28$, $28 - 13 = 15$, $15 - 15 = 0$
 Here, we subtract 8 times to get 0.
 So, $\sqrt{64} = 8$
- b. $121 - 1 = 120$, $120 - 3 = 117$, $117 - 5 = 112$, $112 - 7 = 105$,
 $105 - 9 = 96$, $96 - 11 = 85$, $85 - 13 = 72$, $72 - 15 = 57$,
 $57 - 17 = 40$, $40 - 19 = 21$, $21 - 21 = 0$
 Here, we subtract 11 time to get 0.
 So, $\sqrt{121} = 11$
- c. $144 - 1 = 143$, $143 - 3 = 140$, $140 - 5 = 135$, $135 - 7 = 128$,
 $128 - 9 = 119$, $119 - 11 = 108$, $108 - 13 = 95$, $95 - 15 = 80$,
 $80 - 17 = 63$, $63 - 19 = 44$, $44 - 21 = 23$, $23 - 23 = 0$
 Here, we subtract 12 time to get 0
 So, $\sqrt{144} = 12$
- d. $169 - 1 = 168$, $168 - 3 = 165$, $165 - 5 = 160$, $160 - 7 = 153$,
 $153 - 9 = 144$, $144 - 11 = 133$, $133 - 13 = 120$, $120 - 15 = 105$,
 $105 - 17 = 88$, $88 - 19 = 69$, $69 - 21 = 48$, $48 - 23 = 25$,
 $25 - 25 = 0$
 Here, we subtract 13 time to get 0.
 So, $\sqrt{169} = 13$

2. a. 196

$$\begin{array}{r}
 2 \overline{) 196} \\
 \underline{2} 98 \\
 \underline{7} 49 \\
 \underline{7} 7 \\
 \hline
 1
 \end{array}$$

$$196 = 14 \times 14$$

$$\begin{aligned}
 \sqrt{196} &= \sqrt{2 \times 2 \times 7 \times 7} \\
 &= 2 \times 7 = 14
 \end{aligned}$$

- b. 484

$$\begin{array}{r}
 2 \overline{) 484} \\
 \underline{2} 242 \\
 \underline{11} 121 \\
 \underline{11} 11 \\
 \hline
 1
 \end{array}$$

$$484 = 2 \times 2 \times 11 \times 11$$

$$\begin{aligned}
 \sqrt{484} &= \sqrt{2 \times 2 \times 11 \times 11} \\
 &= 2 \times 11 = 22
 \end{aligned}$$

- c. 784

$$\begin{array}{r}
 2 \overline{) 784} \\
 \underline{2} 392 \\
 \underline{2} 196 \\
 \underline{2} 98 \\
 \hline
 1
 \end{array}
 \quad
 \begin{array}{r}
 7 \overline{) 49} \\
 \underline{7} 7 \\
 \hline
 1
 \end{array}$$

$$784 = 2 \times 2 \times 2 \times 2 \times 7 \times 7$$

$$\begin{aligned}
 \sqrt{784} &= \sqrt{2 \times 2 \times 2 \times 2 \times 7 \times 7} \\
 &= 2 \times 2 \times 7 = 28
 \end{aligned}$$

- d. 1024

$$\begin{array}{r}
 2 \overline{) 1024} \\
 \underline{2} 512 \\
 \underline{2} 256 \\
 \underline{2} 128 \\
 \underline{2} 64 \\
 \hline
 1
 \end{array}
 \quad
 \begin{array}{r}
 2 \overline{) 32} \\
 \underline{2} 16 \\
 \underline{2} 8 \\
 \underline{2} 4 \\
 \underline{2} 2 \\
 \hline
 1
 \end{array}$$

$$1024 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

$$\begin{aligned}
 &\sqrt{1024} \\
 &= \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2} \\
 &= 2 \times 2 \times 2 \times 2 \times 2 = 32
 \end{aligned}$$

e. 1764

2	1764
2	882
7	441
7	63
3	9
3	3
	1

$$1764 = 2 \times 2 \times 7 \times 7 \times 3 \times 3$$

$$\sqrt{1764} = \sqrt{2 \times 2 \times 7 \times 7 \times 3 \times 3}$$

$$= 2 \times 7 \times 3 = 42$$

f. 3025

5	3025
5	605
11	121
11	11
	1

$$3025 = 5 \times 5 \times 11 \times 11$$

$$\sqrt{3025} = \sqrt{5 \times 5 \times 11 \times 11}$$

$$= 5 \times 11 = 55$$

3. 1458

2	1458
3	729
3	243
3	81
3	27
3	9
3	3
3	1

$$1458 = 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$$

Since, prime factor 2 is not making a pair.
So, we have to multiply 1458 by 2 to make it perfect square.

$$\text{So, } 1458 \times 2 = 2916$$

$$\sqrt{2916} = \sqrt{2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3}$$

$$= 2 \times 3 \times 3 \times 3 = 54$$

Hence, the required smallest number is 2
and square root of the number so, obtained
is 54.

g. 4356

2	4356
2	2178
3	1089
3	363
11	121
11	11
	1

$$4356 = 2 \times 2 \times 3 \times 3 \times 11 \times 11$$

$$\sqrt{4356} = \sqrt{2 \times 2 \times 3 \times 3 \times 11 \times 11}$$

$$= 2 \times 3 \times 11 = 66$$

h. 8281

7	8281
7	1183
13	169
13	13
	1

$$8281 = 7 \times 7 \times 13 \times 13$$

$$\sqrt{8281} = \sqrt{7 \times 7 \times 13 \times 13}$$

$$= 7 \times 13 = 91$$

4. 4418

2	4418
47	2209
47	47
	1

$$4418 = 2 \times 47 \times 47$$

Since, prime factor 2 is not making a pair,
So, we have to multiply 4418 by 2 to make
it a perfect square.

$$\text{So, } 4418 \times 2 = 8836$$

$$\sqrt{8836} = \sqrt{2 \times 2 \times 47 \times 47}$$

$$= 2 \times 47 = 94$$

Hence, the required smallest number is 2
and square root of the number so, obtained
is 94.

5. 2800

2	2800
2	1400
2	700
2	350
5	175
5	35
7	7
	1

$$2800 = 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 7$$

Since, prime factor 7 is not making a pair.
So, we have to divide 2800 by 7 to make it a perfect square

$$2800 \div 7 = 400$$

$$\text{So, } \sqrt{400} = \sqrt{2 \times 2 \times 5 \times 5 \times 2 \times 2} \\ = 2 \times 5 \times 2 = 20$$

Here, 2800 must be divided by 7 to make it a perfect square and square root of the number so obtained is 20.

6. 4802

2	4802
7	2401
7	343
7	49
7	7
	1

$$4802 = 2 \times 7 \times 7 \times 7 \times 7$$

Since, prime factor 2 is not making a pair,
So we have to divide 4802 by 2 to make it a perfect square.

$$4802 \div 2 = 2401$$

$$\sqrt{2401} = \sqrt{7 \times 7 \times 7 \times 7} \\ = 7 \times 7 = 49$$

Here, 2401 must be divided by 2 to make it a perfect square and square root of the number so obtain is 49.

7. Let we find the LCM of 7, 21, 28 and 56

7	7, 21, 28, 56
2	1, 3, 4, 8
2	1, 3, 2, 4
	1, 3, 1, 2

$$\text{LCM} = 7 \times 2 \times 2 \times 3 \times 2 = 336$$

Here, 3 and 7 are not making pairs, So 336 is not a perfect square therefore, 336 is multiplied by 3 and 7 to making a perfect square.

$$\text{Hence, the required number} = 84 \times 3 \times 7 \\ = 7056$$

8. Let we find the LCM of 10, 15, 25 and 35

5	10, 15, 25, 35
	2, 3, 5, 7

$$\text{LCM} = 5 \times 2 \times 3 \times 5 \times 7 = 1050$$

Here, 2, 3 and 7 are not making pairs,
So, it is not a perfect square. Therefore, it is multiplied by 2, 3 and 7 to make it a perfect square.

$$\text{Hence, the required number} \\ = 1050 \times 2 \times 3 \times 7 = 44100$$

9. Let the number of rows be x.

So, number of students in each row be x.

$$\text{So, } x \times x = 4225$$

$$x^2 = 4225$$

$$x = \sqrt{4225}$$

5	4225
5	845
13	169
13	13
	1

$$x = \sqrt{5 \times 5 \times 13 \times 13} \\ = 5 \times 13 = 65$$

Hence, number of rows is 65 and number of students in each row is 65.

SEL Helping

10. Let the number of families be x.

$$x \times x = 50625$$

$$x^2 = 50625$$

$$x = \sqrt{50625}$$

$$x = \sqrt{5 \times 5 \times 5 \times 5 \times 3 \times 3 \times 3 \times 3}$$

$$= 5 \times 5 \times 3 \times 3$$

$$= 25 \times 9 = 225$$

Hence, the amount and the number of families is 225.

Critical Thinking Skills

$$\begin{aligned}
 & \sqrt{69 + \sqrt{130 + \sqrt{176 + \sqrt{400}}}} \\
 &= \sqrt{69 + \sqrt{130 + \sqrt{176 + 20}}} \\
 &= \sqrt{69 + \sqrt{130 + \sqrt{196}}} \\
 &= \sqrt{69 + \sqrt{130 + 14}} \\
 &= \sqrt{69 + \sqrt{144}} \\
 &= \sqrt{69 + 12} = \sqrt{81} = 9
 \end{aligned}$$

Assessment Time 1.3

1. a. $6^3 = 6 \times 6 \times 6 = 216$
Sum of first 6 odd number = $31 + 33 + 35 + 37 + 39 + 41 = 216$
- b. $8^3 = 512 = 57 + 59 + 61 + 63 + 65 + 67 + 69 + 71$
- c. $10^3 = 1000 = 91 + 93 + 95 + 97 + 99 + 101 + 103 + 105 + 107 + 109$
- d. $13^3 = 157 + 159 + 161 + 163 + 165 + 167 + 169 + 171 + 173 + 175 + 177 + 179 + 181 = 2197$
2. a. $6^3 - 5^3$
 $(m + 1)^3 - m^3$
 $= 1 + (m + 1) \times m \times 3$
 $= 1 + 6 \times 5 \times 3$
 $= 1 + 90 = 91$
- b. $8^3 - 7^3$
 $= 1 + 8 \times 7 \times 3$
 $= 1 + 168 = 169$
- c. $12^3 - 11^3$
 $= 1 + 12 \times 11 \times 3$
 $= 1 + 132 \times 3$
 $= 1 + 396 = 397$
- d. $15^3 - 14^3$
 $= 1 + 15 \times 14 \times 3$
 $= 1 + 630 = 631$
3. a. $\left(\frac{-2}{5}\right)^3 = \left(\frac{-2}{5}\right) \times \left(\frac{-2}{5}\right) \times \left(\frac{-2}{5}\right) = \frac{-8}{125}$
- b. $\left(\frac{5}{12}\right)^3 = \frac{5}{12} \times \frac{5}{12} \times \frac{5}{12} = \frac{125}{1728}$
- c. $\left(\frac{6}{13}\right)^3 = \frac{6}{13} \times \frac{6}{13} \times \frac{6}{13} = \frac{216}{2197}$
- d. $\left(\frac{9}{-17}\right)^3 = \left(\frac{9}{-17}\right) \times \left(\frac{9}{-17}\right) \times \left(\frac{9}{-17}\right) = \frac{-729}{4913}$
4. a. 2744

2	2744
2	1372
2	686
7	343
7	49
7	7
	1

$$2744 = \overline{2 \times 2 \times 2} \times \overline{7 \times 7 \times 7}$$

Every factor is in the group of 3. So 2744 is a perfect cube.

b. 15360

2	15360	2	120
2	7680	2	60
2	3840	2	30
2	1920	3	15
2	960	5	5
2	480		1
2	240		

$$15360 = \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times 2 \times 3 \times 5$$

Every number is not in group of three.

So, 15360 is not a perfect cube.

c. 32768

2	32768	2	512	2	16
2	16384	2	256	2	8
2	8192	2	128	2	4
2	4096	2	64	2	2
2	2048	2	32		1
2	1024				

$$32768 = \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2}$$

Every number is in the group of three.

So, 32768 is a perfect cube

d. 3375

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

$$3375 = \overline{3 \times 3 \times 3} \times \overline{5 \times 5 \times 5}$$

$$= 3 \times 5 = 15$$

Every number is in group of three.

So, 3375 is a perfect cube

e. 91125

3	91125	5	135
3	30375	3	27
3	10125	3	9
5	3375	3	3
5	675		1

$$91125 = \overline{3 \times 3 \times 3} \times \overline{3 \times 3 \times 3} \times \overline{5 \times 5 \times 5}$$

Every number is in the group of three.

So 91125 is a perfect cube.

f. 46656

3	46656	2	108
3	15552	2	54
3	5184	3	27
2	1728	3	9
2	864	3	3
2	432		1
2	216		

$$46656 = \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{3 \times 3 \times 3} \times \overline{3 \times 3 \times 3}$$

Every number is in group of three.

So, 46656 is a perfect cube.

g. 175616

2	175616	2	1372
2	87808	2	686
2	43904	7	343
2	21952	7	49
2	10976	7	7
2	5488		1
2	2744		

$$175616 = \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{7 \times 7 \times 7}$$

Every number is in the group of three.

So, 175616 is a perfect cube.

h. 27962

2	27962	2	27962
11	13981		
31	1271		
41	41		
	1		

$$27962 = 2 \times 11 \times 31 \times 41$$

Every number is not in the group of three.

So, 27962 is not a perfect cube.

5. 46305

3	46305
3	15435
3	5145
5	1715
7	343
7	49
7	7
	1

Here, the prime factor of 5 is not in the group of three.

So, we need to more 5(25) to make it a perfect cube.

Hence, 46305 must be multiplied by 25 to make it a perfect cube.

6. 12348

2	12348
2	6174
3	3087
3	1029
7	343
7	49
7	7
	1

$$12348 = 2 \times 2 \times 3 \times 3 \times \overline{7 \times 7 \times 7}$$

Hare, the prime factor 2 and 3 is not in the group of three. So, we need one more 2 and 3 to make it a perfect cube.

Hence, 12348 must be multiplied by 2×3

= 6 to make it a perfect cube.

7. 128625

3	128625
5	42875
5	8575
5	1715
7	343
7	49
7	7
	1

$$128625 = \overline{5 \times 5 \times 5} \times 3 \times \overline{7 \times 7 \times 7}$$

Prime factor 3 is not in the group of three.

So, 128625 must be divided by 3.

Hence, 128625 must be divided by 3 to make it a perfect cube.

8. 703040

2	703040		5	10985
2	351520		13	2197
2	175760		13	169
2	87880		13	13
2	43940			1
2	21970			

$$703040 = \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times 2 \times 5 \times \overline{13 \times 13 \times 13}$$

Prime factor 2 and 5 is not in the group of three.

So, 703040 must be divided by 10.

Hence, 703040 must be divided by 10 to make it a perfect cube.

Assessment Time 1.4

1. a. $5832 = 2 \times 2 \times 2 \times \overline{3 \times 3 \times 3} \times \overline{3 \times 3 \times 3}$

2	5832		3	27
2	2916		3	9
2	1458		3	3
3	729			1
3	243			
3	81			

$$\sqrt[3]{5832}$$

$$= \sqrt[3]{\overline{2 \times 2 \times 2} \times \overline{3 \times 3 \times 3} \times \overline{3 \times 3 \times 3}}$$

$$= 2 \times 3 \times 3 = 18$$

b. 15625

5	15625		5	25
5	3125		5	5
5	625			1
5	125			

$$\sqrt[3]{15625} = \sqrt[3]{\overline{5 \times 5 \times 5} \times \overline{5 \times 5 \times 5}}$$

$$= 5 \times 5 = 25$$

c. 32768

2	32768					
2	16384	→	2	256		
2	8192		2	128		
2	4096		2	64		
2	2048		2	32		
2	1024		2	16		
2	512		2	8		
				→	2	4
					2	2
						1

$$32768 = \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2}$$

$$\begin{aligned} \sqrt[3]{32768} &= \sqrt[3]{\overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2}} \\ &= 2 \times 2 \times 2 \times 2 \times 2 = 32 \end{aligned}$$

d. 39304

$$39304 = 2 \times 2 \times 2 \times 17 \times 17 \times 17$$

$$\begin{aligned} \sqrt[3]{39304} &= \sqrt[3]{\overline{2 \times 2 \times 2} \times \overline{17 \times 17 \times 17}} \\ &= 2 \times 17 = 34 \end{aligned}$$

2	39304
2	19652
2	9826
17	4913
17	289
17	17
	1

e. 27000

$$27000 = \overline{2 \times 2 \times 2} \times \overline{3 \times 3 \times 3} \times \overline{5 \times 5 \times 5}$$

$$\begin{aligned} \sqrt[3]{27000} &= \sqrt[3]{\overline{2 \times 2 \times 2} \times \overline{3 \times 3 \times 3} \times \overline{5 \times 5 \times 5}} \\ &= 2 \times 3 \times 5 = 30 \end{aligned}$$

2	27000			
2	13500	→	5	125
2	6750		5	25
3	3375		5	5
3	1125			1
3	375			

f. 74088

$$74088 = \overline{2 \times 2 \times 2} \times \overline{3 \times 3 \times 3} \times \overline{7 \times 7 \times 7}$$

$$\begin{aligned} \sqrt[3]{74088} &= \sqrt[3]{\overline{2 \times 2 \times 2} \times \overline{3 \times 3 \times 3} \times \overline{7 \times 7 \times 7}} \\ &= 2 \times 3 \times 7 = 42 \end{aligned}$$

2	74088	→	3	1029
2	37044		7	343
2	18522		7	49
3	9261		7	7
3	3087			1

g. 250047

$$250047 = \overline{3 \times 3 \times 3} \times \overline{3 \times 3 \times 3} \times \overline{7 \times 7 \times 7}$$

$$\begin{aligned} \sqrt[3]{250047} &= \sqrt[3]{\overline{3 \times 3 \times 3} \times \overline{3 \times 3 \times 3} \times \overline{7 \times 7 \times 7}} \\ &= 3 \times 3 \times 7 = 63 \end{aligned}$$

3	250047			
3	83349	→	7	343
3	27783		7	49
3	9261		7	7
3	3087			1
3	1029			

14 Key Math-8 (Brainbee)

h. 531441

$$531441 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$$

$$\begin{aligned} \sqrt[3]{531441} &= \sqrt[3]{\underbrace{3 \times 3 \times 3} \times \underbrace{3 \times 3 \times 3} \times \underbrace{3 \times 3 \times 3} \times \underbrace{3 \times 3 \times 3} \times \underbrace{3 \times 3 \times 3}} \\ &= 3 \times 3 \times 3 \times 3 = 81 \end{aligned}$$

3	531441	
3	177147	3
3	59049	3
3	19683	3
3	6561	3
3	2187	3
3	729	3
		1

2. a. $\sqrt[3]{32} \times \sqrt[3]{2000} = \sqrt[3]{32 \times 2000}$

$$= \sqrt[3]{\underbrace{2 \times 2 \times 2} \times \underbrace{2 \times 2 \times 2} \times \underbrace{2 \times 2 \times 2} \times \underbrace{5 \times 5 \times 5}}$$

$$= 2 \times 2 \times 2 \times 5 = 40$$

2	32	2	2000	
2	16	2	1000	5
2	8	2	500	5
2	4	2	250	5
2	2	5	125	1
	1			

b. $\sqrt[3]{729} \times \sqrt[3]{8000} = \sqrt[3]{729 \times 8000}$

3	729	2	8000	
3	243	2	4000	5
3	81	2	2000	5
3	27	2	1000	5
3	9	2	500	5
3	3	2	250	1
	1			

$$= \sqrt[3]{\underbrace{3 \times 3 \times 3} \times \underbrace{3 \times 3 \times 3} \times \underbrace{2 \times 2 \times 2} \times \underbrace{2 \times 2 \times 2} \times \underbrace{5 \times 5 \times 5}}$$

$$= 3 \times 3 \times 2 \times 2 \times 5 = 180$$

c. $\sqrt[3]{432} \times \sqrt[3]{4000} = \sqrt[3]{432 \times 4000}$

2	432	2	4000	5
2	216	2	2000	5
2	108	2	1000	5
2	54	2	500	5
3	27	2	250	1
3	9			
3	3			
	1			

$$= \sqrt[3]{\underbrace{2 \times 2 \times 2} \times \underbrace{2 \times 2 \times 2} \times \underbrace{3 \times 3 \times 3} \times \underbrace{2 \times 2 \times 2} \times \underbrace{2 \times 2 \times 2} \times \underbrace{5 \times 5 \times 5}}$$

$$= \sqrt[3]{\underbrace{2 \times 2 \times 2} \times \underbrace{2 \times 2 \times 2} \times \underbrace{2 \times 2 \times 2} \times \underbrace{3 \times 3 \times 3} \times \underbrace{5 \times 5 \times 5}}$$

$$= 2 \times 2 \times 2 \times 3 \times 5 = 120$$

3. a. $35937 = \sqrt[3]{35937}$

Hence, $\sqrt[3]{35937} = \sqrt[3]{3 \times 3 \times 3 \times 11 \times 11 \times 11}$
 $= 3 \times 11 = 33$

3	35937	11	121
3	11979	11	11
3	3993		1
11	1331		

b. $74088 = \sqrt[3]{74088}$

Hence, $\sqrt[3]{74088}$
 $= \sqrt[3]{2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 7 \times 7 \times 7}$
 $= 2 \times 3 \times 7 = 42$

2	74088	7	343
2	37044	7	49
2	18522	7	7
3	9261		1
3	3087		
3	1029		

c. $\frac{39304}{6859}$

$\sqrt[3]{\frac{39304}{6859}} = \frac{\sqrt[3]{39304}}{\sqrt[3]{6859}}$
 $= \frac{\sqrt[3]{2 \times 2 \times 2 \times 17 \times 17 \times 17}}{\sqrt[3]{19 \times 19 \times 19}}$
 $= \frac{2 \times 17}{19} = \frac{34}{19}$

2	39304	19	6859
2	19652	19	361
2	9826	19	19
17	4913		1
17	289		
17	17		
	1		

d. $\frac{4096}{117649}$

2	4096	2	32	7	117649
2	2048	2	16	7	16807
2	1024	2	8	7	2401
2	512	2	4	7	343
2	256	2	2	7	49
2	128		1	7	7
2	64				1

$= \sqrt[3]{\frac{4096}{117649}} = \frac{\sqrt[3]{4096}}{\sqrt[3]{117649}}$
 $= \frac{\sqrt[3]{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}}{\sqrt[3]{7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7}}$
 $= \frac{2 \times 2 \times 2 \times 2}{7 \times 7} = \frac{16}{49}$

Mental Math

1. $(43)^2 = (40 + 3)^2$

$= 40^2 + 2 \times 40 \times 3 + 3^2$

$= 1600 + 240 + 9$

$= 1849$

2. 19

3. $\sqrt{24 + \sqrt{144}} = \sqrt{24 + 12} = \sqrt{36} = 6$

4. $\sqrt{1\frac{9}{16}} = \sqrt{\frac{25}{16}} = \frac{5}{4}$

5. Even

6. odd

7. negative

8. 3

Revision Time

1. a. 342

Since, 342 is ends with 2. So, the ones place digit of its square should be end in 4.

b. 961

Since, 961 is ends with 1. So, the ones place digit of its square should be end in 1.

c. 843

Since, 843 is ends with 3. So, the ones place digit of its square should be end in 9.

d. 1967

Since, 1967 is ends with 7. So, the ones place digit of its square should be end in 9.

2. a. 3364

Since, 3364 is ends with 4. So, the ones place digit of the square root should be ends in 8.

b. 4225

Since, 4225 is ends with 5. So, the ones place digit of the square root should be ends in 5.

c. 4761

Since, 4761 is ends with 1. So, the ones place digit of the square root should be ends in 9.

d. 7744

Since, 7744 is ends with 4. So, the ones place digit of the square root should be ends in 8.

3. a. $29 = (20 + 9)^2$

$$= (20 + 9)(20 + 9)$$

$$= 20(20 + 9) + 9(20 + 9)$$

$$= 400 + 180 + 180 + 81 = 841$$

b. $43 = (40 + 3)^2$

$$= (40 + 3)(40 + 3)$$

$$= 40(40 + 3) + 3(40 + 3)$$

$$= 1600 + 120 + 120 + 9 = 1849$$

c. $64 = (60 + 4)^2$

$$= (60 + 4)(60 + 4)$$

$$= 60(60 + 4) + 4(60 + 4)$$

$$= 3600 + 240 + 240 + 16 = 4096$$

d. $92 = (90 + 2)^2$

$$= (90 + 2)(90 + 2)$$

$$= 90(90 + 2) + 2(90 + 2)$$

$$= 8100 + 180 + 180 + 4 = 8464$$

4. a. $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 19 = \text{Sum of first 9 odd number} = 9^2$

$$= 9 \times 9 = 81$$

b. $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 19 + 21 + 23$

$$= \text{Sum of first 12 odd number} = 12^2$$

$$= 12 \times 12 = 144$$

5. a. $66^2 - 65^2 = 2 \times 65 + 1 = 130 + 1 = 131$

b. $78^2 - 77^2 = 2 \times 77 + 1 = 154 + 1 = 155$

c. $84^2 - 83^2 = 2 \times 83 + 1 = 166 + 1 = 167$

d. $94^2 - 93^2 = 2 \times 93 + 1 = 186 + 1 = 187$

6. a. 1225

$$\text{So, } 1225 = \overline{5 \times 5} \times \overline{7 \times 7}$$

Since, every prime number is in pair.

Hence, 1225 is a perfect square

5	1225
5	245
7	49
7	7
	1

b. $6362 = 2 \times 3181$

Since, it has not pairs.

Hence it is not a perfect square.

$$\begin{array}{r|l} 2 & 6362 \\ & 3181 \end{array}$$

c. $4761 = \overline{3 \times 3} \times \overline{23 \times 23}$

Since, every number is in pair.

Hence, 4761 is a perfect square.

$$\begin{array}{r|l} 3 & 4761 \\ 3 & 1587 \\ 23 & 529 \\ 23 & 23 \\ & 1 \end{array}$$

d. $7921 = \overline{89 \times 89}$

Since, it is in pair.

Hence, 7921 is a perfect square.

$$\begin{array}{r|l} 89 & 7921 \\ 89 & 89 \\ & 1 \end{array}$$

7. a. 81

$81 - 1 = 80,$

$80 - 3 = 77,$

$77 - 5 = 72,$

$72 - 7 = 65,$

$65 - 9 = 56,$

$56 - 11 = 45,$

$45 - 13 = 32,$

$32 - 15 = 17,$

$17 - 17 = 0$

Hence, we subtract 9 time to get 0. So, $\sqrt{81} = 9$

b. 100

$100 - 1 = 99,$

$99 - 3 = 96,$

$96 - 5 = 91,$

$91 - 7 = 84,$

$84 - 9 = 75,$

$75 - 11 = 64,$

$64 - 13 = 51,$

$51 - 15 = 36,$

$36 - 17 = 19$

$19 - 19 = 0$

Hence, we subtract 10 time to get 0. So, $\sqrt{100} = 10$

c. 196

$196 - 1 = 195,$

$195 - 3 = 192,$

$192 - 5 = 187,$

$187 - 7 = 180,$

$180 - 9 = 171,$

$171 - 11 = 160,$

$160 - 13 = 147,$

$147 - 15 = 132,$

$132 - 17 = 115,$

$115 - 19 = 96,$

$96 - 21 = 75,$

$75 - 23 = 52,$

$52 - 25 = 27,$

$27 - 27 = 0$

Hence, we subtract 14 time to get 0. So, $\sqrt{196} = 14$

d. 225

$225 - 1 = 224,$

$224 - 3 = 221,$

$221 - 5 = 216,$

$216 - 7 = 209,$

$209 - 9 = 200,$

$200 - 11 = 189,$

$189 - 13 = 176,$

$176 - 15 = 161,$

$161 - 17 = 144,$

$144 - 19 = 125,$

$125 - 21 = 104,$

$104 - 23 = 81,$

$81 - 25 = 56,$

$56 - 27 = 29,$

$29 - 29 = 0$

Hence, we subtract 15 time to get 0. So, $\sqrt{225} = 15$

8. a. 361

$361 = 19 \times 19$

$\sqrt{361} = \sqrt{19 \times 19}$

$\sqrt{361} = 19$

$$\begin{array}{r|l} 19 & 361 \\ 19 & 19 \\ & 1 \end{array}$$

18 Key Math-8 (Brainbee)

b. 576

$$576 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$$

$$\sqrt{576} = \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3}$$

$$\sqrt{576} = 2 \times 2 \times 2 \times 3 = 24$$

2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

c. 1444

$$1444 = 2 \times 2 \times 19 \times 19$$

$$\sqrt{1444} = \sqrt{2 \times 2 \times 19 \times 19}$$

$$= 2 \times 19 = 38$$

2	1444
2	722
19	361
19	19
	1

d. 5476

$$5476 = 2 \times 2 \times 37 \times 37$$

$$\sqrt{5476} = \sqrt{2 \times 2 \times 37 \times 37}$$

$$\sqrt{5476} = 2 \times 37 = 74$$

2	5476
2	2738
37	1369
37	37
	1

9. $82140 = 2 \times 2 \times 5 \times 3 \times 37 \times 37$

Since, prime factor 5 and 3 is not making a pair.

So, 82140 must be divided by 15 to make it a perfect square

$$= 82140 \div 15 = 5476$$

$$\sqrt{5476} = \sqrt{2 \times 2 \times 37 \times 37}$$

$$= 2 \times 37 = 74$$

2	82140
2	41070
3	20535
5	6845
37	1369
37	37
	1

10. The remainder is 106. So, 106 must be subtracted from 2915 to make it a perfect square.

	53
5	29 15
+5	-25
103	4 15
+3	-3 09
	1 06

11. So, 8496 is greater than $(92)^2$ and the next perfect square is $(93)^2$ or 8649.

So, the least number should be added

$$= 8649 - 8496 = 153$$

Hence, 153 should be added to 8496 to make it a perfect square.

	53
9	84 96
+9	-81
183	3 96
+3	-3 64
	32

12. First we find LCM of 8, 24, 30 and 45

$$\text{So, LCM} = 2 \times 2 \times 2 \times 3 \times 3 \times 5$$

Here, 2 and 5 are not making pairs.

Hence the required number

$$= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$$

$$= 3600$$

13. Let number of soldier be x .

Let rows of soldier be x .

$$\text{So, } x \times x = 4356$$

$$x^2 = 4356$$

$$x = \sqrt{4356}$$

$$x = \sqrt{2 \times 2 \times 3 \times 3 \times 11 \times 11}$$

$$= 2 \times 3 \times 11 = 66$$

Hence, number of rows is 66 and number of soldier in each is 66.

2	4356
2	2178
3	1089
3	363
11	121
11	11
	1

14. a. $5^3 - 4^3$

$$= 1 + 5 \times 4 \times 3$$

$$= 1 + 60 = 61$$

b. $7^3 - 6^3$

$$= 1 + 7 \times 6 \times 3$$

$$= 1 + 126 = 127$$

c. $10^3 - 9^3$

$$= 1 + 10 \times 9 \times 3$$

$$= 1 + 270 = 271$$

d. $13^2 - 12^2$

$$= 1 + 13 \times 12 \times 3$$

$$= 1 + 468 = 469$$

15. a. $\left(\frac{-3}{7}\right)^3 = \left(\frac{-3}{7}\right) \times \left(\frac{-3}{7}\right) \times \left(\frac{-3}{7}\right) = \frac{-27}{343}$

b. $\left(\frac{2}{11}\right)^3 = \left(\frac{2}{11}\right) \times \left(\frac{2}{11}\right) \times \left(\frac{2}{11}\right) = \frac{8}{1331}$

c. $\left(\frac{-8}{13}\right)^3 = \left(\frac{-8}{11}\right) \times \left(\frac{-8}{11}\right) \times \left(\frac{-8}{11}\right) = \frac{-512}{2197}$

d. $\left(\frac{-11}{5}\right)^3 = \left(\frac{-11}{5}\right) \times \left(\frac{-11}{5}\right) \times \left(\frac{-11}{5}\right) = \frac{-1331}{125}$

16. a. 91125

$$91125 = \overline{3 \times 3 \times 3} \times \overline{3 \times 3 \times 3} \times \overline{5 \times 5 \times 5}$$

Since every number is in group of 3. So, 91125 is a perfect cube.

3	91125	3	375
3	30375	5	125
3	10125	5	25
3	3375	5	5
3	1125		1

b. 39304

$$39304 = \overline{2 \times 2 \times 2} \times \overline{17 \times 17 \times 17}$$

Since, every number is in group of 3.

So, 39304 is a perfect cube.

2	39304
2	19652
2	9826
17	4913
17	289
17	17
	1

c. 13720

$$13720 = \overline{2 \times 2 \times 2} \times 5 \times \overline{7 \times 7 \times 7}$$

Every number is not in the group of three.

So, 13720 is not a perfect cube.

2	13720
2	6860
2	3430
5	1715
7	343
7	49
7	7
	1

20 Key Math-8 (Brainbee)

d. 157464

$$157464 = \overline{2 \times 2 \times 2} \times \overline{3 \times 3 \times 3} \times \overline{3 \times 3 \times 3} \times \overline{3 \times 3 \times 3}$$

Every number is in the group of 3.

So, 157464 is a perfect cube.

2	157464	3	243
2	78732	3	81
2	39366	3	27
3	19683	3	9
3	6561	3	3
3	2187		1
3	729		

17. a. 17576

$$\sqrt[3]{17576} = \sqrt[3]{\overline{2 \times 2 \times 2} \times \overline{13 \times 13 \times 13}}$$

$$= 2 \times 13 = 26$$

2	17576
2	8788
2	4394
13	2197
13	169
13	13
	1

b. 46656

$$\sqrt[3]{46656}$$

$$= \sqrt[3]{\overline{2 \times 2 \times 2 \times 2 \times 2 \times 2} \times \overline{3 \times 3 \times 3} \times \overline{3 \times 3 \times 3}}$$

$$= 2 \times 2 \times 3 \times 3 = 36$$

c. 262144

2	262144	2	1024	
2	131072	2	512	
2	65536	2	256	
2	32768	2	128	
2	16384	2	64	
2	8192	2	32	
2	4096	2	16	
2	2048			

$$\sqrt[3]{262144} = \sqrt{\overline{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2} \times \overline{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}}$$

$$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$$

d. 195112

$$\sqrt[3]{195112} = \sqrt[3]{\overline{2 \times 2 \times 2} \times \overline{29 \times 29 \times 29}}$$

$$= 2 \times 29 = 58$$

2	195112
2	97556
2	48778
29	24389
29	841
29	29
	1

$$\begin{aligned}
 18. \text{ a. } \quad & \sqrt[3]{\frac{512}{729}} = \frac{\sqrt[3]{512}}{\sqrt[3]{729}} \\
 &= \frac{\sqrt[3]{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}}{\sqrt[3]{3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3}} \\
 &= \frac{2 \times 2 \times 2}{3 \times 3} = \frac{8}{9}
 \end{aligned}$$

2	512
2	256
2	128
2	64
2	32
	1

2	16
2	8
2	4
2	2
	1

3	729
3	243
3	81
3	27
3	9
3	3
	1

$$\begin{aligned}
 \text{b. } \quad & \sqrt[3]{\frac{1728}{2744}} = \frac{\sqrt[3]{1728}}{\sqrt[3]{2744}} \\
 &= \frac{\sqrt[3]{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3}}{\sqrt[3]{2 \times 2 \times 2 \times 7 \times 7 \times 7}} \\
 &= \frac{2 \times 2 \times 3}{2 \times 7} = \frac{12}{14} = \frac{6}{7}
 \end{aligned}$$

2	1728
2	864
2	432
2	216
2	108
	1

2	54
3	27
3	9
3	3
	1

2	2744
2	1372
2	686
7	343
7	49
7	7
	1

$$\begin{aligned}
 \text{c. } \quad & \sqrt[3]{\frac{3375}{5832}} \\
 &= \frac{\sqrt[3]{3 \times 3 \times 3 \times 5 \times 5 \times 5}}{\sqrt[3]{2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3}} \\
 &= \frac{3 \times 5}{2 \times 3 \times 3} = \frac{15}{18} = \frac{5}{6}
 \end{aligned}$$

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
	1

3	9
3	3
	1

$$\begin{aligned}
 \text{d. } \quad & \sqrt[3]{\frac{2197}{6859}} = \frac{\sqrt[3]{2197}}{\sqrt[3]{6859}} \\
 &= \frac{\sqrt[3]{13 \times 13 \times 13}}{\sqrt[3]{19 \times 19 \times 19}} \\
 &= \frac{13}{19}
 \end{aligned}$$

13	2197
13	169
13	13
	1

19	6859
19	361
19	19
	1

$$19. 185200 = 2 \times 2 \times 5 \times \overline{3 \times 3 \times 3} \times \overline{7 \times 7 \times 7}$$

Hence, the prime factor 2 and 5 is not in group of three.

So, we need one more (2) and two more (5) to make it a perfect cube.

Hence, 185220 must be multiply by 50 to make it a perfect cube.

2	185220
2	92610
3	46305
3	15435
3	5145
5	1715
7	343
7	49
7	7
	1

20. 819200

2	819200	2	6400	2	100
2	409600	2	3200	2	50
2	204800	2	1600	5	25
2	102400	2	800	5	5
2	51200	2	400		1
2	25600	2	200		
2	12800				

$$819200 = \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times 5 \times 5$$

Hence, the prime factor 5 is not in group of three.

So, we need one more 5 to make it a perfect cube.

Hence, 819200 must be divided by 25 to make it a perfect cube.

Multiple Choice Questions

- | | | |
|--------|--------|--------|
| 1. (c) | 2. (d) | 3. (c) |
| 4. (b) | 5. (b) | 6. (a) |

CHAPTER-2: POWER PLAY

Assessment Time 2.1

- $(-6)^8$ Hence, -6 is the base and 8 is the exponents.
 - $\left(\frac{3}{7}\right)^7$ Hence, $\frac{3}{7}$ is the base and 7 is the exponents.
 - $\left(\frac{-8}{9}\right)^6$ Hence, $\frac{-8}{9}$ is the base and 6 is the exponents.
 - $\left(\frac{-13}{23}\right)^5$ Hence, $\frac{-13}{23}$ is the base and 5 is the exponents.
- $(-4) \times (-4) \times (-4) \times (-4) = (-4)^4$
 - $7 \times 7 \times 7 \times 7 \times 7 \dots m \text{ times} = 7^m$
 - $\left(\frac{-11}{8}\right) \times \left(\frac{-11}{8}\right) \times \left(\frac{-11}{8}\right) \times \left(\frac{-11}{8}\right) = \left(\frac{-11}{8}\right)^4$
 - $\left(\frac{-5}{9}\right) \times \left(\frac{-5}{9}\right) \times \left(\frac{-5}{9}\right) \times \dots n \text{ times} = \left(\frac{-5}{9}\right)^n$
- $\frac{27}{125} = \frac{3 \times 3 \times 3}{5 \times 5 \times 5} = \left(\frac{3}{5}\right)^3$
 - $\frac{-64}{343} = \frac{(-4) \times (-4) \times (-4)}{7 \times 7 \times 7} = \left(\frac{-4}{7}\right)^3$
 - $\frac{-32}{243} = \frac{-2 \times -2 \times -2 \times -2 \times -2}{3 \times 3 \times 3 \times 3 \times 3} = \left(\frac{-2}{3}\right)^5$
 - $\frac{-81}{625} = \frac{(-3) \times (-3) \times (-3) \times (-3)}{5 \times 5 \times 5 \times 5} = \left(\frac{-3}{5}\right)^4$
- $\left(\frac{2}{5}\right)^4 \times \left(\frac{2}{5}\right)^6 \times \left(\frac{2}{5}\right)^3 = \left(\frac{2}{5}\right)^{4+6+3} = \left(\frac{2}{5}\right)^{13}$

- b. $\left(\frac{-6}{7}\right)^4 \times \left(\frac{-6}{7}\right)^8 \times \left(\frac{-6}{7}\right)^5 = \left(\frac{-6}{7}\right)^{4+8+5} = \left(\frac{-6}{7}\right)^{17}$
- c. $\left(\frac{5}{8}\right)^7 \div \left(\frac{5}{8}\right)^4 = \left(\frac{5}{8}\right)^{7-4} = \left(\frac{5}{8}\right)^3$
- d. $\left(\frac{-3}{7}\right)^{13} \div \left(\frac{-3}{7}\right)^8 = \left(\frac{-3}{7}\right)^{13-8} = \left(\frac{-3}{7}\right)^5$
5. a. $(6^4)^3 = 6^{4 \times 3} = 6^{12}$
- b. $\left[\left(\frac{-8}{9}\right)^3\right]^4 = \left(\frac{-8}{9}\right)^{3 \times 4} = \left(\frac{-8}{9}\right)^{12}$
- c. $\left[\left(\frac{3}{2}\right)^4\right]^0 = \left(\frac{3}{2}\right)^0 = 1$
- d. $\left[\left(\frac{-5}{7}\right)^0\right]^4 = \left(\frac{-5}{7}\right)^{0 \times 4} = 1$
6. a. $\left[\left(\frac{1}{2}\right)^4 - \left(\frac{1}{2}\right)^3\right] \times 4^2 = \left(\frac{1}{2 \times 2 \times 2 \times 2} - \frac{1}{2 \times 2 \times 2}\right) \times 16$
 $= \left(\frac{1}{16} - \frac{1}{8}\right) \times 16$
 $= \left(\frac{1-2}{16}\right) \times 16 = -1$
- b. $(4^2 - 3^2) \times \frac{1}{49} = (4 \times 4 - 3 \times 3) \times \frac{1}{49}$
 $= (16 - 9) \times \frac{1}{49} = \frac{7}{49} = \frac{1}{7}$
7. a. $\frac{3^4 \times x^5 \times y^2}{3^2 \times x^2 y^4} = 3^{4-2} \times x^{5-2} \times y^{2-4}$
 $= 3^2 \times x^3 \times y^{-2} = \frac{9x^3}{y^2}$
- b. $\frac{5^3 \times a^4 \times b^6 \times c^2}{5^5 \times a^2 \times b^2 \times c^5} = 5^{3-5} \times a^{4-2} \times b^{6-2} \times c^{2-5}$
 $= 5^{-2} \times a^2 \times b^4 \times c^{-3} = \frac{a^2 \times b^4}{5^2 \times c^3}$
8. a. $5^m \div 5^2 = 125$
 $5^m \div 5^2 = 5^3$
 (on comparing the exponent)
 $m - 2 = 3$
 $m = 3 + 2 = 5$
 $10 = 2m$
- b. $2^{2m+4} = 2^{2(2m-3)}$
 (on comparing the exponent)
 $2m + 4 = 2(2m - 3)$
 $2m + 4 = 4m - 6$
 $4 + 6 = 4m - 2m$
 $m = \frac{10}{2} = 5$

Assessment Time 2.2

1. a. $x^m \times x^{-n} = x^{m-n}$
- b. $(x^{-6})^3 = x^{-18}$
- c. $a^5 \div a^{-3} = a^{5-(-3)} = a^{5+3} = a^8$
- d. $a^{-6} \div a^{-5} = a^{-6-(-5)} = a^{-6+5} = a^{-1}$
2. a. $6^3 \times 6^{-5} = 6^{3-5}$
- b. $9^{-3} \times 9^{-6} \times 9^{-5} = 9^{-3-6-5}$
 $= 9^{-9-5}$
 $= 9^{-14} = \frac{1}{9^{14}}$
- $= 6^{-2} = \frac{1}{6^2}$

- c. $\left(\frac{5}{4}\right)^{-3} \times \left(\frac{5}{4}\right)^6 \times \left(\frac{5}{4}\right)^{-2} = \left(\frac{5}{4}\right)^{-3+6-2}$
 $= \left(\frac{5}{4}\right)^{6-5} = \frac{5}{4}$
- d. $\left(\frac{-6}{11}\right)^{-4} \times \left(\frac{-6}{11}\right)^{-2} = \left(\frac{-6}{11}\right)^{-4-2}$
 $= \left(\frac{-6}{11}\right)^{-6} = \left(\frac{-11}{6}\right)^6$
3. a. $10^{-6} \div 10^{-4} = 10^{-6-(-4)}$
 $= 10^{-6+4} = 10^{-2} = \frac{1}{10^2}$
- b. $\left(\frac{7}{2}\right)^{-3} \div \left(\frac{7}{2}\right)^{-5} = \left(\frac{7}{2}\right)^{-3-(-5)}$
 $= \left(\frac{7}{2}\right)^{-3+5} = \left(\frac{7}{2}\right)^2$
- c. $\left(\frac{-3}{5}\right)^{-4} \div \left(\frac{-3}{5}\right)^{-4} = \left(\frac{-3}{5}\right)^{-4-(-4)}$
 $= \left(\frac{-3}{5}\right)^0 = 1$
- d. $\left(\frac{-6}{7}\right)^5 \div \left(\frac{-7}{6}\right)^3 = \left(\frac{-6}{7}\right)^5 \div \left(\frac{-6}{7}\right)^{-3}$
 $= \left(\frac{-6}{7}\right)^{5-(-3)} = \left(\frac{-6}{7}\right)^{5+3} = \left(\frac{-6}{7}\right)^8$
4. a. $(3)^{-9} \times 3^0 \div 5^{-1} = \frac{1}{3^9} \div \frac{1}{5} = \frac{5}{3^9} = \frac{5}{19,683}$
- b. $(-4)^{-2} \times (5)^{-3} \times 5^4 = \frac{1}{(-4)^2} \times \frac{1}{(5)^3} \times 5^4$
 $= \frac{5 \times 5 \times 5 \times 5}{(-4) \times (-4) \times 5 \times 5 \times 5 \times 5} = \frac{5}{16}$
- c. $3^{-2} \times \left(\frac{5}{9}\right)^0 \times 4^2 = \frac{1}{3 \times 3} \times 4^2 = \frac{1}{9} \times 16 = \frac{16}{9}$
- d. $\left[\left(\frac{-2}{7}\right)^0 + \left(\frac{3}{7}\right)^0\right] \div 7^0 = [1 + 1] \div 1 = 2 \div 1 = 2$
5. a. $(4^{-1} + 5^{-1}) \times 2^2 = \left(\frac{1}{4} + \frac{1}{5}\right) \times 4$
 $= \frac{5+4}{20} \times 4 = \frac{9 \times 4}{20} = \frac{9}{5}$
- b. $(3^{-1} + 5^{-1} + 10^{-1})^{-1} = \left(\frac{1}{3} + \frac{1}{5} + \frac{1}{10}\right)^{-1}$
 $= \left(\frac{10+6+3}{30}\right)^{-1} = \left(\frac{19}{30}\right)^{-1} = \frac{30}{19}$
- c. $\left\{\left(\frac{1}{3}\right)^{-2} - \left(\frac{1}{2}\right)^{-2}\right\} \div \left(\frac{1}{4}\right)^{-2} = [(3)^2 - (2)^2] \div (4)^2$
 $= (9 - 4) \div (4)^2 = 5 \div 16 = \frac{5}{16}$
- d. $\left[\left(\frac{-5}{7}\right)^{-1} \times \left(\frac{10}{21}\right)^{-1}\right] \div \left(\frac{4}{14}\right)^{-1} = \left(\frac{-7}{5} \times \frac{21}{10}\right) \div \frac{14}{4}$
 $= \frac{-147}{50} \div \frac{14}{4} = \frac{-144}{50} \times \frac{4}{14}$
 $= \frac{-21}{25} \times \frac{2}{2} = \frac{-21}{25}$
6. a. $(169)^{\frac{3}{2}} = (13)^{2 \times \frac{3}{2}} = (13)^3 = 13 \times 13 \times 13 = 2197$
- b. $(729)^{\frac{-5}{6}} = 3^{6 \times \frac{-5}{6}} = 3^{(-5)}$
 $= \frac{1}{3^5} \frac{1}{3 \times 3 \times 3 \times 3 \times 3} = \frac{1}{243}$

$$\begin{aligned} \text{c. } \left(\frac{125}{343}\right) &= \left(\frac{5}{7}\right)^{3 \times \frac{-2}{3}} = \left(\frac{5}{7}\right)^{-2} \\ &= \left(\frac{7}{5}\right)^2 = \frac{49}{25} \end{aligned}$$

$$\text{d. } \left(\frac{32}{729}\right)^{\frac{-2}{5}} = \left(\frac{2}{3}\right)^{5 \times \frac{-2}{5}} = \left(\frac{2}{3}\right)^{-2} = \left(\frac{3}{2}\right)^2 = \left(\frac{9}{4}\right)$$

$$7. \text{ a. } 5^{m-3} = 1$$

On comparing the exponent

$$m - 3 = 0$$

$$m = 3$$

$$\text{b. } (-4)^4 \times (-4)^{2m-1} = (-4)^{3m}$$

$$(-4)^{4+2m-1} = (-4)^{3m}$$

$$(-4)^{3+2m} = (-4)^{3m}$$

On comparing the exponent

$$3 + 2m = 3m$$

$$3 = 3m - 2m$$

$$m = 3$$

$$\text{c. } 6^m \div 6^{-4} = 6^3$$

$$6^{m+4} = 6^3$$

On comparing the exponent

$$m + 4 = 3$$

$$m = 3 - 4 = -1$$

$$m = -1$$

$$\text{d. } \left(\frac{-6}{7}\right)^2 \times \left(\frac{-6}{7}\right)^{2m-1} = \left(\frac{-6}{7}\right)^{-2}$$

$$\left(\frac{-6}{7}\right)^{2+2m-1} = \left(\frac{-6}{7}\right)^{-2}$$

$$\left(\frac{-6}{7}\right)^{2m+1} = \left(\frac{-6}{7}\right)^2$$

On comparing the exponent

$$2m + 1 = 2$$

$$2m = 2 - 1 = 1$$

$$m = \frac{1}{2}$$

SEL-Social Behaviour

$$\text{Dengali} = 64 = 2^6$$

$$\text{Marathis} = 256 = 2^8$$

$$\text{Total people} = 64 + 256 = 320$$

$$\begin{aligned} \text{Total handshakes} &= \frac{n(n-1)}{2} \\ &= \frac{320(320-1)}{2} = 50880 \end{aligned}$$

Critical Thinking Skills

$$\frac{a}{b} = \left(\frac{5}{2}\right)^{-2} \div \left(\frac{3}{4}\right)^0$$

$$\frac{a}{b} = \left(\frac{5}{2}\right)^{-2} \div 1$$

$$\frac{a}{b} = \left(\frac{2}{5}\right)^2$$

$$\frac{a}{b} = \frac{4}{25}$$

$$\left(\frac{a}{b}\right)^{-3} = \left(\frac{4}{25}\right)^{-3} = \left(\frac{25}{4}\right)^3 = \frac{15625}{64}$$

Assessment Time 2.3

$$1. \text{ a. } \sqrt{32} = (32)^{\frac{1}{2}}$$

$$\text{c. } \sqrt[5]{\frac{8}{13}} = \left(\frac{8}{13}\right)^{\frac{1}{5}}$$

$$\text{b. } \sqrt[3]{71} = (71)^{\frac{1}{3}}$$

$$\text{d. } \sqrt[7]{\frac{9}{17}} = \left(\frac{9}{17}\right)^{\frac{1}{7}}$$

2. a. $\sqrt[7]{3}$

b. $\sqrt[5]{15}$

c. $\sqrt[7]{\left(\frac{1}{4}\right)^3}$

d. $\sqrt[6]{\left(\frac{3}{11}\right)}$

3.
$$\begin{aligned} 4^{\frac{1}{3}} \times (4)^{3 \times \frac{1}{2}} \times 4^{\frac{2}{3}} &= 4^{\frac{1}{3}} \times (4)^{\frac{3}{2}} \times 4^{\frac{2}{3}} \\ &= 4^{\left(\frac{1}{3} + \frac{3}{2} + \frac{2}{3}\right)} = 4^{\left(\frac{2+9+4}{6}\right)} \\ &= 4^{\left(\frac{15}{6}\right)} = 4^{\left(\frac{5}{2}\right)} \end{aligned}$$

b. $(125)^{\frac{-2}{3}} \times (64)^{\frac{5}{3}}$

$$= 5^{3 \times \frac{-2}{3}} \times 4^{3 \times \frac{5}{3}}$$

$$= (5)^{-2} \times (4)^5$$

$$= \frac{1}{(5)^2} \times (4)^5 = \frac{1024}{25}$$

d. $(216)^{\frac{-1}{3}} \times (216)^{\frac{2}{3}} \times (216)^{\frac{-4}{3}}$

$$= (216)^{\frac{-1}{3} + \frac{2}{3} - \frac{4}{3}} = (216)^{\frac{-3}{3}}$$

$$= (6^3)^{\frac{-3}{3}} = (216)^{-1} = \frac{1}{216}$$

4. a. $(5^2 + 12^2)^{\frac{3}{2}}$

$$= (25 + 144)^2$$

$$= (169)^{\frac{3}{2}} = (13)^{2 \times \frac{3}{2}}$$

$$= (13)^3 = 2197$$

b. $(1^3 + 2^3 + 3^3)^{\frac{-3}{2}}$

$$= (1 + 8 + 27)^{\frac{-3}{2}}$$

$$= (36)^{\frac{-3}{2}} = (6)^{2 \times \frac{-3}{2}}$$

$$= (6)^{-3} = \frac{1}{216}$$

c. $(27)^{\frac{2}{3}} \times (27)^{\frac{1}{3}} \times (27)^{\frac{-4}{3}}$

$$= (27)^{\frac{2}{3} + \frac{1}{3} - \frac{4}{3}}$$

$$= (27)^{\frac{-1}{3}} = 3^{(3 \times \frac{-1}{3})}$$

$$= 3^{-1} = \frac{1}{3}$$

c. $(10^2 - 8^2)^{\frac{1}{2}}$

$$= (100 - 64)^{\frac{1}{2}}$$

$$= (36)^{\frac{1}{2}} = 6^{2 \times \frac{1}{2}} = 6$$

d. $(17^2 - 8^2)^{\frac{1}{2}}$

$$= (289 - 64)^{\frac{1}{2}}$$

$$= (225)^{\frac{1}{2}} = (15)^{2 \times \frac{1}{2}} = 15$$

5. a. $(0.008)^{\frac{-2}{3}}$

$$= (0.2^3)^{\frac{-2}{3}}$$

$$= (0.2)^{3 \times \frac{-2}{3}} = (0.2)^{-2}$$

$$= (0.04)^{-1} = \frac{1}{0.04}$$

b. $(0.125)^{\frac{-2}{3}}$

$$= (0.5^3)$$

$$= (0.5)^{3 \times \frac{-2}{3}} = (0.5)^{-2}$$

$$= (0.25)^{-1} = \frac{1}{0.25}$$

c. $(0.00064)^{\frac{-2}{3}}$

$$= (0.4^3)^{\frac{-2}{3}}$$

$$= (0.4)^{3 \times \frac{-2}{3}} = (0.4)^{-2}$$

$$= (0.16)^{-1} = \frac{1}{0.16}$$

d. $(0.01024)^{\frac{3}{5}}$

$$= \{(0.4)^5\}^{\frac{3}{5}}$$

$$= (0.4)^3 = 0.064$$

$$\begin{aligned}
 6. \quad a. \quad & \sqrt{\frac{49}{64}} \times \sqrt[3]{\frac{343}{512}} \\
 &= \left(\frac{49}{64}\right)^{\frac{1}{2}} \times \left(\frac{343}{512}\right)^{\frac{1}{3}} \\
 &= \left[\left(\frac{7}{8}\right)^2\right]^{\frac{1}{2}} \times \left[\left(\frac{7}{8}\right)^3\right]^{\frac{1}{3}} \\
 &= \frac{7}{8} \times \frac{7}{8} = \frac{49}{64}
 \end{aligned}$$

$$\begin{aligned}
 b. \quad & \sqrt[5]{\frac{243}{3125}} \times \sqrt[3]{\frac{125}{27}} \\
 &= \left[\left(\frac{3}{5}\right)^5\right]^{\frac{1}{5}} \times \left[\left(\frac{5}{3}\right)^3\right]^{\frac{1}{3}} \\
 &= \frac{3}{5} \times \frac{5}{3} = 1
 \end{aligned}$$

$$\begin{aligned}
 c. \quad & \sqrt[4]{\frac{81}{256}} \times \sqrt[5]{\frac{32}{243}} \\
 &= \left[\left(\frac{3}{4}\right)^4\right]^{\frac{1}{4}} \times \left[\left(\frac{2}{3}\right)^5\right]^{\frac{1}{5}} \\
 &= \left(\frac{3}{4}\right)^{4 \times \frac{1}{4}} \times \left(\frac{2}{3}\right)^{5 \times \frac{1}{5}} \\
 &= \frac{3}{4} \times \frac{2}{3} = \frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 d. \quad & \sqrt[5]{\frac{16}{625}} \times \sqrt[5]{\frac{2}{5}} = \sqrt[5]{\frac{16}{625} \times \frac{2}{5}} \\
 &= \left[\left(\frac{2}{5}\right)^5\right]^{\frac{1}{5}} = \frac{2}{5}
 \end{aligned}$$

$$\begin{aligned}
 7. \quad a. \quad & 4x^{\frac{-2}{5}} \times 5x^{\frac{-3}{10}} = 5 \times 4 \times x^{\frac{-2}{5} + \frac{-3}{10}} \\
 &= 20x^{\frac{-4-3}{10}} \\
 &= 20x^{\frac{-7}{10}} = \frac{10}{x^{\frac{7}{10}}}
 \end{aligned}$$

$$\begin{aligned}
 b. \quad & (y^{-3})^4 \times (x^{\frac{-3}{5}})^{10} = y^{-12} \times x^{\frac{-3}{5} \times 10} \\
 &= y^{-12} \times x^{-6} \\
 &= x^{-6} y^{-12} = \frac{1}{x^6 y^{12}}
 \end{aligned}$$

$$\begin{aligned}
 c. \quad & \left[\sqrt[3]{\left(\frac{a}{b}\right)^9} \right]^{-15} = \left[\left(\frac{a}{b}\right)^{\frac{1}{3} \times 9} \right]^{-15} \\
 &= \left[\left(\frac{a}{b}\right)^3 \right]^{-15} = \left(\frac{a}{b}\right)^{-45} = \left(\frac{b}{a}\right)^{45}
 \end{aligned}$$

$$\begin{aligned}
 d. \quad & \left[\sqrt[4]{\left(\frac{m}{n}\right)^{-16}} \right]^{\frac{1}{4}} = \left[\left(\frac{m}{n}\right)^{\frac{1}{4} \times (-16)} \right]^{\frac{1}{4}} \\
 &= \left(\frac{m}{n}\right)^{-4 \times \frac{1}{4}} = \left(\frac{m}{n}\right)^{-1} = \frac{n}{m}
 \end{aligned}$$

$$\begin{aligned}
 8. \quad a. \quad & \frac{3^{-4} \times 5^{-2} \times 27^{\frac{2}{3}}}{6^3 \times (125)^{\frac{1}{3}} \times (49)^{\frac{-1}{2}}} \\
 &= \frac{3^{-4} \times 5^{-2} \times 3^{3 \times \frac{2}{3}}}{6^3 \times (5^3)^{\frac{1}{3}} \times (7^2)^{\frac{-1}{2}}} \\
 &= \frac{3^{-4} \times 5^{-2} \times 3^2}{6^3 \times (5^3)^{\frac{1}{3}} \times (7^2)^{\frac{-1}{2}}} \\
 &= \frac{3^{-4} \times 5^{-2} \times 3^{3 \times \frac{2}{3}}}{6^3 \times 5 \times 7^{-1}} \\
 &= \frac{3^{-4} \times 5^{-2} \times 3^2}{6^3 \times 5 \times 7^{-1}} \\
 &= \frac{7 \times 3^{-4+2} \times 5^{-2-1}}{2^3 \times 3^3}
 \end{aligned}$$

$$= \frac{7 \times 3^{-2-3} \times 5^{-3}}{2^3}$$

$$= \frac{7 \times 3^{-5} \times 5^{-3}}{2^3}$$

$$= \frac{7}{2^3 \times 3^5 \times 5^3}$$

$$\begin{aligned}
 b. \quad & \frac{(2^2)^{-2} \times 5^{-3} \times 4^{3 \times \frac{2}{3}}}{5^{3 \times \left(\frac{-2}{3}\right)} \times (10^3)^{\frac{2}{3}} \times 3^2} \\
 &= \frac{2^{-4} \times 5^{-3} \times 16}{5^{-2} \times 10^2 \times 3^2} \\
 &= \frac{2^{-4} \times 5^{-3} \times 2^4}{5^{-2} \times 2^2 \times 5^2 \times 3^2} \\
 &= \frac{2^{-4+4} \times 5^{-3-(-2)-2}}{2^2 \times 3^2}
 \end{aligned}$$

$$= \frac{1}{5^3 \times 2^2 \times 3^2} = \frac{1}{125 \times 4 \times 9}$$

$$= \frac{1}{4500}$$

c. $(x^{-15}y^{10})^{\frac{1}{5}} \div (x^{14}y^{-7})^{\frac{1}{7}}$

$$= x^{-15 \times \frac{1}{5}} y^{10 \times \frac{1}{5}} \div x^{14 \times \frac{1}{7}} y^{-7 \times \frac{1}{7}}$$

$$= x^{-3} y^2 \div x y^{-1} = \frac{x^{-3} y^2}{x^1 y^{-1}} = x^{-3-2} y^{2-(-1)}$$

$$= x^{-5} y^3 = \frac{y^3}{x^5}$$

d. $\sqrt[3]{x^{-6}y^9} \div \sqrt[5]{x^{-5}y^{20}} = (x^{-6}y^9)^{\frac{1}{3}} \div (x^{-5}y^{20})^{\frac{1}{5}}$

$$= x^{-6 \times \frac{1}{3}} y^{9 \times \frac{1}{3}} \div x^{-5 \times \frac{1}{5}} y^{20 \times \frac{1}{5}} = x^{-2} y^3 \div x^{-1} y^4$$

$$= \frac{x^{-2} y^3}{x^{-1} y^4} = x^{-2-(-1)} y^{3-4} = x^{-2+1} y^{-1}$$

$$= x^{-1} y^{-1} = \frac{1}{xy}$$

Assessment Time 11.4

- a. 67500000

$$67500000 = 6.75 \times 10^7$$

Decimal point is shifting by 7 place from right to left.

b. 816000000.0 = 8.16×10^8

Decimal point is shifting by 8 place from right to left.

c. 0.0000673 = 6.73×10^{-5}

Decimal point is shifting by 5 place from left to right.

d. 0.0000000896 = 8.96×10^{-8}

Decimal point is shifting by 8 place from left to right.
- a. $2.76 \times 10^6 = 2760000$

b. $3.59 \times 10^8 = 359000000$

c. $5.6 \times 10^{-5} = 0.000056$

d. $4.76 \times 10^{-7} = 0.000000476$
- a. The speed of the light is 3.0×10^8 m/s

b. 1 nanometre is equal to 1.0×10^{-9} m

c. The size of plant cell is 1.275×10^{-5} m

d. Diameter of the sun is 1.4×10^9 m

Critical Thinking Skills

Thickness of 8 books = $8 \times 25 = 200$ mm

Thickness of 10 paper = $10 \times 0.012 = 0.12$ mm

So, total thickness of stock = $200 + 0.12$

$$= 200.12 \text{ mm}$$

Mental Math

- | | | | |
|-------------|--------------------------|-------------------|---------------------------------|
| 1. -3 | 2. 2 | 3. $\frac{7}{12}$ | 4. $\left(\frac{7}{2}\right)^3$ |
| 5. 648 | 6. 1 | 7. 1 | 8. 13 |
| 9. 0.000632 | 10. 6.7×10^{-5} | | |

Revision Time

1. a. $6^3 = 6 \times 6 \times 6 = 216$ b. $5^{-3} = \frac{1}{5^3} = \frac{1}{5 \times 5 \times 5} = \frac{1}{125}$
 c. $\left(\frac{3}{4}\right)^{-2} = \left(\frac{4}{3}\right)^2 = \frac{4 \times 4}{3 \times 3} = \frac{16}{9}$ d. $\left(\frac{2}{7}\right)^{-3} = \left(\frac{7}{2}\right)^3 = \frac{7 \times 7 \times 7}{2 \times 2 \times 2} = \frac{343}{8}$
2. a. $(\sqrt{7})^0 + 5^0 = 1 + 1 = 2$
 b. $6^0 - 5^0 = 1 - 1 = 0$
 c. $(8^0 + 3^0) + (7^0 - 3^0) = (1 + 1) + (1 - 1) = 2 + 0 = 2$
 d. $\left(\frac{5}{6}\right)^0 + \left(\frac{3}{4}\right)^0 - \left(\frac{6}{7}\right)^0 = 1 + 1 - 1 = 2 - 1 = 1$
3. a. $32^{\frac{-2}{5}} = 2^{5 \times \frac{-2}{5}} = 2^{-2} = \frac{1}{2^2} = \frac{1}{4}$
 b. $\left(\frac{125}{343}\right)^{\frac{-2}{3}} = \left[\left(\frac{5}{7}\right)^3\right]^{\frac{-2}{3}} = \left(\frac{5}{7}\right)^{3 \times \frac{-2}{3}} = \left(\frac{5}{7}\right)^{-2} = \left(\frac{7}{5}\right)^2 = \frac{49}{25}$
 c. $\left(\frac{81}{2401}\right)^{\frac{-1}{4}} = \left\{\left(\frac{3}{4}\right)^4\right\}^{\frac{-1}{4}} = \left(\frac{3}{4}\right)^{-1} = \frac{4}{3}$
 d. $\left(\frac{16}{625}\right)^{\frac{-3}{4}} = \left[\left(\frac{2}{5}\right)^4\right]^{\frac{-3}{4}} = \left(\frac{2}{5}\right)^{4 \times \frac{-3}{4}} = \left(\frac{2}{5}\right)^{-3} = \left(\frac{5}{2}\right)^3 = \frac{125}{8}$
4. a. $\left(\frac{3}{4}\right)^2 \times \left(\frac{3}{4}\right)^{-6} \times \left(\frac{3}{4}\right)^{-4} = \left(\frac{3}{4}\right)^{2-6-7} = \left(\frac{3}{4}\right)^{2-10} = \left(\frac{3}{4}\right)^{-8} = \left(\frac{4}{3}\right)^8$
 b. $(3^{-7} \times 3^{-8}) \div 3^{-20} = (3^{-7-8}) \div 3^{-20}$

$$= 3^{-15} \div 3^{-20} = \frac{3^{-15}}{3^{-20}}$$

$$= 3^{-15-(-20)} = 3^{-15+20} = 3^5$$

 c. $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{4}\right)^{-2} + \left(\frac{-1}{6}\right)^{-2} = (2)^2 + (4)^2 + (-6)^2$

$$= 4 + 16 + 36 = 56$$
5. a. $\left[\left(\frac{3}{25}\right)^{-6}\right]^0 = \left(\frac{3}{25}\right)^{-6 \times 0} = 1$
 b. $\left[\left(\frac{4}{15}\right)^{-2}\right]^3 = \left(\frac{4}{15}\right)^{-6} = \left(\frac{15}{4}\right)^6$
 c. $\left[\left(\frac{-5}{19}\right)^3\right]^0 = \left(\frac{-5}{19}\right)^0 = 1$

30 Key Math-8 (Brainbee)

6. a. $(\sqrt{2})^{2m} = (2)^{\frac{1}{2} \times 2m} = 2^m$

$$2^m = 2^7$$

On comparing the exponent, we get

$$m = 7$$

b. $\left(\frac{-3}{7}\right)^{3m+4} \times \left(\frac{-3}{7}\right)^{-6} = \left(\frac{-3}{7}\right)^{-2}$

$$\left(\frac{-3}{7}\right)^{3m+4-6} = \left(\frac{-3}{7}\right)^{-2}$$

On comparing the exponent, we get

$$3m - 2 = -2$$

$$3m = 0$$

$$m = 0$$

7. a. $\sqrt[3]{\frac{27}{343}} \times \sqrt[5]{\frac{16807}{243}} = \left(\frac{3}{7}\right)^{3 \times \frac{1}{3}} \times \left(\frac{7}{3}\right)^{5 \times \frac{1}{5}} = \frac{3}{7} \times \frac{7}{3} = 1$

b. $\left[4 \sqrt{\left(\frac{x}{y}\right)^{\frac{-1}{2}}}\right]^{\frac{-2}{3}} = \left[\left(\frac{x}{y}\right)^{\frac{1}{4} \times \frac{-1}{2} \times \frac{-2}{3}}\right] = \left(\frac{x}{y}\right)^{\frac{1}{12}}$

8. a.
$$\begin{aligned} \frac{4^{-3} \times 5^{-2} \times (4^3)^{\frac{2}{3}}}{(5^{-3})^{\frac{-4}{3}} \times (10^4)^{\frac{3}{4}} \times 3^3} &= \frac{4^{-3} \times 5^{-2} \times 4^2}{5^{-4} \times 10^3 \times 3^3} \\ &= \frac{4^{-3} \times 5^{-2} \times 4^2}{5^{-4} \times 2^3 \times 5^3 \times 3^3} = \frac{4^{-1} \times 5^{-2-(-4)-3}}{2^3 \times 3^3} \\ &= \frac{1}{5 \times 5 \times 2^3 \times 3^3} = \frac{1}{2^2 \times 5 \times 2^3 \times 3^3} \\ &= \frac{1}{2^5 \times 5 \times 3^3} \\ &= \frac{1}{27 \times 5 \times 32} = \frac{1}{4320} \end{aligned}$$

b.
$$\begin{aligned} \sqrt[5]{a^{10}b^{-15}} \times \sqrt[3]{a^{-6}b^9} &= a^{10 \times \frac{1}{5}} b^{-15 \times \frac{1}{5}} \times a^{-6 \times \frac{1}{3}} b^{9 \times \frac{1}{3}} \\ &= a^2 b^{-3} \times a^{-2} \times b^3 \\ &= a^{2-2} \times b^{-3+3} \\ &= a^0 \times b^0 = 1 \times 1 = 1 \end{aligned}$$

9. 1.673×10^{-15}

10. 0.000632

Multiple Choice Questions

1. (b)

2. (d)

3. (b)

4. (a)

5. (a)

6. (c)

7. (c)

CHAPTER 3: A STORY OF NUMBERS

Assessment Time 3.1

1. a. XVII < XL

$$\Rightarrow 10 + 5 + 1 + 1 < (50 - 10)$$

$$\Rightarrow 17 < 40$$

- b. $\text{XCVI} > \text{XCIV}$
 $\Rightarrow (100 - 10) + 5 + 1 > (100 - 10) + (5 - 1)$
 $\Rightarrow 96 > 94$
- c. $\text{XLIX} > \text{XLIV}$
 $\Rightarrow (50 - 10) + (10 - 1) > (50 - 10) + (5 - 1)$
 $\Rightarrow 49 > 44$
- d. $\text{CDXLV} > \text{DXCVI}$
 $\Rightarrow (500 - 100) + (50 - 10) + 5 > 500 + (100 - 10) + 5 + 1$
 $\Rightarrow 445 > 596$
2. a. F b. T c. F d. F
3. a. $475 = 400 + 50 + 10 + 10 + 5 = \text{CDLXXV}$
 b. $783 = 500 + 100 + 100 + 50 + 10 + 10 + 10 + 10 + 3 = \text{DCCLXXXIII}$
 c. $815 = 500 + 100 + 100 + 100 + 10 + 5 = \text{DCCCXV}$
 d. $625 = 500 + 100 + 10 + 10 + 5 = \text{DCXXV}$
4. a. $\text{CDXIV} = (500 - 100) + 10 + (5 - 1) = 414$
 b. $\text{CDXLVIII} = (500 - 100) + (40 - 10) + 5 + 3 = 448$
 c. $\text{CLXXVI} = 100 + 50 + 10 + 10 + 5 + 1 = 176$
 d. $\text{DXLVII} = 500 + (50 - 10) + 5 + 2 = 547$

Assessment Time 3.2

1. a. $3045 = 1000 + 1000 + 1000 + 10 + 10 + 10 + 10 + 5$
 $= \overline{\text{X}} \overline{\text{X}} \overline{\text{X}} \text{nnnn}$
- b. $4023 = 1000 + 1000 + 1000 + 1000 + 10 + 10 + 3$
 $= \overline{\text{X}} \overline{\text{X}} \overline{\text{X}} \overline{\text{X}} \text{nn}$
- c. $5667 = 1000 + 1000 + 1000 + 1000 + 1000 + 100 + 100 + 100 + 100 + 100 + 100$
 $+ 10 + 10 + 10 + 10 + 10 + 10 + 7$
 $= \overline{\text{X}} \overline{\text{X}} \overline{\text{X}} \overline{\text{X}} \overline{\text{X}} \text{nnnnnnnnnnnn}$
- d. $32784 = 10000 + 10000 + 10000 + 1000 + 1000 + 100 + 100 + 100 + 100 + 100$
 $+ 100 + 100 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 4$
 $= \text{ppp} \overline{\text{X}} \overline{\text{X}} \text{nnnnnnnnnnnnnnnn}$
- e. $33455 = 10000 + 10000 + 10000 + 1000 + 1000 + 1000 + 100 + 100 + 100 + 100$
 $+ 10 + 10 + 10 + 10 + 10 + 5$
 $= \text{ppp} \overline{\text{X}} \overline{\text{X}} \overline{\text{X}} \text{nnnnnnnnnn}$
- f. $70708 = 10000 + 10000 + 10000 + 10000 + 10000 + 10000 + 10000 + 100 + 100$
 $+ 100 + 100 + 100 + 100 + 100 + 8$
 $= \text{ppppppppnnnnnnnnnn}$

32 Key Math-8 (Brainbee)

2. a. $\begin{array}{c} \text{999} \\ \text{nnnn} \\ \text{nnnn} \\ \text{llllll} \end{array} = 100 + 100 + 100 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 6 = 396$
- b. $\begin{array}{c} \text{X} \text{X} \text{X} \text{X} \text{X} \text{X} \\ \text{9999} \\ \text{llnnnn} \end{array} = 1000 + 1000 + 1000 + 1000 + 1000 + 100 + 100 + 100 + 100 + 10 + 10 + 10 + 10 + 2 = 5442$
- c. $\begin{array}{c} \text{P} \text{P} \\ \text{9999} \\ \text{nnnn} \\ \text{llllll} \end{array} = 10000 + 10000 + 100 + 100 + 100 + 100 + 10 + 10 + 10 + 10 + 8 = 20448$

Assessment Time 3.3

- t1. a. $10 = 5 + 5 = \square\square$ b. $75 = 25 + 25 + 25 = \text{hexagon hexagon hexagon}$
- c. $232 = 125 + 25 + 25 + 25 + 25 + 5 + 2 = \text{circle hexagon hexagon hexagon square triangle triangle}$
- d. $393 = 125 + 125 + 125 + 5 + 5 + 5 + 3 = \text{circle circle circle square square square triangle triangle triangle}$
- e. $751 = 625 + 125 + 1 = \text{pentagon circle triangle}$
2. a. $\begin{array}{c} \text{X} \text{X} \text{X} \\ \text{X} \text{X} \text{X} \\ \text{X} \text{X} \text{X} \end{array} \begin{array}{c} \text{999} \\ \text{999} \\ \text{999} \end{array} \begin{array}{c} \text{lll} \\ \text{lll} \\ \text{lll} \end{array} \text{ and } \begin{array}{c} \text{999} \\ \text{9999} \\ \text{9999} \end{array} \begin{array}{c} \text{llll} \\ \text{llll} \\ \text{ll} \end{array} = \begin{array}{c} \text{X} \text{X} \text{X} \text{X} \text{X} \text{X} \text{999} \\ \text{X} \text{X} \text{X} \text{X} \text{X} \text{X} \text{nnnnnnnn} \end{array}$
- b. $\begin{array}{c} \text{nnn} \\ \text{X} \text{X} \text{X} \text{nnnn} \\ \text{nnn} \end{array} \text{ and } \begin{array}{c} \text{nnn} \text{llll} \\ \text{nnn} \text{llll} \\ \text{n} \text{ll} \end{array} = \text{X} \text{X} \text{X} \text{9nnnnnnnn}$
3. $\text{circle circle hexagon hexagon square triangle triangle} + \text{circle circle circle hexagon square square triangle triangle triangle} = \text{up arrow up arrow up arrow circle circle square}$

Assessment Time 3.4

1. a. $\text{n} \times \text{n} \times \text{n} = 10 \times 10 \times 10 = 10^3 = \text{X}$
- b. $\text{n} \times \text{9} \times \text{9} = 10 \times 10^2 \times 10^2 = 10^5 = \text{eye}$
- c. $\text{X} \times \text{n} \times \text{n} = 10^3 \times 10 \times 10 = 10^5 = \text{eye}$
- d. $\text{P} \times \text{n} \times \text{n} \times \text{n} = 10^4 \times 10 \times 10 \times 10 = 10^7 = \text{sun}$
2. a. $\text{n} \times \text{9} \times \text{9} \times \text{9} = 10 \times 10^2 \times 10^2 \times 10^2 = 10^7 = \text{sun}$
- b. $\text{9} \times \text{9} \times \text{9} = 10^2 \times 10^2 \times 10^2 = 10^6 = \text{eye}$

c. $\Delta \times \mathcal{Q} \times \cap = 10^3 \times 10^2 \times 10 = 10^6 = \mathfrak{U}$

d. $\mathcal{P} \times \mathcal{Q} \times \mathcal{R} = 10^4 \times 10^2 \times 10 = 10^7 = \text{---}\bigodot\text{---}$

3. a. $\cap \times \cap \times \text{egg} = 10 \times 10 \times 10^5 = 10^7 = \text{☼}$

b. $10^2 \times 10^3 = 10^2 \times 10^3 = 10^5 =$ 

c. $\sqrt[3]{10^3} \times \sqrt[3]{10^3} = 10^3 \times 10^3 = 10^6 = 1,000,000$

d. $10^4 \times 10^6 = 10^{10}$ = 

Assessment Time 3.5

1. a. $66 = 50 + 10 + 6$

The diagram shows an equals sign followed by two terms. The first term consists of two rows of three braiding symbols (curved arrows) each. The second term consists of two rows of three identity symbols (vertical lines with triangles at the top and bottom) each.

b. $232 = 180 + 50 + 2$

$$= \begin{array}{c} \diamond 1 \diamond 1 \diamond 1 \\ \blacktriangleleft \blacktriangleleft \blacktriangleleft \\ \blacktriangleleft \blacktriangleleft \blacktriangleleft \end{array}$$

c. $300 = 5 \times 50$

$$= \begin{array}{c} \diamond \\ 1 \end{array} \begin{array}{c} \diamond \\ 1 \end{array} \begin{array}{c} \diamond \\ 1 \end{array} \begin{array}{c} \diamond \\ 1 \end{array} \begin{array}{c} \diamond \\ 1 \end{array}$$

d. $460 = 7 \times 60 + 40$

$$= \begin{array}{ccccccc} \diamond & \diamond & \diamond & \diamond & \blacktriangleleft & \blacktriangleleft \\ \diamond & \diamond & \blacktriangleleft & \blacktriangleleft & & \end{array}$$

e. $4605 = 3600 + 16 \times 60 + 45$

$$= \text{Diagram with diamond 2, 6 black arcs, and diamond 1}$$

Mental Math

1. 10

2. K

3. D

4. X

5. 410

Revision Time

1. a. $79 = 50 + 10 + 10 + (10 - 1) = \text{LXXIX}$

b. $138 = 100 + 10 + 10 + 10 + 5 + 3 = \text{CXXXVIII}$

c. $475 = (500 - 100) + 50 + 10 + 10 + 5 = \text{CDLXXV}$

d. $624 = 500 + 100 + 10 + 10 + 4 = \text{DCXXIV}$

2. a. $\text{CLIX} = 100 + 50 + (10 - 1) = 159$

b. XXXVI = 10 + 10 + 10 + 5 + 1 = 36

c. $\text{XCIV} = (100 - 10) + (5 - 1) = 94$

d. $\text{LXXV} = 50 + 10 + 10 + 5 = 75$

3. a. $458 = 100 + 100 + 100 + 100 + 10 + 10 + 10 + 10 + 10 + 8$

[illegible]

b. $2023 = 1000 + 1000 + 10 + 10 + 3$

$$= \text{diagram with two crossings, two loops, and three vertical lines}$$

c. $3660 = 1000 + 1000 + 1000 + 100 + 100 + 100 + 100 + 100 + 100 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10$

$$= \text{[Diagram showing three vertices connected by wavy lines, followed by two groups of four wavy lines each.]}$$

d. $5784 = 1000 + 1000 + 1000 + 1000 + 1000 + 100 + 100 + 100 + 100 + 100 + 100$
 $+ 100 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 4$

[illegible]

4. a. $25 = 5^2 = \text{hexagon}$

b. $65 = 25 + 25 + 5 + 5 + 5$
 $=$ 

c. $237 = 125 + 25 + 25 + 25 + 25 + 5 + 5 + 2$
 $=$ 

d. $451 = 125 + 125 + 125 + 25 + 25 + 25 + 1$
 $= \bigcirc \bigcirc \bigcirc \hexagon \hexagon \hexagon \triangle$

5. a. $\begin{array}{cccc} \cap & \cap & \cap & | \\ \cap & \cap & \cap & | \\ \cap & \cap & & | \end{array}$ and $\begin{array}{cccc} \cap & \cap & \cap & | \\ \cap & \cap & \cap & | \\ \cap & \cap & & | \end{array}$ = $\begin{array}{cccccccc} \cap & \cap & \cap & \cap & \cap & \cap & \cap & \cap \\ & & & & & & & \\ & & & & & & & \end{array}$

b. 

6. a. $\cap \times \cap \times \text{🐙} = 10 \times 10 \times 10^5 = 10^7 = \text{☼}$

b. $10^2 \times 10^3 = 10^5 =$

c. $\begin{array}{c} \nearrow \\ \Delta \end{array} \times \begin{array}{c} \nearrow \\ \Delta \end{array} \times \begin{array}{c} \nearrow \\ \Delta \end{array} = 10^3 \times 10^3 \times 10^3 = 10^7 \times 10^2 = \begin{array}{c} \text{---} \odot \text{---} \\ \text{---} \end{array} \times \mathcal{Q}$

d. $10^4 \times 10^6 = 10^{10} = 10^7 \times 10^3 = 10^7 \times 10^3$

7. a. $63 = 60 + 3 = \text{one ten, three ones}$

b. $132 = 60 + 60 + 10 + 2 =$   

c. $200 = \underset{\uparrow}{60} + 60 + 60 + \underset{\downarrow}{10} + \underset{\downarrow}{10} = \diamond 1 \diamond 1 \diamond 1 \blacktriangleleft \blacktriangleleft$

d. $60 = \diamond 1$

e. $3605 = 60^2 + 5 = \diamond 2 \quad \begin{array}{c} \nabla \\ \nabla \\ \nabla \\ \nabla \\ \nabla \end{array}$

8. a. $456 = 4 \times 100 + 5 \times 10 + 6$

b. $678 = 6 \times 100 + 7 \times 10 + 8$

c. $5678 = 5 \times 1000 + 6 \times 100 + 7 \times 10 + 8$

d. $8764 = 8 \times 1000 + 7 \times 100 + 6 \times 10 + 4$

MCQs

1. (c)

2. (d)

3. (b)

4. (c)

5. (a)

CHAPTER-4: QUADRILATERALS

Assessment Time 4.1

1. Given angle = 75°

Let the other angles be x

$$\begin{aligned} x + 75^\circ &= 180^\circ & \Rightarrow & & x + 75^\circ &= 180^\circ \\ x &= 180^\circ - 75^\circ & \Rightarrow & & x &= 105^\circ \end{aligned}$$

Hence, other angles are $105^\circ, 75^\circ, 105^\circ$ and 75°

2. Lengths of diagonals of a rectangle are equal.

So, length of other diagonal = length of one diagonal = 10 cm

3. Length of all sides of a rhombus are equal.

So, length of all sides is 12 cm 12 cm and 12 cm.

4. Ratio of angles of a parallelogram = 1 : 3

Let angles are x and $3x$.

Now, $x + 3x = 180^\circ$ (Sum of adjacent angles)

$$4x = 180^\circ \Rightarrow x = 45^\circ$$

Hence, angles are $45^\circ, 135^\circ, 45^\circ, 135^\circ$

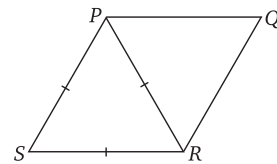
5. a. Rhombus, square b. kite c. rectangle d. square

6. Since, $PR = PS$

But all sides of a rhombus are equal.

So, $\triangle PSR$ is an equilateral triangle

$\angle S = 60^\circ$ and $\angle R = 60^\circ + 60^\circ = 120^\circ$



7. Let the angle of quadrilateral be $4x, 2x, 3x$ and x

$$4x + 2x + 3x + x = 360^\circ$$

$$\Rightarrow 6x + 4x = 360^\circ$$

$$\Rightarrow 10x = 360^\circ$$

$$x = \frac{360^\circ}{10} = 36^\circ$$

$$4x = 4 \times 36 = 144^\circ, 2 \times 36 = 72^\circ, 3 \times 36 = 108^\circ, x = 36^\circ$$

Hence, the angle of quadrilateral be $144^\circ, 72^\circ, 108^\circ, 36^\circ$

8. No. it is not rectangle. It may be rhombus or parallelogram.

9. Square, since both diagonals are equal.

10. Let other side of kite be x m

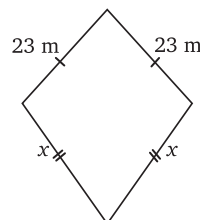
Adjacent sides of a kite are equal.

So, $23 + 23 + x + x = 106$

$$2x = 106 - 46 = 60$$

$$\text{or } x = 30$$

Hence, length of other two sides are 23 m, 30, 30 m.



11. a. Adjacent sides : $PQ, QR; QR, RS; RS, SP; SP, PQ$

b. Adjacent angles : $\angle P, \angle Q; \angle Q, \angle R; \angle R, \angle S; \angle S, \angle P$

c. Diagonals : PR and QS

36 Key Math-8 (Brainbee)

12. a. Square
c. Isosceles trapezium
e. Rhombus
b. Parallelogram
d. Rectangle
f. kite

13. $\angle RQY = 60^\circ$

$\therefore \angle SRQ = \angle RQY = 60^\circ$ (alternate interior angles)

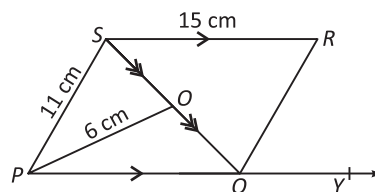
$\angle S + \angle R = 180^\circ$ (co-interior angles)

$\angle S = 180^\circ - 60^\circ = 120^\circ$

$PQ = SR = 15 \text{ cm}$

$QR = SP = 11 \text{ cm}$

$PR = 2 \times OP = 2 \times 6 = 12 \text{ cm}$ (Since diagonals bisect other)



14. $\angle FTI = \angle TIS = 25^\circ$ (alternate interior angles)

In $\triangle OFT$

$\angle SFT + 110^\circ + 25^\circ = 180^\circ$

$\angle SFT = 180^\circ - 135^\circ = 45^\circ$

$\angle OTS = \angle FIO = 35^\circ$ (alternate interior angles)

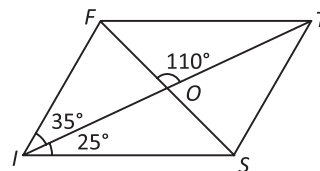
$\angle TOS = 180^\circ - 110^\circ = 70^\circ$

In $\triangle TOS$,

$\angle OST + 70^\circ + 35^\circ = 180^\circ$

$\angle OST = 180^\circ - 105^\circ = 75^\circ$

Hence, $\angle SFT = 45^\circ$, $\angle OST = 75^\circ$, $\angle STO = 35^\circ$



15. $\angle M + \angle O = 180^\circ$

$\frac{1}{2}(\angle M + \angle O) = 90^\circ$

In $\triangle MOQ$,

$\angle MQO + \frac{1}{2}(\angle M + \angle O) = 180^\circ$

$\angle MQO = 180^\circ - 90^\circ = 90^\circ$

16. $\angle B + \angle D = 180^\circ$ (adjacent angles)

$130^\circ + \angle D = 180^\circ$

$\angle D = 180^\circ - 130^\circ = 50^\circ$

$\angle OCD = \angle F = 30^\circ$ (opposite angles of a parallelogram)

In $\triangle OCD$,

$x + 50^\circ + 30^\circ = 180^\circ$

$x = 180^\circ - 80^\circ \Rightarrow x = 100^\circ$

17. Ratio of angles of a quadrilateral = 5 : 4 : 5 : 4

So, angles are $5x$, $4x$, $5x$ and $4x$

Now, $5x + 4x + 5x + 4x = 360^\circ$

$18x = 360^\circ \Rightarrow x = \frac{360^\circ}{18} = 20^\circ$

Hence, angles are 100° , 80° , 100° and 80° . It is a parallelogram.

18. Adjacent angles of a rhombus are equal.

Let each equal angle be x° .

$\therefore x^\circ + x^\circ = 180^\circ$

$$2x = 180^\circ \Rightarrow x = 90^\circ$$

Hence, each angle is 90° . It is a square.

19. Kite is a quadrilateral

20. All properties of square are in rhombus but rhombus has not all properties of square.

Revision Time

1. a. Sum of angles = $30^\circ + 45^\circ + 105^\circ = 180^\circ$

Yes, a triangle can form.

- b. Sum of angles = $60^\circ + 90^\circ + 50^\circ$
 $= 200^\circ \neq 180^\circ$

No, triangle cannot form.

2. Let each equal angle be x° .

$$\therefore 70^\circ + x^\circ + x^\circ = 180^\circ$$

$$2x = 180^\circ - 70^\circ = 110^\circ \Rightarrow x = 55^\circ$$

Hence, each equal angle is 55° .

3. All sides of a square are equal.

So, length of other side is 16 cm.

4. Ratio of adjacent angles = 2 : 3

Let angles be $2x$ and $3x$

$$\text{Now, } 2x + 3x = 180^\circ$$

$$5x = 180^\circ \Rightarrow x = 36^\circ$$

Hence, angles are $72^\circ, 108^\circ, 72^\circ, 108^\circ$.

5. a. Sum of two right angles is 180° , third angle can not zero.

So, triangle cannot possible.

b. yes

c. No, sum of two angles cannot more than 180° .

d. Yes

6. In $\triangle ABD$,

$$\angle ABD + \angle BAD + \angle ADB = 180^\circ \quad \dots(1)$$

In $\triangle CBD$,

$$\angle BDC + \angle CBD + \angle BCD = 180^\circ \quad \dots(2)$$

On adding both eqs, we have

$$\begin{aligned} \angle ABD + \angle BAD + \angle ADB + \angle BDC + \angle CBD + \angle BCD \\ = 180^\circ + 180^\circ = 360^\circ \end{aligned}$$

7. Ratio of angles of a quadrilateral = 2 : 5 : 3 : 2

So, angles are $2x, 5x, 3x$ and $2x$

$$\text{Now, } 2x + 5x + 3x + 2x = 360^\circ$$

$$12x = 360^\circ \Rightarrow x = 30^\circ$$

Hence, angles are $60^\circ, 150^\circ, 90^\circ$ and 60° .

8. Do yourself

9. Sum of adjacent angles = 180°

$$(2x - 4) + (3x - 1) = 180^\circ \Rightarrow 5x - 5 = 180^\circ$$

$$5x = 185^\circ \Rightarrow x = 37^\circ$$

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Hence, angles are $2 \times 37 - 4 = 70^\circ$
and $3 \times 37 - 1 = 110^\circ$

10. It may be square or rectangle.

11. a. Adjacent sides : $KI, IT; IT, TE; TE, EK; EK, KI$
b. Adjacent angles : $\angle K, \angle I; \angle I, \angle T; \angle T, \angle E; \angle E, \angle K$
c. Opposite sides : KI, ET and IT, KE

12. $JF = 8x + 4, EG = 24x - 8$

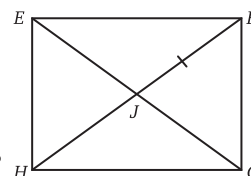
$$\therefore HF = EG$$

$$JF = \frac{1}{2}HF = \frac{1}{2}EG$$

$$8x + 4 = \frac{1}{2}(24x - 8) \Rightarrow 2(8x + 4) = 24x - 8$$

$$16x + 8 = 24x - 8 \Rightarrow 16x - 24x = -8 - 8$$

$$-8x = -16 \quad \text{or} \quad x = 2$$



13. $2y = 120^\circ$ (opposite angles of a parallelogram)

$$y = 60^\circ$$

$$120^\circ + (5x + 10) = 180^\circ \quad (\text{adjacent angles})$$

$$5x = 180^\circ - 130^\circ \Rightarrow 5x = 50^\circ$$

$$x = 10^\circ$$

Hence, $x = 10^\circ, y = 60^\circ$

14. a. $x = 5$ cm (opposite sides of a parallelogram)

$y = 6$ cm (opposite sides of a parallelogram)

b. $QR = RS = PS = PQ = 4$ cm

c. $y^\circ = 80^\circ$ (opposite angles of a || gm)

$$x^\circ + 80^\circ = 180^\circ \quad (\text{adjacent angles})$$

$$x = 180^\circ - 80^\circ = 100^\circ$$

$$z = x = 100^\circ \quad (\text{opposite angles})$$

or $x = 3$ cm (adjacent sides)

$y = 5$ cm (adjacent sides)

CHAPTER 5: NUMBER PLAY

Assessment Time 5.1

- | | |
|---|------------------------------------|
| 1. a. 1, 2, 3, 4, 6, 12 | b. 1, 3, 5, 15 |
| c. 1, 5, 25 | d. 1, 2, 3, 5, 6, 10, 15, 30 |
| e. 1, 2, 3, 4, 5, 6, 10, 12, 15, 30, 60 | f. 1, 2, 5, 7, 10, 14, 35, 70 |
| g. 1, 2, 4, 5, 8, 10, 16, 20, 40, 80 | h. 1, 2, 4, 8, 11, 22, 44, 88 |
| i. 1, 2, 4, 6, 8, 16, 24, 32, 48, 96 | j. 1, 2, 4, 5, 10, 20, 25, 50, 100 |

$$\begin{array}{r} 2. \quad 9 \overline{)95} \\ \underline{-9} \\ 05 \\ \underline{00} \\ 5 \end{array}$$

95 is not exactly divisible by 9. So, 9 is not a factor of 95.

$$\begin{array}{r} 3. \quad 8 \overline{)342} \\ \underline{-32} \\ 22 \\ \underline{-16} \\ 6 \end{array}$$

342 is not exactly divisible by 8.
So, 8 is not a factor of 342.

$$\begin{array}{r} 4. \quad 5 \overline{)120} \\ \underline{-10} \\ 20 \\ \underline{-20} \\ 0 \end{array}$$

120 is exactly divisible by 5.
So, 5 is a factor of 120.

$$\begin{array}{r} 5. \quad 7 \overline{)257} \\ \underline{-21} \\ 47 \\ \underline{-42} \\ 5 \end{array}$$

257 is not exactly divisible by 7.
So, 7 is not a factor of 257.

Assessment Time 5.2

1. a. F b. T c. T d. T
2. a. 5, 10, 15, 20, 25 b. 7, 14, 21, 28, 35
c. 15, 30, 45, 60, 75 d. 27, 54, 81, 108, 135
3. a. 8th multiple of 9 = $8 \times 9 = 72$
b. 6th multiple of 13 = $13 \times 6 = 78$
c. 9th multiple of 12 = $9 \times 12 = 108$
d. 10th multiple of 19 = $19 \times 10 = 190$
4. a. Multiple of 4 are 4, 8, 12, 16, 20, 24, 28
Multiples of 6 are 6, 12, 18, 24, 30,
Two common multiples of 4 and 6 are 12, 24.
b. Multiples of 5 are 5, 10, 15, 20, 25,
Multiples of 10 are 10, 20, 30,
Two common multiples of 5 and 10 are 10, 20.
c. Multiples of 4 are 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44,
Multiples of 5 are 5, 10, 15, 20, 25, 30, 35, 40, 45
Two common multiples of 4 and 5 are 20, 40.
d. Multiples of 6 are 6, 12, 18, 24, 30,
Multiples of 12 are 12, 24, 36, 48, 60,
Two common multiples of 6 and 12 are 12, 24.
5. a. 95 is not divisible by 10, so it is not multiple
b. 124 is not divisible by 6, so it is not multiple
c. 320 is divisible by 5, so it is multiple
d. 368 is divisible by 4, so it is multiple

Assessment Time 5.3

1. Let four consecutive numbers be $x, x + 1, x + 2, x + 3$

According to question,

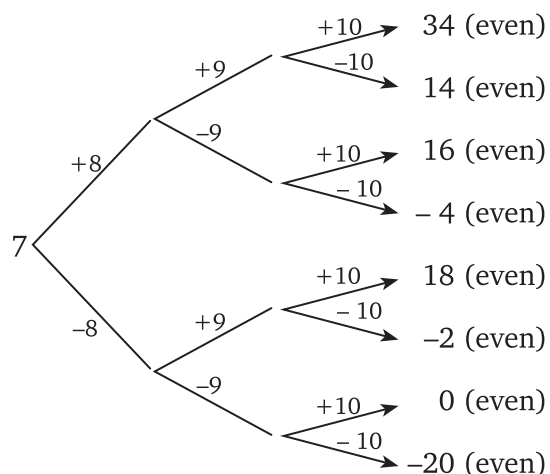
$$x + x + 1 + x + 2 + x + 3 = 45$$

$$\Rightarrow 4x + 6 = 46 \quad \Rightarrow 4x = 46 - 6 = 40$$

$$\therefore x = \frac{40}{4} = 10$$

Hence, numbers are 10, 11, 12, 13

- 2.



All eight results are even numbers.

3. **First Case**

Let number be p .

$$\therefore p = 4k + 3$$

Where $k = 1, 2, 3, \dots$

$$\therefore p_1 = 4 \times 1 + 3 = 7$$

$$p_2 = 4 \times 2 + 3 = 11$$

$$p_3 = 4 \times 3 + 3 = 15$$

So, required numbers are 7, 11, 15,

- Second case**

Let number be q .

$$\therefore q = 7k + 4$$

Where, $k = 1, 2, 3, \dots$

$$q_1 = 7 \times 1 + 4 = 11$$

$$q_2 = 7 \times 2 + 4 = 18$$

$$q_3 = 7 \times 3 + 4 = 25$$

So, required numbers are 11, 18, 25,

4. Let numbers of pebbles be N .

When I group is 5s, yet one's still left, So, possible numbers are 11, 16, 21, 26, 31, 36, 41, 46, 51, 56, 61, 66, 71, 76, 81, 86, 91, 96,

When 9 group is 3's yet one's still left.

So, possible numbers are 31, 61, 91

When I group is 7's, it is perfect.

So, 31 is not divisible by 7.

61 is not divisible by 7.

but 91 is divisible by 7.

Hence, required number is 91.

5. No, Manya's claim is not true because sum of three numbers is divisible by 3.

6. Given,

$$661 = k \times 7 + 3, \text{ where } k = 1, 2, 3, 4, \dots$$

$$\text{and } 4729 = k \times 7 + 5$$

Algebraic Method

(i) $4779 + 661 = 4779 = 682 \times 7 + 5$

Remainder = 5

and $661 = 94 \times 7 + 3$, Remainder = 3

$$\therefore \frac{4779+661}{7} = \frac{5+3}{7} = \frac{8}{7}, 1 \text{ is remainder}$$

(ii) $\frac{4779-661}{7} = \frac{5-3}{7} = \frac{2}{7}, 2 \text{ is remainder}$

Visualization Method

$$\begin{aligned}
 \text{(i)} \quad 4779 + 661 &= (682 \times 7) + 5 + (94 \times 7) + 3 \\
 &= 7(682 + 94) + 5 + 3 \\
 &= 7 \times 776 + 8 \\
 &= \text{Divisible by } 7 + \frac{8}{7}
 \end{aligned}$$

So, 1 is remainder.

$$\begin{aligned}
 \text{(ii)} \quad 4779 - 661 &= (682 \times 7) + 5 - (94 \times 7) + 3 \\
 &= 7(682 - 94) + 2 = 7 \times 588 + 2
 \end{aligned}$$

So, 2 is remainder

7. First Case

$$\begin{aligned}
 p_1 &= 3k + 2 \\
 &= 3 \times 1 + 2 = 5 \\
 &= 3 \times 2 + 2 = 8 \\
 &= 3 \times 3 + 2 = 11 \\
 &= 3 \times 4 + 2 = 14
 \end{aligned}$$

Second Case

$$\begin{aligned}
 p_2 &= 4k + 3 \\
 &= 4 \times 1 + 3 = 7 \\
 &= 4 \times 2 + 3 = 11 \\
 &= 4 \times 3 + 3 = 15
 \end{aligned}$$

Third Case

$$\begin{aligned}
 p_3 &= 5k + 4 \\
 &= 5 \times 1 + 4 = 9 \\
 &= 5 \times 2 + 4 = 14 \\
 &= 5 \times 3 + 4 = 19
 \end{aligned}$$

$$\begin{aligned}
 \text{Smallest number} &= \text{LCM of } (3, 4, 5) - 1 \\
 &= 60 - 1 = 59
 \end{aligned}$$

Hence, required number is 59.

Assessment Time 5.4

1. a. 57284

 $\rightarrow$ 4 is even

So, it is divisible by 2.

c. 75678

 $\rightarrow$ 8 is even

So, it is divisible by 2.

b. 67329

 $\rightarrow$ 9 is odd

So, it is not divisible by 2.

d. 470690

 $\rightarrow$ 0 is divisible by 2

So, it is divisible by 2.

2. a. Sum of digits of 46356 = $4 + 6 + 3 + 5 + 6 = 24$

Yes, it is divisible by 3.

b. Sum of digits of 502831 = $8 + 0 + 2 + 8 + 3 + 1 = 19$

No, it is not divisible by 3.

c. Sum of digits of 672481 = $6 + 7 + 2 + 4 + 8 + 1 = 28$

No, it is not divisible by 3.

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- d. Sum of digits of 960324 = $9 + 6 + 0 + 3 + 2 + 4 = 24$
Yes, it is divisible by 3.
3. a. 74263
 $\begin{array}{r} \text{ } \\ \text{ } \end{array} \rightarrow 63 \text{ is not divisible by 4.}$
 So, it is not divisible by 4.
- b. 98632
 $\begin{array}{r} \text{ } \\ \text{ } \end{array} \rightarrow 32 \text{ is divisible by 4.}$
 So, it is divisible by 4.
- c. 51748
 $\begin{array}{r} \text{ } \\ \text{ } \end{array} \rightarrow 48 \text{ is divisible by 4.}$
 So, it is divisible by 4.
- d. 61433
 $\begin{array}{r} \text{ } \\ \text{ } \end{array} \rightarrow 33 \text{ is not divisible by 4.}$
 So, it is not divisible by 4.
4. a. 83450
 $\begin{array}{r} \text{ } \\ \text{ } \end{array} \rightarrow \text{divisible by 5.}$
 So, it is divisible by 5.
- b. 43955
 $\begin{array}{r} \text{ } \\ \text{ } \end{array} \rightarrow \text{divisible by 5.}$
 So, it is divisible by 5.
- c. 51743
 $\begin{array}{r} \text{ } \\ \text{ } \end{array} \rightarrow \text{not divisible by 5.}$
 So, it is not divisible by 5.
- d. 916380
 $\begin{array}{r} \text{ } \\ \text{ } \end{array} \rightarrow \text{divisible by 5.}$
 So, it is divisible by 5.
5. a. 2645②, divisible by 2.
 Sum of its digits = $2 + 6 + 4 + 5 + 2 = 19$
 19 is not divisible by 3.
 So, it is not divisible by 6.
- b. 6783⑥, divisible by 2.
 Sum of its digits = $6 + 7 + 8 + 3 + 6 = 30$
 30 is divisible by 3.
 So, it is divisible by 6.
- c. 9532⑧, is divisible by 2
 Sum of its digits = $9 + 5 + 3 + 2 + 8 = 27$
 30 is divisible by 3.
 So, it is divisible by 6.
- d. 4596③, is not divisible by 2
 So, it is not divisible by 6.
6. a. 2920
 $\begin{array}{r} \text{ } \\ \text{ } \end{array} \rightarrow \text{divisible by 8.}$
 So, it is divisible by 8.
- b. 71782
 $\begin{array}{r} \text{ } \\ \text{ } \end{array} \rightarrow \text{not divisible by 8.}$
 So, it is not divisible by 8.
- c. 71520
 $\begin{array}{r} \text{ } \\ \text{ } \end{array} \rightarrow \text{divisible by 8.}$
 So, it is divisible by 8.
- d. 67285
 $\begin{array}{r} \text{ } \\ \text{ } \end{array} \rightarrow \text{not divisible by 8.}$
 So, it is not divisible by 8.
7. a. 8235 $\rightarrow$ Sum of its digits = $8 + 2 + 3 + 5 = 18$, divisible by 9
 So, it is divisible by 9.
- b. 35672 $\rightarrow$ Sum of its digits = $3 + 5 + 6 + 7 + 2 = 23$, not divisible by 9
 So, it is not divisible by 9.
- c. 92925 $\rightarrow$ Sum of its digits = $9 + 2 + 9 + 2 + 5 = 27$, divisible by 9
 So, it is divisible by 9.
- d. 98685 $\rightarrow$ Sum of its digits = $9 + 8 + 6 + 8 + 5 = 36$, divisible by 9
 So, it is divisible by 9.
8. a, c
9. a. 658614 $\rightarrow$ Sum of digits in odd places = $4 + 6 + 5 = 15$
 Sum of digits in even places = $1 + 8 + 6 = 15$

- Difference = $15 - 15 = 0$
So, it is divisible by 11.
- b. $592623 \rightarrow$ Sum of digits in odd places = $3 + 6 + 9 = 18$
Sum of digits in even places = $2 + 2 + 5 = 9$
Difference = $18 - 9 = 9$
So, it is not divisible by 11.
- c. $472856 \rightarrow$ Sum of digits in odd places = $6 + 8 + 7 = 21$
Sum of digits in even places = $5 + 2 + 4 = 11$
Difference = $21 - 11 = 10$
So, it is not divisible by 11.
- d. $6586217 \rightarrow$ Sum of digits in odd places = $7 + 2 + 8 + 6 = 23$
Sum of digits in even places = $1 + 6 + 5 = 12$
Difference = $23 - 12 = 11$
So, it is divisible by 11.

Critical Thinking Skills

- a. $772x5 \rightarrow$ Sum of digits = $7 + 7 + 2 + x + 5$
 $= 21 + x \approx 27$
So, x will be 6.
- b. $572y91 \rightarrow$ Sum of digits = $5 + 7 + 2 + y + 9 + 1$
 $= 24 + y \approx 27$
So, y will be 3.

Assessment Time 5.5

- Given:** Number = $4xy4$ (a 4-digit number). It is divisible by 36
Condition for 36: $36 = 4 \times 9$. So number must be divisible by 4 and by 9.
 - Divisible by 4:** Last two digits = $y4$ must be divisible by 4 $\Rightarrow$ possible $y = 0, 2, 4, 6, 8$
 - Divisible by 9:** Sum of digits = $4 + x + y + 4 = x + y + 8$ must be multiple of 9
 $\Rightarrow x + y + 8 = 9$ or 18 or 27 But x is a digit (0-9)
Case A: $x + y + 8 = 9 \Rightarrow x + y = 1$ With y will be $\{0, 2, 4, 6, 8\}$ Pairs: $(x, y) = (1, 0)$ only.
Case B: $x + y + 8 = 18 \Rightarrow x + y = 10$ With y will be $\{0, 2, 4, 6, 8\}$ and $x \in \{0-9\}$ possible:
 $(x, y) = (9, 10)$ not a digit, other fail No solutions
All possible (x, y) : $(1, 0), (2, 8), (4, 6), (6, 4), (8, 2)$
- For the 6-digit number $59a76b$
 $59a76b$ to be divisible by 24, it must be simultaneously divisible by both 6 and 8
(since, $24 = 3 \times 8$, $24 = 3 \times 8$ and they are co-prime)
 - Divisibility by 8 (Last three digits must be divisible by 8):
The last three digits are $76b$. We test value of b such that $76b$ is divisible by 8.

$$\frac{760}{8} = 95 \text{ (divisible)} \qquad \frac{768}{8} = 96 \text{ (divisible)}$$
 - Divisibility by 3
Sum of digits of $59a76b = 5 + 9 + a + 7 + 6 + b$
 $= 27 + a + b$
For $27 + a + b$ to be divisible by 3,

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So, possible pairs where $b = 0$ are $(0, 0)$, $(3, 0)$, $(6, 0)$, $(9, 0)$

Possible pairs where $b = 8$ are $(1, 8)$, $(4, 8)$, $(7, 8)$

Hence, all possible pairs of (a, b) are $(0, 0)$, $(3, 0)$, $(6, 0)$, $(9, 0)$, $(1, 8)$, $(4, 8)$, $(7, 8)$

3. $39 \overline{)70000}(1794$

$$\begin{array}{r} -39 \\ \hline 310 \\ -273 \\ \hline 370 \\ -351 \\ \hline 190 \\ -159 \\ \hline 34 \end{array}$$

So, first multiple of 39 greater than 70,000 = $70,000 + (39 - 34)$
= 70,005

Hence, five multiples are 70005, 70044, 70083, 70122, 70161

4. Three consecutive number are 14, 15 and 16 which are divisible by 7, 5 and 8 respectively.

5. a. Not always

720 is divided by 18 but 027 is not divisible by 18

b. Not possible

6. 0 to 12

7. 3, 4 and 5

8. $7mn5$

If a number is divisible by 15 so it must be divisible by 3 and 5.

For divisibility by 3

$$7 + m + n + 5 = 12 + m + n$$

So, $m + n = 0$ or 3 or 6 or 9

So, possible pairs are $(0, 0)$, $(0, 3)$, $(3, 0)$, $(0, 6)$, $(6, 0)$, $(0, 9)$, $(9, 0)$

9. Let 7 consecutive odd number be $x, x + 2, x + 4, x + 6, x + 8, x + 10, x + 12$

$$\text{Now, } x + 6 = 71$$

$$x = 71 - 6 = 65$$

So, numbers are 65, 67, 69, 71, 73, 75, 77

10. a. $\begin{array}{r} 9567 \\ + 1085 \\ \hline 10652 \end{array}$

b. $\begin{array}{r} 12734 \\ + 12734 \\ \hline 25468 \end{array}$

c. $\begin{array}{r} 8186 \\ + 8106 \\ \hline 16292 \end{array}$

Revision Time

1. Let four consecutive number be $x, x + 1, x + 2, x + 3$

$$x + x + 1 + x + 2 + x + 3 = 82$$

$$\Rightarrow 4x + 6 = 82$$

$$\Rightarrow 3x = 82 - 6$$

$$\Rightarrow x = \frac{76}{4} = 19$$

So, number are 19, 20, 21, 22

2. Required expression $4k + 2$

3. LCM of 12 and 18 is 36
So, required smallest number is 36.
4. $7k + 5$
5. Digital root of $7344 = 7 + 3 + 4 + 4 = 18 = 1 + 8 = 9$
6. $4p8q$
If a number is divisible by 18, it must be divisible by 2 and 9.
Sum of digits $= 4 + p + 7 + 1 = 11 + p + q$
 $= p + q = 7$
So, $p = 7, q = 0$
7. Required numbers are 56, 57, 58
56 is multiple of 8, $57 = 55 + 2$ is 2 more than a multiple of 5.
58 is a multiple of 29.
8.
$$\begin{array}{r} 47 \overline{)40000} (851 \\ \underline{-376} \\ 240 \\ \underline{-235} \\ 50 \\ \underline{-47} \\ 3 \end{array}$$

So, required numbers are $40000 + (47 - 3)$
 $= 40044, 40091, 40138, 40185, 40232$
9. Let 7 consecutive odd numbers be $x, x + 2, x + 4, x + 6, x + 8, x + 10, x + 12$
So, $x + 6 = 53 \Rightarrow x = 53 - 6 = 47$
Hence, numbers are 47, 49, 51, 53, 55, 57, 59,
Sum $= 47 + 49 + 51 + 53 + 55 + 57 + 59 = 371$
10. $13^2 = 169$ (multiple of 169)
 $26^2 = 676$ (multiple of 169)
yes, square of all multiple of 13 is multiple of 169.
11. a. Not always $20 + 30 = 50$ (not a multiple of 20)
b. Not always
c. True

MCQs

- | | | | |
|--------|--------|--------|--------|
| 1. (c) | 2. (a) | 3. (c) | 4. (b) |
| 5. (c) | 6. (d) | 7. (a) | 8. (a) |

CHAPTER-6: WE DISTRIBUTE YET THINGS MULTIPLY**Assessment Time 6.1**

- | | | | |
|----------------------------|---|--------------|---------------|
| 1. a. Positive, negative | b. monomial | c. two terms | d. three or 3 |
| 2. a. $15x^2 - 3y^2 + 2xy$ | The terms are : $15x^2, 3y^2$ and $2xy$ | | |
| b. $6xy + 4y^2$ | The terms are : $6xy, 4y^2$ | | |

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- c. $8y^2 + 18xy - 4$ The terms are : $8y^2$, $18xy$ and 4
- d. $2m^2 + n^2 - 2mn + 5m^2n$ The terms are $2m^2$, n^2 , $2mn$, $5m^2n$
3. a. The like terms are $5x^2y$, $3x^2y - 6yx^2$; $3x^2y^2$, $4x^2y^2$; $14xy$, $-9yx$
- b. The like terms are : $4mn$, $7mn$, $8mn$; $5m^2$, $-3m^2$; $-7n^2$, $4n^2$; $6m^2n$, $-8nm^2$
4. a. $4m^2n + 16n^2$ This algebraic expression has two terms.
So, it is a binomial
- b. $-16mn + 4n^2 + 12n^2m$ This algebraic expression has three terms.
So, it is a trinomial.
- c. $\frac{-15yz}{17}$ This algebraic expression has only one term.
So, it is a monomial.
- d. $\frac{8x^2y}{13}$ This algebraic expression has only one term.
So, it is a monomial.
- e. $5y^2z - 64$ This algebraic expression has only two terms.
So, it is a binomial.
- f. $-4x^2 + 5y^2 + 12xy + 13$ This algebraic expression has more than two terms.
So, it is a polynomial.
5. a. $6x^2 + 5xy - 3xy - 3y^2$ The degree is 2.
- b. $8y^2 + 6x^2y^2 + 4y^5$ The degree is 5.
- c. $4m^2n^3 + 3mn + 5n^2$ The degree is 5.
- d. $\frac{3}{5} a^2b^2c^3 + 2a^5c^4 - 6ab^2$ The degree is 9.
6. a. $(5x^2 + 6xy + 4y^2) + (-16xy + 7x^2 - 9y^2)$
 $= 5x^2 + 6xy + 4y^2 - 16xy + 7x^2 - 9y^2$
 $= (5x^2 + 7x^2) + (4y^2 - 9y^2) + (6xy - 16xy)$
 $= 12x^2 - 5y^2 - 10xy$
- b. $3mn + 4n^2 + 6m^2$ and $-5m^2 - 8n^2 + 5mn$
 $= (3mn + 4n^2 + 6m^2) + (-5m^2 - 8n^2 + 5mn)$
 $= 3mn + 4n^2 + 6m^2 - 5m^2 - 8n^2 + 5mn$
 $= (3mn + 5mn) + (4n^2 - 8n^2) + (6m^2 - 5m^2)$
 $= 8mn - 4n^2 + m^2$
7. a. On arrange the like terms in column, we get
- | | | |
|----------|---------|--------|
| $6m^2$ | $+5n^2$ | $-6mn$ |
| $4m^2$ | $-6n^2$ | $+8mn$ |
| $-10m^2$ | $-3n^2$ | $+4mn$ |
| <hr/> | | |
| | $-4n^2$ | $+6mn$ |
- b. On arranging the terms in column.
- | | | |
|-------------|----------|---------|
| $16y^2$ | $-8x^2$ | $+5xy$ |
| $-9y^2$ | $+4x^2$ | $+3xy$ |
| $(+) 12y^2$ | $-6x^2$ | $+4xy$ |
| <hr/> | | |
| $19y^2$ | $-10x^2$ | $+12xy$ |
8. a. $(7x^2 + 3xy - 2y^2) - (4y^2 + 2xy - 9x^2)$
 $= 7x^2 + 3xy - 2y^2 - 4y^2 - 2xy + 9x^2$
 $= 7x^2 + 9x^2 + 3xy - 2xy - 2y^2 - 4y^2$
 $= 16x^2 + xy - 6y^2$

- b. $(-3m^2 - 8n^2 - 3mn) - (6mn + 5m^2 + 2n^2)$
 $= -3m^2 - 8n^2 - 3mn - 6mn - 5m^2 - 2n^2$
 $= -10n^2 - 8m^2 - 9mn$
9. a. $-7x^2 - 3xy + 4y^2$ from $-6y^2 + 4xy - 3x^2$
 On arranging the terms in column, we get
- b. $5mn + 6m^2n - 3n^2m$ from $5m^2n + 2n^2m - 15mn$
 On arranging the terms in column, we get

$$\begin{array}{r} -6y^2 + 4xy - 3x^2 \\ 4y^2 - 3xy - 7x^2 \\ (-) - \quad + \quad + \\ \hline -10y^2 + 7xy + 4x^2 \end{array}$$

$$\begin{array}{r} 5m^2n + 2n^2m - 15mn \\ 6m^2n - 3n^2m + 5mn \\ (-) - \quad + \quad - \\ \hline -m^2n + 5n^2m - 20mn \end{array}$$

10. a. $4a^2 + 5b^2 - 6ab + 2a^2 - 6b^2 + 7ab + 12a^2$
 $= (4a^2 + 2a^2 + 12a^2) + (5b^2 - 6b^2) + (-6ab + 7ab)$
 $= 18a^2 - b^2 + ab$
- b. $-6mn + 2m^2 + 4n^2 - 2mn + 8mn - 6m^2 - 8n^2$
 $= (-6mn - 2mn + 8mn) + (2m^2 - 6m^2) + (4n^2 - 8n^2)$
 $= -4m^2 + 4n^2$

Assessment Time 6.2

1. a. $5x^2$ by $6x^3y^2$
 $5x^2 \times 6x^3y^2 = (5 \times 6) \times (x^2 \times x^3 \times y^2)$
 $= 30 \times x^{2+3} \times y^2 = 30 \times x^5 \times y^2$
 $= 30x^5y^2$
- b. $(-6m^2n^2p)$ by $(7m^3n^2)$
 $(-6m^2n^2p) \times (7m^3n^2) = (-6 \times 7) \times (m^2 \times m^3 \times n^2 \times n^2 \times p)$
 $= -42 \times (m^{2+3}n^{2+2}p) = -42m^5n^4p$
- c. $\left(\frac{-5}{16}x^2yt^2\right)$ by $\left(\frac{4}{25}y^2t^3\right) = \left(\frac{-5}{16} \times \frac{4}{25}\right) \times (x^2yt^2 \times y^2t^3)$
 $= \frac{-1}{20} \times (x^2 \times y^{1+2} \times t^{2+3}) = \frac{-1}{20} x^2y^3t^5 = \frac{-x^2y^3t^5}{20}$
- d. $\left(\frac{-18}{5}a^2b^3c^2\right)$ by $\left(\frac{-25}{27}a^3b^4c^7\right) = \left(\frac{-18}{5} \times \frac{-25}{27}\right) (a^2b^3c^2 \times a^3b^4c^7)$
 $= \frac{10}{3} (a^{2+3}b^{3+4}c^{2+7}) = \frac{10}{3} a^5b^7c^9$
2. a. $(-7ab^2c) \times (4a^2b^3c^2) = (-7 \times 4)(a^{1+2}b^{2+3}c^{1+2})$
 $= -28 a^3b^5c^3 = -28 (-2)^3 \times \left(\frac{-1}{2}\right)^5 \times (-3)^3$
 $= -28 \times (-8) \times \left(\frac{-1}{32}\right) \times (-27)^3 = (7 \times 27) = 189$
- b. $\left(\frac{-7}{5}m^2n\right) \times \left(\frac{10}{14}n^2p\right) = \left(\frac{-7}{5} \times \frac{10}{14}\right) \times (m^2n^{1+2}p)$
 $= \frac{-1}{4} \times (2)^2 \times (-1)^3 \times 3 = \frac{-1}{4} \times 4 \times (-1) \times 3$
 $= \frac{+12}{4} = 3$

$$\begin{aligned}
 \text{c. } \left(\frac{-5}{7}mn\right) \times \left(\frac{10}{17}n^2p\right) \times \left(\frac{-28}{25}m^2p^2\right) &= \left(\frac{-5}{7} \times \frac{10}{17} \times \frac{-28}{25}\right) \times (m^{2+1} \times n^{1+2} \times p^{2+1}) \\
 &= \frac{4}{7} \times (m^3n^3p^3) = \frac{4}{7} \times [(2)^3 \times (-1)^3 \times (3)^3] \\
 &= \frac{4}{7} \times 8 \times (-1) \times 27 = \frac{32 \times (-27)}{7} = \frac{-864}{7} \\
 \text{d. } \left(\frac{-1}{5}a^2b\right) \times \left(\frac{-3}{8}b^2c^3\right) \times \left(\frac{16}{9}a^3b^2\right) &= \left(\frac{-1}{5} \times \frac{-3}{8} \times \frac{16}{9}\right) \times (a^{2+3}b^{2+1+2}c^3) \\
 &= \frac{2}{15} \times (a^5b^5c^3) = \frac{2}{15} \times (2)^5 \times \left(\frac{-1}{2}\right)^5 \times (-3)^3 \\
 &= \frac{-2}{15} \times 27 = \frac{-18}{5}
 \end{aligned}$$

3. a. Area = Length $\times$ Breadth

$$= 3x \times 5y^2 = 15xy^2$$

Volume = Length $\times$ Breadth $\times$ Height

$$= 3x \times 5y^2 \times 6xy = 90 \times x^{1+1} \times y^{2+1}$$

$$= 90x^2y^3$$

b. Area = Length $\times$ Breadth

$$= 5m^2n \times 3mn = 15m^{2+1} \times n^{1+1} = 15m^3n^2$$

Volume = Length $\times$ Breadth $\times$ Height

$$= 5m^2n \times 3mn \times 2n^3 = 30 \times m^{2+1} \times n^{1+1+3}$$

$$= 30m^3n^5$$

c. Area = Length $\times$ Breadth

$$= 2q \times 4q^2p = 8q^{1+2} \times p = 8q^3p$$

Volume = Length $\times$ Breadth $\times$ Height

$$= 2q \times 4q^2p \times 6p^3 = 48q^{1+2} \times p^{3+1} = 48q^3p^4$$

d. Area = Length $\times$ Breadth

$$= 2l^2m \times 3ln^2 = 6l^{2+1} \times m^{2+1} = 6l^3m^3$$

Volume = Length $\times$ Breadth $\times$ Height

$$= 2l^2m \times 3ln^2 \times 4p^2m$$

$$= 24l^{2+1} \times m^{1+2+1} \times p^2 = 24l^3m^4p^2$$

4. a. $4x \times (y^2 - 3xy) = 4x \times y^2 - 4x \times 3xy$

$$= 4xy^2 - 12x^{1+1}y = 4xy^2 - 12x^2y$$

b. $6m^2n \times (mn - m^2 + 6n^2)$

$$= 6m^2n \times mn - 6m^2n \times m^2 + 6m^2n \times 6n^2$$

$$= 6m^{2+1}n^{1+1} - 6m^{2+2}n + 36m^2n^{1+2}$$

$$= 6m^3n^2 - 6m^4n + 36m^2n^3$$

c. $\frac{5}{7}ab \times (6a^2 - 3ab + 2b^2)$

$$= \frac{5}{7} \times 6 \times a^{2+1} \times b - 3 \times \frac{5}{7} a^{1+1} \times b^{1+1} + 2 \times \frac{5}{7} a \times b^{2+1}$$

$$= \frac{30}{7} \times a^{2+1} \times b - \frac{15}{7} a^{1+1} \times b^{1+1} + \frac{10}{7} a \times b^{2+1}$$

$$= \frac{30}{7} \times a^3b - \frac{15}{7} a^2b^2 + \frac{10}{7} ab^3$$

$$\begin{aligned}
 \text{d. } & \frac{-4}{27}xy^2z \times (x^2 - \frac{3}{8}y^2 + 4z) \\
 &= \frac{-4}{27} \times x^{2+1} \times y^2 \times z - \frac{-4}{27} \times \frac{3}{8} \times x \times y^{2+2} \times z - \frac{-4}{27} \times 4 \times x \times y^2 \times z^{1+1} \\
 &= \frac{-4}{27}x^3y^2z + \frac{1}{18}xy^4z + \frac{16}{27}xy^2z
 \end{aligned}$$

$$\begin{aligned}
 5. \text{ a. } & (2a + b) \times (6b - c) = 2a(6b - c) + b(6b - c) \\
 &= 12ab - 2ac + 6b^2 - bc
 \end{aligned}$$

$$\begin{aligned}
 \text{b. } & (3m^2 + 4n^2) \times (2m - 3n) = 3m^2(2m - 3n) + 4n^2(2m - 3n) \\
 &= 6m^{2+1} - 9m^2n + 8n^2m - 12n^3 \\
 &= 6m^3 - 9m^2n + 8n^2m - 12n^3
 \end{aligned}$$

$$\begin{aligned}
 \text{c. } & (2x^2 - 5y^2) \times (x^2 + 4y^2) = 2x^2(x^2 + 4y^2) - 5y^2(x^2 + 4y^2) \\
 &= 2x^{2+2} + 8x^2y^2 - 5x^2y^2 - 20y^{2+2} \\
 &= 2x^4 + 8x^2y^2 - 5x^2y^2 - 20y^4 \\
 &= 2x^4 + 3x^2y^2 - 20y^4
 \end{aligned}$$

$$\begin{aligned}
 \text{d. } & (3p^2 + q^2) \times (2p^2 - 4q^2) = 3p^2(2p^2 - 4q^2) + q^2(2p^2 - 4q^2) \\
 &= 6p^{2+2} - 12q^2p^2 + 2p^2q^2 - 4q^{2+2} \\
 &= 6p^4 - 12q^2p^2 + 2p^2q^2 - 4q^4 \\
 &= 6p^4 - 10q^2p^2 - 4q^4
 \end{aligned}$$

$$\begin{aligned}
 6. \text{ a. } & (4x - y)(3x - 2y + 4) = 4x(3x - 2y + 4) - y(3x - 2y + 4) \\
 &= 12x^2 - 8xy + 16x - 3xy + 2y^2 - 4y \\
 &= 12x^2 + 2y^2 - 8xy - 3xy + 16x - 4y \\
 &= 12x^2 + 2y^2 - 11xy + 16x - 4y
 \end{aligned}$$

$$\begin{aligned}
 \text{b. } & (4a + 3b)(a^2 - 2ab + b^2) = 4a(a^2 - 2ab + b^2) + 3b(a^2 - 2ab + b^2) \\
 &= 4a^3 - 8a^2b + 4ab^2 + 3a^2b - 6ab^2 + 3b^3 \\
 &= 4a^3 + 3b^3 - 5a^2b - 2ab^2
 \end{aligned}$$

$$\begin{aligned}
 \text{c. } & (5x - 2)(x^2 - 2xy + 2y^2) = 5x(x^2 - 2xy + 2y^2) - 2(x^2 - 2xy + 2y^2) \\
 &= 5x^3 - 10x^2y + 10xy^2 - 2x^2 + 4xy - 4y^2 \\
 &= 5x^3 - 10x^2y + 10xy^2 - 2x^2 + 4xy - 4y^2
 \end{aligned}$$

$$\begin{aligned}
 \text{d. } & (2m - 3n)(m^2 + 4mn + n^2) = 2m(m^2 + 4mn + n^2) - 3n(m^2 + 4mn + n^2) \\
 &= 2m^3 + 8m^2n + 2mn^2 - 3nm^2 - 12mn^2 - 3n^3 \\
 &= 2m^3 + 5m^2n - 10mn^2 - 3n^3
 \end{aligned}$$

7. a.

	4x	-3y
×	4x	+2y
	8xy	-6y ²
	16x ²	-12xy
	16x ²	-4xy -6y ²

b.

	2p ²	+q ²
×	3p ²	-2q ³
	-4p ² q ³	-2q ⁵
		6p ⁴ + 3p ² q ²
	-4p ² q ³	-2q ⁵ + 6p ⁴ + 3p ² q ²

$$\begin{array}{r}
 \begin{array}{r}
 x^2 \quad -5x \quad +6 \\
 \times \quad x^2 \quad +2x \quad +7 \\
 \hline
 7x^2 \quad -35x \quad +42 \\
 2x^3 \quad -10x^2 \quad +12x \\
 \hline
 x^4 \quad -5x^3 \quad +6x^2 \\
 \hline
 x^4 \quad -3x^3 \quad +3x^2 \quad -23x \quad +42
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{r}
 2a \quad +3b \quad +4c \\
 \times \quad 3a \quad -2b \quad +5c \\
 \hline
 10ac \quad +15bc \quad +20c^2 \\
 -4ab \quad -6b^2 \quad -8bc \\
 \hline
 6a^2 \quad +9ab \quad +12ac \\
 \hline
 6a^2 \quad +5ab \quad -6b^2 \quad +22ac \quad +7bc \quad +20c^2
 \end{array}
 \end{array}$$

8. a. $\{(a+b)(c-d)\} + \{(c+d)(a-b)\} + 2(ac+bd)$
 $= a(c-d) + b(c-d) + c(a-b) + d(a-b) + 2(ac+bd)$
 $= ac - ad + bc - bd + ca - cb + da - db + 2ac + 2bd$
 $= 2ac - 2bd + 2ac + 2bd$
 $= 2ac + 2ac = 4ac$
- b. $(3x+4)(2x-5) + (7x-4)(2x+3)$
 $= 3x(2x-5) + 4(2x-5) + 7x(2x+3) - 4(2x+3)$
 $= 6x^2 - 15x + 8x - 20 + 14x^2 + 21x - 8x - 12$
 $= 20x^2 + 6x - 32$
7. a. $(a+b)(2a-3b+c) - (2a-3b)c$
 $= a(2a-3b+c) + b(2a-3b+c) - (2a-3b)c$
 $= 2a^2 - 3ab + ac + 2ab - 3b^2 + bc - 2ac + 3bc$
 $= 2a^2 - 3b^2 - ab - ac + 4bc$
- b. $m^2n(m-n^2) + mn^2(4mn-2m^2) - m^3n(1-2n)$
 $= m^3n - m^2n^3 + 4m^2n^3 - 2m^3n^2 - m^3n + 2m^3n^2$
 $= 3m^2n^3$

SEL-Decision Making

9. $5x + 2xy + 1 + 2xy + 2 + 4y + 3x + 4y + 5 = 8x + 8y + 4xy + 8$
Hence, the expression of total number of student is
 $8x + 8y + 4xy + 8$

Critical Thinking Skills

$$\begin{aligned}
 & \left(\frac{-3}{4} m^2n + 2mn \right) \times \left(\frac{4}{9} mn - 3mn^2 \right) \\
 &= \frac{-3}{4} m^2n \left(\frac{4}{9} mn - 3mn^2 \right) + 2mn \left(\frac{4}{9} mn - 3mn^2 \right) \\
 &= \left(\frac{-3}{4} \times \frac{4}{9} \right) m^{2+1}n^{1+1} + \frac{9}{4} m^{2+1} \times n^{2+1} + 2 \times \frac{4}{9} \times m^{1+1} \times n^{1+1} - 3 \times 2 \times m^{1+1} \times n^{2+1} \\
 &= \frac{-m^3n^2}{3} + \frac{9}{4} m^3n^3 + \frac{8}{9} m^2n^2 - 6m^2n^3 \\
 &\text{Now Putting } m = 2, n = -1 \\
 &= \frac{-1}{3} (2)^3(-1)^2 + \frac{9}{4} (2)^3(-1)^3 - 6(2)^3(-1)^3 \\
 &= \frac{-8}{3} - 18 + 48 = \frac{-8}{3} + 30 \\
 &= \frac{-8 + 90}{3} = \frac{82}{3}
 \end{aligned}$$

Assessment Time 6.3

1. a. $(m+4)(m+3) = m^2 + (4+3)m + 4 \times 3$ $(x+a)(x+b) = x^2 + (a+b)x + ab$
 $= m^2 + 7m + 12$
 - b. $(m^2+4)(m^2-6) = (m^2)^2 + (4+(-6))m^2 + 4 \times (-6)$
 $= m^4 - 2m^2 - 24$
 - c. $\left(y^2 + \frac{3}{11}\right)\left(y^2 - \frac{2}{11}\right) = (y^2)^2 + \left\{\frac{3}{11} + \left(-\frac{2}{11}\right)\right\}y^2 + \frac{3}{11} \times \left(-\frac{2}{11}\right)$
 $= y^4 + \frac{1}{11}y^2 - \frac{6}{121} = y^4 + \frac{y^2}{11} - \frac{6}{121}$
 - d. $(9x+4)(9x-5) = (9x)^2 + (4+(-5))9x + 4 \times (-5)$
 $= 81x^2 - 9x - 20$
-
2. a. $(x+4y)^2 = (x^2) + (4y)^2 + 2 \times x \times 4y$ $(a+b)^2 = a^2 + b^2 + 2ab$
 $= x^2 + 16y^2 + 8xy$
 - b. $(5m-3n)^2 = (5m)^2 + (3n)^2 - 2 \times 5m \times 3n$ $(a-b)^2 = a^2 + b^2 - 2ab$
 $= 25m^2 + 9n^2 - 30mn$
 - c. $(6x^2-2y^2)^2 = (6x^2)^2 + (2y^2)^2 - 2 \times 6x^2 \times 2y^2$ $(a-b)^2 = a^2 + b^2 - 2ab$
 $= 36x^4 + 4y^4 - 24x^2y^2$
 - d. $(0.7x+0.5y)^2 = (0.7x)^2 + (0.5y)^2 + 2 \times 0.7x \times 0.5y$ $(a+b)^2 = a^2 + b^2 + 2ab$
 $= 0.49x^2 + 0.25y^2 + 0.7xy$
 - e. $\left(\frac{2}{5}m + \frac{4}{3}n\right)^2 = \left(\frac{2}{5}m\right)^2 + \left(\frac{4}{3}n\right)^2 + 2 \times \frac{2}{5}m \times \frac{4}{3}n$ $(a+b)^2 = a^2 + b^2 + 2ab$
 $= \frac{4}{25}m^2 + \frac{16}{9}n^2 + \frac{16}{15}mn$
 - f. $\left(\frac{mn}{4} - \frac{p}{3}\right)^2 = \left(\frac{mn}{4}\right)^2 + \left(\frac{p}{3}\right)^2 - 2 \times \frac{mn}{4} \times \frac{p}{3}$
 $= \frac{m^2n^2}{16} + \frac{p^2}{9} - \frac{2mnp}{12}$
 $= \frac{m^2n^2}{16} + \frac{p^2}{9} - \frac{mnp}{6}$
-
3. a. $(3x+4y)(3x-4y) = (3x)^2 - (4y)^2$ $(a+b)(a-b) = a^2 - b^2$
 $= 9x^2 - 16y^2$
 - b. $(a^2+b^2)(a^2-b^2) = (a^2)^2 - (b^2)^2$ $(a+b)(a-b) = a^2 - b^2$
 $= a^4 - b^4$
 - c. $(1.1m-0.4)(1.1m+0.4) = (1.1m)^2 - (0.4)^2$ $(a+b)(a-b) = a^2 - b^2$
 $= 1.21m^2 - 0.16$
 - d. $(mn^2+p)(mn^2-p) = (mn^2)^2 - p^2$ $(a+b)(a-b) = a^2 - b^2$
 $= m^2n^4 - p^2$
 - e. $\left(\frac{x}{2} + \frac{2y}{5}\right)\left(\frac{x}{2} - \frac{2y}{5}\right) = \left(\frac{x}{2}\right)^2 - \left(\frac{2y}{5}\right)^2 = \frac{x^2}{4} - \frac{4y^2}{25}$ $(a+b)(a-b) = a^2 - b^2$
 - f. $\left(\frac{m^2}{4} - \frac{n^2}{3}\right)\left(\frac{m^2}{4} + \frac{n^2}{3}\right) = \left(\frac{m^2}{4}\right)^2 - \left(\frac{n^2}{3}\right)^2 = \frac{m^4}{16} - \frac{n^4}{9}$ $(a+b)(a-b) = a^2 - b^2$
-
4. a. 106×104

- $$\begin{aligned}
 &= (100 + 6) \times (100 + 4) && (x^2 + (a+b)x + ab) \\
 &= (100)^2 + (6 + 4) \times 100 + 6 \times 4 \\
 &= 10000 + 1000 + 24 = 11024
 \end{aligned}$$
- b. $204 \times 196 = (200 + 4) \times (200 - 4) \quad \{(a+b)(a-b) = a^2 - b^2\}$
- $$\begin{aligned}
 &= (200)^2 - (4)^2 \\
 &= 40000 - 16 = 39984
 \end{aligned}$$
- c. $(205)^2 = (200 + 5)^2 = (200)^2 + (5)^2 + 2 \times (200) \times (5)$
- $$\begin{aligned}
 &= 40000 + 25 + 2000 = 42025
 \end{aligned}$$
- d. $(8.9)^2 = (10 - 1.1)^2$
- $$\begin{aligned}
 &= (10)^2 + (1.1)^2 - 2 \times 10 \times 1.1 \\
 &= 100 + 1.21 - 22 = 79.21
 \end{aligned}$$
- c. $142^2 - 141^2 = (142 + 141)(142 - 141) \quad \{a^2 - b^2 = (a+b)(a-b)\}$
- $$\begin{aligned}
 &= 283 \times 1 = 283
 \end{aligned}$$
- f. $(999)^2 = (1000 - 1)^2 = (1000)^2 + (1)^2 - 2 \times 1000$
- $$\begin{aligned}
 &= 1000000 + 1 - 2000 \\
 &= 1000001 - 2000 = 998001
 \end{aligned}$$
5. a. $(5m - 3n)^2 + (5m + 3n)^2 = 25m^2 + 9n^2 - 30mn + 25m^2 + 9n^2 + 30mn$
- $$\begin{aligned}
 &= 50m^2 + 18n^2
 \end{aligned}$$
- b. $(2x + 5)^2 - (2x - 5)^2 = (4x^2 + 25 + 20x) - (4x^2 + 36 - 20x)$
- $$\begin{aligned}
 &= 4x^2 + 25 + 20x - 4x^2 - 36 + 20x \\
 &= 40x
 \end{aligned}$$
- c. $(m^2n - 6p)^2 + 24m^2np = (m^2n)^2 + (6p)^2 - 2 \times mn \times 6p + 24m^2np$
- $$\begin{aligned}
 &= m^4n^2 + 36p^2 - 12m^2np + 24m^2np \\
 &= m^4n^2 + 36p^2 + 12m^2np
 \end{aligned}$$
- d. $(2.5m - 1.5n)^2 - (1.5m - 2.5n)^2$
- $$\begin{aligned}
 &= (2.5m)^2 + (1.5n)^2 - 2 \times 2.5m \times 1.5n - \{(1.5m)^2 + (2.5n)^2 - 2 \times 1.5m \times 2.5n\} \\
 &= 6.25m^2 + 2.25n^2 - 7.5mn - (2.25m^2 + 6.25n^2 - 7.5mn) \\
 &= 6.25m^2 + 2.25n^2 - 7.5mn - 2.25m^2 - 6.25n^2 + 7.5mn \\
 &= 4m^2 - 4n^2
 \end{aligned}$$
- e. $\left(\frac{5}{2}mn - p\right)^2 + \left(\frac{5}{2}mn + p\right)^2$
- $$\begin{aligned}
 &= \left(\frac{5}{2}mn\right)^2 + (p)^2 - 2 \times \frac{5}{2}mn \times p + \left\{\left(\frac{5}{2}mn\right)^2 + (p)^2 + 2 \times \frac{5}{2} \times mn \times p\right\} \\
 &= \frac{25}{4}m^2n^2 + p^2 - 5mnp + \frac{25}{4}m^2n^2 + p^2 + 5mnp \\
 &= \frac{50}{4}m^2n^2 + 2p^2 = \frac{25}{2}m^2n^2 + 2p^2
 \end{aligned}$$
- f. $(a + b)(a - b) + (b + c)(b - c) + (c + a)(c - a)$
- $$\begin{aligned}
 &= a^2 - b^2 + b^2 - c^2 + c^2 - a^2 = 0
 \end{aligned}$$
6. a. $(3x + 7)^2 - 84x = (3x - 7)^2$
- $$\begin{aligned}
 &= (3x)^2 + (7)^2 + 42x - 84x
 \end{aligned}$$

- $$= (3x)^2 + (7)^2 - 42x$$
- $$9x^2 + 49 - 42x = 9x^2 + 49 - 42x$$
- $$\text{LHS} = \text{RHS}$$
- b. $(4pq + 3q)^2 - (4pq - 3q)^2 = 48pq^2$
 $(4pq)^2 + (3q)^2 + 2 \times (4pq) \times (3q) - \{(4pq)^2 + (3q)^2 - 2 \times (4pq) \times (3q)\} = 48pq^2$
 $16p^2q^2 + 9q^2 + 24pq^2 - 16p^2q^2 - 9q^2 + 24pq^2 = 48pq^2$
 $48pq^2 = 48pq^2$
 $\text{LHS} = \text{RHS}$
7. a. $81m^2 + 54mn + 9n^2$, when $m = 1, n = -2$
 $= (9m)^2 + 2 \times 3n \times 9m + (3n)^2 = (9m + 3n)^2$
 $= (9 \times 1 + 3 \times (-2))^2 = (9 - 6)^2 = (3)^2 = 9$
- b. $16x^2 - 48xy + 36y^2$,
 where $x = 2, y = -3$
 $= (4x)^2 - 2 \times 4x \times 6y + (6y)^2$
 $= (4x - 6y)^2$
 $= (4 \times 2 - 6 \times (-3))^2$
 $= (8 + 18)^2$
 $= (26)^2 = 676$
8. a. $x + \frac{1}{x} = 6$
 $\left(x + \frac{1}{x}\right)^2 = (6)^2$
 (On squaring both side)
 $x^2 + 2 \times x \times \frac{1}{x} + \frac{1}{x^2} = 36$
 $x^2 + \frac{1}{x^2} = 36 - 2$
 $x^2 + \frac{1}{x^2} = 34$
- b. $x^2 + \frac{1}{x^2} = 34$
 $\left(x^2 + \frac{1}{x^2}\right)^2 = (34)^2$
 $x^4 + \frac{1}{x^4} + 2 \times x^2 \times \frac{1}{x^2} = 1156$
 $x^4 + \frac{1}{x^4} = 1156 - 2$
9. a. $x - \frac{1}{x} = \sqrt{3}$ (on squaring both side)
 $\left(x - \frac{1}{x}\right)^2 = (\sqrt{3})^2$
 $\Rightarrow x^2 + \frac{1}{x^2} - 2 \times x \times \frac{1}{x} = 3$
 $x^2 + \frac{1}{x^2} = 3 + 2$
 $\Rightarrow x^2 + \frac{1}{x^2} = 5$
- b. $\left(x^2 + \frac{1}{x^2}\right)^2 = (5)^2$ (On squaring both side)
 $x^4 + \frac{1}{x^4} + 2 \times x^2 \times \frac{1}{x^2} = 25$
 $x^4 + \frac{1}{x^4} + 2 = 25$
 $x^4 + \frac{1}{x^4} = 25 - 2$
 $x^4 + \frac{1}{x^4} = 23$
10. $\left(x^2 + \frac{1}{x^2}\right) = 47$
 $\left(x + \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} + 2 \times x \times \frac{1}{x}$
 $\left(x + \frac{1}{x}\right)^2 = 47 + 2$
 $\left(x + \frac{1}{x}\right)^2 = 49$
 $x + \frac{1}{x} = \sqrt{49} = \pm 7$

Critical Thinking Skills

$$\begin{aligned} & \{(x+y)(x-y)\}(x^2+y^2)(x^4+y^4)(x^8+y^8) \\ &= \{(x^2-y^2)(x^2+y^2)\}(x^4+y^4)(x^8+y^8) \\ &= \{(x^4-y^4)(x^4+y^4)\}(x^8+y^8) \\ &= (x^8-y^8)(x^8+y^8) \\ &= x^{16}-y^{16} \end{aligned}$$

Mental Math

- | | | |
|-------------------|-----------------|-------------------------|
| 1. Monomial | 2. Trinomial | 3. 4 |
| 4. 5 | 5. $-15x^2y^3z$ | 6. $-\frac{2}{3}m^5n^2$ |
| 7. $9x^2 - 25y^2$ | 8. 18000 | |

Revision Time

- is a polynomial
- The degree of $7x^2 + 5x + 2$ is 2
 - The degree of $5x^2y^3 + 7x^3 + 15$ is 5
 - The degree of $9m^2 + 7n^3 - 3m^4n^5$ is 9
 - The degree of $51 - 7x$ is 1
- $3y^2z \times (-7x^3yz^2) = -21x^3y^{2+1} \times z^{2+1} = -21x^3y^3z^3$
 - $$\left(\frac{-1}{24}a^3b^7\right) \times (18ab^2) = \left(\frac{-1}{27} \times 18\right)(a^{3+1}) \times (b^{7+2})$$

$$= \frac{-2}{3}a^4b^9 = \frac{-2a^4b^9}{3}$$
 - $$\left(\frac{5}{9}m^3n^2p\right) \times \left(\frac{-18}{25}mn^3p^2\right) = \left\{\frac{5}{9} \times \left(\frac{-18}{25}\right)\right\} \times (m^{3+1} \times n^{2+3} \times p^{2+1})$$

$$= \frac{-2}{5}m^4n^5p^3$$
 - $$\left(\frac{-5}{16}a^3b^2c\right) \times \left(\frac{40}{75}c^3ba^2\right) = \left(\frac{-5}{16} \times \frac{40}{75}\right)(a^{3+2} \times b^{2+1} \times c^{3+1})$$

$$= \frac{-1}{6}a^5b^3c^4 = \frac{-a^5b^3c^4}{6}$$
- $$7x^2 \times (5x + 5y^2 - 3) = 7 \times 5 \times x^{2+1} + 7x^2 \times 5y^2 - 7x^2 \times 3$$

$$= 35x + 35x^2y^2 - 21x^2$$
 - $$10a^2b(0.1a - 0.4b^2) = 0.1 \times 10 \times a \times b \times a^{2+1} - 0.4 \times 10a \times b^{2+1}$$

$$= a^3b - 4ab^3$$
 - $$\frac{-4}{27}x^2y^3\left(\frac{9}{2}xyz^2 - \frac{3}{4}z^2x\right) = \frac{-4}{27} \times \frac{9}{2} \times x^{2+1} \times y^{3+1} \times z^2 - \frac{3}{4} \times \left(\frac{-4}{27}\right) \times x^{2+1} \times y^3 \times z^2$$

$$= \frac{-2}{3}x^3y^4z^2 + \frac{1}{9}x^3y^3z^2$$
 - $$\frac{1}{2}m^2n\left(5m - \frac{3}{2}mn + \frac{5}{4}n^3\right) = \frac{1}{2}m^2n \times 5m - \frac{1}{2}m^2n \times \frac{3}{2}mn + \frac{1}{2}m^2n \times \frac{5}{4}n^3$$

$$= \frac{5m^3n}{2} - \frac{3}{4}m^3n^2 + \frac{5m^2n^4}{8}$$
- $$(2y + 3) \times (7y - 6 + 8x) = 2y(7y - 6 + 8x) + 3(7y - 6 + 8x)$$

$$= 14y^2 - 12y + 16xy + 21y - 18 + 24x$$

$$= 14y^2 + 9y + 16xy + 24x - 18$$
 - $$(4x^2 - y^2) \times (3x + 7y^2) = 4x^2(3x + 7y^2) - y^2(3x + 7y^2)$$

$$= 12x^4 + 28x^2y^2 - 3x^2y^2 - 7y^4$$

$$= 12x^4 + 25x^2y^2 - 7y^4$$
 - $$(4a + 3b)(a^2 - 6ab + 2b^2) = 4a(a^2 - 6ab + 2b^2) + 3b(a^2 - 6ab + 2b^2)$$

$$= 4a^3 - 24a^2b + 8ab^2 + 3a^2b - 18ab^2 + 6b^3$$

$$= 4a^3 + 6b^3 - 21a^2b - 10ab^2$$

- d. $(3x - 4y + 5)(2x + 3y + 2)$
 $= 3x(2x + 3y + 2) - 4y(2x + 3y + 2) + 5(2x + 3y + 2)$
 $= 6x^2 + 9xy + 6x - 8xy - 12y^2 - 8y + 10x + 15y + 10$
 $= 6x^2 - 12y^2 + xy + 16x + 7 + 10$
6. a. $(3x + 4)(2x - 6) + (3x - 5)(2x + 5)$
 $= 3x(2x - 6) + 4(2x - 6) + 3x(2x + 5) - 5(2x + 5)$
 $= 6x^2 - 18x + 8x - 24 + 6x^2 + 15x - 10x - 25$
 $= 12x^2 - 5x - 49$
- b. $(x + 3y)(x - 2y) + (y + 4x)(y - 3x)$
 $= x(x - 2y) + 3y(x - 2y) + y(y - 3x) + 4x(y - 3x)$
 $= x^2 - 2xy + 3xy - 6y^2 + y^2 - 3xy + 4xy - 12x^2$
 $= -11x^2 + 2xy - 5y^2$
7. a. $(4x - 5)(4x + 3) = x^2 + (a + b)x + ab$
 $= (4x)^2 + (-5 + 3)4x + (-5) \times 3$
 $= 16x^2 - 8x - 15$
- b. $(7mn + 4)(7mn + 3) = x^2 + (a + b)x + ab$
 $= (7mn)^2 + (4 + 3)7mn + 4 \times 3$
 $= 49m^2n^2 + 49mn + 12$
- c. $\left(\frac{2}{3}mn + \frac{1}{7}p\right)\left(\frac{2}{3}mn - \frac{1}{7}p\right) = \left(\frac{2}{3}mn\right)^2 - \left(\frac{1}{7}p\right)^2$ $(a + b)(a - b) = a^2 - b^2$
 $= \frac{4}{9}m^2n^2 - \frac{1}{49}p^2$
- d. $(2.5m - 1.5n)(2.5m + 1.5n) = (2.5m)^2 - (1.5n)^2$ $(a - b)(a + b) = (a^2 - b^2)$
 $= 6.25m^2 - 2.25n^2$
8. a. $(xy - 32)^2 = (xy)^2 + (32)^2 - 2 \times xy \times 32$ $(a - b)^2 = a^2 + b^2 - 2ab$
 $= x^2y^2 + 1024 - 64xy$
 $= x^2y^2 - 64xy + 1024$
- b. $\left(5y + \frac{2}{3}x\right)^2 = (5y)^2 + \left(\frac{2}{3}x\right)^2 + 2 \times 5y \times \frac{2}{3}x$
 $= 25y^2 + \frac{4}{9}x^2 + \frac{20}{3}xy$
- c. $(0.4mn - 0.3p)^2 = (0.4mn)^2 + (0.3p)^2 - 2 \times 0.4mn \times 0.3p$
 $= 0.16m^2n^2 + 0.09p^2 - 0.24mnp$
- d. $\left(\frac{2}{5}a + \frac{3}{4}bc\right)^2 = \left(\frac{2}{5}a\right)^2 + \left(\frac{3}{4}bc\right)^2 + 2 \times \frac{2}{5}a \times \frac{3}{4}bc$
 $= \left(\frac{4}{5}a\right)^2 + \left(\frac{3}{4}bc\right)^2 + 2 \times \frac{2}{5}a \times \frac{3}{4}bc$
 $= \frac{4a^2}{25} + \frac{9}{16}b^2c^2 + \frac{12}{20}abc$
 $= \frac{4a^2}{25} + \frac{9}{16}b^2c^2 + \frac{3}{5}abc$

9. a. $(mn + np)^2 - 4mn^2p = (mn)^2 + (np)^2 + 2 \times (mn) \times (np) - 4mn^2p$
 $= m^2n^2 + n^2p^2 + 2mn^2p - 4mn^2p$
 $= m^2n^2 + n^2p^2 - 2mn^2p$
 $= (mn - np)^2$
- b. $(9x - 5y)^2 + 180xy = (9x)^2 + (5y)^2 - 2 \times 9x \times 5y + 180xy$
 $= 81x^2 + 25y^2 - 90xy + 180xy$
 $= 81x^2 + 25y^2 + 90xy$
 $= (9x + 5y)^2$
10. a. $(102)^2 = (100 + 2)^2 = (100)^2 + (2)^2 + 2 \times 100 \times 2$
 $= 10000 + 4 + 400 = 10404$
- b. $78 \times 82 = (80 - 2)(80 + 2)$
 $= (80)^2 - (2)^2 = 6400 - 4 = 6396$
- c. $(5.2)^2 = (5 + 0.2)^2$
 $= (5)^2 + (0.2)^2 + 2 \times 5 \times 0.2$
 $= 25 + 0.04 + 2 = 27.04$
- d. $(12.1)^2 - (7.9)^2 = (12.1 + 7.9)(12.1 - 7.9)$ $(a)^2 - (b)^2 = (a + b)(a - b)$
 $= 20 \times 4.2 = 84$
11. a. $\frac{4.7 \times 4.7 + 2 \times 4.7 \times 3.3 + 3.3 \times 3.3}{4.7 \times 4.7 - 3.3 \times 3.3} = \frac{(4.7)^2 + 2 \times (4.7) \times (3.3) + (3.3)^2}{(4.7)^2 - (3.3)^2}$
 $= \frac{(4.7 + 3.3)^2}{(4.7 + 3.3)(4.7 - 3.3)}$
 $= \frac{(4.7 + 3.3)}{(4.7 - 3.3)} = \frac{8.0}{1.4} = \frac{80}{14} = \frac{40}{7}$
- b. $\frac{6.7 \times 6.7 - 4.3 \times 4.3}{6.7 - 4.3} = \frac{(6.7)^2 - (4.3)^2}{6.7 - 4.3}$
 $= \frac{(6.7 + 4.3)(6.7 - 4.3)}{(6.7 - 4.3)} = (6.7 + 4.3) = 11$
12. $\left(x - \frac{1}{x}\right) = x^2 + \frac{1}{x^2} - 2 \times x \times \frac{1}{x}$
 $= \left(x - \frac{1}{x}\right)^2 = 38 - 2 = \left(x - \frac{1}{x}\right)^2 = 36$
 $x - \frac{1}{x} = \sqrt{36} = \pm 6$
13. $\left(x - \frac{1}{x}\right) = x^2 + \frac{1}{x^2} - 2$
 $= \left(x + \frac{1}{x}\right)^2 - 4 = 8^2 - 4 = 64 - 4 = 60$
 $\therefore x - \frac{1}{x} = \pm \sqrt{60}$
 $= \pm 2\sqrt{15}$

Multiple Choice Questions

1. (b) 2. (c) 3. (a) 4. (b) 5. (c)
 6. (b) 7. (d) 8. (a) 9. (c) 10. (b)

CHAPTER-7: PROPORTIONAL REASONING-I**Assessment Time 7.1**

1. a. $2.5 \text{ to } 6.0 = \frac{2.5}{6.0} = \frac{25}{60} = \frac{5}{12} = 5 : 12$
 b. $200 \text{ g to } 800 \text{ g} = \frac{200}{800} = \frac{1}{4} = 1 : 4$
 c. $5 \text{ kg to } 350 \text{ g} = \frac{5000}{350} = \frac{100}{7} = 100 : 7$ ($\because 5 \text{ kg} = 5000 \text{ g}$)
 d. $55 \text{ paise to } ₹ 3 = \frac{55}{300} = \frac{11}{60} = 11 : 60$ ($\because ₹ 3 = 300 \text{ p}$)
 e. $500 \text{ mL to } 7 \text{ L} = \frac{500}{7000} = \frac{1}{14} = 1 : 14$ ($\because 7 \text{ L} = 7000 \text{ mL}$)
 f. $20 \text{ min to } 3 \text{ hrs} = \frac{20}{180} = \frac{1}{9} = 1 : 9$ ($\because 3 \text{ hrs} = 180 \text{ min}$)
 g. $6 \text{ months to } 3 \text{ years} = \frac{6}{36} = \frac{1}{6} = 1 : 6$ ($\because 3 \text{ years} = 36 \text{ months}$)
 h. $30 \text{ cm to } 5 \text{ m} = \frac{30}{500} = \frac{3}{50} = 3 : 50$ ($\because 5 \text{ m} = 500 \text{ cm}$)
 i. $400 \text{ m to } 6 \text{ km} = \frac{400}{6000} = \frac{1}{15} = 1 : 15$ ($\because 6 \text{ km} = 6000 \text{ m}$)
2. a. $\frac{5}{8} \times \frac{3}{3} = \frac{15}{24} = 15 : 24$ b. $\frac{9}{11} \times \frac{5}{5} = \frac{45}{55} = 45 : 55$
 c. $\frac{8 \div 2}{18 \div 2} = \frac{4}{9} = 4 : 9$ d. $\frac{70 \div 10}{80 \div 10} = \frac{7}{10} = 7 : 8$
3. a. $\frac{5}{12} \not\sim \frac{3}{10}$
 $\Rightarrow 5 \times 10 > 3 \times 12$
 i.e. $50 > 36$
 or $5 : 12 > 3 : 10$
 b. $\frac{8}{15} \not\sim \frac{13}{20}$
 $\Rightarrow 8 \times 20 < 13 \times 15$
 $\Rightarrow 160 < 195$
 or $8 : 15 < 13 : 20$
 c. $\frac{3}{10} \not\sim \frac{2}{15}$
 $\Rightarrow 3 \times 15 > 2 \times 10$
 $\Rightarrow 45 > 20$
 or $3 : 10 > 2 : 15$
4. a. $\frac{5}{7}, \frac{3}{14}, \frac{8}{28}, \frac{9}{21}$ LCM of 7, 14, 28, 21 = 84

$$\text{Now } \frac{5}{7} = \frac{5 \times 12}{7 \times 12} = \frac{60}{84}, \quad \frac{3}{14} = \frac{3 \times 6}{14 \times 6} = \frac{18}{84}, \quad \frac{8}{28} = \frac{8 \times 3}{28 \times 3} = \frac{24}{84}$$

$$\frac{9}{21} = \frac{9 \times 4}{21 \times 4} = \frac{36}{84}$$

$$\text{So, } \frac{60}{84} > \frac{36}{84} > \frac{24}{84} > \frac{18}{84}$$

Descending order of given ratios is 5 : 7, 9 : 21, 8 : 28, 3 : 14

$$\text{b. } \frac{3}{10}, \frac{7}{15}, \frac{16}{24}, \frac{17}{20} \quad \text{LCM of 10, 15, 25, 20 is 300.}$$

$$\frac{3}{10} = \frac{3 \times 30}{10 \times 30} = \frac{90}{300}$$

$$\frac{7}{15} = \frac{7 \times 20}{15 \times 20} = \frac{140}{300}$$

$$\frac{16}{25} = \frac{16 \times 12}{25 \times 12} = \frac{192}{300}$$

$$\frac{17}{20} = \frac{17 \times 15}{20 \times 15} = \frac{255}{300}$$

$$\text{So, } \frac{255}{300} > \frac{192}{300} > \frac{140}{300} > \frac{90}{300}$$

So, descending order of given ratios is 17 : 20, 16 : 25, 7 : 15, 3 : 10.

5. Total length = 84 cm

$$\text{Ratio} = 13 : 8$$

$$\text{Sum of ratio} = 13 + 8 = 21$$

$$\text{So, first length} = \frac{13}{21} \times 84 = 52$$

$$\text{Second length} = \frac{8}{21} \times 84 = 32 \text{ cm}$$

6. Sum of three numbers = 4917

$$\text{Ratio of numbers} = \frac{10}{3} : \frac{21}{5} : \frac{49}{8}$$

LCM of 3, 5, and 8 is 120

$$\therefore \frac{10}{3} \times 120 = 400$$

$$\frac{21}{5} \times 120 = 504$$

$$\frac{49}{8} \times 120 = 735$$

$$\text{So, ratio in simple form} = 400 : 504 : 735$$

$$\text{Sum of ratios} = 400 + 504 + 735 = 1639$$

$$\text{So, first number} = \frac{400}{1639} \times 4917 = 1200$$

$$\text{Second number} = \frac{504}{1639} \times 4917 = 1512$$

$$\text{Third number} = \frac{735}{1639} \times 4917 = 2205$$

7. Weight of alloy = 7.8 kg

$$\text{Ratio of aluminium and copper} = 5 : 8$$

$$\text{Sum of ratio} = 5 + 8 = 13$$

$$\text{So, weight of aluminium} = \frac{5}{13} \times 7.8 = 3 \text{ kg}$$

$$\text{Weight of copper} = \frac{8}{13} \times 7.8 = 4.8 \text{ kg}$$

8. Monthly income = ₹ 72,000

Savings = ₹ 20,000

So, expenditure = ₹ 52,000

a. Ratio of income to savings = $\frac{72000}{20000} = \frac{18}{5} = 18 : 5$

b. Ratio of savings to expenditure = $\frac{20000}{52000} = \frac{5}{13} = 5 : 13$

c. Ratio of expenditure to income = $\frac{52000}{72000} = \frac{13}{18} = 13 : 18$

9. Ratio of gold and copper of first gold smith = 5 : 3

Ratio of gold and copper of second gold smith = 6 : 4

Now $\frac{5}{3} \nleftrightarrow \frac{6}{4}$

$5 \times 4 = 20$ and $6 \times 3 = 18$

So, $\frac{5}{3} > \frac{6}{4}$

So, quality of first goldsmith is better.

10. a. T

b. F

c. F

d. T

Assessment Time 7.2

1. a. 15, 20, 25, 30

Product of extremes = $15 \times 30 = 450$

Product of means = $20 \times 25 = 500$

Since, product of extremes $\neq$ product of means

So, numbers are not in proportion

b. 8, 32, 4, 16

Product of extremes = $8 \times 16 = 128$

Product of means = $32 \times 4 = 128$

Since, product of extremes = product of means

So, number are in proportion.

c. 36, 20, 25, 18

Product of extremes = $36 \times 18 = 648$

Product of means = $20 \times 25 = 500$

Since, product of extremes $\neq$ product of means

So, number are not in proportion.

d. 20, 50, 18, 45

Product of extremes = $20 \times 45 = 900$

Product of means = $50 \times 18 = 900$

Product of extremes = product of means

So, number are in proportion.

2. a. 30, x, 45, 60

Since, numbers are in proportion. So, product of extremes = product of means

$\Rightarrow 30 \times 60 = x \times 45$

$$\Rightarrow x = \frac{30 \times 60}{45} = 40$$

b. 16, 24, 6, x

$$\text{So, } 16 \times x = 24 \times 6$$

$$\Rightarrow x = \frac{24 \times 6}{16} = 9$$

c. 9, 12, x , 8

$$\text{So, } 9 \times 8 = 12 \times x$$

$$\Rightarrow x = \frac{9 \times 8}{12} = 6$$

d. x , 40, 30, 25

$$\text{So, } x \times 25 = 40 \times 30$$

$$\Rightarrow x = \frac{40 \times 30}{25} = 48$$

3. a. 25, y , 36

$$\therefore 25 : y = y : 36 \quad \text{Since, numbers are in continued proportion.}$$

$$\Rightarrow 25 \times 36 = y \times y$$

$$\Rightarrow y = \sqrt{25 \times 36} = 5 \times 6 = 30$$

b. y , 42, 98

$$\text{So, } y : 42 = 42 : 98 \quad \text{Since, numbers are in continued proportion.}$$

$$\Rightarrow y \times 98 = 42 \times 42$$

$$\Rightarrow y = \frac{42 \times 42}{98} = 18$$

c. 72, 36, y

$$\text{So, } 72 : 36 = 36 : y \quad \text{Since, numbers are in continued proportion.}$$

$$\Rightarrow 72 \times y = 36 \times 36$$

$$\Rightarrow y = \frac{36 \times 36}{72} = 18$$

d. 60, 30, y

$$\text{So, } 60 : 30 = 30 : y \quad \text{Since, numbers are in continued proportion.}$$

$$\Rightarrow 60 \times y = 30 \times 30$$

$$\Rightarrow y = \frac{30 \times 30}{60} = 15$$

4. a. Mean proportion of 9 and 4 = $\sqrt{9 \times 4} = 6$

b. Mean proportion of 25 and 36 = $\sqrt{25 \times 36} = 30$

c. Mean proportion of 64 and 81 = $\sqrt{64 \times 81} = 72$

d. Mean proportion of 16 and 25 = $\sqrt{16 \times 25} = 20$

5. a. $27 : 9 : 9 : x$

$$\Rightarrow 27 \times x = 9 \times 9$$

$$\Rightarrow x = \frac{9 \times 9}{27} = 3$$

b. $1.6 : 0.8 = 0.8 \times x$

$$\Rightarrow 1.6 \times x = 0.8 \times 0.8$$

$$\Rightarrow x = \frac{0.8 \times 0.8}{1.6} = 0.4$$

c. $\frac{2}{3} : \frac{5}{7} = \frac{5}{7} : x$

$$\Rightarrow \frac{2}{3} \times x = \frac{5}{7} \times \frac{5}{7}$$

$$\Rightarrow x = \frac{5 \times 5 \times 3}{7 \times 7 \times 2} = \frac{75}{98}$$

d. $\frac{7}{10} : \frac{13}{25} = \frac{13}{25} : x$

$$\Rightarrow \frac{7}{10} \times x = \frac{13}{25} \times \frac{13}{25}$$

$$\Rightarrow x = \frac{13 \times 13 \times 10}{25 \times 25 \times 7} = \frac{338}{875}$$

6. Ratio of Income to savings

$$\Rightarrow 13 : 4 = x : 1696$$

$$\Rightarrow 13 \times 1696 = 4 \times x$$

$$\Rightarrow x = \frac{13 \times 1696}{4} = 5512$$

Hence, income is ₹ 5512.

8. Ratio of length to width

$$\Rightarrow 8 : 5 = 200 : x$$

$$\Rightarrow 8 \times x = 5 \times 200$$

$$\Rightarrow x = \frac{5 \times 200}{8}$$

$$x = 125 \text{ m}$$

7. Ratio of copper to zinc

$$\Rightarrow 9 : 7 = x : 10.5$$

$$\Rightarrow 9 \times 10.5 = 7 \times x$$

$$\Rightarrow x = \frac{9 \times 10.5}{7} = 13.5 \text{ kg}$$

9. Ratio of income to savings

$$\Rightarrow 20 : 8 = x : 6400$$

$$\Rightarrow 20 \times 6400 = 8 \times x$$

$$\Rightarrow x = \frac{20 \times 6400}{8}$$

$$x = 16000$$

Income after donation

$$= ₹ (16000 - 2000) = ₹ 14000$$

10. a. extreme term

b. $5 : x = 10 : 20$

$$\Rightarrow 5 \times 20 = x \times 10$$

$$\Rightarrow x = \frac{5 \times 20}{10} = 10$$

c. $35 : 70 = 25 : x$

$$\Rightarrow 35 \times x = 70 \times 25$$

$$\Rightarrow x = \frac{70 \times 25}{35} = 50$$

d. Mean proportion of 16 and 64 = $\sqrt{16 \times 64} = 32$

Critical Thinking Skill

1. Ratio of income to expenditure

$$15 : 13 = 50625 : x$$

$$\Rightarrow 15 \times x = 13 \times 50625$$

$$\Rightarrow x = \frac{13 \times 50625}{15} = 43875$$

So, savings = ₹ (50625 - 43875)

$$= ₹ 6750$$

2. $2 : 12 = 50 : x$

$$\Rightarrow 2 \times x = 12 \times 50$$

$$\Rightarrow x = \frac{12 \times 50}{2}$$

$$x = 300 \text{ km}$$

Mental Math

1. $\frac{75}{155} = \frac{15}{27} = \frac{8}{9} : 5 : 9$

3. 300 mL to 4 L = $\frac{300}{4000} = \frac{3}{40} = 3 : 40$

5. $b^2 = ac$

2. antecedent

4. $\frac{80}{500} = 4 : 25$

6. $4 : 8 = x : 2$

$$\Rightarrow 4 \times 2 = 8 \times x$$

$$\Rightarrow x = \frac{8}{8} = 1$$

7. Difference, Quotient

8. $\frac{3}{4} \begin{array}{c} \nearrow \searrow \\ \nwarrow \nearrow \end{array} \frac{4}{5}$

$$3 \times 5 < 4 \times 4$$

$$15 < 16 \text{ (less)}$$

Revision Time

1. a. $4 \text{ kg to } 600 \text{ g} = \frac{4000}{600} = \frac{20}{3} = 20 : 3$ ($\because 4 \text{ kg} = 4000 \text{ g}$)
 - b. $80 \text{ L to } 300 \text{ L} = \frac{80}{300} = \frac{4}{15} = 4 : 15$
 - c. $60 \text{ g to } 500 \text{ mg} = \frac{60000}{500} = \frac{120}{1} = 120 : 1$ ($\because 60 \text{ g} = 60000 \text{ mg}$)
 - d. $35 \text{ paise to } ₹ 7 = \frac{35}{700} = \frac{1}{20} = 1 : 20$ ($\because ₹ 7 = 700 \text{ paise}$)
 - e. $40 \text{ cm to } 2 \text{ m} = \frac{40}{200} = \frac{1}{5} = 1 : 5$ ($\because 2 \text{ m} = 200 \text{ cm}$)
 - f. $4 \text{ months to } 3 \text{ years} = \frac{4}{3 \times 12} = \frac{1}{9} = 1 : 9$ ($\because 3 \text{ years} = 36 \text{ months}$)
2. a. 5, 10, 25, 50
 Product of extremes = $5 \times 50 = 250$
 Product of means = $10 \times 25 = 250$
 Since, product of extremes = product of means
 So, numbers are in proportion.
 - b. 40, 12, 80, 50
 Product of extremes = $40 \times 50 = 2000$
 Product of means = $12 \times 80 = 960$
 Since, product of extremes $\neq$ product of means
 So, numbers are not in proportion.
 - c. 9, 12, 6, 8
 Product of extremes = $9 \times 8 = 72$
 Product of means = $12 \times 6 = 72$
 Since, product of extremes = product of means
 So, numbers are in proportion.
 - d. 6, 15, 12, 30
 Product of extremes = $6 \times 30 = 180$
 Product of means = $15 \times 12 = 180$
 Since, product of extremes = product of means
 So, numbers are in proportion.
 - e. 21, 11, 12, 4
 Product of extremes = $21 \times 4 = 84$
 Product of means = $11 \times 12 = 132$
 Since, product of extremes $\neq$ product of means
 So, numbers are not in proportion.
 - f. 10, 12, 15, 18
 Product of extremes = $10 \times 18 = 180$
 Product of means = $12 \times 15 = 180$
 Since, product of extremes = product of means
 So, numbers are in proportion.

3. a. 8, x, 12, 9
 Product of extremes = product of means
 $\Rightarrow 8 \times 9 = x \times 12$
 $\Rightarrow x = \frac{72}{12} = 6$
- b. 16, x, 32, 8
 Product of extremes = product of means
 $\Rightarrow 16 \times 8 = x \times 32$
 $\Rightarrow x = \frac{16 \times 8}{32} = 4$
- c. 15, 40, x, 80
 Product of extremes = product of means
 $\Rightarrow 15 \times 80 = 40 \times x$
 $\Rightarrow x = \frac{15 \times 80}{40} = 30$
4. a. Means proportion of 16 and 36 = $\sqrt{16 \times 36} = 24$
 b. Means proportion of 9 and 64 = $\sqrt{9 \times 64} = 24$
 c. Mean proportion of 64 and 100 = $\sqrt{64 \times 100} = 80$
5. Ratio of A B and C = 2 : 3 : 1
 Sum of ratio = 2 + 3 + 1 = 6
 So, A got = $\frac{2}{6} \times 642 = ₹ 214$
 B got = $\frac{3}{6} \times 642 = ₹ 321$
 C got = $\frac{1}{6} \times 642 = ₹ 107$
6. Ratio of sides = 2 : 2 : 3
 Sum of ratio = 2 + 2 + 3 = 7
 So, First side = $\frac{2}{7} \times 35 = 10$ cm
 Second side = $\frac{2}{7} \times 35 = 10$ cm
 Third side = $\frac{3}{7} \times 35 = 15$ cm
7. Ratio of length to width $\Rightarrow 5 : 3 = x : 60$
 $\Rightarrow 5 \times 60 = 3 \times x$
 $\Rightarrow x = \frac{50 \times 60}{3} = 100$ m
8. Total students = 4320
 No. of girls = 2300
 $\therefore$ No of boys = 4320 - 2300 = 2020
- a. Ratio of boys to total number of students = $\frac{2020}{4320} = \frac{101}{216} = 101 : 216$
- b. Ratio of girls to total number of students = $\frac{2300}{4320} = \frac{115}{216} = 115 : 216$

MCQs

- | | | |
|--------|--------|--------|
| 1. (b) | 2. (a) | 3. (d) |
| 4. (c) | 5. (a) | 6. (c) |

CHAPTER-8: RATIONAL NUMBERS

Assessment Time 8.1

1. a. $\frac{-24}{72}$ HCF of 24 and 72 is 24

$$\frac{-24 \div 24}{72 \div 24} = \frac{-1}{3}$$
 b. $\frac{125}{-400}$ HCF of 125 and 400 is 25

$$\frac{125 \div 25}{-400 \div 25} = \frac{5}{-16} \times \frac{-1}{-1} = \frac{-5}{16}$$
 c. HCF of 50 and 160 is 10

$$\frac{50 \div 10}{160 \div 10} = \frac{5}{6}$$
 d. $\frac{39}{-169}$ HCF of 39 and 169 is 13

$$\frac{39 \div 13}{-169 \div 13} = \frac{3}{13} \times \frac{-1}{-1} = \frac{-3}{13}$$
2. a. The absolute value of $\left| \frac{-8}{13} \right|$ is $\frac{8}{13}$
 b. The absolute value of $\left| \frac{7}{-19} \right|$ is $\frac{7}{19}$
 c. The absolute value of $\left| \frac{-23}{-29} \right|$ is $\frac{23}{29}$
 d. The absolute value of $\left| \frac{-21}{37} \right|$ is $\frac{21}{37}$
3. a. $\frac{6}{13}$ and $\frac{-5}{13}$

$$\frac{6}{13} + \left(\frac{-5}{13} \right) = \frac{6-5}{13} = \frac{1}{13}$$
 b. $\frac{-8}{17}$ and $\frac{-3}{17}$

$$\frac{-8}{17} - \frac{3}{17} = \frac{-8-3}{17} = \frac{-11}{17}$$
 c. $\frac{21}{37} - \frac{16}{37} = \frac{21-16}{37} = \frac{5}{37}$
5. a. $\frac{5}{8}$ and $\frac{16}{25} = \frac{5}{8} \times \frac{16}{25} = \frac{5 \times 16}{8 \times 25} = \frac{2}{5}$
 b. $\frac{-3}{10}$ and $\frac{-5}{16} = \frac{-3 \times (-5)}{10 \times 16} = \frac{15}{160} = \frac{3}{32}$
 c. $\frac{4}{17}$ and $\frac{34}{60} = \frac{4}{17} \times \frac{34}{60} = \frac{4 \times 34}{17 \times 60} = \frac{4 \times 2}{60} = \frac{8}{60} = \frac{4}{30} = \frac{2}{15}$
6. a. $\frac{15}{16} \div \frac{10}{32} = \frac{15}{16} \times \frac{32}{10} = \frac{15 \times 2}{10} = \frac{15}{5}$
 b. $\frac{-17}{10} \div \frac{14}{-15} = \frac{-17}{10} \times \frac{-15}{14} = \frac{(-17) \times (-15)}{10 \times 14} = \frac{51}{28}$
 c. $\frac{7}{10} \div \frac{-21}{30} = \frac{7}{10} \times \frac{30}{-21} = \frac{210}{-210} = -1$
7. Sum of two numbers = $\frac{-5}{8}$, One number = $\frac{-3}{16}$

Let the other number be x .

According to the questions

$$\begin{aligned}
 x + \left(\frac{-3}{16} \right) &= \frac{-5}{8} \\
 x - \frac{3}{16} &= \frac{-5}{8} \\
 x &= \frac{-5}{8} + \frac{3}{16} = \frac{2 \times (-5) + 1 \times 3}{16} \\
 &= \frac{-10 + 3}{16} = \frac{-7}{16}
 \end{aligned}$$

Hence, the other number is $\frac{-7}{16}$.

8. Let the other number be x .

One number = $\frac{26}{35}$, Product of two number = $\frac{-13}{10}$

$$x \times \frac{26}{35} = \frac{-13}{10} \Rightarrow x = \frac{-13 \times 35}{26 \times 10} = \frac{-35}{20} = \frac{-7}{4}$$

Hence, the other number is $\frac{-7}{4}$.

9. Difference of two rational number = $\frac{-16}{25}$

One number = $\frac{-8}{15}$

Let the other number be x

$$\text{So, } \frac{-8}{15} - x = \frac{-16}{25}$$

$$\Rightarrow -x = \frac{-16}{25} + \frac{8}{15} = \frac{-48 + 40}{75}$$

$$\Rightarrow -x = \frac{-8}{75} \Rightarrow x = \frac{8}{75}$$

10. Quotient of two rational numbers = $\frac{16}{30}$

One number = $\frac{-8}{15}$

$$\text{So, other number} = \frac{16}{30} \div \frac{-8}{15} = \frac{16}{30} \times \frac{-15}{8} = -1$$

Assessment Time 8.2

1. a. $\frac{-3}{7} < \frac{-2}{7}$

b. $\frac{-6}{13} < \frac{3}{13}$

c. $\frac{-19}{23} > \frac{-23}{23}$

d. $\frac{5}{7} < \frac{7}{5}$

$$5 \times 5 = 25$$

$$\text{Since } 25 < 49,$$

$$\text{Hence, } \frac{5}{7} < \frac{7}{5}$$

On cross multiplication we get

$$\text{and } 7 \times 7 = 49$$

$$\text{So, } 5 \times 5 < 7 \times 7$$

e. $\frac{-6}{13} < \frac{-4}{26}$

$$\frac{-6}{13} < \frac{-4}{26}$$

$$-6 \times 26 = -156 \quad \text{and} \quad 13 \times -4 = -52$$

$$\text{Since } -156 < -52$$

$$\text{So, } -6 \times 26 < 13 \times (-4)$$

$$\text{Hence, } \frac{-6}{13} < \frac{-4}{26}$$

f. $\frac{-8}{15} \square \frac{-3}{10}$

$$\frac{-8}{15} \times \frac{-3}{10}$$

$$-8 \times 10 = -80$$

$$\text{Since, } -80 < -45$$

$$\text{Hence, } \frac{-8}{15} < \frac{-3}{10}$$

On cross multiplication, we get

$$\text{and } 15 \times -3 = -45$$

$$\text{So, } -8 \times 10 < 15 \times -3$$

2. a. $\frac{-5}{3}$ or $\frac{-3}{12}$

$$\frac{-5}{8} \times \frac{3}{3} = \frac{-15}{24}$$

$$\text{Here, } \frac{-15}{24} < \frac{-6}{24}$$

$$\text{Hence, } \frac{-5}{8} < \frac{-3}{12}$$

LCM of 8 and 12 is 24

$$\text{and } \frac{-3}{12} \times \frac{2}{2} = \frac{-6}{24}$$

$$(\text{Since, } -15 < -6)$$

b. $\frac{-15}{18}$ or $\frac{-7}{19}$

$$\frac{-15}{18} \times \frac{19}{19} = \frac{-285}{342}$$

$$\text{Here, } \frac{-285}{342} < \frac{-126}{342}$$

$$\text{Hence, } \frac{-15}{18} < \frac{-7}{19}$$

LCM of 18 and 19 is 342

$$\frac{-7}{19} \times \frac{18}{18} = \frac{-126}{342}$$

$$(\text{Since, } -285 < -126)$$

c. $\frac{-12}{5}$ or $\frac{-3}{1}$

$$\frac{-12}{5} \times \frac{1}{1} = \frac{-12}{5}$$

$$\text{Here } \frac{-12}{5} > \frac{-15}{5}$$

$$\text{Hence, } \frac{-12}{5} > -3$$

LCM of 5 and 1 is 5

$$\frac{-3}{1} \times \frac{5}{5} = \frac{-15}{5}$$

$$(\text{Since, } -12 > -15)$$

d. $\frac{-3}{10}$ or $\frac{-5}{18}$

$$\frac{-3}{10} \times \frac{9}{9} = \frac{-27}{90}$$

$$\text{Here, } \frac{-27}{90} < \frac{-25}{90}$$

$$\text{Hence, } \frac{-3}{10} < \frac{-5}{18}$$

LCM of 10 and 18 is 90

$$\frac{-5}{18} \times \frac{5}{5} = \frac{-25}{90}$$

$$(\text{Since, } -27 < -25)$$

3. a. $\frac{-6}{7}$ or $\frac{-4}{7}$

$$\frac{-6}{7} < \frac{-4}{7}$$

$$\text{So, } \frac{-6}{7} \text{ is smaller}$$

b. $\frac{-3}{7}$ or $\frac{-2}{14}$ LCM of 7 and 14 is 14

$$\frac{-3}{7} \times \frac{2}{2} = \frac{-6}{14}$$

$$\frac{-2}{14} \times \frac{1}{1} = \frac{-2}{14}$$

$$\text{Here } \frac{-6}{14} < \frac{-2}{14}$$

$$(\text{Since, } -6 < -2)$$

$$\text{So, } \frac{-3}{7} < \frac{-2}{14}$$

$$\text{Hence, } \frac{-3}{7} \text{ is smaller}$$

c. $\frac{-5}{16}$ or $\frac{3}{15}$ LCM of 16 and 15 is 240

$$\frac{-5}{16} \times \frac{15}{15} = \frac{-75}{240} \quad \text{and} \quad \frac{-3}{15} \times \frac{16}{16} = \frac{-48}{240}$$

Here, $\frac{-75}{240} < \frac{-48}{240}$ (Since, $-75 < -48$)

So, $\frac{-5}{16} < \frac{-3}{15}$ Hence, $\frac{-5}{16}$ is smaller

d. $\frac{-3}{7}$ or $\frac{-4}{11}$ LCM of 7 and 11 is 77.

$$\frac{-3}{7} \times \frac{11}{11} = \frac{-33}{77} \quad \text{and} \quad \frac{-4}{11} \times \frac{7}{7} = \frac{-28}{77}$$

Here, $\frac{-33}{77} < \frac{-28}{77}$, Since, $-33 < -28$

So, $\frac{-3}{7} < \frac{-4}{11}$ Hence, $\frac{-3}{7}$ is smaller

e. $\frac{6}{-11}$ or $\frac{17}{-33}$ LCM of 11 and 33 is 33.

$$\frac{-6}{11} \times \frac{3}{3} = \frac{-18}{33} \quad \text{and} \quad \frac{-17}{33} \times \frac{1}{1} = \frac{-17}{33}$$

Here, $\frac{-18}{33} < \frac{-17}{33}$ (Since, $-18 < -17$)

So, $\frac{6}{-11} < \frac{17}{-33}$ Hence, $\frac{6}{-11}$ is smaller.

f. $\frac{9}{16}$ or $\frac{5}{32}$ LCM of 16 and 32 is 32.

$$\frac{9}{16} \times \frac{2}{2} = \frac{18}{32} \quad \text{and} \quad \frac{5}{32} \times \frac{1}{1} = \frac{5}{32}$$

Here, $\frac{18}{32} > \frac{5}{32}$ (Since, $18 > 5$)

So, $\frac{9}{16} > \frac{5}{32}$ Hence, $\frac{5}{32}$ is smaller.

4. a. $\frac{-9}{20}, \frac{-8}{15}, \frac{19}{-30}, \frac{-3}{10}$ On converting $\frac{19}{-30}$ in the standard form we get

$$\frac{19}{-30} \times \frac{(-1)}{(-1)} = \frac{-19}{30}$$

LCM of 20, 15, 30 and 10 is 60

$$\frac{-9}{20} \times \frac{3}{3} = \frac{-27}{60} \quad \frac{-8}{15} \times \frac{4}{4} = \frac{-32}{60}$$

$$\frac{-19}{30} \times \frac{2}{2} = \frac{-38}{60} \quad \frac{-3}{10} \times \frac{6}{6} = \frac{-18}{60}$$

Since, $\frac{-38}{60} < \frac{-32}{60} < \frac{-27}{60} < \frac{-18}{60}$

So, $\frac{-19}{30} < \frac{-8}{15} < \frac{-9}{20} < \frac{-3}{10}$

Hence, ascending order is $\frac{-19}{30}, \frac{-8}{15}, \frac{-9}{20}$ and $\frac{-3}{10}$.

b. $\frac{-7}{12}, \frac{-13}{15}, \frac{-13}{18}, \frac{-5}{6}$

LCM of 12, 15, 18 and 6 is 180.

$$\frac{-7}{12} \times \frac{15}{15} = \frac{-105}{180}$$

$$\frac{-13}{15} \times \frac{12}{12} = \frac{-156}{180}$$

$$\frac{-13}{18} \times \frac{10}{10} = \frac{-130}{180}$$

$$\frac{-5}{6} \times \frac{30}{30} = \frac{-150}{180}$$

Since, $\frac{-156}{180} < \frac{-150}{180} < \frac{-130}{180} < \frac{-105}{180}$

So, $\frac{-13}{15} < \frac{-5}{6} < \frac{-13}{18} < \frac{-7}{12}$

Hence, ascending order is $\frac{-13}{15}, \frac{-5}{6}, \frac{-13}{18}$ and $\frac{-7}{12}$.

c. $\frac{-4}{9}, \frac{-11}{18}, \frac{-2}{3}, \frac{-7}{12}$

LCM of 9, 18, 3 and 12 is 36

$$\frac{-4}{9} \times \frac{4}{4} = \frac{-16}{36}$$

$$\frac{-11}{18} \times \frac{2}{2} = \frac{-22}{36}$$

$$\frac{-2}{3} \times \frac{12}{12} = \frac{-24}{36}$$

$$\frac{-7}{12} \times \frac{3}{3} = \frac{-21}{36}$$

$$\frac{-24}{36} < \frac{-22}{36} < \frac{-21}{36} < \frac{-16}{36}$$

Hence, the ascending order is $\frac{-2}{3}, \frac{-11}{18}, \frac{-7}{12}$ and $\frac{-4}{9}$

d. $\frac{-6}{7}, \frac{-4}{21}, \frac{-15}{42}, \frac{-8}{14}$

LCM of 7, 21, 42 and 14 is 42

$$\frac{-6}{7} \times \frac{6}{6} = \frac{-36}{42}$$

$$\frac{-4}{21} \times \frac{2}{2} = \frac{-8}{42}$$

$$\frac{-15}{42} \times \frac{1}{1} = \frac{-15}{42}$$

$$\frac{-8}{14} \times \frac{3}{3} = \frac{-24}{42}$$

$$\frac{-36}{42} < \frac{-24}{42} < \frac{-15}{42} < \frac{-8}{42}$$

Hence, the ascending order is $\frac{-6}{7}, \frac{-8}{14}, \frac{-15}{42}, \frac{-4}{21}$

5. a. $\frac{-6}{11}, \frac{-17}{33}, \frac{-9}{22}, \frac{-3}{1}$

LCM of 11, 33, 22 and 1 is 66

$$\frac{-6}{11} \times \frac{6}{6} = \frac{-36}{66}$$

$$\frac{-17}{33} \times \frac{2}{2} = \frac{-34}{66}$$

$$\frac{-9}{22} \times \frac{3}{3} = \frac{-27}{66}$$

$$\frac{-3}{1} \times \frac{66}{66} = \frac{-198}{66}$$

Since, $\frac{-27}{66} > \frac{-34}{66} > \frac{-36}{66} > \frac{-198}{66}$

Hence, descending order is $\frac{-9}{22}, \frac{-17}{33}, \frac{-6}{11}$ and -3

b. $\frac{-7}{10}, \frac{-3}{8}, \frac{9}{-20}, \frac{-13}{15}$

On converting $\frac{9}{-20}$ into standard form we get

$$\frac{9}{-20} \times \frac{(-1)}{(-1)} = \frac{-9}{20}$$

$$\frac{-7}{10} \times \frac{12}{12} = \frac{-84}{120}$$

$$\frac{-3}{8} \times \frac{15}{15} = \frac{-45}{120}$$

$$\frac{-9}{20} \times \frac{6}{6} = \frac{-54}{120}$$

$$\frac{-13}{15} \times \frac{8}{8} = \frac{-104}{120}$$

Since, $\frac{-45}{120} > \frac{-54}{120} > \frac{-84}{120} > \frac{-104}{120}$

$$\text{So, } \frac{-3}{8} > \frac{-9}{20} > \frac{-7}{10} > \frac{-13}{15}$$

Hence, descending order is $\frac{-3}{8}, \frac{-9}{20}, \frac{-7}{10}$ and $\frac{-13}{15}$

c. $\frac{-3}{5}, \frac{-13}{15}, \frac{-7}{10}, \frac{17}{-25}$

LCM of 5, 15, 10 and 25 is 150

$$\frac{-3}{5} \times \frac{30}{30} = \frac{-90}{150}$$

$$\frac{-13}{15} \times \frac{10}{10} = \frac{-130}{150}$$

$$\frac{-7}{10} \times \frac{15}{15} = \frac{-105}{150}$$

$$\frac{-17}{25} \times \frac{6}{6} = \frac{-102}{150}$$

Since, $\frac{-90}{150} > \frac{-102}{150} > \frac{-105}{150} > \frac{-130}{150}$

$$\text{So, } \frac{-3}{5} > \frac{-17}{25} > \frac{-7}{10} > \frac{-13}{15}$$

Hence, the descending order is $\frac{-3}{5}, \frac{-17}{25}, \frac{-7}{10}$ and $\frac{-13}{15}$

d. $\frac{-10}{11}, \frac{-11}{22}, \frac{-21}{33}, \frac{-18}{44}$

LCM of 11, 22, 33 and 44 is 132

$$-\frac{10}{11} \times \frac{12}{12} = \frac{-120}{132}$$

$$\frac{-11}{22} \times \frac{6}{6} = \frac{-66}{132}$$

$$\frac{-21}{33} \times \frac{4}{4} = \frac{-84}{132}$$

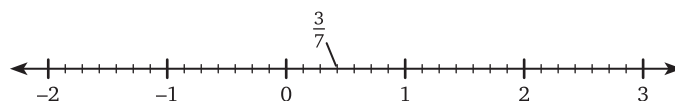
$$\frac{-18}{44} \times \frac{3}{3} = \frac{-54}{132}$$

Since, $-\frac{54}{132} > -\frac{66}{132} > -\frac{84}{132} > -\frac{120}{132}$

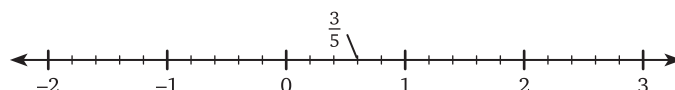
Hence, descending order is $\frac{-18}{44}, \frac{-11}{22}, \frac{-21}{33}$ and $\frac{-10}{11}$

1. a. F b. T c. T d. T

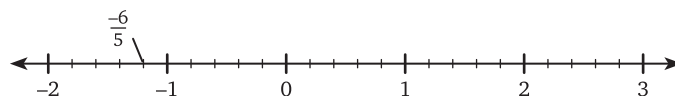
2. a. Divide the each unit into 7 equal parts



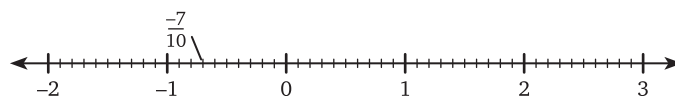
b. Divide each unit into 5 equal parts



- c. Divide each unit into 5 equal parts



- d. Divide each unit into 10 equal parts



Assessment Time 8.4

1. a. $\frac{5}{13} + \frac{-15}{26} + \frac{-12}{39} = \frac{5 \times 6 + (-15) \times 3 + (-12) \times 2}{78}$
 $= \frac{30 - 45 - 24}{78} = \frac{30 - 69}{78}$
 $= \frac{-39}{78} = \frac{-1}{2}$

b. $\frac{-13}{27} + \frac{8}{36} + \left(\frac{-6}{18}\right) = \frac{(-13) \times 4 + 8 \times 3 + 6 \times (-6)}{108}$
 $= \frac{-52 + 24 - 36}{108} = \frac{-88 + 24}{108}$
 $= \frac{-64}{108} = \frac{-16}{27}$

c. $\frac{5}{21} + \frac{-17}{42} + \frac{-9}{14} = \frac{5 \times 2 + (-17) \times 1 + (-9) \times 3}{42}$
 $= \frac{10 - 17 - 27}{42} = \frac{-34}{42} = \frac{-17}{21}$
2. a. $\frac{8}{13}$ from $\frac{-19}{39}$
 $\frac{-19}{39} - \frac{8}{13} = \frac{-19 - 8 \times 3}{39} = \frac{-19 - 24}{39} = \frac{-43}{39}$

b. -8 from $\frac{-3}{17}$
 $\frac{-3}{17} - (-8) = \frac{-3}{17} + 8 = \frac{-3 + 126}{17} = \frac{123}{17} = 7\frac{14}{17}$

c. $\frac{-32}{13}$ from $\frac{-5}{6} = \frac{-5}{6} - \left(\frac{-32}{13}\right)$
 $= \frac{-5 \times (+13) - (-32) \times 6}{78}$
 $= \frac{-65 + 192}{78} = \frac{127}{78} = 1\frac{49}{78}$
3. a. $\frac{-5}{16} + \frac{7}{20} + \frac{-8}{15} + \frac{-6}{12} = \frac{(-5) \times 15 + 7 \times 12 + 16 \times (-8) + (-6) \times 20}{240}$
 $= \frac{-75 + 84 - 128 - 120}{240} = \frac{-239}{240}$

b. $\frac{7}{8} - \frac{11}{24} + \frac{-3}{18} + \frac{4}{-16} = \frac{7 \times 18 - 11 \times 6 + 8 \times (-3) + 4 \times (-9)}{144}$
 $= \frac{126 - 66 - 24 - 36}{144}$

$$= \frac{126 - 126}{144} = 0$$

$$\begin{aligned} \text{c. } \frac{-3}{14} + \frac{-5}{21} + \frac{-9}{28} - \frac{4}{7} &= \frac{(-3 \times 6 + (-5) \times 4 + (-9) \times 3 - 4 \times 12)}{84} \\ &= \frac{-18 - 20 - 27 - 48}{84} \\ &= \frac{-113}{84} = -1\frac{29}{84} \end{aligned}$$

4. Let the required number be x .

$$\begin{aligned} \frac{-3}{10} + x &= \frac{7}{15} \\ x &= \frac{7}{15} - \left(\frac{-3}{10}\right) = \frac{7}{15} + \frac{3}{10} \\ &= \frac{7 \times 2 + 3 \times 3}{30} = \frac{14 + 9}{30} = \frac{23}{30} \end{aligned}$$

Hence, the required number is $\frac{23}{30}$.

5. Let the required number be x .

$$\begin{aligned} \frac{-8}{21} - x &= \frac{-5}{14} \\ x &= \frac{-8}{21} + \frac{5}{14} = \frac{(+6) \times (-8) + 3 \times 5}{42} \\ &= \frac{-16 + 15}{42} = \frac{-1}{42} \end{aligned}$$

Hence, the required number is $\frac{-1}{42}$.

6. Let the required number be x .

$$\begin{aligned} \frac{3}{20} - x &= \frac{-7}{25} & \Rightarrow & \frac{3}{20} + \frac{7}{25} = x \\ \Rightarrow \frac{5 \times 3 + 4 \times 7}{100} &= x & \Rightarrow & \frac{15 + 28}{100} = x \\ \Rightarrow x &= \frac{43}{100} \end{aligned}$$

Critical Thinking Skills

According to the questions

$$\begin{aligned} \left(\frac{4}{34} + \frac{-8}{51}\right) - \left(\frac{3}{17}\right) &= \frac{4 \times 3 - 5 \times 2 - 3 \times 6}{102} \\ &= \frac{12 - 16 - 18}{102} = \frac{-22}{102} = \frac{-11}{51} \end{aligned}$$

Assessment Time 8.5

$$\begin{aligned} 1. \text{ a. } \frac{-7}{12} \times \frac{24}{35} \times \frac{-1}{6} &= \frac{-7 \times 24 \times -1}{12 \times 35 \times 6} = \frac{1}{15} \\ \text{b. } \frac{-9}{34} \times \frac{51}{54} \times \frac{-8}{6} &= \frac{-9 \times 51 \times -8}{34 \times 54 \times 6} = \frac{1}{3} \\ \text{c. } \frac{4}{15} \times \frac{25}{22} \times \frac{-33}{10} &= -1 \end{aligned}$$

$$\begin{aligned}
 2. \quad a. \quad \frac{2}{5} \times \frac{-3}{7} - \frac{1}{6} \times \frac{3}{2} + \frac{1}{10} \times \frac{3}{7} &= \frac{-6}{35} - \frac{3}{12} + \frac{3}{70} \\
 &= \frac{-6 \times 12 - 3 \times 35 + 3 \times 6}{420} \\
 &= \frac{-72 - 105 + 18}{420} = \frac{-177 + 18}{420} \\
 &= \frac{-161}{420} = \frac{-57}{140}
 \end{aligned}$$

$$\begin{aligned}
 b. \quad \frac{-3}{8} \times \frac{1}{5} + \frac{1}{14} - \frac{1}{5} \times \frac{4}{5} &= \frac{-3}{40} + \frac{1}{14} - \frac{4}{25} \\
 &= \frac{-3 \times 35 + 1 \times 100 - 4 \times 56}{1400} \\
 &= \frac{-105 + 100 - 224}{1400} = \frac{-229}{1400}
 \end{aligned}$$

$$\begin{aligned}
 c. \quad \frac{-5}{7} \times \frac{2}{3} + \frac{1}{15} \times \frac{5}{6} - \frac{2}{3} \times \frac{1}{7} &= \frac{-10}{21} + \frac{5}{90} - \frac{2}{21} = \frac{-10 \times 30 + 5 \times 7 - 2 \times 30}{630} \\
 &= \frac{-300 + 35 - 60}{630} = \frac{-360 + 35}{630} \\
 &= \frac{-325}{630} = \frac{-65}{126}
 \end{aligned}$$

$$3. \quad a. \quad \frac{-6}{25} \text{ by } \frac{9}{15}$$

$$\frac{-6}{25} \div \frac{9}{15} = \frac{-6}{25} \times \frac{15}{9} = \frac{-2}{5}$$

$$c. \quad \frac{13}{14} \div \frac{-52}{70} = \frac{13}{14} \times \frac{70}{-52} = \frac{-5}{4}$$

$$b. \quad \frac{4}{9} \text{ by } \frac{-20}{27} = \frac{4}{9} \times \frac{-27}{20} = \frac{-3}{5}$$

4. Let the required rational number be $\frac{a}{b}$.

$$\frac{-8}{17} \times \frac{a}{b} = \frac{16}{51}$$

$$\frac{a}{b} = \frac{16}{51} \times \frac{-17}{8} = \frac{-2}{3}$$

Hence, the required rational number is $\frac{-2}{3}$.

5. Let the required rational number be $\frac{a}{b}$.

$$\frac{3}{13} \div \frac{a}{b} = \frac{-6}{39}$$

$$\Rightarrow \frac{3}{13} \times \frac{b}{a} = \frac{-6}{39}$$

$$\frac{b}{a} = \frac{-6}{39} \times \frac{13}{3} = \frac{-2}{3}$$

$$\Rightarrow \frac{a}{b} = \frac{-3}{2}$$

6. Let the required number be $\frac{a}{b}$.

$$\frac{-3}{8} \div \frac{a}{b} = \frac{6}{14}$$

$$\frac{-3}{8} \times \frac{b}{a} = \frac{6}{14}$$

$$\frac{b}{a} = \frac{6}{14} \times \frac{8}{-3} = \frac{2 \times 4}{7} = \frac{8}{-7}$$

$$\frac{a}{b} = \frac{-7}{8}$$

Critical Thinking Skills

$$\begin{aligned} \text{Sum} \quad \frac{3}{14} + \left(\frac{-8}{35}\right) &= \frac{3 \times 5 + (-8) \times 2}{70} \\ &= \frac{15 - 16}{70} = \frac{-1}{70} \end{aligned}$$

$$\begin{aligned} \text{Product} \quad \frac{3}{14} \times \frac{-8}{35} &= \frac{-24}{490} \\ \frac{-1}{70} \div \frac{-24}{490} &= \frac{-1}{70} \times \frac{490}{-24} = \frac{7}{24} \end{aligned}$$

Assessment Time 8.6

1. Length of a wire = $20\frac{1}{5}$ m

Long piece cut from it = $7\frac{1}{4}$ m

$$\begin{aligned} \text{Length of remaining piece} &= \frac{101}{5} - \frac{29}{4} = \frac{101 \times 4 - 29 \times 5}{20} \\ &= \frac{404 - 145}{20} = \frac{259}{20} = 12\frac{19}{20} \text{ m} \end{aligned}$$

Hence, the length of remaining piece is $12\frac{19}{20}$ m.

2. Weight of a empty jute bag = $2\frac{1}{4}$ kg

Weight of rice = $40\frac{1}{5}$ kg

$$\begin{aligned} \text{Weight of filled bag of rice} &= 2\frac{1}{4} + 40\frac{1}{5} \\ &= \frac{9}{4} + \frac{201}{5} = \frac{45 + 804}{20} \\ &= \frac{849}{20} = 42\frac{9}{20} \text{ kg} \end{aligned}$$

Hence, the weight of filled bag is $42\frac{9}{20}$ kg.

3. Suresh walk in 1 hour = $4\frac{1}{3}$ km

Suresh cover distance in $3\frac{2}{5}$ hour

$$\begin{aligned} &= 4\frac{1}{3} \times 3\frac{2}{5} \\ &= \frac{13}{3} \times \frac{17}{5} = \frac{221}{15} = 14\frac{11}{15} \text{ km} \end{aligned}$$

Hence, the distance cover $14\frac{11}{15}$ km

4. Cost of $3\frac{1}{2}$ m of wire = ₹ $57\frac{3}{4}$

Cost of 1 m of wire = $57\frac{3}{4} \div 3\frac{1}{2}$

$$= \frac{231}{4} \div \frac{7}{2} = \frac{231}{4} \times \frac{2}{7}$$

$$= \frac{231}{14} = \frac{33}{2} = ₹ 16 \frac{1}{2}$$

Hence, the cost of 1 m of wire is ₹ $16 \frac{1}{2}$.

5. Cost of 1 m of rope = ₹ $50 \frac{1}{4}$

$$\text{Cost of } 12 \frac{1}{5} \text{ m of rope} = 50 \frac{1}{4} \div 12 \frac{1}{5}$$

$$= \frac{21}{4} \times \frac{61}{5} = \frac{21 \times 61}{4 \times 5}$$

$$= \frac{1281}{20} = ₹ 613 \frac{1}{20}$$

Hence, the cost of $12 \frac{1}{5}$ m of wire is ₹ $613 \frac{1}{20}$.

6. Cost of 1 toy = ₹ $75 \frac{1}{2}$

$$\text{Cost of 8 toys} = ₹ \left(75 \frac{1}{2} \times 8 \right)$$

$$= ₹ \left(\frac{151}{2} \times 8 \right) = ₹ 604$$

Hence, the cost of 8 toys is ₹ 604.

7. Meeta has rope = $20 \frac{3}{4}$ m

She divide it into 5 equal parts

$$\text{Length of 1 part} = 20 \frac{3}{4} \div 5$$

$$= \frac{4 \times 20 + 3}{4} \div 5$$

$$= \frac{83}{4} \div 5 = \frac{83}{4} \times \frac{1}{5}$$

$$= \frac{83}{20} = 4 \frac{3}{20} \text{ m.}$$

Hence, the length of 1 part is $4 \frac{3}{20}$ m.

8. Mohit buys almonds = 10 kg

$$\text{He keeps} = \frac{3}{4} \times 10 = \frac{15}{2} \text{ kg}$$

$$\text{Left almonds} = 10 - \frac{15}{2} = \frac{5}{2} \text{ kg}$$

$$\text{So, cost of } \frac{5}{2} \text{ kg of almonds} = ₹ \left(\frac{5}{2} \times 800 \frac{1}{4} \right)$$

$$= ₹ \left(\frac{5}{2} \times \frac{3201}{4} \right)$$

$$= ₹ \frac{16005}{8} = ₹ 2000 \frac{5}{8}$$

Critical Thinking Skills

Geeta has = ₹ 2000

$$\begin{aligned}\text{Cost of 5 kg mangoes} &= ₹ \left(80\frac{1}{4} \times 5 \right) \\ &= ₹ \left(\frac{321}{4} \times 5 \right) = ₹ \frac{1605}{4}\end{aligned}$$

$$\begin{aligned}\text{Cost of 4 kg apples} &= ₹ \left(120\frac{1}{5} \times 4 \right) \\ &= ₹ \left(\frac{601}{5} \times 4 \right) = ₹ \frac{2404}{5}\end{aligned}$$

$$\text{Cost of 10 kg oranges} = ₹ \left(\frac{201}{4} \times 10 \right) = ₹ \frac{2010}{4}$$

$$\begin{aligned}\text{Total cost of all fruits} &= ₹ \left(\frac{1605}{4} + \frac{2404}{5} + \frac{2010}{4} \right) \\ &= ₹ \left(\frac{8025 + 9616 + 10050}{20} \right) = ₹ \frac{27691}{20}\end{aligned}$$

$$\begin{aligned}\text{Left money} &= 2000 - \left(\frac{27691}{20} \right) \\ &= \frac{40000 - 27692}{20} = ₹ \frac{12309}{20} = ₹ 615 \frac{9}{20}\end{aligned}$$

Revision Time

1. a. $\frac{-3}{7}$ and $\frac{-2}{5}$ LCM of 7 and 5 is 35.

$$\frac{-3}{7} \times \frac{5}{5} = \frac{-15}{35} \quad \text{and} \quad \frac{-2}{5} \times \frac{7}{7} = \frac{-14}{35}$$

Here, $\frac{-15}{35} < \frac{-14}{35}$, Since, $-15 < -14$

Hence, $\frac{-3}{7} < \frac{-2}{5}$

b. $\frac{6}{9}$ and $\frac{3}{5}$

$$\frac{6}{9} \times \frac{5}{5} = \frac{30}{45} \quad \text{and} \quad \frac{3}{5} \times \frac{9}{9} = \frac{27}{45}$$

Here, $\frac{30}{45} > \frac{27}{45}$ Since, $30 > 27$

Hence, $\frac{6}{9} > \frac{3}{5}$

2. a. $\frac{-3}{7}, \frac{-2}{21}, \frac{-6}{15}, \frac{-13}{28}$ LCM of 7, 21, 15 and 28 is 420

$$\frac{-3}{7} \times \frac{60}{60} = \frac{-180}{420} \quad \frac{-2}{21} \times \frac{20}{20} = \frac{-40}{420}$$

$$\frac{-6}{15} \times \frac{28}{28} = \frac{-168}{420} \quad \frac{-13}{28} \times \frac{15}{15} = \frac{-195}{420}$$

Since, $\frac{-195}{420} < \frac{-180}{420} < \frac{-168}{420} < \frac{-40}{420}$

Hence, the ascending order of given rational numbers is

$$\frac{-13}{28}, \frac{-3}{7}, \frac{-6}{15} \text{ and } \frac{-2}{21}$$

b. $\frac{-2}{5}, \frac{-4}{15}, \frac{-3}{10}, \frac{-4}{25}$

LCM of 5, 15, 10 and 25 is 150

$$\frac{-2}{5} \times \frac{30}{30} = \frac{-60}{150}$$

$$\frac{-4}{15} \times \frac{10}{10} = \frac{-40}{150}$$

$$\frac{-3}{10} \times \frac{15}{15} = \frac{-45}{150}$$

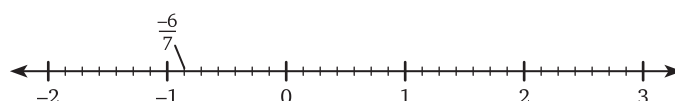
$$\frac{-4}{25} \times \frac{6}{6} = \frac{-24}{150}$$

Since, $\frac{-60}{150} < \frac{-45}{150} < \frac{-40}{150} < \frac{-24}{150}$

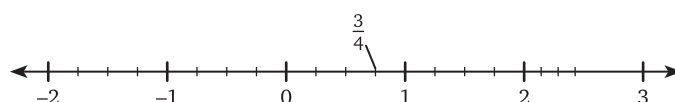
Hence, the ascending order of given rational numbers is

$$\frac{-2}{5}, \frac{-3}{10}, \frac{-4}{15} \text{ and } \frac{-4}{25}$$

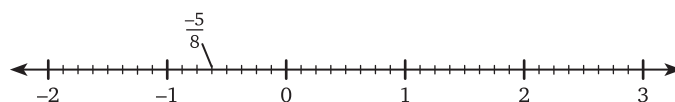
3. a. Divide each unit into 7 equal parts



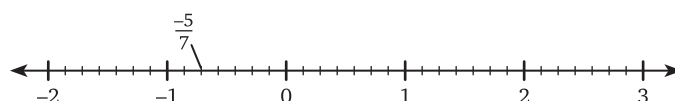
- b. Divide each unit into 4 equal parts



- c. Divide each unit into 8 equal parts



- d. Divide each unit into 7 equal parts



4. $\frac{-2}{5}$ and $\frac{1}{10}$

$$\frac{-2}{5} \times \frac{2}{2} = \frac{-4}{10}$$

$$\frac{1}{10} \times \frac{1}{1} = \frac{1}{10}$$

The four rational number $\frac{-4}{10}$ and $\frac{1}{10}$ are $\frac{-3}{10}, \frac{-2}{10}, \frac{-1}{10}$ and 0.

5. a. $\frac{-3}{14} + \frac{-6}{28} - \frac{4}{7} + \frac{-8}{21} = \frac{-3 \times 6 + (-6) \times 3 - 4 \times 12 + (-8) \times 4}{84}$

$$= \frac{-18 - 18 - 48 - 32}{84} = \frac{-116}{84} = \frac{-29}{21}$$

b. $\frac{-7}{10} + \frac{-3}{20} - \frac{6}{15} - \left(\frac{-3}{5}\right) = \frac{-7 \times 6 + -3 \times 3 - 6 \times 4 + 3 \times 12}{60}$

$$= \frac{-42 - 9 - 24 + 36}{60} = \frac{-39}{60} = \frac{-13}{20}$$

6. a. $\frac{-3}{4} \times \frac{16}{21} \times \frac{-7}{8} = \frac{-3 \times 16 \times -7}{4 \times 21 \times 8} = \frac{2}{9}$

- b. $\frac{-16}{32} \times \frac{5}{35} \times \frac{28}{10} = \frac{-16 \times 5 \times 28}{32 \times 35 \times 10} = \frac{-1}{5}$
7. a. $\frac{5}{7} \times \frac{-2}{10} - \frac{1}{6} \times \frac{3}{5} + \frac{-5}{7} \times \frac{3}{10} = \frac{5}{7} \times \left(\frac{-2}{10} - \frac{3}{10} \right) - \frac{1}{6} \times \frac{3}{5}$
 $= \frac{5}{7} \times \left(\frac{-5}{10} \right) - \frac{1}{10} = -\frac{5}{14} - \frac{1}{10}$
 $= \frac{-25-7}{70} = \frac{-32}{70} = \frac{-16}{35}$
- b. $\frac{3}{5} \times \frac{-2}{3} + \frac{1}{7} \times \frac{2}{7} - \frac{3}{7} \times \frac{2}{3} = \frac{2}{3} \left(-\frac{3}{5} - \frac{3}{7} \right) + \frac{2}{49} = \frac{2}{3} \left(\frac{-21-15}{35} \right) + \frac{2}{49}$
 $= \frac{2}{3} \times \frac{-36}{35} + \frac{2}{49} = \frac{-24}{35} + \frac{2}{49}$
 $= \frac{-24 \times 7 + 2 \times 5}{245} = \frac{-168+10}{245} = \frac{-158}{245}$
8. a. $\frac{-16}{15} \div \frac{18}{25} = \frac{-16}{15} \times \frac{25}{18} = -\frac{40}{27} = -1 \frac{13}{27}$
- b. $\frac{3}{17} \div \frac{-6}{34} = \frac{3}{17} \times \frac{34}{-6} = -1$
- c. $\frac{8}{19} \div \frac{-16}{57} = \frac{8}{19} \times \frac{-57}{16} = \frac{-3}{2}$
9. Required number $= \frac{5}{14} - \left(\frac{-3}{7} \right) = \frac{5}{14} + \frac{3}{7}$
 $= \frac{5+6}{14} = \frac{11}{14}$
10. $\frac{C}{5} = \frac{F-32}{9}$
 $\Rightarrow \frac{-16}{5} = \frac{F-32}{9}$
 $\Rightarrow F-32 = \frac{-16}{5} \times 9 = \frac{-144}{5}$
 $\Rightarrow F = \frac{-144}{5} + 32 = -\frac{144+160}{5} = \frac{16}{5}^{\circ}\text{F} = 3.2^{\circ}\text{F}$

CHAPTER-9: LINEAR EQUATION IN ONE VARIABLE

Assessment Time 9.1

1. a. $5x + 4 = 9$
 $5x = 9 - 4$
 $5x = 5$
 $x = \frac{5}{5} = 1$
- b. $5(x - 2) = 7$
 $5x - 10 = 7$
 $5x = 7 + 10$
 $5x = 17$
 $x = \frac{17}{5}$

$$c. \quad \frac{15}{4} - 7x = 10$$

$$\frac{15 - 28x}{4} = 10$$

$$15 - 40 = 28x$$

$$-25 = 28x$$

$$x = \frac{-25}{28}$$

$$d. \quad \frac{x}{2} + \frac{2}{5} = \frac{-3}{10}$$

$$\frac{5x + 6}{15} = \frac{-3}{10}$$

$$10(5x + 6) = -3 \times 15$$

$$50x + 60 = -45$$

$$50x = -45 - 60$$

$$50x = -105$$

$$x = \frac{-105}{50} = \frac{-21}{10}$$

$$2. \quad a. \quad 3x + 4 = 2x - 18$$

$$3x - 2x = -18 - 4$$

$$x = -22$$

$$b. \quad 2y + \frac{5}{3} = \frac{24}{5} - 3y$$

$$\frac{6y + 5}{3} = \frac{24 - 15y}{5}$$

$$5(6y + 5) = 3(24 - 15y)$$

$$30y + 25 = 72 - 25$$

$$75y = 47$$

$$y = \frac{47}{75}$$

$$c. \quad 2m = 5m - \frac{7}{4}$$

$$\Rightarrow \frac{7}{4} = 5m - 2m$$

$$\Rightarrow \frac{7}{4} = 3m$$

$$\Rightarrow m = \frac{7}{3 \times 4} = \frac{7}{12}$$

$$e. \quad 2x - 1 = 15 - x$$

$$2x + x = 15 + 1$$

$$3x = 16$$

$$x = \frac{16}{3}$$

$$f. \quad 4z + 6 = 7 + 3z$$

$$4z - 3z = 7 - 6$$

$$z = 1$$

Verification

$$3x - 22 + 4 = 2 \times -22 - 18$$

$$-66 + 4 = -44 - 18$$

$$-62 = -62$$

$$\text{LHS} = \text{RHS}$$

Verification

$$2 \times \frac{47}{75} + \frac{5}{3} = \frac{24}{5} - \frac{3 \times 47}{75}$$

$$\frac{94}{75} + \frac{5}{3} = \frac{24}{5} - \frac{141}{75}$$

$$\frac{94 + 5 \times 25}{75} = \frac{24 \times 15 - 141}{75}$$

$$\frac{94 + 125}{75} = \frac{360 - 141}{75}$$

$$\frac{219}{75} = \frac{219}{75}$$

$$\text{LHS} = \text{RHS}$$

Verification:

$$2 \times \frac{7}{12} = 5 \times \frac{7}{12} - \frac{7}{4}$$

$$= \frac{14}{12} = \frac{35}{12} - \frac{7}{4}$$

$$\Rightarrow \frac{14}{12} = \frac{35 - 7 \times 3}{12}$$

$$\Rightarrow \frac{14}{12} = \frac{35 - 21}{12}$$

$$\Rightarrow \frac{14}{12} = \frac{14}{12}$$

$$\text{LHS} = \text{RHS}$$

$$\begin{aligned}
 \text{d. } \frac{x}{2} - \frac{1}{5} &= \frac{x}{4} + \frac{3}{10} \\
 \Rightarrow \frac{x}{2} - \frac{x}{4} &= \frac{3}{10} + \frac{1}{5} \\
 \frac{2x-x}{4} &= \frac{3+2}{10} \\
 \frac{x}{4} &= \frac{5}{10} \\
 \Rightarrow \frac{x}{4} &= \frac{1}{2} \\
 \Rightarrow x &= \frac{4}{2} = 2
 \end{aligned}$$

Verification:

$$\begin{aligned}
 \frac{x}{2} - \frac{1}{5} &= \frac{x}{4} + \frac{3}{10} \\
 \Rightarrow \frac{2}{2} - \frac{1}{5} &= \frac{2}{4} + \frac{3}{10} \\
 1 - \frac{1}{5} &= \frac{1}{2} + \frac{3}{10} \\
 \Rightarrow \frac{5-1}{5} &= \frac{5+3}{10} \\
 \frac{4}{5} &= \frac{8}{10} \Rightarrow \frac{4}{5} = \frac{4}{5}
 \end{aligned}$$

LHS = RHS

$$\begin{aligned}
 \text{e. } \frac{6x+1}{3} + 2 &= \frac{x-3}{4} \\
 \frac{6x+1+6}{3} &= \frac{x-3}{4} \\
 \frac{6x+7}{3} &= \frac{x-3}{4} \\
 4(6x+7) &= 3(x-3) \\
 24x+28 &= 3x-9 \\
 24x-3x &= -9-28 \\
 21x &= -37 \\
 x &= \frac{-37}{21}
 \end{aligned}$$

Verification:

$$\begin{aligned}
 \frac{6x+1}{3} + 2 &= \frac{x-3}{4} \\
 \frac{6x+7}{3} &= \frac{x-3}{4} \\
 24x+28 &= 3x-9 \\
 24 \times \left(\frac{-37}{21}\right) + 28 &= 3 \times \left(\frac{-37}{21}\right) - 9 \\
 8 \times \frac{-37}{7} + 28 &= \frac{-37}{7} - 9 \\
 \frac{-296}{7} + 28 &= \frac{-37-63}{7} \\
 \frac{-296+196}{7} &= \frac{-100}{7} \\
 \frac{-100}{7} &= \frac{-100}{7} \\
 \text{LHS} &= \text{RHS}
 \end{aligned}$$

$$\begin{aligned}
 \text{f. } 3(t-4) &= 5(2t+1) \\
 3t-12 &= 10t+5 \\
 3t-10t &= 5+12 \\
 -7t &= 17 \\
 t &= \frac{-17}{7}
 \end{aligned}$$

Verification:

$$\begin{aligned}
 3(t-4) &= 5(2t+1) \\
 3t-12 &= 10t+5 \\
 3 \times \frac{-17}{7} - 12 &= 10 \times \frac{-17}{7} + 5 \\
 \frac{-51}{7} - 12 &= \frac{-170}{7} + 5 \\
 \frac{-51-84}{7} &= \frac{-170-35}{7} \\
 -51-84 &= -170+35 \\
 -135 &= -135 \\
 \text{LHS} &= \text{RHS}
 \end{aligned}$$

$$\begin{aligned}
 3. \quad a. \quad & \frac{3x}{4x+2} = -4 \\
 & 3x = -4(4x+2) \\
 & 3x = -16x-8 \\
 & 3x+16x = -8 \\
 & 19x = -8 \\
 & x = \frac{-8}{19}
 \end{aligned}$$

$$\begin{aligned}
 b. \quad & \frac{2m+1}{3m-2} = \frac{3}{2} \\
 & 2(2m+1) = 3(3m-2) \\
 & 4m+2 = 9m-6 \\
 & 2+6 = 9m-4m \\
 & 8 = 5m \\
 & m = \frac{8}{5}
 \end{aligned}$$

$$\begin{aligned}
 c. \quad & \frac{7y+3}{4-y} = \frac{17}{3} \\
 & 3(7y+3) = 17(4-y) \\
 & 21y+9 = 68-17y \\
 & 21y+9 = 68-17y \\
 & 21y+17y = 68-9 \\
 & 38y = 59 \\
 & y = \frac{59}{38}
 \end{aligned}$$

$$\begin{aligned}
 d. \quad & \frac{3y+7}{5y-11} = \frac{-1}{3} \\
 & 3(3y+7) = -1(5y-11) \\
 & 9y+21 = -5y+11 \\
 & 9y+5y = 11-21 \\
 & 14y = -10 \\
 & y = \frac{-10}{14} = \frac{-5}{7}
 \end{aligned}$$

$$\begin{aligned}
 e. \quad & \frac{7-3n}{n+3} = \frac{1}{5} \\
 \Rightarrow & 5(7-3n) = n+3 \\
 \Rightarrow & 35-15n = n+3 \\
 \Rightarrow & 32 = 16n \\
 \Rightarrow & \frac{32}{16} = n \\
 \Rightarrow & n = 2
 \end{aligned}$$

$$\begin{aligned}
 f. \quad & \frac{7n+4}{n+2} = \frac{-4}{5} \\
 & 5(7n+4) = -4(n+2) \\
 & 35n+20 = -4n-8 \\
 & 35n+4n = -8-20 \\
 & 39n = -28 \\
 & n = \frac{-28}{39}
 \end{aligned}$$

$$\begin{aligned}
 4. \quad a. \quad & \frac{2p-(6-5p)}{9p-(3+5p)} = \frac{7}{6} \quad \Rightarrow \quad \frac{2p-6+5p}{9p-3-5p} = \frac{7}{6} \\
 & \frac{7p-6}{4p-3} = \frac{7}{6} \quad \Rightarrow \quad 6(7p-6) = 7(4p-3) \\
 & 42p-36 = 28p-21 \\
 & 42p-28p = -21+36 \\
 & 14p = 15 \quad \Rightarrow \quad p = \frac{15}{14}
 \end{aligned}$$

$$b. \quad \frac{2(4-5x)-3(4-x)}{2-3x} = 2 \quad c. \quad \frac{15(2-y)-5(y+6)}{1-5y} = 10$$

$$\begin{aligned}
 & 8-10x-12+3x = 2(2-3x) \\
 & -4-7x = 4-6x \\
 & -4-4 = -6x+7x \\
 & -8 = x
 \end{aligned}$$

$$\begin{aligned}
 & 30-15y-5y-30 = 10-50y \\
 & -20y = 10-50y \\
 & -20y+50y = 10 \\
 & 30y = 10 \\
 & y = \frac{10}{30} = \frac{1}{3}
 \end{aligned}$$

$$\begin{aligned}
 d. \quad & 0.25(4f-3) = 0.05(10f-1) \\
 & 1f-0.75 = 0.5f-0.45 \quad \Rightarrow \quad 1f-0.5f = -0.45+0.75 \\
 & 0.5f = 0.30 \quad \Rightarrow \quad f = \frac{0.3}{0.5} = 0.6
 \end{aligned}$$

Critical Thinking Skills

$$\begin{aligned}
4(x+2)^2 - 2(x-1)^2 &= 28x + 24 \\
4(x^2 + 4 + 4x) - 2(x^2 + 1 - 2x) &= 28x + 24 \\
4x^2 + 16 + 16x - 2x^2 - 2 + 4x &= 28x + 24 \\
2x^2 + 14 + 20x - 28x - 24 &= 0 \\
2x^2 - 10 - 8x &= 0 \\
2(x^2 - 4x - 5) &= 0 \\
x^2 - 5x + x - 5 &= 0 \\
x(x-5) + 1(x-5) &= 0 \\
(x+1)(x-5) &= 0 \\
x &= -1 \text{ or } 5
\end{aligned}$$

Assessment Time 9.2

1. Let the two consecutive even natural numbers is $x + 2, x + 4$,

$$\begin{aligned}
x + 2 + x + 4 &= 86 \\
2x + 6 &= 86 \\
2x &= 86 - 6 = 80 \\
2x &= 80 \\
x &= \frac{80}{2} = 40
\end{aligned}$$

So, $x + 2 = 40 + 2 = 42$ and $x + 4 = 40 + 4 = 44$

Hence, the two consecutive even natural numbers are 42 and 44.

2. Let the three consecutive multiple of 3 are $x, (x + 3), (x + 6)$

$$\begin{aligned}
x + x + 3 + x + 6 &= 207 \\
3x + 9 &= 207 \\
3x &= 207 - 9 = 198 \\
x &= \frac{198}{3} = 66
\end{aligned}$$

$x = 66, x + 3 = 66 + 3 = 69, x + 6 = 66 + 6 = 72$

Hence, the three consecutive multiples of 3 are 66, 69 and 72

3. The ratio of three numbers are $2 : 4 : 5$

So, numbers be $2x, 4x$ and $5x$.

According to the given questions,

$$\begin{aligned}
2x + 4x + 5x &= 99 \\
11x &= 99 \Rightarrow x = \frac{99}{11} = 9
\end{aligned}$$

$2 \times 9 = 18, 4 \times 9 = 36, 5 \times 9 = 45$

Hence, the numbers be 18, 36 and 45.

4. Let the Arnav's age be x .

According to the given condition,

$$\begin{aligned}
15 + x &= 4x \Rightarrow 15 = 4x - x \\
15 &= 3x \Rightarrow 3x = 15 \\
x &= \frac{15}{3} = 5
\end{aligned}$$

Hence, the Arav's age is 5 years.

5. Mehul's age = x

Mehul's father age = $3x$

$$x + 5 + 3x + 5 = 66 \quad \Rightarrow \quad 4x + 10 = 66$$

$$4x = 66 - 10 \quad \Rightarrow \quad 4x = 56$$

$$x = \frac{56}{4} = 14$$

Mehul's age $x = 14$ years

Mehul's father age = $14 \times 3 = 42$ years

6. Ratio of 50 rupees notes to 20

Rupee notes = $3 : 5$

Let 50 rupees note be $3x$

20 rupees note be $5x$

$$\begin{aligned} \text{So, } 10 \text{ rupees note} &= 25 - (3x + 5x) \\ &= 25 - 8x \end{aligned}$$

Total money = ₹ 590

$$\text{So, } 50 \times 3x + 20 \times 5x + 10(25 - 8x) = 590$$

$$\Rightarrow 150x + 100x + 250 - 80x = 590$$

$$\Rightarrow 170x = 590 - 250$$

$$\Rightarrow 170x = 340$$

$$\therefore x = 2$$

Hence, 50 rupees notes = 6

20 rupees notes = 10

10 rupees notes = 9

7. Let tens place digit be x

$\therefore$ Ones place digit be $5 - x$

$$\begin{aligned} \text{So, number} &= 10x + 5 - x \\ &= 9x + 5 \end{aligned}$$

On reversing the digit

$$\begin{aligned} \text{New number} &= 10(5 - x) + x \\ &= 50 - 9x \end{aligned}$$

According to given condition,

$$(9x + 5) - (50 - 9x) = 9$$

$$\Rightarrow 18x = 9 + 45 = 54$$

$$\Rightarrow x = 3$$

$$\text{Hence, number} = 9 \times 3 + 5 = 32$$

8. Let the numerator be $x - 4$

Let the denominator be x

According to the condition

$$\frac{x - 4 + 1}{x} = \frac{2}{5}$$

$$\frac{x - 3}{x} = \frac{2}{5}$$

$$5x - 15 = 2x$$

$$5x - 2x = 15$$

$$3x = 15$$

$$x = \frac{15}{3} = 5$$

Hence, the fraction is $\frac{5-4}{5} = \frac{1}{5}$

9. Let the speed of steamer be x km/hrs in still water

So, speed of stream in downstream (in the direction of stream) = $(x + 2)$ km/hr

and the speed of stream in upstream (in the opposite direction of the stream) = $(x - 2)$ km/hr

Distance = speed $\times$ time

Distance covered in downstream = $(x + 2) \times 4 = (4x + 8)$ km

Distance covered in upstream = $(x - 2) \times 6 = (6x - 12)$ km

Since, both distance are equal

$$4x + 8 = 6x - 12$$

$$\Rightarrow 8 + 12 = 6x - 4x$$

$$\Rightarrow 20 = 2x \quad \Rightarrow \quad x = \frac{20}{2} = 10$$

Hence, the speed of steamer in still water is 10 km/hr.

10. Ratio of length to breadth = 11 : 4

Let the length be $11x$ m

Breadth be $4x$ m

$$\text{Perimeter of land} = \frac{75000}{100} = 750$$

Now, Perimeter of land = $2(L + B)$

$$\Rightarrow 750 = 2(11x + 4x)$$

$$\Rightarrow 750 = 30x \quad \Rightarrow \quad x = 25$$

Hence, Length = $11 \times 25 = 275$ m

Breadth = $4 \times 25 = 100$ m

Mental Math

1. Linear equation

2. 1

3. changes

$$4. \quad \frac{3x}{4} + \frac{x}{6} = 22$$

$$\frac{9x + 2x}{12} = 22$$

$$x = \frac{22 \times 12}{11} = 24$$

$$5. \quad \frac{2x + 5}{4x - 3} = 2$$

$$2x + 5 = 8x - 6$$

$$6x = 11$$

$$x = \frac{11}{6}$$

Revision Time

1. a. $\frac{x}{4} - 5 = 6$

$$\frac{x - 20}{4} = 6$$

$$\Rightarrow x - 20 = 24$$

$$x = 24 + 20 = 44$$

b. $\frac{t + 4}{3} = 9$

$$t + 4 = 9 \times 3$$

$$\Rightarrow t + 4 = 27$$

$$t = 27 - 4$$

$$\Rightarrow t = 23$$

$$\begin{aligned} \text{c. } \frac{m}{3} + \frac{3m}{4} &= 13 \\ \frac{m \times 4 + 3 \times 3m}{12} &= 13 \\ 4m + 9m &= 13 \times 12 \\ m &= \frac{13 \times 12}{13} = 12 \end{aligned}$$

$$\begin{aligned} \text{d. } 4y + \frac{3y}{5} &= 2y - \frac{1}{10} \\ 4y - 2y &= -\frac{1}{10} - \frac{3}{5} \\ 2y &= \frac{-1-6}{10} = \frac{-7}{10} \\ y &= \frac{-7}{20} \end{aligned}$$

$$\begin{aligned} \text{e. } 10p - (4p - 3) &= 3(p + 1) + 8 \\ 10p - 4p + 3 &= 3p + 3 + 8 \\ 6p + 3 &= 3p + 11 \\ 6p - 3p &= 11 - 3 \\ 3p &= 8 \\ p &= \frac{8}{3} \end{aligned}$$

$$\begin{aligned} \text{f. } 4(x + 3) - 3(x - 1) &= 3x + 2 \\ 4x + 12 - 3x + 3 &= 3x + 2 \\ x + 15 &= 3x + 2 \\ 15 - 2 &= 3x - x \\ 13 &= 2x \\ x &= \frac{13}{2} \end{aligned}$$

$$\begin{aligned} 2. \text{ a. } \frac{6}{2m + 1} &= \frac{5}{3m - 6} \\ 6(3m - 6) &= 5(2m + 1) \\ 18m - 36 &= 10m + 5 \\ 18m - 10m &= 36 + 5 \\ 8m &= 41 \\ \Rightarrow m &= \frac{41}{8} \end{aligned}$$

$$\begin{aligned} \text{b. } \frac{2x + 3}{5} &= \frac{4x + 7}{8} \\ 8(2x + 3) &= 5(4x + 7) \\ 16x + 24 &= 20x + 35 \\ 24 - 35 &= 20x - 16x \\ -11 &= 4x \\ \Rightarrow x &= \frac{-11}{4} \end{aligned}$$

$$\begin{aligned} \text{c. } \frac{17(2 - x) - 5(x + 12)}{1 - 6x} &= 5 \\ 34 - 17x - 5x - 60 &= 5(1 - 6x) \\ -26 - 22x &= 5 - 30x \\ -26 - 5 &= -30x + 22x \\ -31 &= -8x \\ x &= \frac{31}{8} \end{aligned}$$

$$\begin{aligned} \text{d. } \frac{(2x + 3) - 2(4x - 6)}{6x + 5} &= \frac{-5}{3} \\ \frac{2x + 3 - 8x + 12}{6x + 5} &= \frac{-5}{3} \\ \frac{-6x + 15}{6x + 5} &= \frac{-5}{3} \\ 3(-6x + 15) &= -5(6x + 5) \\ -18x + 30x &= -25 - 45 \\ 12x &= -70 \\ x &= \frac{-70}{12} = \frac{-35}{6} \end{aligned}$$

3. Let the three consecutive odd numbers be $x, x+2, x+4$

$$\begin{aligned} x + x + 2 + x + 4 &= 135 \\ 3x + 6 &= 135 \\ 3x &= 135 - 6 \\ x &= \frac{129}{3} = 43 \end{aligned}$$

$$x = 43, x + 2 = 43 + 2 = 45, x + 4 = 43 + 4 = 47$$

4. Mishi's present age = x , Neha's present age = $24 + x$
10 years ago

$$24 + x - 10 = 5(x - 10)$$

$$14 + x = 5x - 50$$

$$5x - x = 14 + 50$$

$$4x = 64$$

$$x = \frac{64}{4} = 16$$

Hence, Mishi's present age is 16 years and Neha's present age is $24 + 16 = 40$ years

5. Ratio of ages of Tina and Ina = 5 : 7

Let age of Tina be $5x$ years

So, Ina age be $7x$ years

After 4 years,

$$\frac{5x + 4}{7x + 4} = \frac{3}{4}$$

$$20x + 16 = 21x + 12$$

$$21x - 20x = 16 - 12$$

$$x = 4$$

Hence, age of Tina is 20 years and age of Ina is 28 years.

6. Let five rupees coins be x

Then two rupees coin is $3x$

According to questions,

$$3x \times 2 + x \times 5 = 154$$

$$6x + 5x = 154$$

$$11x = 154$$

$$x = \frac{154}{11} = 14$$

Hence, five rupees coin is 14 and two rupees coin is 42.

7. Let numerator be x

Then denominator is $x + 2$

According to question,

$$\frac{x + 3}{x + 2 + 3} = \frac{5}{6}$$

$$6x + 18 = 5x + 25$$

$$6x - 5x = 25 - 18 \Rightarrow x = 7$$

Hence, fraction $\frac{7}{9}$

8. Let ones place digit be x then tens place digit = $2x$.

So, number = $10 \times 2x + x = 21x$

On reversing the digits, new numerator = $10x + 2x = 12x$

According to question,

$$21x - 12x = 36$$

$$9x = 36 \Rightarrow x = 4$$

Hence, number = $21 \times 4 = 84$

9. Let tens place digit be x

Then ones place digit be = $9 - x$

$$= 10x + 9 - x$$

$$= 9x + 9$$

$$\begin{aligned}\text{On reversing the order of digits, new number} &= 10(9 - x) + x \\ &= 90 - 9x\end{aligned}$$

According to question,

$$\begin{aligned}(90 - 9x) - (9x + 9) &= 27 \\ \Rightarrow 81 - 18x &= 27 \\ \Rightarrow 81 - 18x &= 27 \\ \Rightarrow 18x &= 81 - 27 = 54 \quad \Rightarrow x = 3\end{aligned}$$

$$\text{Hence, number} = 9 \times 3 + 9 = 36$$

10. Let total number of sheep be x

$$\text{No. of sheep grazing} = \frac{x}{2}$$

$$\text{No. of sheep playing near by river} = \frac{3}{4} \times \frac{x}{2} = \frac{3x}{8}$$

$$\text{Now, } \frac{x}{2} + \frac{3x}{8} + 9 = x$$

$$\begin{aligned}9 &= x - \frac{x}{2} - \frac{3x}{8} \\ &= \frac{8x - 4x - 3x}{8} = \frac{x}{8} \\ x &= 72\end{aligned}$$

Multiple Choice Questions

1. (c) 2. (b) 3. (a) 4. (d) 5. (a)

CHAPTER-10: PERCENTAGE AND ITS APPLICATION

Assessment Time 10.1

1. Original salary = ₹ 25,000
 New salary = ₹ 30,000
 Increase in salary = ₹ (30,000 - 25,000) = ₹ 5,000
 Increase percentage = $\left(\frac{\text{Increase in value}}{\text{Original value}}\right) \times 100$
 $= \left(\frac{5,000}{25,000}\right) \times 100 = \frac{1}{5} \times 100 = 20\%$

Hence, increase percentage in salary is 20%

2. Original price = ₹ 22,000
 New price = ₹ 18,000
 Decrease in price = ₹ (22,000 - 18,000) = ₹ 4,000
 Decrease percentage = $\left(\frac{\text{Decrease in value}}{\text{Original value}}\right) \times 100$
 $= \left(\frac{4,000}{22,000}\right) \times 100 = 18.18\%$

Hence, the decrease percentage in the price of LED TV is 18.18%

3. Price of motorcycle last year = ₹ 75,000

Increase in price = ₹ (8% of 75000)

$$= ₹ \left(\frac{8}{100} \times 75000 \right) = ₹ 6000$$

So, new price of motorcycle = ₹ (75000 + 6000)

$$= ₹ 81000$$

Hence, the new price of motorcycle is ₹ 81,000

4. Percentage of girls = 30%

Percentage of boys = (100 - 30)% = 70%

Let the total no. of student be x .

Number of boys = 560

70% of x = 560

$$x = \left(\frac{560 \times 100}{70} \right) = 800$$

Hence, the total number of student is 800.

Number of girls = 30% of 800 = $\left(\frac{30}{100} \times 800 \right) = 240$

Hence, the total number of girls is 240.

5. Let the money before spending be x .

Left % = (100 - 70) = 30 %

(30% of x) = ₹ 4800

$$\left(\frac{30}{100} \times x \right) = 4800 \quad \Rightarrow \quad x = \left(\frac{4800 \times 100}{30} \right) = ₹ 16,000$$

6. Total weight of fruits = 300 kg

Weights of apples = 30% of 300 = $\frac{30}{100} \times 300 = 90$ kg

Weight of oranges = $\frac{20}{100} \times 300 = 60$ kg

Weight of watermelon = $\frac{15}{100} \times 300 = 45$ kg

Weight of pears = (300 kg - 90 kg - 60 kg - 45 kg)
= 300 kg - 195 kg = 105 kg

Hence, the weight of oranges is 60 kg, watermelon is 45 kg, apples is 90 kg and pears is 105 kg.

7. Let the original quantity of mangoes be x .

(100 - 80)% = 20%

20% of x = 5 kg $\Rightarrow \frac{20}{100} \times x = 5$

$$x = \frac{5 \times 100}{20} = \frac{500}{20} = 25 \text{ kg}$$

Hence, the original quantity of mangoes is 25 kg.

8. Drum contained oil = 80 L

Oil after leaked = (80 - 5) L = 75 L

Percentage decrease = $\frac{\text{Decrease value}}{\text{Original value}} \times 100$

$$= \left(\frac{75}{80} \times 100 \right) = \frac{750}{8} = 93.75\%$$

Hence, the percentage of oil remained in the drum is 93.75%.

9. Students weak in Maths = 40% of 60 = $\frac{40}{100} \times 60 = 24$ students
 Students good in Maths = 60 – 24 = 36 students
 Hence, 36 students are good in Maths.

SEL-Helping

10. Percentage of money left with Manoj = $(100 - 20 - 35 - 15)\%$
 $= (100 - 70)\% = 30\%$

Let monthly salary be x .

So, 30% of $x = ₹ 12,000$

$$\frac{30}{100} \times x = 12000$$

$$x = \frac{12000 \times 100}{30} = ₹ 40,000$$

Hence, his monthly salary is ₹ 40,000.

Critical Thinking Skills

Sides of rectangle are 30 cm and 20 cm

$$\text{Side increase} = 10\% \text{ of } 30 = 30 \times \frac{10}{100} = 3 \text{ cm}$$

$$\text{New side (l)} = 30 \text{ cm} + 3 \text{ cm} = 33 \text{ cm}$$

$$\text{Side increase (b)} = 10\% \text{ of } 20$$

$$= \frac{10}{100} \times 20 = 2 \text{ cm}$$

$$\text{New breadth} = 20 + 2 = 22 \text{ cm}$$

$$\text{Original area} = 30 \times 20 = 600 \text{ cm}^2$$

$$\text{New area} = 33 \times 22 = 726 \text{ cm}^2$$

$$\text{Increase in area} = 726 - 600 = 126 \text{ cm}^2$$

$$\begin{aligned} \text{Percentage \%} &= \frac{126}{600} \times 100 \\ &= 21\% \end{aligned}$$

Assessment Time 10.2

1. a. Cost price b. Profit c. Loss
 d. Transportation charge, repairing charge, labour charges.

2. Cost of a bike = ₹ 3,000

Oney spent on accessories = ₹ 500

$$\text{Total cost of a bike} = ₹ (3,000 + 500) = ₹ 3,500$$

Selling price of it = ₹ 5,000

Here, SP > CP, so there is a profit.

$$\text{Profit (SP - CP)} = ₹ (5,000 - 3,500) = ₹ 1,500$$

$$\text{Profit \%} = \frac{\text{Profit}}{\text{CP}} \times 100 = \frac{1500}{3500} \times 100 = 42.85\%$$

Hence, Manoj make a profit of 42.85% on bike.

3. SP of chair = ₹ 432, Loss = 4%

$$\begin{aligned}\text{So, } CP &= \left(\frac{100}{100 - L\%} \right) \times SP = \left(\frac{100}{100 - 4} \right) \times 432 \\ &= \frac{100}{96} \times 432 = \frac{43200}{96} = 450\end{aligned}$$

$$\begin{aligned}\text{New SP of chair as to gain 15\%} &= \left(\frac{100 + p\%}{100} \right) \times CP \\ &= \left(\frac{100 + 15}{100} \times 450 \right) = \left(\frac{115}{100} \times 450 \right) \\ &= \left(\frac{115 \times 9}{2} \right) = 517.50\end{aligned}$$

Hence, he sell it for ₹ 517.50

4. SP of scooter = ₹ 2700, Loss = 10%

$$\begin{aligned}CP &= \left(\frac{100}{100 - L\%} \right) \times SP \\ &= \left(\frac{100}{100 - 10} \right) \times 2700 = \left(\frac{100}{90} \times 2700 \right) \\ &= 100 \times 30 = 3,000\end{aligned}$$

$$\begin{aligned}\text{New SP of hair as to gain 8\%} &= \left(\frac{100 + p\%}{100} \right) \times CP \\ &= \left(\frac{100 + 8}{100} \right) \times 3000 = \left(\frac{108}{100} \times 3000 \right) \\ &= 108 \times 30 = 3240\end{aligned}$$

Hence, he sell the scooter for ₹ 3240.

5. Let CP of the toy car be ₹ x .

$$\text{SP of 16\% profit} = \left(\frac{100 + 16}{100} \right) \times x = ₹ \frac{116}{100} \times x$$

$$\text{SP at 20\% profit} = \left(\frac{100 + 20}{100} \right) \times x = ₹ \frac{120x}{100}$$

According to questions,

$$\frac{120x}{100} - \frac{116x}{100} = 100$$

$$\frac{4x}{100} = 100$$

$$x = \frac{100 \times 100}{4} = ₹ 2500$$

6. CP of one jeans = ₹ 500

$$\text{CP of 100 jeans} = ₹ (500 \times 100) = ₹ 50,000$$

$$\begin{aligned}\text{SP at 25\%} &= \left(\frac{100 + 25}{100} \right) \times 50,000 \\ &= ₹ (125 \times 500) = ₹ 62,500\end{aligned}$$

$$\text{Selling price of 20 jeans} = ₹ (300 \times 20) = ₹ 6000$$

$$\therefore \text{SP of 80 jeans} = 62,500 - 6000 = ₹ 56,500$$

$$\therefore \text{Cost of 1 jeans} = ₹ \frac{56,500}{80} = ₹ 706.25$$

7. CP of 50 kg tea leaves at ₹ 150 per kg = ₹ (50 × 150)
= ₹ 7500

$$\text{CP of 50 kg tea leaves at ₹ 50 per kg} = ₹ (50 \times 50) \\ = ₹ 2500$$

$$\text{Total CP of 100 kg tea leaves} = ₹ (7500 + 2500) \\ = ₹ 10,000$$

$$\text{SP of 100 kg tea leaves} = ₹ (130 \times 100) \\ = ₹ 13,000$$

$$\text{So, Profit} = \text{SP} - \text{CP} \\ = ₹ (13000 - 10000) = ₹ 3000$$

$$P\% = \frac{3000}{10000} \times 100 = 30\%$$

8. Let CP of one buffalo be ₹ x .

$$\text{So, CP of other buffalo} = ₹ (80000 - x)$$

$$\text{SP at 20\% gain} = \text{SP at 20\% loss}$$

$$\left(\frac{100 + 20}{100}\right) \times x = \left(\frac{100 - 20}{100}\right) \times (80000 - x)$$

$$120x = 6400000 - 80x$$

$$200x = 6400000$$

$$x = \frac{6400000}{200} = 32000$$

Hence, CP of one buffalo is ₹ 32,000 and CP of other buffalo is = ₹ 48,000

9. Cost price of 1 copy = ₹ 1

$$\text{So, CP of 10 copies} = ₹ 10$$

$$\text{SP of 8 copies} = \text{CP of 10 copies} = ₹ 10$$

$$\text{SP of 1 copy} = ₹ \left(\frac{10}{8}\right) = ₹ \left(\frac{5}{4}\right)$$

$$\text{Profit} = \text{SP} - \text{CP} = ₹ \left(\frac{5}{4} - 1\right)$$

$$= ₹ \left(\frac{5 - 4}{4}\right) = ₹ \frac{1}{4}$$

$$\text{Profit \%} = \frac{\text{Profit}}{\text{CP}} \times 100 = \frac{1}{4} \times 100 = 25\%$$

Hence, the profit on one copy is 25%.

SDG-Good Health

10. Total books = 2,00,000

$$20\% \text{ of } 2,00,000 = \frac{20}{100} \times 200000 \\ = 40,000$$

$$\text{Cost of 40,000 books} = 40,000 \times 60 \\ = ₹ 24,00,000$$

$$\text{Profit on one book} = \frac{30}{100} \times 60 = ₹ 18$$

$$\text{Profit on 1,60,000 books} = ₹ (160000 \times 18) \\ = ₹ 28,80,000$$

$$\text{Net profit} = ₹ (28,80,000 - 24,00,000) = ₹ 4,80,000$$

$$\begin{aligned}\text{Net p\%} &= \frac{480000}{\text{Total cost of 20,000 books}} \times 100 \\ &= \frac{480000}{12000000} = 4\%\end{aligned}$$

Assessment Time 10.3

1. Market price of the shoes (MP) = ₹ 1,500

Selling price of the shoes (SP) = ₹ 1,200

Discount = MP – SP

$$= ₹ (1,500 - 1,200) = ₹ 300$$

$$\begin{aligned}\text{Discount \%} &= \frac{\text{Discount}}{\text{MP}} \times 100 \\ &= \frac{300}{1500} \times 100 = 20\%\end{aligned}$$

Hence, the discount is 20%

2. Market price of a desert cooler = ₹ 8,000, Discount = 15%

$$\begin{aligned}\text{SP} \times \text{MP} &= \left(1 - \frac{\text{D\%}}{100}\right) \times \text{MP} \\ &= \left(1 - \frac{15}{100}\right) \times 8,000 \\ &= 85 \times 80 = ₹ 6800\end{aligned}$$

Hence, the selling price is ₹ 6,800.

3. Discount = 20%, SP = ₹ 1200

$$\begin{aligned}&= \left(1 - \frac{\text{D\%}}{100}\right) \times \text{MP} = \left(\frac{\text{SP} \times 100}{1 - \text{D\%}}\right) = \text{MP} \\ &= \left(\frac{1200 \times 100}{100 - 20}\right) = \text{MP} = \frac{120000}{80} = \text{MP} \\ \text{MP} &= ₹ 1500\end{aligned}$$

Hence, the marked price is ₹ 1500.

4. Let CP of 1 article = ₹ 100

$$\begin{aligned}\text{MP} &= ₹ (100 + 40\% \text{ of } 100) \\ &= ₹ \left(100 + \frac{40}{100} \times 100\right) \\ &= ₹ (100 + 40) = ₹ 140\end{aligned}$$

Discount = 15%

$$\begin{aligned}\text{SP} &= \left(1 - \frac{\text{D\%}}{100}\right) \times \text{MP} \\ &= ₹ \left(1 - \frac{15}{100}\right) \times 140 = ₹ \left(\frac{100 - 15}{100}\right) \times 140 \\ &= ₹ \left(\frac{85}{100} \times 140\right) = ₹ \left(\frac{85}{5} \times 7\right) \\ &= ₹ (17 \times 7) = ₹ 119\end{aligned}$$

So,

$$\begin{aligned}\text{Profit} &= \text{SP} - \text{CP} \\ &= ₹ (119 - 100) = ₹ 19\end{aligned}$$

$$\text{Profit \%} = \frac{\text{Profit}}{\text{CP}} \times 100$$

$$= ₹ \left(\frac{19}{100} \times 100 \right) \% = 19\%$$

Hence, shopkeeper makes a profit of 19%.

5. Let MP of the article be x .

$$\begin{aligned} SP &= \left(\frac{100 - D\%}{100} \right) \times MP \\ &= \left(\frac{100 - 10}{100} \right) \times x = \frac{90}{100} x = ₹ \frac{9}{10} x \\ SP &= \left(\frac{100 + p\%}{100} \right) \times CP \\ ₹ \frac{9}{10} x &= ₹ \left(\frac{100 + 20}{100} \right) \times 900 \\ ₹ \frac{9}{10} x &= ₹ \left(\frac{120}{100} \times 900 \right) \\ ₹ \frac{9}{10} x &= ₹ 1080 \\ x &= ₹ \frac{1080 \times 10}{9} = ₹ 1200 \end{aligned}$$

6. 50% discount is better.

Let MP be ₹ 100

$$SP \text{ after } 50\% \text{ discount} = \left(1 - \frac{50}{100} \right) \times 100 = ₹ 50$$

$$SP \text{ after } 25\% \text{ and } 25\% \text{ discount} = \left(1 - \frac{25}{100} \right) \left(1 - \frac{25}{100} \right) \times 100 = ₹ 56.25$$

Assessment Time 10.4

1. Principal for the 1st year = ₹ 4,000

Rate (R) = 6%, Time (T) = 10 years

$$\begin{aligned} \text{Interest for 1st year} &= \frac{P \times R \times T}{100} \\ &= ₹ \frac{4000 \times 6 \times 1}{100} = ₹ 240 \end{aligned}$$

Amount = (Principal + Interest) = ₹ 4000 + ₹ 240

Principal for the 2nd year = ₹ 4,240, Rate = 6%

Time (T) = 1 year

$$\text{Interest for 2nd year} = ₹ \frac{4240 \times 1 \times 6}{100} = ₹ 254.40$$

$$\begin{aligned} \text{Amount} &= \text{Principal} + \text{Interest} \\ &= ₹ (4240 + 254.40) = ₹ 4494.40 \end{aligned}$$

$$\begin{aligned} \text{Compound Interest} &= A - P \\ &= ₹ (4494.40 - 4000) = ₹ 494.40 \end{aligned}$$

Hence, compound interest for 2 years is ₹ 494.40

2. Principal for 1st year = ₹ 10,000

Rate (R) = 5%, Time (T) = 1 year

$$\begin{aligned}\text{Interest for 1st year} &= \frac{P \times R \times T}{100} \\ &= \frac{10,000 \times 1 \times 5}{100} = ₹ 500\end{aligned}$$

$$\begin{aligned}\text{Amount} &= \text{Principal} + \text{Interest} \\ &= ₹ (10,000 + 500) = ₹ 10,500\end{aligned}$$

Principal for second year = ₹ 10,500, Rate (R) = 5%,
Time (T) = 1 year

$$\begin{aligned}\text{Interest for 2nd year} &= \frac{P \times R \times T}{100} \\ &= \frac{10500 \times 5 \times 1}{100} = ₹ 525\end{aligned}$$

$$\begin{aligned}\text{Amount} &= \text{Principal} + \text{Interest} \\ &= 10500 + 525 = ₹ 11,025\end{aligned}$$

$$\begin{aligned}\text{Principal for 3rd year} &= \frac{P \times R \times T}{100} \\ &= \frac{11025 \times 5 \times 1}{100} = ₹ 551.25\end{aligned}$$

$$\begin{aligned}\text{Amount} &= \text{Principal} + \text{Interest} \\ &= 11025 + 551.25 = ₹ 11576.25\end{aligned}$$

$$CI = A - P$$

$$= ₹ (11,576.25 - 10,000) = ₹ 1,576.25$$

3. Principal for 1st year = ₹ 20,000, Rate (R) = 8%

Time (T) = 4 years

$$\begin{aligned}\text{Interest} &= \frac{P \times R \times T}{100} \\ &= \frac{20,000 \times 8 \times 1}{100} = ₹ 1600\end{aligned}$$

Compound Interest on ₹ 1600

$$\begin{aligned}\text{Amount} &= (\text{Principal} + \text{Interest}) \\ &= (20,000 + 1600) = 21,600\end{aligned}$$

Principal for 2nd year = ₹ 21,600, Rate (R) = 8%

Time (T) = 1 year

$$\text{Interest for 2nd year} = \frac{21,600 \times 8 \times 1}{100} = ₹ 1728$$

$$\begin{aligned}\text{Amount} &= (\text{Principal} + \text{Interest}) \\ &= (21600 + 1728) = ₹ 23328\end{aligned}$$

Principal for 3rd year = 23328, Rate (R) = 8%

Time (T) = 1 year

$$\text{Interest for 3rd year} = \frac{23,328 \times 8 \times 1}{100} = ₹ 1866.24$$

$$\begin{aligned}\text{Amount} &= (\text{Principal} + \text{Interest}) \\ &= (23328 + 1866.24) = ₹ 25194.24\end{aligned}$$

Principal for 4th year = 25194.24, Rate (R) = 8%

Time (T) = 1 year

$$\text{Interest for 4th year} = \frac{25,194.24 \times 8 \times 1}{100} = 2015.5392$$

$$= ₹ 2015.54$$

$$\text{Amount} = (\text{Principal} + \text{Interest})$$

$$= 25194.24 + 2015.54 = ₹ 27209.78$$

Hence, the compound interest for 4 years is ₹ 27209.78

4. $SI = ₹ 1800$, Rate (R) = 6%, Time (T) = 3 years

$$SI = \frac{P \times R \times T}{100}$$

$$1800 = \frac{P \times 6 \times 3}{100}$$

$$P = \frac{1800 \times 100}{6 \times 3} = \frac{180000}{18} = 10000$$

Computing compound interest on ₹ 10,000

$$\text{Interest for the 1st year} = ₹ \left(\frac{10,000 \times 10 \times 1}{100} \right) = ₹ 1,000$$

$$\text{Principal for the 2nd year} = ₹ (10,000 + 1,000) = ₹ 11,000$$

$$\text{Interest for the 2nd year} = ₹ \left(\frac{11,000 \times 10 \times 1}{100} \right) = ₹ 1100$$

$$\text{Principal for the 3rd year} = 11000 + 1100 = ₹ 12100$$

$$\text{Interest for the 3rd year} = ₹ \left(\frac{12100 \times 10 \times 1}{100} \right) = ₹ 1210$$

$$\text{Amount after three year} = 12100 + 1210 = ₹ 13310$$

$$CI = A - P$$

$$= 13310 - 10000 = ₹ 3310$$

Hence, the compound interest for 3 years is ₹ 3,310.

5. Principal on 1st year = ₹ 25,000, Rate (R) = 5%,
Time (T) = 1 year

$$\begin{aligned} \text{Interest for 1 year} &= \frac{P \times R \times T}{100} \\ &= \left(\frac{25,000 \times 5 \times 1}{100} \right) = 1,250 \end{aligned}$$

$$\text{Amount} = (\text{Principal} + \text{Interest})$$

$$= ₹ (25,000 + 1,250) = ₹ 26,250$$

$$\text{Principal on 2nd year} = ₹ 26,250, \text{Rate } (R) = 6\%$$

$$\text{Time } (T) = 1 \text{ year}$$

$$\begin{aligned} \text{Interest for 2nd year} &= \left(\frac{P \times R \times T}{100} \right) \\ &= ₹ \left(\frac{26,250 \times 6 \times 1}{100} \right) = ₹ 1575 \end{aligned}$$

$$\text{Amount} = (\text{Principal} + \text{Interest})$$

$$= ₹ (26,250 + 1,575) = ₹ 27,825$$

$$\text{Principal for 3rd year} = ₹ 27,825, \text{Rate } (R) = 8\%,$$

$$\text{Time } (T) = 1 \text{ year}$$

$$\begin{aligned} \text{Interest for 3rd year} &= \left(\frac{P \times R \times T}{100} \right) \\ &= ₹ \left(\frac{27,825 \times 8 \times 1}{100} \right) = ₹ 30,051 \end{aligned}$$

$$\text{Compound Interest} = A - P$$

$$= 30,051 - 25,000 = ₹ 5,051$$

Hence, the amount is ₹ 30,051 and the compound interest is ₹ 5,051

6. Principal (P) = ₹ 50,000, Rate (R) = 12%, Time (T) = ₹ year

$$\begin{aligned} SI &= \left(\frac{P \times R \times T}{100} \right) \\ &= \frac{50,000 \times 12 \times 1}{100} = ₹ 6000 \end{aligned}$$

$$\text{Amount} = (\text{Principal} + \text{Interest})$$

$$= ₹ (50,000 + 6,000) = ₹ 56,000$$

Principal for second year = ₹ 56,000, Rate (R) = 12%

Time (T) = 1 year

$$\begin{aligned} SI &= \left(\frac{P \times R \times T}{100} \right) \\ &= \frac{56,000 \times 12 \times 1}{100} = ₹ 6720 \end{aligned}$$

$$\text{Amount} = (\text{Principal} + \text{Interest})$$

$$= ₹ (56,000 + 6,720) = ₹ 62,720$$

Principal for third year = ₹ 62,720, Rate (R) = 12%

Time (T) = 1 year

$$\begin{aligned} SI &= \left(\frac{P \times R \times T}{100} \right) \\ &= \frac{62,720 \times 12 \times 1}{100} = ₹ 7526.40 \end{aligned}$$

$$\text{Amount} = (\text{Principal} + \text{Interest})$$

$$= ₹ (62,720 + 7526.40) = ₹ 70,246.40$$

$$\text{Compound Interest} = A - P$$

$$= 70,246.40 - 50,000 = 20,246.40$$

7. Principal (P) = ₹ 24,000, Rate (R) = 8%, Time (T) = 3 years

$$\begin{aligned} SI &= \left(\frac{P \times R \times T}{100} \right) \\ &= \frac{24,000 \times 8 \times 3}{100} = 240 \times 24 = ₹ 5760 \end{aligned}$$

Computing Compound Interest

$$\text{Interest for the 1st year} = ₹ \left(\frac{24,000 \times 8 \times 1}{100} \right) = ₹ 1920$$

$$\text{Principal for the 2nd year} = ₹ (24,000 + 1920) = ₹ 25,920$$

$$\text{Interest for the 2nd year} = ₹ \left(\frac{25,920 \times 8 \times 1}{100} \right) = ₹ 2073.60$$

$$\text{Principal for the 3rd year} = ₹ (25,920 + 2073.60) = ₹ 27,993.60$$

$$\text{Interest for the 3rd year} = ₹ \left(\frac{27,993.60 \times 8 \times 1}{100} \right) = ₹ 2239.48$$

$$\text{Amount} = ₹ (27,993.60 + 2239.48) = ₹ 30,233.08$$

$$\text{Compound Interest} = ₹ (30,233.08 - 24,000) = ₹ 6,233.08$$

$$\text{So, difference between CI and SI} = ₹ (6,233.08 - 5,760) = ₹ 473.08$$

SDG-Good Quality

8. Saving for Shalini = 40% of 3,00,000

$$= ₹ \left(\frac{40}{100} \times 3,00,000 \right) = ₹ 1,20,000$$

Here, $P = ₹ 1,20,000$, $R = 8\%$,

$$SI \text{ for 1 year} = \frac{120000 \times 8 \times 1}{100} = ₹ 9600$$

$$\text{Amount} = ₹ (120000 + 9600) = ₹ 1,29,600$$

$$\text{So, principal for next year} = ₹ (1,29,600 + 120000) = ₹ 2,49,600$$

$$SI \text{ for 2nd year} = \frac{249600 \times 8 \times 1}{100} = ₹ 19968$$

$$\text{Amount} = ₹ (2,49,600 + 19968) = ₹ 2,69,568$$

$$\text{Principal for third year} = ₹ (2,69,568 + 120000) = ₹ 3,89,568$$

$$SI \text{ for third year} = \frac{389568 \times 8 \times 1}{100} = ₹ 31,615.44$$

$$\text{Amount} = ₹ (3,89,568 + 31,615.44) = ₹ 4,21,183.44$$

$$\text{Principal for fourth year} = ₹ (4,21,183.44 + 120000) = ₹ 5,41,183.44$$

$$SI = \frac{541183.44 \times 8 \times 1}{100} = ₹ 43,294.68$$

$$\begin{aligned} \text{Amount at the end fourth year} &= ₹ (5,41,183.44 + 43,294.68) \\ &= ₹ 5,84,478.12 \end{aligned}$$

Assessment Time 10.5

1. Principal (
- P
-) = ₹ 15,000, Rate (
- R
-) = 12%, Time (
- T
-) = 2 year

$$\begin{aligned} A &= P \left(1 + \frac{r}{100} \right)^n \\ &= 15000 \left(1 + \frac{12}{100} \right)^2 = 15000 \left(\frac{112}{100} \right)^2 \\ &= 15000 \times \frac{112}{100} \times \frac{112}{100} = 18816 = ₹ 18816 \\ CI &= A - P \\ &= ₹ (18816 - 15000) = ₹ 3816 \end{aligned}$$

2. Principal (
- P
-) = ₹ 5000, Rate (
- R
-) = 10%, Time (
- T
-) =
- $\frac{7}{2}$
- years

Rate will 10% for 3 years, but for $\frac{1}{2}$ years it will be $\frac{1}{2} \times 10 = 5\%$

$$\begin{aligned} \text{Amount (A)} &= P \left(1 + \frac{r_1}{100} \right)^3 \left(1 + \frac{r_2}{100} \right)^1 \\ &= 5000 \left(1 + \frac{10}{100} \right)^3 \left(1 + \frac{5}{100} \right)^1 \\ &= 5000 \left(\frac{110}{100} \right)^3 \left(\frac{105}{100} \right)^1 \\ &= 5000 \times \frac{110}{100} \times \frac{110}{100} \times \frac{110}{100} \times \frac{105}{100} = ₹ (20963.25) \end{aligned}$$

$$CI = ₹ (20,963.25 - 15000) = ₹ 5963.25$$

3. Principal (P) = ₹ 40,000, Rate (R) = $\frac{25}{2}\%$, Time (T) = 4 years

$$\begin{aligned} A &= P \left(1 + \frac{r}{100} \right)^n \\ &= 40,000 \left(1 + \frac{25}{2 \times 100} \right)^4 = 40,000 \left(\frac{225}{200} \right)^4 \\ &= 40,000 \left(\frac{9}{8} \right)^4 = 40,000 \times \frac{9}{8} \times \frac{9}{8} \times \frac{9}{8} \times \frac{9}{8} \\ &= ₹ 64072.26 \end{aligned}$$

4. Principal (P) = ₹ 1,50,000, Rate (R) = 10%

Rate will be 10% p.a. for 3 years but for $\frac{1}{2}$ year, it will be $\frac{1}{2} \times 10\% = 5\%$

$$\begin{aligned} \text{Amount (A)} &= P \left(1 + \frac{r_1}{100} \right)^3 \left(1 + \frac{r_2}{100} \right)^1 \\ &= 1,50,000 \left(1 + \frac{10}{100} \right)^3 \left(1 + \frac{5}{100} \right)^1 \\ &= 1,50,000 \left(\frac{110}{100} \right)^3 \left(\frac{105}{100} \right)^1 \\ &= 1,50,000 \times \frac{110}{100} \times \frac{110}{100} \times \frac{110}{100} \times \frac{105}{100} = ₹ 2,09,632.50 \end{aligned}$$

5. $SI = ₹ 5200$, $T = 2$ Years, $R = 6\frac{1}{2}\%$ p.a.

$$\begin{aligned} P &= \frac{SI \times 100}{T \times R} \\ &= \frac{5200 \times 100}{2 \times \frac{13}{2}} = ₹ 40,000 \\ A &= P \left(1 + \frac{r}{100} \right)^n \\ &= 40000 \left(1 + \frac{13}{200} \right)^2 = ₹ 45,369 \\ CI &= A - P \\ &= ₹ (45369 - 40000) = ₹ 5369 \end{aligned}$$

6. $A = ₹ 31,492.80$, $R = 8\%$, $T = 3$ years

$$\begin{aligned} A &= P \left(1 + \frac{R}{100} \right)^n \\ 31,492.80 &= \left(1 + \frac{8}{100} \right)^3 \\ P &= (1.08)^3 \\ P &= \frac{31492.50}{1.08 \times 1.08 \times 1.08} = ₹ 25,000 \end{aligned}$$

7. Here, $P = ₹ 90,000$, $r_1 = 10\%$, $r_2 = 12\%$

$$\begin{aligned} A &= P \left(1 + \frac{r_1}{100} \right)^2 \left(1 + \frac{r_2}{100} \right)^2 \\ &= 90000 \left(1 + \frac{10}{100} \right)^2 \left(1 + \frac{12}{100} \right)^2 \end{aligned}$$

$$= 90000 (1.1)^2(1.12)^2 = ₹ 1,36,604.16$$

$$CI = ₹ (136604.16 - 90000) = ₹ 46,604.16$$

8. Here, $P = ₹ 9000$, $A = ₹ 10240$, $n = 2$, $r = ?$

$$A = P \left(1 + \frac{r}{100} \right)^n$$

$$10240 = 9000 \left(1 + \frac{r}{100} \right)^2$$

$$\frac{10240}{9000} = \left(1 + \frac{r}{100} \right)^2$$

$$\frac{1024}{900} = \left(1 + \frac{r}{100} \right)^2$$

$$\left(\frac{32}{30} \right)^2 = \left(1 + \frac{r}{100} \right)^2$$

$$\frac{32}{30} = 1 + \frac{r}{100}$$

$$\frac{r}{100} = \frac{32}{30} - 1 = \frac{2}{30}$$

$$r = \frac{2}{30} \times 100 = \frac{200}{30} = 6\frac{2}{3}$$

Hence, $r = 6\frac{2}{3}\%$

9. Here, $P = ₹ 1600$, $A = ₹ 1852.20$, $R = 5\%$ p.a.

$$A = P \left(1 + \frac{r}{100} \right)^n$$

$$1852.20 = 1600 \left(1 + \frac{5}{100} \right)^n$$

$$\frac{185220}{160000} = \left(\frac{21}{20} \right)^n$$

$$\frac{9261}{8000} = \left(\frac{21}{20} \right)^n$$

$$\left(\frac{21}{20} \right)^3 = \left(\frac{21}{20} \right)^n$$

On comparing, $n = 3$

Hence, time is 3 years.

10. $P = ₹ 1,00,000$, $r = 8\frac{3}{4} = \frac{35}{4}\%$, $n = 3$

$$A = P \left(1 + \frac{r}{100} \right)^n$$

$$= 100000 \left(1 + \frac{35}{400} \right)^3 = 100000 \left(\frac{435}{400} \right)^3$$

$$= ₹ 1,28,613.86$$

$$CI = ₹ (128613.86 - 100000) = ₹ 28613.86$$

He donates = 20% of 28613.86

$$= ₹ \left(\frac{20}{100} \times 28613.86 \right) = ₹ 5722.77$$

Critical Thinking Skills

$$P = ₹ 2,50,000$$

$$\begin{aligned}\text{Amount after 2 years} &= P \left(1 + \frac{r}{100}\right)^n \\ &= 250000 \left(1 + \frac{5}{100}\right)^2 \\ &= 25000 \times \frac{105}{100} \times \frac{105}{100} \\ &= ₹ 2,75,625\end{aligned}$$

$$\text{Interest for 3rd year} = ₹ \frac{275625 \times 5 \times 5}{100} = ₹ 13,781.25$$

Assessment Time 10.6

1. $P = ₹ 3,50,000$, $n = 4$, $r = 6\%$

$$\begin{aligned}\text{Value of car after 4 years} &= 350000 \left(1 - \frac{6}{100}\right)^4 \\ &= 350000 \left(\frac{94}{100}\right)^4 = ₹ 2,73,262.14\end{aligned}$$

2. Here, $P = ₹ 2,00,000$, $r_1 = 10\%$, $r_2 = 7.5\%$

$$\begin{aligned}\text{Value of machine after 3 years} &= 200000 \left(1 - \frac{10}{100}\right) \left(1 - \frac{7.5}{100}\right)^2 \\ &= ₹ 1,54,012.50\end{aligned}$$

3. Here, $P = 20$ lakhs, $r = 3.5\%$, $n = 2$

$$\text{Population after 2 years} = 20 \left(1 + \frac{3.5}{100}\right)^2 = 21.4245 \text{ lakhs}$$

4. $P = ₹ 25$ lakh, $r = 30\%$, $n = 3$

$$\begin{aligned}\text{Value of flat after 3 years} &= 25 \left(1 + \frac{30}{100}\right)^3 = 25 \left(\frac{130}{100}\right)^3 \\ &= 54.925 \text{ lakhs}\end{aligned}$$

5. Population in 2010 = 2,20,000, $r = 4\%$

- a. Let population of town in 2007 be x .

$$\begin{aligned}220000 &= x \left(1 + \frac{4}{100}\right)^3 \\ 220000 &= x \left(\frac{104}{100}\right)^3 \Rightarrow x = 220000 \left(\frac{100}{104}\right)^3 \\ &= 1,95,579.19 = 1,95,579 \text{ (approx)}\end{aligned}$$

b. Population in 2014 = $220000 \left(1 + \frac{4}{100}\right)^4 = 220000 \left(\frac{104}{100}\right)^4$
 $= 2,57,368.88 = 2,57,368 \text{ (approx)}$

6. Here, $P = 60$ lakh, $r = 4\%$, $n = 3$

$$\begin{aligned}\text{Value of machine after 3 years} &= 60 \left(1 - \frac{4}{100}\right)^3 \\ &= 60 \left(\frac{96}{100}\right)^3 = 53.08 \text{ lakh}\end{aligned}$$

100 Key Math-8 (Brainbee)

Value of machine after 3 years at 10% depreciation

$$= 60 \left(1 - \frac{10}{100} \right)^3 = 60 \left(\frac{9}{10} \right)^3 = 43.74$$

$$\text{Saving} = 53.08 - 43.74 = 9.34 \text{ lakhs}$$

He distribute = 50% of 9.34

$$= \frac{50}{100} \times 9.34 = 4.67 \text{ lakhs}$$

Critical Thinking Skills

$$P = 10 \text{ lakh, net rate } (r) = 5 - 2.5 = 2.5 \% \text{ p.a., } n = 2$$

$$\begin{aligned} \text{Population after 2 years} &= 10 \left(1 + \frac{2.5}{100} \right)^2 = 10 \left(\frac{102.5}{100} \right)^2 \\ &= 10.51 \text{ lakh (approx)} \end{aligned}$$

Mental Math

$$1. \quad 30\% \text{ of } 80 = \frac{30}{100} \times 80 = 24$$

$$2. \quad \text{Profit} = \text{SP} - \text{CP}$$

$$= ₹ (700 - 650) = ₹ 50$$

$$\begin{aligned} 3. \quad \text{Loss} &= \text{CP} - \text{SP} \\ &= ₹ (550 - 500) = ₹ 50 \end{aligned}$$

$$4. \quad 100$$

$$5. \quad \text{compound interest}$$

$$6. \quad \text{compound interest}$$

$$7. \quad P \left[\left(1 + \frac{r}{100} \right)^n - 1 \right]$$

$$8. \quad n$$

$$9. \quad A = P \left(1 - \frac{r}{100} \right)^n$$

Revision Time

$$1. \quad \text{Original weight} = 50 \text{ kg, New weight} = 60 \text{ kg}$$

$$\text{Increase in weight} = (60 - 50) \text{ kg} = 10 \text{ kg}$$

$$\begin{aligned} \text{Increase percent} &= \left(\frac{\text{Increase in weight}}{\text{Original weight}} \right) \times 100 \\ &= \left(\frac{10}{50} \times 100 \right) = 20\% \end{aligned}$$

Hence, the percentage increase is 20%.

$$2. \quad \text{Price of microwave last year} = ₹ 20,000$$

$$\text{Decrease in price} = (12\% \text{ of } ₹ 20,000)$$

$$= \frac{12}{100} \times 20,000 = ₹ 2,400$$

$$\text{So, new price of the motorcycle} = ₹ (20,000 - 2,400) = ₹ 17,600$$

Hence, the new price of motorcycle is ₹ 17,600.

$$3. \quad \text{Present population} = 50,000, \text{ Population increase} = 8\%$$

$$\text{Increase in population} = (8\% \text{ of } 50,000)$$

$$= \frac{8}{100} \times 50,000 = 500 \times 8 = 4,000$$

$$\text{So, the population increase} = (50,000 + 4,000) = 54,000$$

Hence, the population after one year is 54,000.

4. Fruit seller bought fruit = 200 kg

Fruit rotten = 10% of 200 kg

$$= \left(\frac{10}{100} \times 200 \right) = 20 \text{ kg}$$

Fruits remained = $(200 - 20) \text{ kg} = 180 \text{ kg}$

Hence, 180 kg of fruits are remained.

5. CP of 1 articles = 15, CP of 13 articles = 15

SP of 12 articles = CP of 15 articles = ₹ 15

$$\text{SP of 1 article} = ₹ \left(\frac{15}{12} \right) = ₹ \left(\frac{5}{4} \right)$$

Profit = SP - CP

$$= ₹ \left(\frac{5 - 4}{3} \right) = ₹ \frac{1}{4}$$

$$\text{Profit \%} = \frac{\text{Profit}}{\text{CP}} \times 100$$

$$= \frac{1}{4} \times 100 = 25\%$$

Hence, the gain percent is 25%

6. CP of 7 toffees = ₹ 1

$$\text{CP of 1 toffee} = ₹ \frac{1}{7}$$

SP of 4 toffees = ₹ 1

$$\text{SP of 1 toffee} = ₹ \frac{1}{4}$$

$$\text{So, profit} = \frac{1}{4} - \frac{1}{7} = \frac{7 - 4}{28} = \frac{3}{28}$$

$$\text{So, gain \%} = \frac{\frac{3}{28}}{\frac{1}{7}} \times 100 = \frac{3}{4} \times 100 = 75\%$$

7. SP of sofa at 10% loss = ₹ 18,000

$$\text{CP of sofa at 10\% loss} = \left(\frac{100}{100 - L\%} \right) \times \text{SP}$$

$$= \left(\frac{100}{100 - 10} \right) \times 18000 = ₹ \frac{100}{90} \times 18000 = ₹ 20,000$$

$$\text{So, SP at 20\% gain} = \left(\frac{100 + 20}{100} \right) \times \text{CP}$$

$$= \frac{120}{100} \times 2000 = ₹ 24,000$$

8. Let CP of the almirah be ₹ x.

$$\text{SP at 16\% gain} = \left(\frac{100 + 16}{100} \right) \times x = \frac{116}{100} x$$

$$\text{SP at 20\% gain} = \left(\frac{100 + 20}{100} \right) \times x = \frac{120x}{100}$$

According to question,

$$\frac{120x}{100} - \frac{116x}{100} = 2000$$

$$\frac{120x + 116x}{100} = 2000$$

$$4x = 2000 \times 100$$

$$x = \frac{200000}{4} = ₹ 50,000$$

9. CP of 80 kg apples = ₹ (70 × 80) = ₹ 5600

$$60\% \text{ of } 80 \text{ kg} = \frac{60}{100} \times 80 = 48 \text{ kg}$$

$$\text{SP of 48 kg apples} = ₹ (48 \times 90) = ₹ 4320$$

$$\text{SP of remaining 32 kg apples} = ₹ (32 \times 65) = ₹ 2080$$

$$\text{Total SP of 80 kg apples} = ₹ (4320 + 2080) = ₹ 6400$$

$$\text{Profit} = ₹ (6400 - 5600) = ₹ 800$$

$$P\% = \frac{800}{5600} \times 100 = 14.28\%$$

10. Let CP of mobile for Sonu be ₹ x.

$$\text{SP of Sonu} = \text{CP for Tanu}$$

$$= \left(\frac{100 + 10}{100} \right) \times x = \frac{11}{10}x$$

$$\text{SP for Tanu} = \text{CP for Mahesh}$$

$$2336.40 = \left(\frac{100 + 18}{100} \right) \times \frac{11}{10}x$$

$$\frac{2336.40 \times 1000}{118 \times 11} = x$$

$$x = ₹ 1800$$

11. Let MP be ₹ 100

$$\text{SP} = 100 \left(1 - \frac{D_1}{100} \right) \left(1 - \frac{D_2}{100} \right)$$

$$= 100 \left(1 - \frac{20}{100} \right) \left(1 - \frac{10}{100} \right)$$

$$= 100 \times \frac{80}{100} \times \frac{90}{100} = ₹ 72$$

So, discount = ₹ (100 - 72) = ₹ 28

$$\text{Discount \%} = \frac{28}{100} \times 100 = 28\%$$

12. MP = ₹ 2000, D% = 10% P% = 20%

$$\text{SP} = \text{MP} \left(1 - \frac{D}{100} \right)$$

$$= 2000 \left(1 - \frac{10}{100} \right) = ₹ \left(2000 - \frac{90}{100} \right) = ₹ 1800$$

Now, $\text{CP} = \left(\frac{100}{100 + P\%} \right) \times \text{SP}$

$$= \left(\frac{100}{100 + 20} \right) \times 1500 = ₹ \left(\frac{100}{120} \times 1500 \right) = ₹ 1500$$

13. $\text{SP} = \text{MP} \left(1 - \frac{D_1}{100} \right) \left(1 - \frac{D_2}{100} \right)$

$$= 12000 \left(1 - \frac{20}{100} \right) \left(1 - \frac{5}{100} \right)$$

$$= 12000 \times \frac{80}{100} \times \frac{95}{100} = ₹ 9120$$

14. Here, $P = ₹ 18,000$, $r = 8\%$ p.a., $n = 2$

$$\begin{aligned} A &= P \left(1 + \frac{r}{100} \right)^n \\ &= 18000 \left(1 + \frac{8}{100} \right)^2 = 18000 \left(\frac{108}{100} \right)^2 = ₹ 20,995.20 \end{aligned}$$

$$\begin{aligned} CI &= A - P \\ &= ₹ (20,995.20 - 18000) = ₹ 2,995.20 \end{aligned}$$

15. Here, $P = ₹ 80,000$, $r_1 = 10\%$, $r_2 = 12\%$, $r_3 = 15\%$

$$\begin{aligned} A &= P \left(1 + \frac{r_1}{100} \right) \left(1 + \frac{r_2}{100} \right) \left(1 + \frac{r_3}{100} \right) \\ &= 80000 \left(1 + \frac{10}{100} \right) \left(1 + \frac{12}{100} \right) \left(1 + \frac{15}{100} \right) \\ &= 80000 \times \frac{110}{100} \times \frac{112}{100} \times \frac{115}{100} = ₹ 1,13,344 \end{aligned}$$

$$CI = ₹ (1,13,344 - 80,000) = ₹ 33,344$$

16. $P = ₹ 18000$, $A = ₹ 20,480$, $n = 2$

$$\begin{aligned} A &= P \left(1 + \frac{r}{100} \right)^n \\ \Rightarrow 20480 &= 18000 \left(1 + \frac{r}{100} \right)^2 \\ \Rightarrow \frac{20480}{18000} &= \left(1 + \frac{r}{100} \right)^2 \Rightarrow \frac{1024}{900} = \left(1 + \frac{r}{100} \right)^2 \\ \Rightarrow \left(\frac{32}{30} \right)^2 &= \left(1 + \frac{r}{100} \right)^2 \Rightarrow \frac{32}{30} = 1 + \frac{r}{100} \\ \frac{r}{100} &= \frac{32}{30} - 1 = \frac{2}{30} = \frac{1}{15} \\ r &= \frac{100}{15} = 6.67\% \end{aligned}$$

Hence, $r = 6.67\%$

17. Here, $A = ₹ 20,480$, $r = \frac{20}{3}\%$ p.a., $n = 2$

$$\begin{aligned} A &= P \left(1 + \frac{r}{100} \right)^n \\ 20480 &= P \left(1 + \frac{20}{300} \right)^2 \\ 20480 &= P \left(\frac{320}{300} \right)^2 \\ P &= \frac{20480 \times 300 \times 300}{320 \times 320} = ₹ 18,000 \end{aligned}$$

18. Let $P = ₹ 100$, $A = ₹ 900$, $n = 2$, $r = ?$

$$\begin{aligned} A &= P \left(1 + \frac{r}{100} \right)^n \\ 900 &= 100 \left(1 + \frac{r}{100} \right)^2 \Rightarrow 9 = \left(1 + \frac{r}{100} \right)^2 \\ \Rightarrow 3^2 &= \left(1 + \frac{r}{100} \right)^2 \Rightarrow 3 = 1 + \frac{r}{100} \end{aligned}$$

$$\Rightarrow \frac{r}{100} = 3 - 1$$

$$r = 2 \times 100 = 200\%$$

19. Here, $P = ₹ 1,25,000$, $r = 10\%$, $n = 4$

$$\text{Value of motor cycle after 4 years} = 125000 \left(1 - \frac{10}{100}\right)^4$$

$$= 125000 \left(\frac{9}{10}\right)^4 = ₹ 82,012.50$$

20. Here, $P = 1,40,530$, $r = 3.2\%$

Values after 3 hours or in the starting of fourth hour

$$= 140530 \left(1 - \frac{3.2}{100}\right)^3 = 140530 \left(\frac{103.2}{100}\right)^3$$

$$= 1,54,457 \text{ (approx)}$$

Multiple Choice Questions

1. (c) 2. (a) 3. (b) 4. (b)

5. $60\% \text{ of } 80 = \frac{60}{100} \times 80 = 48$ (a)

6. (a)

$$4356 = 3600 \left(1 + \frac{10}{100}\right)^n = \frac{4356}{3600} = \left(\frac{11}{10}\right)^n$$

$$(1.1)^2 = (1.1)^n$$

$$n = 2$$

7. (a)

$$CI = P \left[\left(1 + \frac{r}{100}\right)^n - 1 \right]$$

$$328 = P \left[\left(1 + \frac{5}{100}\right)^2 - 1 \right]$$

$$328 = P \{0.1025\}$$

$$P = \frac{328}{0.1025} = ₹ 3170$$

$$SI = \frac{3470 \times 2 \times 5}{100} = ₹ 317$$

8. (b)

$$P = ₹ 1000, A = ₹ 1331, n = 3$$

$$A = P \left(1 + \frac{r}{100}\right)^n$$

$$1331 = 1000 \left(1 + \frac{r}{100}\right)^3$$

$$\left(\frac{11}{10}\right)^3 = \left(1 + \frac{r}{100}\right)^3$$

$$1 + \frac{r}{100} = \frac{11}{10}$$

$$r = \frac{1}{10} \times 100 = 10\%$$

CHAPTER 11: DIRECT AND INDIRECT (INVERSE) PROPORTION

Assessment Time 11.1

1. Since, it is a direct variation

$$\text{So, } \frac{6}{10} = \frac{30}{p}$$

$$p = \frac{30 \times 10}{6} = 50$$

$$\text{So, } \frac{30}{50} = \frac{m}{70}$$

$$m = \frac{70 \times 30}{50} = \frac{210}{5} = 42$$

$$\text{So, } \frac{42}{70} = \frac{78}{n}$$

$$n = \frac{78 \times 70}{42} = 13 \times 10 = 130$$

x	6	30	42	78
y	10	50	70	130

2. Hence, the quantity of sugar is increasing.

So, cost will also be increased. So, it is a direct variation.

Quantity of sugar	7 kg	18 kg
Cost (in ₹)	210	x

$$\text{So, } \frac{7}{210} = \frac{18}{x}$$

$$x = \frac{18 \times 210}{7} = 18 \times 30 = 540$$

The cost of 18 kg sugar is ₹ 540.

3. Here, the minute is decreasing. So, the words will also decrease. So, it is a direct variation.

Words	720	x
Minutes	12	9

$$\text{So, } \frac{720}{12} = \frac{x}{9}$$

$$x = \frac{720 \times 9}{12} = 60 \times 9 = 540$$

Hence, the 540 words will be typed in 9 minutes.

4. Since, it is a direct variation. So, according to the question.

Distance	472	x
Petrol	32	45

$$\text{So, } \frac{472}{32} = \frac{x}{45}$$

$$x = \frac{472 \times 45}{32} = 663.75 \text{ km}$$

Hence, 663.75 km will be covered in 45 L of petrol.

5. Since, it is a direct variation. So, according to the question.

Wheat	9	x
Price	166.50	259

$$\text{So, } \frac{9}{166.50} = \frac{x}{259}$$

$$x = \frac{9 \times 259}{166.50} = \frac{9 \times 259 \times 100}{16650} = 14 \text{ kg}$$

6. Since, it is a direct variation. So, according to the situation.

Length	22.5	y
Weight	78.75	112

$$\frac{22.5}{78.75} = \frac{y}{112}$$

$$y = \frac{22.5 \times 112}{78.75} = \frac{225 \times 112 \times 10}{7875} = 32 \text{ m}$$

Hence, the length of the rod is 32 m.

7. Distance = Speed $\times$ Time

$$90 \text{ km} = 60 \text{ km/hr} \times \text{Time}$$

$$\Rightarrow \text{Time} = \frac{90}{60} = \frac{3}{2} = 1 \frac{1}{2} \text{ hours}$$

Hence, it takes $1 \frac{1}{2}$ hours to cover 90 km distance.

- 8.

Height of the pole	15.40	18.60
Length of the shadow	10.60	y

$$\frac{15.40}{10.60} = \frac{18.60}{y}$$

$$y = \frac{18.60 \times 10.6}{15.40} = 12.80 \text{ m}$$

- 9.

Workers	20	x
Day	10	5
Length	8 mm	8 km

Since, it is indirect proportion,

$$20 \times 10 = x \times 5$$

$$\therefore x = \frac{20 \times 10}{5} = 40$$

40 workers

Critical Thinking Skills

- 10.

Actual Distance	2	x
Map Distance	1	6.5

It is direct variation

$$\frac{2}{1} = \frac{x}{6.5}$$

$$\therefore x = 6.5 \times 2 = 13 \text{ km}$$

Assessment Time 11.2

1.

Number of horse	18	x
Number of days	30	36

Since, it is an inverse variation

$$18 \times 30 = x \times 36$$

$$x = \frac{18 \times 30}{36} = 15$$

Hence, 15 horses can graze the same field.

2. According to the given condition, it is an inverse proportion

Number of men	20	x
Number of days	12	8

$$20 \times 12 = x \times 8$$

$$x = \frac{20 \times 12}{8} = 30$$

Hence, 30 men are required.

3.

Number of men	32	24
Number of days	18	x

Since it is an inverse variation

$$32 \times 18 = 24 \times x$$

$$x = \frac{32 \times 18}{24} = 24$$

Hence, 24 days are required.

4. According to the given condition, it is an inverse proportion

Speed	56	x
Hours	7	5

$$56 \times 7 = x \times 5$$

$$x = \frac{56 \times 7}{5} = 78.4$$

Hence, the speed of the car is 78.4 km/hr to cover the same distance in 5 hours.

5.

Number of sweets	24	20
Number of boxes	30	x

According to given condition, it is an inverse proportion

$$24 \times 30 = 20 \times x$$

$$x = \frac{24 \times 30}{20} = 36$$

Hence, 36 boxes are required.

6.

Number of soldiers	120	150
Number of days	50	x

According to the given condition it is an inverse proportion

$$120 \times 50 = 150 \times x$$

$$x = \frac{120 \times 50}{150} = 40$$

Hence, 40 days are required.

7.

Number of victims	320	400
Number of days	8	x

According to the given condition, it is an inverse proportion

$$320 \times 8 = 400 \times x$$

$$x = \frac{320 \times 8}{400} = 6.4$$

Hence, 6.4 days are required.

SEL-Sharing

No. of children	2	5
Chocolates	5	x

Inverse proportion

$$2 \times 5 = 5 \times x$$

$$\therefore x = \frac{10}{5} = 2$$

Critical Thinking Skills

Workers	60	x
Days	28	15

Inverse variation

$$60 \times 28 = x \times 15$$

$$\therefore x = \frac{60 \times 28}{15} = 112$$

More workers needed = $112 - 60 = 52$

Mental Math

- Increase
- Increases
- $\frac{x}{y} = \text{Constant}$
- $xy = \text{constant}$
- 5

Revision Time

1.

x	28	x	224	z
y	7	35	y	84

According to the condition, it is an direct variation

$$\text{So, } \frac{28}{7} = \frac{x}{35} \quad x = \frac{35 \times 28}{7} = 5 \times 28 = 140$$

$$\text{So, } \frac{140}{35} = \frac{224}{y} \quad y = \frac{224 \times 35}{140} = 56$$

$$\text{So, } \frac{224}{56} = \frac{z}{84} \quad z = \frac{224 \times 84}{56} = 336$$

x	28	140	224	336
y	7	35	56	84

2.

x	10	x	20	z
y	4	5	y	8

According to the condition, it is in a direct variation.

$$\text{So, } 10 \times 4 = x \times 5 \quad x = \frac{4 \times 10}{5} = 8$$

$$\text{So, } x \times 5 = 20 \times y \quad 8 \times 5 = 20 \times y$$

$$y = \frac{40}{20} = 2$$

$$\text{So, } 20 \times 2 = z \times 8 \quad 20 \times 2 = z \times 8$$

$$40 = z \times 8$$

$$z = \frac{40}{8} = 5$$

x	10	8	20	5
7	4	5	2	8

3. According to the condition, it is a direct proportion.

Number of soap	10	18
Cost of soap	84	x

$$\frac{10}{84} = \frac{18}{x}$$

$$x = \frac{84 \times 18}{10} = 151.20$$

Hence, the cost of 18 soap bars is ₹ 151.20

4.

Number of pumps	25	45
Number of hours	18	x

According to the condition it is an indirect variation

$$25 \times 18 = 45 \times x$$

$$x = \frac{25 \times 18}{45} = 10$$

Hence, 10 hours are required for 45 pumps to do the same work.

5. Speed = 40 km/hr, Time = 32 minutes = $\frac{32}{60}$ hours

Distance = speed $\times$ time

$$= 40 \times \frac{32}{60} = 21.33 \text{ km}$$

6. According to the given condition, it is a direct proportion.

Thickness	3.5	x
Sheet of paper	400	150

$$\frac{3.5}{400} = \frac{x}{150}$$

$$x = \frac{3.5 \times 150}{400} = \frac{35 \times 150}{4000}$$

$$= 1.3125 \text{ cm}$$

Hence, the thickness of 150 sheets is 1.3125 cm.

7.

Number of men	18	x
Number of days	48	36

Since, it is an inverse proportion

$$18 \times 48 = x \times 36$$

$$x = \frac{18 \times 48}{36} = 24$$

Hence, 24 men can dig the same canal in 36 days.

8. $1 : 20,00,000 = 8 : x$

$$\frac{1}{20,00,000} = \frac{8}{x}$$

$$\Rightarrow x = 20,00,000 \times 8$$

$$\Rightarrow = 1,60,00,000 \text{ cm}$$

$$\text{or } \frac{1,60,00,000}{1,00,000} = 160 \text{ km}$$

9.

Number of persons	300	400
Number of days	12	x

According to condition, it is an inverse proportion.

$$300 \times 12 = 400 \times x$$

$$x = \frac{300 \times 12}{400} = 9$$

Hence, the stock will last long for 9 days.

10.

Number of machines	14	x
Number of days	63	49

According to the condition, it is an inverse proportion

$$14 \times 63 = x \times 49$$

$$x = \frac{14 \times 63}{49} = 18$$

$$\text{More machines} = 18 - 14 = 4$$

Hence, 4 man machines are required to produce same number of chair.

Case Study

1. $360 \times 3.5 = 72 \times x$

$$\therefore x = \frac{360 \times 3.5}{72} = 17.5 \text{ years}$$

2. No

Multiple Choice Questions (MCQs)

1. (b) 2. (c) 3. (a) 4. (b) 5. (c)

CHAPTER 12: FACTORISATION

Assessment Time 12.1

1. a. Factor of $14pq = 2 \times 7 \times p \times q$
 Factor of $-21p^2q^2r = -1 \times 3 \times 7 \times p \times p \times q \times q \times r$
 Common factors are 7, p and q
 So, the greatest common factors of given terms is $7pq$.
- b. Factors of $15p^2q^2 = 3 \times 5 \times p \times p \times q \times q$
 Factors of $-20p^2q = -2 \times 2 \times 5 \times p \times p \times q$
 Factors of $25q^2r^2 = 5 \times 5 \times q \times q \times r \times r$
 Common factors are $5q$.
- c. Factors of $11m^2n^2 = 11 \times m \times m \times n \times n$
 Factors of $22n^2p^2 = 2 \times 11 \times n \times n \times p \times p$
 Factors of $-33mnp = -3 \times 11 \times m \times n \times p$
 Common factors are 11, m , n and p
 So, the greatest common factors of given terms is $11mnp$.
- d. Factors of $3x^2y^2 = 3 \times x \times x \times y \times y$
 Factors of $10y^3x^2z = 2 \times 5 \times y \times y \times y \times x \times x \times z$
 Factor of $-15x^2z^3 = -3 \times 5 \times x \times x \times z \times z \times z$
 Common factors are x, x
 The greatest common factor is x^2 .
2. a. $24a^3b + 15b^2a$
 $14a^3b = 2 \times 2 \times 2 \times 3 \times a \times a \times a \times b$
 $15b^2a = 3 \times 5 \times b \times b \times a$
 Common factor are 3, b and a
 So, the greatest common factor of given terms is $3ab$.
 Now, $24a^3b + 15b^2a = 3ab(8a^2 + 5b)$
- b. $63ab^3c - 99a^2c^2b$
 $63ab^3c = 3 \times 3 \times 7 \times a \times b \times b \times b \times c$
 $99a^2c^2b = 3 \times 3 \times 11 \times a \times a \times c \times c \times b$
 Common factors are 3, 3, a , b , c
 So, the greatest common factor of given terms is $9abc$.
 Now, $63ab^3c - 99a^2c^2b = 9abc(7b^2 - 11ac)$
- c. $8x^2 - 72xy + 18x^2y^2$
 $8x^2 = 2 \times 2 \times 2 \times x \times x$
 $72xy = 2 \times 2 \times 2 \times 3 \times 3 \times x \times y$
 $18x^2y^2 = 2 \times 3 \times x \times x \times y \times y$
 Common factors are 2, x
 So, the greatest common factor of given term is $2x$.
 $8x^2 - 72xy + 18(xy)^2 = 2x(4x - 36y + 9xy^2)$

d. $-10ab^3 + 40b^2 + 25a^2b^2$

$$10ab^3 = 2 \times 5 \times a \times b \times b \times b$$

$$40b^2 = 2 \times 2 \times 2 \times 5 \times b \times b$$

$$25a^2b^2 = 5 \times 5 \times a \times a \times b \times b$$

Common factor are 5, b

So, the greatest common factor of given terms is $5b$.

$$\text{Now, } -10a^3b + 40b^2 + 25a^2b^2 = 5b(-2a^3 + 8b + 5a^2b)$$

e. $15 = 3 \times 5$

$$25t^3 = 5 \times 5 \times t \times t \times t$$

$$30t^2 = 2 \times 3 \times 5 \times t \times t$$

Common factors are 5,

So, the greatest common factor of given terms is 5.

$$-15 + 25t^3 - 30t^2 = 5(-3 + 5t^3 - 6t^2)$$

f. $m^3np - 6mn^2 + 30m^2n^2$

$$m^3np = m \times m \times m \times n \times p$$

$$6mn^2 = 6 \times m \times n \times n$$

$$30m^2n^2 = 2 \times 3 \times 5 \times m \times m \times n \times n$$

Common factor are m and n

So, the greatest common factor of given terms is mn .

$$m^3np - 6mn^2 + 30m^2n^2 = mn(m^2p - 6n + 30mn)$$

3. a. $18pq + 9q + 5 + 10p = 9q(2p + 1) + 5(1 + 2p)$
 $= (2p + 1)(9q + 5)$

b. $m^2 - mn + mp - np = m(m - n) + p(m - n)$
 $= (m - n)(m + p)$

c. $ar^2 - br^2 + 7a - 7b = r^2(a - b) + (a - b)$
 $= (r^2 + 7)(a - b)$

d. $x(x + y) + 8x + 8y = x(x + y) + 8(x + y)$
 $= (x + y)(x + 8)$

4. a. $25x^2 + 30x + 9 = (5x)^2 + 2 \times 5x \times 3 + (3)^2$
 $= (5x + 3)^2$
 $= (5x + 3)(5x + 3)$

b. $p^2 - 10p + 25 = (p)^2 - 2 \times 5 \times p + (5)^2$
 $= (p - 5)^2 = (p - 5)(p - 5)$

c. $64 - 16y + y^2 = (8)^2 - 2 \times 8 \times y + (y)^2$
 $= (8 - y)^2$

d. $2m^2 + 12m + 18 = 2(m^2 + 2 \times 3m + 3^2)$
 $= 2(m + 3)^2$
 $= 2(m + 3)(m + 3)$

e. $49m^4 - 112m^2n^2 + 64n^4$
 $= (7m^2)^2 - 2 \times 7m^2 \times 8n^2 + (8n^2)^2 = (7m^2 - 8n^2)^2$
 $= (7m^2 - 8n^2)(7m^2 - 8n^2)$

- f. $16a^2 + 40a + 25 = (4a)^2 + 2 \times 4a \times 5 + (5)^2$
 $= (4a + 5)^2$
 $= (4a + 5)(4a + 5)$
5. a. $x^2 - 4y^2 = x^2 - (2y)^2$ $[\because a^2 - b^2 = (a + b)(a - b)]$
 $= (x + 2y)(x - 2y)$
- b. $16x^5 - 144x^3 = 16x^3(x^2 - 9)$
 $= 16x^3\{(x)^2 - (3)^2\}$ $[\because a^2 - b^2 = (a + b)(a - b)]$
 $= 16x^3(x + 3)(x - 3)$
- c. $0.09x^2 - 0.49y^2 = (0.3x)^2 - (0.7y)^2$
 $= (0.3x + 0.7y)(0.3x - 0.7y)$
- d. $(l + m)^2 - (l - m)^2$ $[\because a^2 - b^2 = (a + b)(a - b)]$
 $= (l + m + l - m)(l + m - l + m)$
 $= (2l)(2m) = 4lm$
- e. $y^2 - \frac{49}{25} = (y)^2 - \left(\frac{7}{5}\right)^2$ $[\because a^2 - b^2 = (a + b)(a - b)]$
 $= \left(y + \frac{7}{5}\right)\left(y - \frac{7}{5}\right)$
- f. $36 - a^2 - b^2 - 2ab$
 $= 36 - (a^2 + b^2 + 2ab)$
 $= (6)^2 - (a + b)^2$ $[\because a^2 - b^2 = (a + b)(a - b)]$
 $= (6 + a + b)(6 - a - b)$
6. a. $(x + y)^2 - 4xy = x^2 + y^2 + 2xy - 4xy$
 $= x^2 + y^2 - xy = (x - y)^2$
- b. $(ax + by)^2 - (bx + ay)^2$
 $= a^2x^2 + b^2y^2 + 2axby - (b^2x^2 + a^2y^2 + 2axby)$
 $= a^2x^2 + b^2y^2 + 2axby - b^2x^2 - a^2y^2 - 2axby$
 $= (a^2x^2 - b^2x^2) + (b^2y^2 - a^2y^2)$
 $= x^2(a^2 - b^2) - y^2(a^2 - b^2)$
 $= (a^2 - b^2)(x^2 - y^2)$
- c. $(x - 2)^4 - x^4$
 $= \{(x - 2)^2\}^2 - (x^2)^2$
 $= \{(x - 2)^2 + x^2\}\{(x - 2)^2 - x^2\}$
 $= (x^2 + 4 - 4x + x^2)(x - 2 - x)(x - 2 + x)$
 $= (2x^2 - 4x + 4)(-2)(2x - 2)$
 $= -8(x^2 - 2x + 2)(x - 1)$
- d. $(m - 2n)^2 + 8mn = m^2 + (2n)^2 - 4mn + 8mn$
 $= m^2 + (2n)^2 + 4mn$
 $= (m + 2n)^2$
- e. $(a^2 - b^2)^2 + 4a^2b^2 = a^4 + b^4 - 2a^2b^2 + 4a^2b^2$
 $= a^4 + b^4 + 2a^2b^2 = (a^2 + b^2)^2$

$$\begin{aligned}
 \text{f. } m^4 - 256 &= (m^2)^2 - 16^2 \\
 &= (m^2 + 16)(m^2 - 16) \\
 &= (m^2 + 16)(m^2 - 4^2) \\
 &= (m^2 + 16)(m + 4)(m - 4)
 \end{aligned}$$

Assessment Time 12.2

$$\begin{aligned}
 1. \quad x^2 + 6x + 5 &= x^2 + 5x + x + 5 \\
 &= x(x + 5) + 1(x + 5) \\
 &= (x + 5)(x + 1)
 \end{aligned}$$

$$\begin{aligned}
 2. \quad x^2 + 8x + 15 \\
 &= x^2 + 3x + 5x + 15 \\
 &= x(x + 3) + 5(x + 3) \\
 &= (x + 3)(x + 5)
 \end{aligned}$$

$$\begin{aligned}
 4. \quad x^2 - 21x + 68 \\
 &= x^2 - 17x - 4x + 68 \\
 &= x(x - 17) - 4(x - 17) \\
 &= (x - 17)(x - 4)
 \end{aligned}$$

$$\begin{aligned}
 6. \quad x^2 - 29x + 204 \\
 &= x^2 - 12x - 17x + 204 \\
 &= x(x - 12) - 17(x - 12) \\
 &= (x - 12)(x - 17)
 \end{aligned}$$

$$\begin{aligned}
 8. \quad y^2 + 23y - 108 \\
 &= y^2 + 27y - 4y - 108 \\
 &= y(y + 27) - 4(y + 27) \\
 &= (y + 27)(y - 4)
 \end{aligned}$$

$$\begin{aligned}
 10. \quad p^2 - 25p + 84 \\
 &= p^2 - 21p - 4p + 84 \\
 &= p(p - 21) - 4(p - 21) \\
 &= (p - 21)(p - 4)
 \end{aligned}$$

$$\begin{aligned}
 12. \quad x^2 - 8x - 65 \\
 &= x^2 - 13x + 5x - 65 \\
 &= x(x - 13) + 5(x - 13) \\
 &= (x - 13)(x + 5)
 \end{aligned}$$

$$\begin{aligned}
 14. \quad y^2 - 10y + 21 \\
 &= y^2 - 3y - 7y + 21 \\
 &= y(y - 3) - 7(y - 3) \\
 &= (y - 3)(y - 7)
 \end{aligned}$$

$$\begin{aligned}
 3. \quad x^2 - 6x - 7 &= x^2 - 7x + x - 7 \\
 &= x(x - 7) + 1(x - 7) \\
 &= (x - 7)(x + 1)
 \end{aligned}$$

$$\begin{aligned}
 5. \quad x^2 - 2x - 24 \\
 &= x^2 - 6x + 4x - 24 \\
 &= x(x - 6) + 4(x - 6) \\
 &= (x - 6)(x + 4)
 \end{aligned}$$

$$\begin{aligned}
 7. \quad 48 + 22m - m^2 \\
 &= 48 + 24m - 2m - m^2 \\
 &= 24(2 + m) - m(2 + m) \\
 &= (2 + m)(24 - m)
 \end{aligned}$$

$$\begin{aligned}
 9. \quad x^2 + 19x - 150 \\
 &= x^2 + 25x - 6x - 150 \\
 &= x(x + 25) - 6(x + 25) \\
 &= (x + 25)(x - 6)
 \end{aligned}$$

$$\begin{aligned}
 11. \quad -5x^2 - x + 4 \\
 &= -5x^2 - 5x + 4x + 4 \\
 &= -5x(x + 1) + 4(x + 1) \\
 &= (x + 1)(-5x + 4)
 \end{aligned}$$

$$\begin{aligned}
 13. \quad a^2 + a - 56 \\
 &= a^2 + 8a - 7a - 56 \\
 &= a(a + 8) - 7(a + 8) \\
 &= (a + 8)(a - 7)
 \end{aligned}$$

$$\begin{aligned}
 15. \quad 6m^2 + 7m - 3 \\
 &= 6m^2 + 9m - 2m - 3 \\
 &= 3m(2m + 3) - 1(2m + 3) \\
 &= (3m - 1)(2m + 3)
 \end{aligned}$$

16. $3y^2 - 10y + 8$

$$= 3y^2 - 4y - 6y + 8$$

$$= y(3y - 4) - 2(3y - 4)$$

$$= (y - 2)(3y - 4)$$

18. $3m^2 - 4m - 4$

$$= 3m^2 - 6m + 2m - 4$$

$$= 3m(m - 2) + 2(m - 2)$$

$$= (3m + 2)(m - 2)$$

20. $4x^2 + 24x + 20$

$$= 4x^2 + 20x + 4x + 20$$

$$= 4x(x + 5) + 4(x + 5)$$

$$= (4x + 4)(x + 5)$$

$$= 4(x + 1)(x + 5)$$

22. $40x^2 + x - 6$

$$= 40x^2 + 16x - 15x - 6$$

$$= 8x(5x + 2) - 3(5x + 2)$$

$$= (8x - 3)(5x + 2)$$

24. $y^4 - 5y^2 - 36$

$$= y^4 - 9y^2 + 4y^2 - 36$$

$$= y^2(y^2 - 9) + 4(y^2 - 9)$$

$$= (y^2 + 4)(y^2 - 9)$$

$$= (y^2 + 4)(y + 3)(y - 3)$$

17. $2y^2 + y - 45$

$$= 2y^2 + 10y - 9y - 45$$

$$= 2y(y + 5) - 9(y + 5)$$

$$= (2y - 9)(y + 5)$$

19. $3x^2 - 19x + 30$

$$= 3x^2 - 10x - 9x + 30$$

$$= x(3x - 10) - 3(3x - 10)$$

$$= (x - 3)(3x - 10)$$

$$= (x - 3)(3x - 10)$$

21. $-27c^2 - 9c + 6$

$$= -27c^2 - 18c + 9c + 6$$

$$= -9c(3c + 2) + 3(3c + 2)$$

$$= (-9c + 3)(3c + 2)$$

$$= -3(1 - 3c)(3c + 2)$$

23. $2x^3 + 10x^2 - 28x$

$$= 2x(x^2 + 5x - 14)$$

$$= 2x(x^2 + 7x - 2x - 14)$$

$$= 2x\{x(x + 7) - 2(x + 7)\}$$

$$= 2x(x + 7)(x - 2)$$

Assessment Time 12.3

1. $5pq(4p^2 - 9q^2)$ by $10p(2p + 3q)$

$$5pq(4p^2 - 9q^2) = 5pq\{(2p)^2 - (3q)^2\}$$

$$= 5pq(2p + 3q)(2p - 3q)$$

$[a^2 - b^2 = (a + b)(a - b)]$

$$\text{Now, } \frac{5pq(2p + 3q)(2p - 3q)}{10p(2p + 3q)}$$

$$= \frac{q(2p + 3q)(2p - 3q)}{2(2p + 3q)} = \frac{q(2p - 3q)}{2}$$

2. $(m^2 - 14m - 32)$ by $(m - 16)$

$$m^2 - 14m - 32 = m^2 - 16m + 2m - 32$$

$$= m(m - 16) + 2(m - 16)$$

$$= (m - 16)(m + 2)$$

$$\text{Now, } \frac{(m + 2)(m - 16)}{(m - 16)} = (m + 2)$$

3. $4xy(9x^2 - 16y^2)$ by $14xy(3x + 4y)$

$$4xy(9x^2 - 16y^2) = 4xy\{(3x)^2 - (4y)^2\}$$

$$= 4xy(3x + 4y)(3x - 4y)$$

$$\text{Now, } \frac{4xy(3x + 4y)(3x - 4y)}{14xy(3x + 4y)} = \frac{2}{7}(3x - 4y)$$

4. $39m^2(50m^2 - 98)$ by $52m(5m - 7)$

$$\begin{aligned} 39m^2(50m^2 - 98) &= 39m^2 \times 2(25m^2 - 49) \\ &= 78m^2\{(5m)^2 - (7)^2\} \\ &= 78m^2(5m + 7)(5m - 7) \end{aligned}$$

$$\text{Now, } \frac{78m^2(5m + 7)(5m - 7)}{52m(5m - 7)} = \frac{3}{2}m(5m + 7)$$

5. $28(50m^2 - 200n^2)$ by $14(m - 2n)$

$$\begin{aligned} 28(50m^2 - 200n^2) &= 28 \times 50(m^2 - 4n^2) \\ &= 1400\{(m)^2 - (2n)^2\} \\ &= 1400(m + 2n)(m - 2n) \end{aligned}$$

$$\text{Now, } \frac{1400(m + 2n)(m - 2n)}{14(m - 2n)} = 100(m + 2n)$$

6. $48(2x^4 - 36x^2 + 16^2)$ by $4(x + 3)^2$

$$\begin{aligned} 48(2x^4 - 36x^2 + 16^2) &= 48 \times 2(x^4 - 18x^2 + 81) \\ &= 96(x^4 - 9x^2 - 9x^2 + 81) \\ &= 96\{x^2(x^2 - 9) - 9(x^2 + 9)\} \\ &= 96(x^2 - 9)(x^2 - 9) \\ &= 96\{(x)^2 - (3)^2\}\{(x)^2 - (3)^2\} \\ &= 96\{(x + 3)(x - 3)\}\{(x + 3)(x - 3)\} \\ &= 96(x + 3)(x - 3)(x + 3)(x - 3) \end{aligned}$$

$$\text{Now, } \frac{96(x + 3)(x - 3)(x + 3)(x - 3)}{4(x + 3)^2} = 24(x - 3)^2$$

7. $(5p^2 - 25p + 20)$ by $(p - 4)$

$$\begin{aligned} 5p^2 - 25p + 20 &= 5(p^2 - 5p + 4) \\ &= 5(p^2 - 4p - p + 4) = 5\{p(p - 4) - 1(p - 4)\} \\ &= 5(p - 4)(p - 1) \end{aligned}$$

$$\text{Now, } \frac{5p(p - 4)(p - 1)}{(p - 4)} = 5p(p - 1)$$

8. $y^4 - 10y^3 + 21y^2 = y^4 - 7y^3 - 3y^3 + 21y^2$

$$\begin{aligned} &= y^3(y - 7) - 3y^2(y^3 - 7) = (y - 7)(y^3 - 3y^2) \\ &= (y - 7)y^2(y - 3) = y^2(y - 7)(y - 3) \end{aligned}$$

$$\text{Now, } \frac{y^2(3 - y)(y - 7)}{(3 - y)} = y^2(y - 7)$$

9. $4y(3y^2 - 4y - 4)$ by $8(3y + 2)$

$$\begin{aligned} 4y(3y^2 - 4y - 4) &= 4y(3y^2 - 6y + 2y - 4) \\ &= 4y\{3y(y - 2) + 2(y - 2)\} \\ &= 4y(y - 2)(3y + 2) \end{aligned}$$

$$\text{Now, } \frac{4y(y - 2)(3y + 2)}{8(3y + 2)} = \frac{y}{2}(y - 2)$$

10. $15p(p + q) - 7q(p + q)$ by $(15p - 7q)$
 $15p(p + q) - 7q(p + q) = (p + q)(15p - 7q)$
 Now, $\frac{(p + q)(15p - 7q)}{(15p - 7q)} = (p + q)$

Critical Thinking Skills

$$\begin{aligned} & \frac{(x^2 - 11x - 80)(x + 8)(x + 5)}{(x - 16)(x^2 + 5x - 24)} \\ &= \frac{(x^2 - 16x + 5x - 80)(x + 8)(x + 5)}{(x - 16)(x^2 + 8x - 3x - 24)} \\ &= \frac{x(x - 16) + 5(x - 16)(x + 8)(x + 5)}{(x - 16)\{x(x + 8) - 3(x + 8)\}} \\ &= \frac{(x - 16)(x + 5)(x + 8)(x + 5)}{(x - 16)(x + 8)(x - 3)} = \frac{(x + 5)^2}{(x - 3)} \end{aligned}$$

Mental Math

- $6(x^2 + 3)$
- $(y - x)(2p - q)$
- $3x(x + 5)(x - 5)$
- $\left(x - \frac{y}{10}\right)\left(x + \frac{y}{10}\right)$
- $(y - 8)(y + 5)$

Revision Time

- $3x^2y^3 = 3 \times x \times x \times y \times y \times y$
 $15xy^2 = 3 \times 5 \times x \times y \times y$
 Common factors are 3, x, y, y
 The greatest common factor of given term is $3xy^2$.
 - Factors of $-9m^2np^2 = -3 \times 3 \times m \times m \times n \times p \times p$
 Factors of $12mnp^3 = 2 \times 2 \times 3 \times m \times n \times p \times p \times p$
 Common factors are 3, m, n, p, p
 So, the greatest common factor of given terms are $3mnp^2$.
 - $15p^2q^2r, -25pqr^3$
 Factors of $15p^2q^2r = 3 \times 5 \times p \times p \times q \times q \times r$
 Factors of $25pqr^3 = 5 \times 5 \times p \times q \times r \times r \times r$
 So, the greatest common factor of given terms are $5pqr$.
- $44x^2y^3z - 66xyz^2$
 $= 22xyz(2xy^2 - 3z)$
 $= 22xyz(2xy^2 - 3z)$
 - $-10a^3b + 15ab^2 + 25a^2b^2$
 $= 5ab(-2a^2 + 3b + 5ab)$
 - $-25 + 15t^2 - 30t^3$
 $= 5(-5 + 3t^2 - 6t^3)$
- $6mn - n^2 + 12mp - 2np$
 $= n(6m - n) + 2p(6m - n)$
 $= (n + 2p)(6m - n)$
 - $2ax^2 + 2a - 36x^2 - 36$
 $= 2a(x^2 + 1) - 36(x^2 + 1)$
 $= (2a - 36)(x^2 + 1)$

4. a. $36m^2 + 60mn + 25n^2$
 $= (6m)^2 + 2 \times 6m \times 5n + (5n)^2$
 $= (6m + 5n)^2$
 $= (6m + 5n)(6m + 5n)$
- c. $\frac{4}{9}x^2 - \frac{4}{15}xy + \frac{1}{25}y^2$
 $= \left(\frac{2}{3}x\right)^2 - 2 \times \frac{2}{3}x \times \frac{1}{5}y + \left(\frac{1}{5}y\right)^2$
 $= \left(\frac{2}{3}x - \frac{1}{5}y\right)^2$
5. a. $4m^2 - 64$
 $= 4(m^2 - 16)$
 $= 4\{(m)^2 - (4)^2\}$
 $= 4(m + 4)(m - 4)$
- c. $25a^2 + 10ac + c^2 - 49b^2$
 $= (5a)^2 + 2 \times 5a \times c + (c)^2 - (7b)^2$
 $= (5a + c)^2 - (7b)^2$
 $= (5a + c + 7b)(5a + c - 7b)$
6. a. $x^2 - 10x + 21$
 $= x^2 - 3x - 7x + 21$
 $= x(x - 3) - 7(x - 3)$
 $= (x - 7)(x - 3)$
- c. $x^2 - 11x - 102$
 $= x^2 - 17x + 6x - 102$
 $= x(x - 17) + 6(x - 17)$
 $= (x + 6)(x - 17)$
7. a. $4y^2 + 24y + 20$
 $= 4(y^2 + 6y + 5)$
 $= 4(y^2 + 5y + y + 5)$
 $= 4\{y(y + 5) + 1(y + 5)\}$
 $= 4(y + 1)(y + 5)$
- c. $13x^2 + 19x + 6$
 $= 13x^2 + 13x + 6x + 6$
 $= 13x(x + 1) + 6(x + 1)$
 $= (13x + 6)(x + 1)$
- b. $64 - 16x + x^2$
 $= x^2 - 16x + 64$
 $= x^2 - 8x - 8x + 64$
 $= x(x - 8) - 8(x - 8)$
 $= (x - 8)(x - 8) = (x - 8)^2$
- d. $\frac{25}{64}m^2n^2 + \frac{5}{16}mnp + \frac{1}{16}p^2$
 $= \left(\frac{5}{8}mn\right)^2 + 2 \times \frac{5}{8} \times \frac{1}{4}p + \left(\frac{1}{4}p\right)^2$
 $= \left(\frac{5}{8}mn + \frac{p}{4}\right)^2$
- b. $x^4 - 625$
 $= (x^2)^2 - (25)^2$
 $= (x^2 + 25)(x^2 - 25)$
 $= (x^2 + 25)\{(x)^2 - (5)^2\}$
 $= (x^2 + 25)(x + 5)(x - 5)$
- d. $(x - y)^4 - z^4$
 $= \{(x - y)^2\}^2 - (z^2)^2$
 $= \{(x - y)^2 + z^2\}\{(x - y)^2 - z^2\}$
 $= \{(x - y)^2 + z^2\}(x - y + z)(x - y - z)$
 $= \{(x - y)^2 + z^2\}(x - y + z)(x - y - z)$
- b. $-3m^2 + 12m + 15$
 $= -3(m^2 - 4m - 5)$
 $= -3(m^2 - 5m + m - 5)$
 $= -3\{m(m - 5) + 1(m - 5)\}$
 $= -3(m + 1)(m - 5)$
- d. $y^2 + 29y + 204$
 $= y^2 + 17y + 12y + 204$
 $= y(y + 17) + 12(y + 17)$
 $= (y + 12)(y + 17)$
- b. $2m^2 + 4mn - 15n^2$
 $= 2m^2 + 10mn - 3mn - 15n^2$
 $= 2m(m + 5n) - 3n(m - 5n)$
 $= (2m - 3n)(m - 5n)$
- d. $6y^6 - 21y^4 - 12y^2$
 $= 6y^6 - 24y^4 + 3y^4 - 12y^2$
 $= 6y^4(y^2 - 4) + 3y^2(y^2 - 4)$
 $= (6y^4 + 3y^2)(y^2 - 4)$
 $= 3y^2(2y^2 + 1)(y - 2)(y + 2)$

8. a. $(x^2 + 6x + 5)$ by $(x + 5)$
 $x^2 + 7x + 5$
 $= x^2 + 5x + x + 5$
 $= x(x + 5) + 1(x + 5)$
 $= (x + 1)(x + 5)$
 Now, $\frac{(x + 1)(x + 5)}{(x + 5)} = (x + 1)$
- b. $(15y^2 - 26y + 8)$ by $(3y - 4)$
 $15y^2 - 26y + 8$
 $= 15y^2 - 20y - 6y + 8$
 $= 5y(3y - 4) - 2(3y - 4)$
 $= (5y - 2)(3y - 4)$
 Now, $\frac{(5y - 2)(3y - 4)}{(3y - 4)} = (5y - 2)$
9. a. $5x^2 + 15x^3y$ by $(-20x)$
 $= \frac{5x^2(1 + 3xy)}{-20x} = \frac{x(1 + 3xy)}{-4}$
 $= -\frac{x(1 + 3xy)}{4}$
- b. $39mnp + 52n^2p$ by $13mn$
 $= 39mnp + 52n^2p$
 $= 13np(3m + 4n)$
 $= \frac{13np(3m + 4n)}{13mn} = \frac{13p(3m + 4n)}{13m}$
 $= \frac{p(3m + 4n)}{m} = 3p + \frac{4np}{m}$
10. a. $44(5x^2 - 20x - 84 + 2xy)$
 $= 44\{5x(x - 4) + 2y(x - 4)\}$
 $= 44(x - 4)(5x + 2y)$
 Now, $\frac{44(x - 4)(5x + 2y)}{(5x + 2y)} = 44(x - 4)$
- b. $72(m^4 - 32m^2 + 256)$ by $18(m - 4)^2$
 $= 72(m^4 - 16m^2 - 16m^2 + 256)$
 $= 72\{m^2(m^2 - 16) - 16(m^2 - 16)\}$
 $= 72\{(m^2 - 16)(m^2 - 16)\}$
 $= 72\{[(m)^2 - (4)^2]\{[(m)^2 - (4)^2]\}$
 $= 72(m + 4)(m - 4)(m + 4)(m - 4)$
 Now, $\frac{72(m + 4)(m - 4)(m + 4)(m - 4)}{18(m - 4)^2}$
 $= 4(m + 2)^2$

Multiple Choice Questions

1. (c) 2. (c) 3. (c) 4. (d) 5. (d)

CHAPTER-13: INTRODUCTION TO GRAPH

Assessment Time 13.1

- | | | |
|-----------------------------|-----------------------------|------------|
| 1. $(-, -)$ | 2. y-axis | 3. 0 |
| 4. on x-axis | 5. Do yourself | 6. 8 units |
| 7. $(a, 0), (-a, 0)$ | | |
| 8. (x) IV | (ii) I | (iii) II |
| 9. $(8, 0), (0, 6)$ | | (iv) III |
| 10. On x-axis – C, F, G | On y-axis – A, D, E | |
| 11. (i) $A(-2, 3), B(0, 3)$ | (ii) $LM = 3 + 4 = 7$ units | |

12.

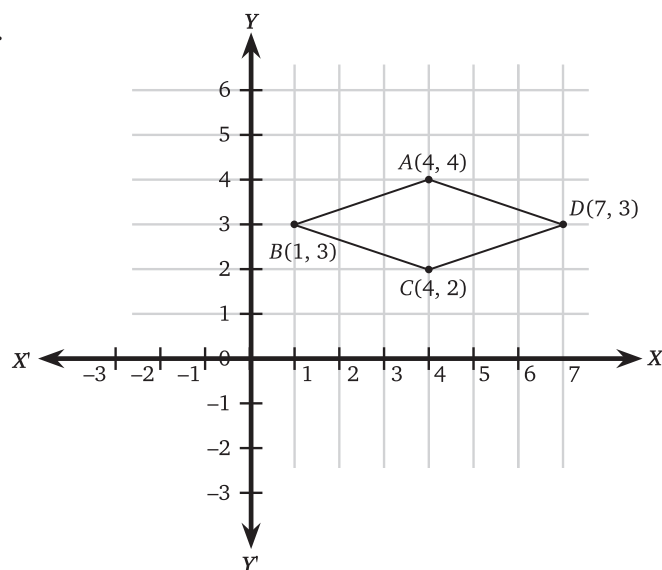
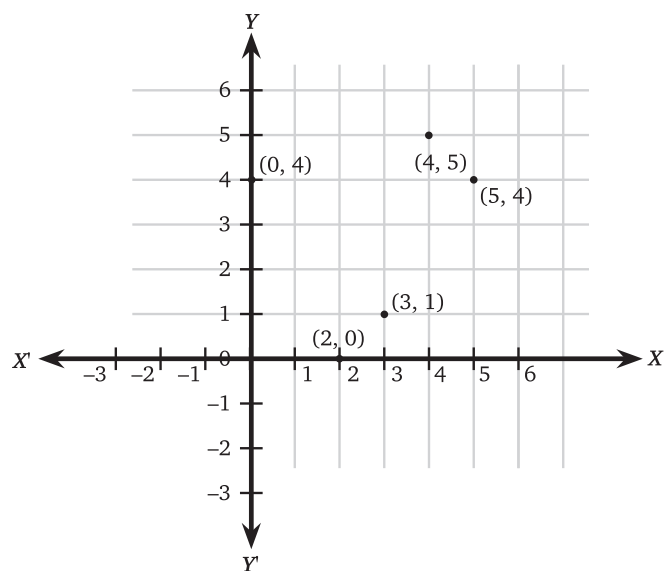
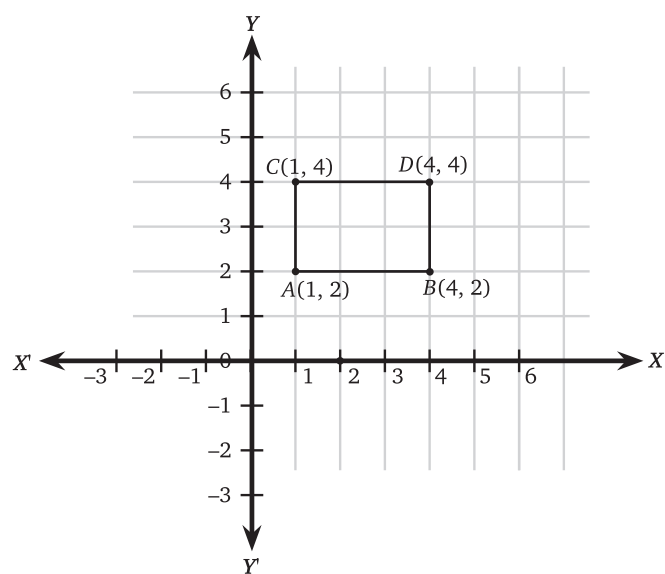


Figure $ABCD$ is a rhombus

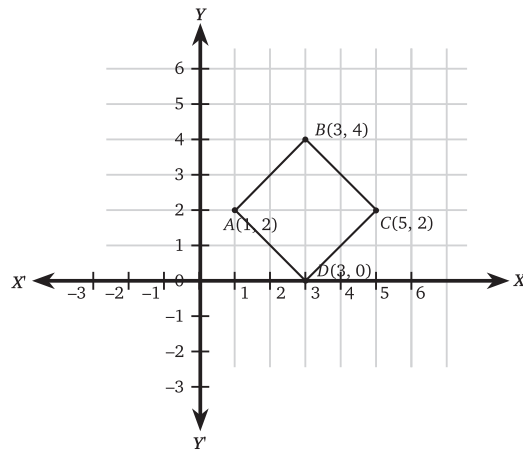
13.



14. Coordinator of D are $(4, 4)$



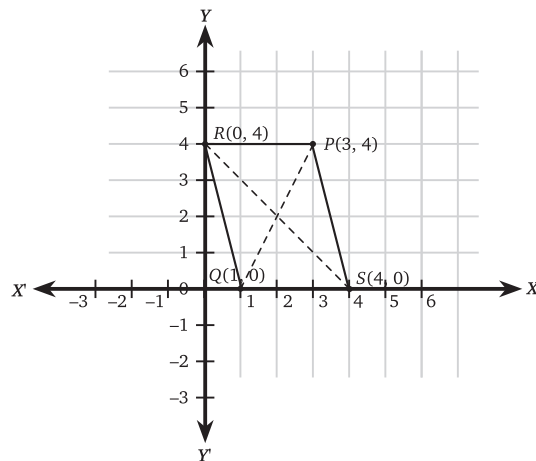
15.



Coordinator of D are $(3, 0)$

$AB = CD$, Yes equal

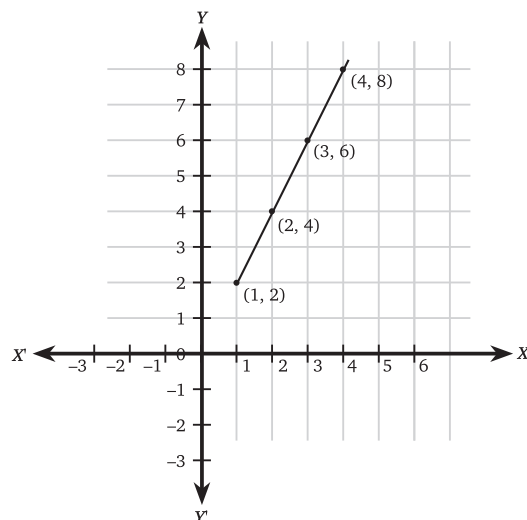
16.



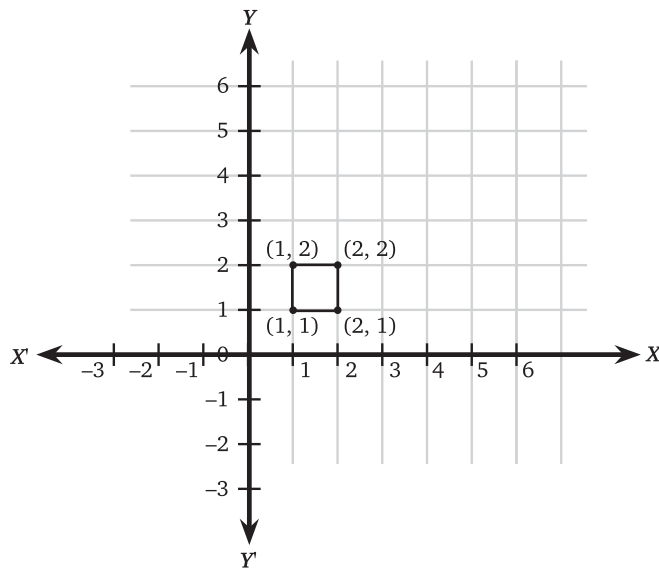
Coordinator of intersection of PQ and RS are $O(2, 2)$

17. $A(4, 7)$, $B(7, 4)$, $C(4, 1)$, $D(1, 4)$, $E(3, 5)$, $F(5, 5)$, $G(5, 3)$,
 $H(3, 3)$, $I(4, 5)$, $J(5, 4)$, $K(4, 3)$, $L(3, 4)$

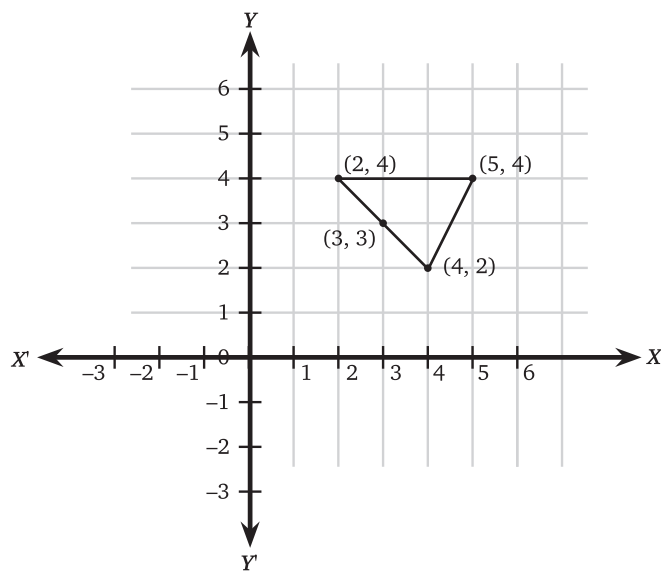
18. a. Yes, Straight line



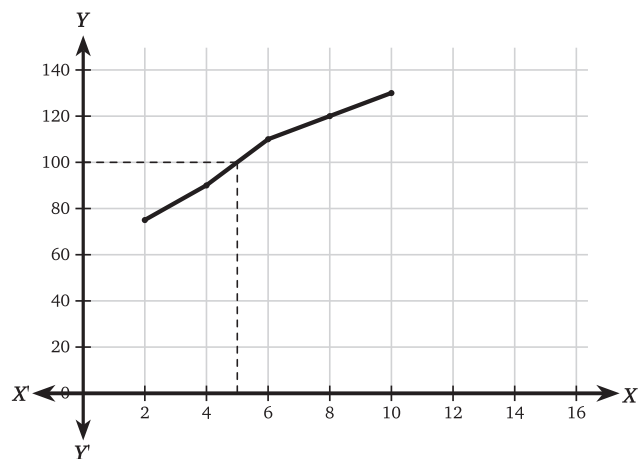
b. Square



c. Triangle



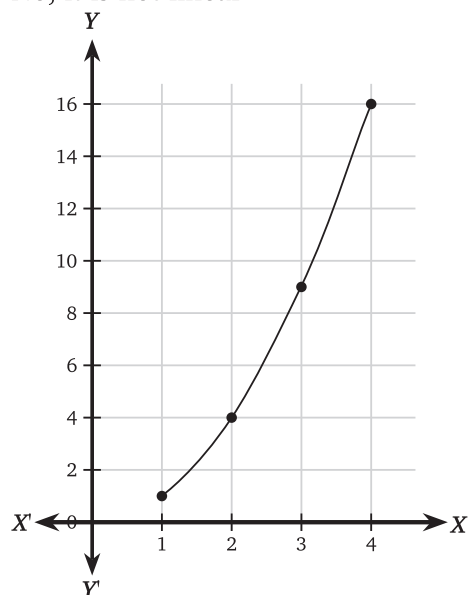
19. a. at 5 parks, 110 cm



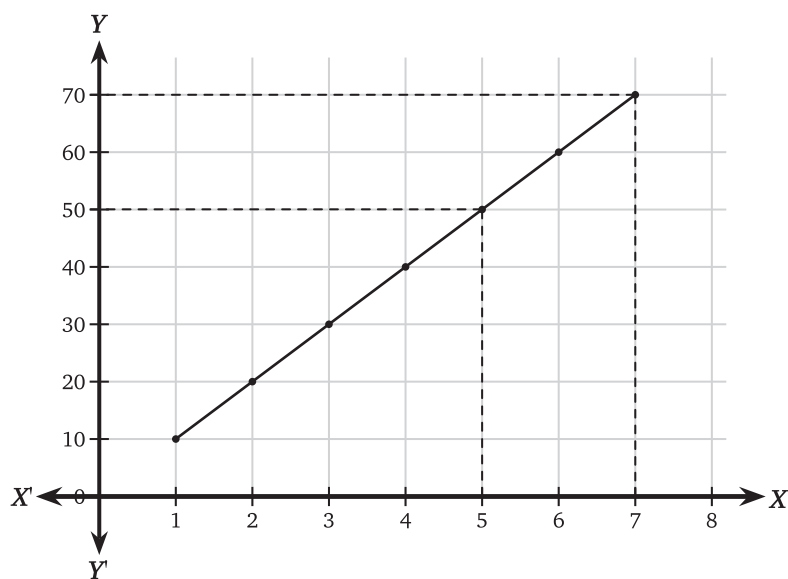
- b. Difference = $130 - 110 = 20$
 c. Between 4 and 6

Assessment Time 13.2

1. No, it is not linear

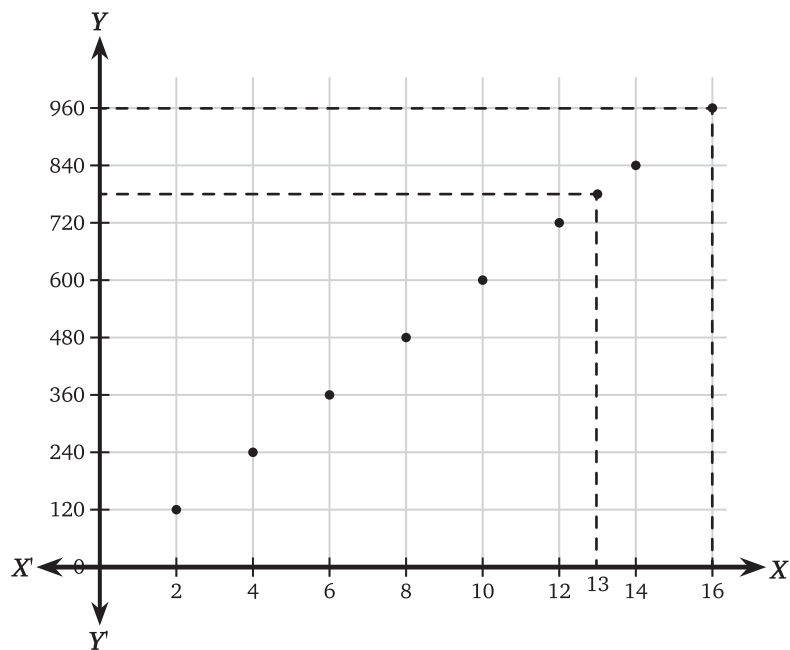


- 2.



- a. Cost of 7 notebooks is ₹ 70 b. 5 notebooks

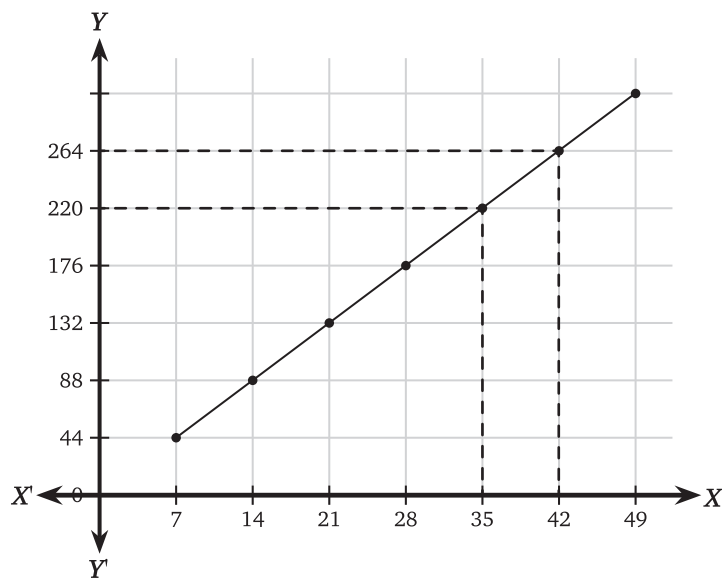
3.



Cost of 13 kg apples = ₹ 780 Cost of 16 kg apples = ₹ 960

4. a. Uniform motion b. rest
c. non uniform motion

5.



R (cm)	7	14	21	28
C (cm)	44	88	132	176

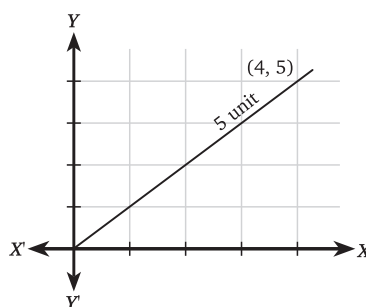
- a. $C = 264$ cm
b. $R = 35$ cm
6. a. Distance in 2 hrs = 80 km b. 5 hrs
c. 2 hrs d. 120 km
e. 6 hrs

Mental Math

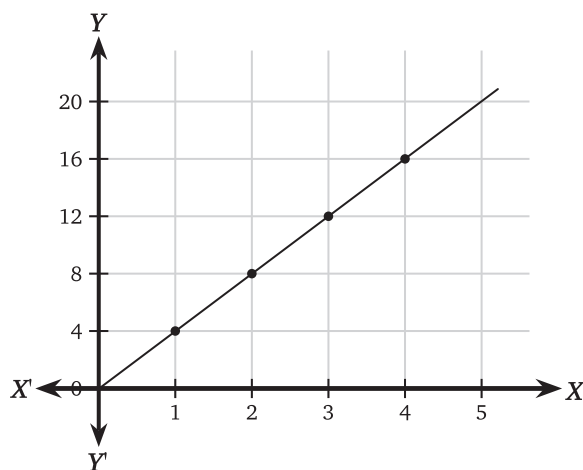
- | | | |
|---------------|-----------|-----------|
| 1. (0, 0) | 2. y-axis | 3. x-axis |
| 4. coordinate | 5. x | 6. x-axis |
| 7. 2 units | 8. 0 | 9. 4 |
| 10. abscissa | | |

Revision Time

1. 0
2. IIInd
3. 7 units
4. (0, -8)
5. 5 units



6. Yes, it is linear



7. 8. 9. Do yourself

10. a. 60°C b. 68°F

11. a. Subject wise marks in test I and II.

b. Maths

c. English and Hindi

d. No

e. 6

12. a. M temperature in a week

2. Sunday

3. Wednesday

4. Friday

13. (a) B

(b) Saturday

(c) Saturday

(d) Wednesday

(e) Monday and Tuesday

Multiple Choice Questions

1. (b)
2. (c)
3. (a)
4. (d)
5. (b)

CHAPTER 14: DATA HANDLING

Assessment Time 14.1

1. Tabular form of Marks

Marks	Tally Marks	Number of Student
1		1
5		1
6		2
8		1
10		6
15		2
19		1
20		1
25		1
30		1
40		7
42		1
45		3
48		1
49		1
50		2
		32

2. Tabular form of outcomes

Die Number	Tally Marks	Number of outcomes
1		5
2		4
3		4
4		5
5		6
6		6
		30

3. Tabular form of weight

Weight in (kg)	Tall mark	Number of students
10		1
12		2
15		1
18		2
22		1

25		2
27		2
28		4
29		2
30		2
		20

4.

a. 0

b. B

c. $9 \times 10 = 90$

d. $50 \times 10 = 500$
5.

a. 40

b. Friday

c. $(10 - 2) \times 5 = 40$

d. $40 \times 5 = 200$
6.

 = 10 cycle

Days	Cycles
First Week	       
Second Week	      
Third Week	           
Fourth Week	    

7.

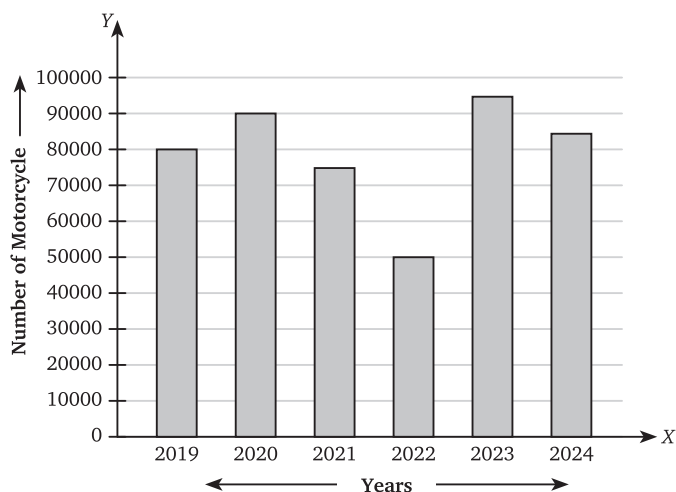
 = 10 books

Subject	Number of books
Hindi	        
English	             
Maths	          
Science	      
Others	                   

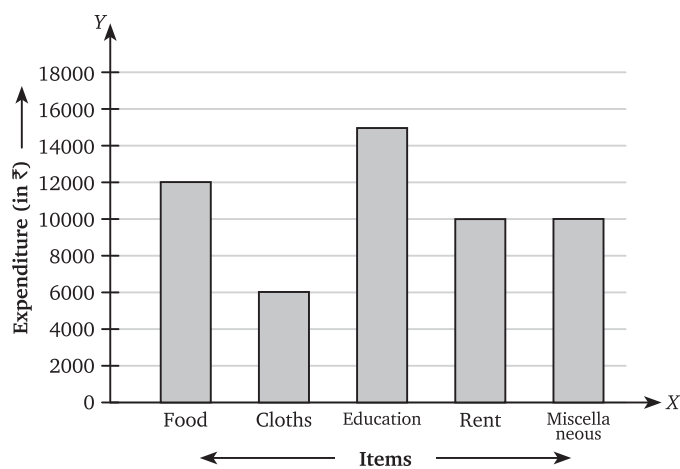
Assessment Time 14.2

1. a. June b. August
 c. Difference = $450 - 200 = 250$
 d. Total t-shirts = $350 + 400 + 600 + 450 = 2000$
2. a. 130 b. second inning c. 30
 d. Total score = $80 + 130 + 30 + 100 + 65 = 405$

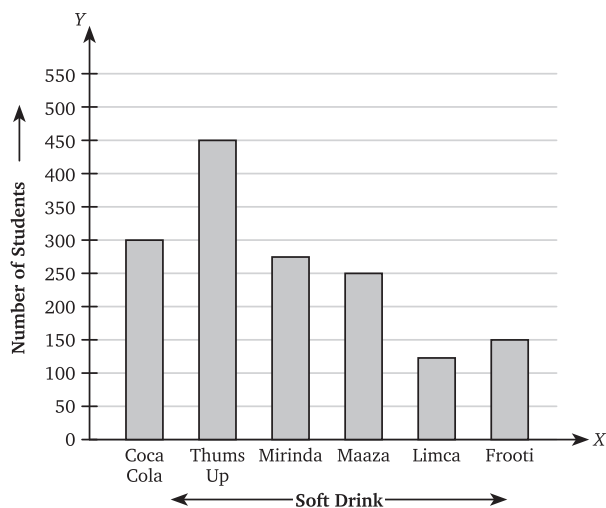
3.



4.



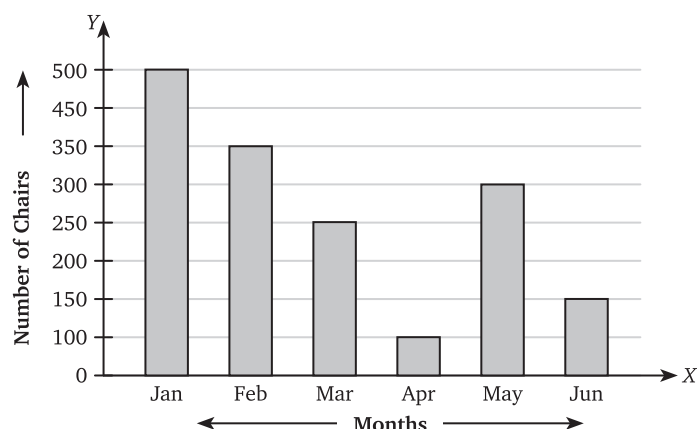
5.



a. Thumsup

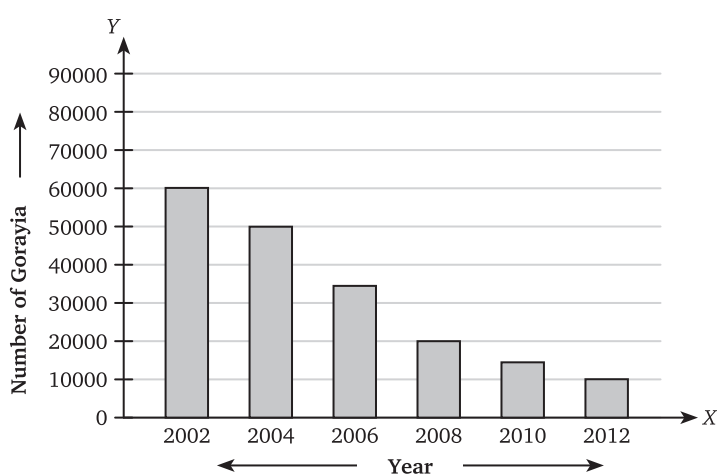
b. Limca

6.



7. SEL-Humanity

a.

**Assessment Time 14.3**

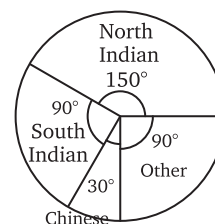
1. Total people = 50 + 30 + 10 + 30 = 120

$$\text{Central angle for North Indian} = \left(\frac{50}{120} \times 360 \right)^\circ = 150^\circ$$

$$\text{Central angle for South Indian} = \left(\frac{30}{120} \times 360 \right)^\circ = 90^\circ$$

$$\text{Central angle for Chinese} = \left(\frac{10}{120} \times 360 \right)^\circ = 30^\circ$$

$$\text{Central angle for others} = \left(\frac{30}{120} \times 360 \right)^\circ = 90^\circ$$



2. a. Bus is the common mode of transport.

$$\text{b. Fraction of children travel by car} = \frac{90}{360} = \frac{1}{4}$$

$$\text{c. } \frac{1}{4} \text{ of total children} = 18$$

$$\therefore \text{Total children} = 18 \times 4 = 72$$

130 Key Math-8 (Brainbee)

- d. Children use taxi = $\frac{30}{360} \times 72 = 6$
e. Cycle and walk.
3. Total number of animals = $42 + 15 + 26 + 24 + 13 = 120$

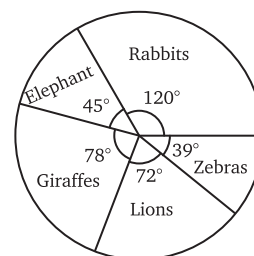
$$\text{Central angle for rabbits} = \left(\frac{42}{120} \times 360 \right)^\circ = 126^\circ$$

$$\text{Central angle for elephants} = \left(\frac{15}{120} \times 360 \right)^\circ = 45^\circ$$

$$\text{Central angle for giraffes} = \left(\frac{26}{120} \times 360 \right)^\circ = 78^\circ$$

$$\text{Central angle for lions} = \left(\frac{24}{120} \times 360 \right)^\circ = 72^\circ$$

$$\text{Central angle for zebras} = \left(\frac{13}{120} \times 360 \right)^\circ = 39^\circ$$



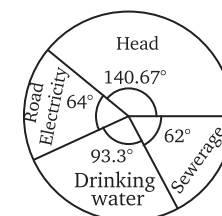
4. Total amount = $42.2 + 19.2 + 28 + 18.6 = 108$

$$\text{Central angle for head} = \left(\frac{42.2}{108} \times 360 \right)^\circ = 140.67^\circ$$

$$\text{Central angle for road electricity} = \left(\frac{19.2}{108} \times 360 \right)^\circ = 64^\circ$$

$$\text{Central angle for Drinking water} = \left(\frac{28}{108} \times 360 \right)^\circ = 93.3^\circ$$

$$\text{Central angle for sewerage} = \left(\frac{18.6}{108} \times 360 \right)^\circ = 62^\circ$$

**Assessment Time 14.4**

1. Total possible outcomes = 2 (T, H)
Number of favourable outcome = 1 (T)
So, probability of getting a tail on the coin
$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{1}{2}$$
2. Total possible outcomes = 6 (1, 2, 3, 4, 5, 6)
Number of favourable outcome = 3 (2, 3, 5)
So, probability of getting a prime number of die
$$= \frac{\text{Number of favourable outcome}}{\text{Total possible outcomes}} = \frac{3}{6} = \frac{1}{2}$$
3. Total possible outcomes = 6 (1, 2, 3, 4, 5, 6)
Number of favourable outcome = 3 (1, 3, 5)
So, probability of getting on odd number on a die
$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{3}{6} = \frac{1}{2}$$
4. Total possible outcomes = 5 (I, N, D, I, A)
Number of favourable outcome = 1 (D)
So, probability =
$$\frac{\text{No. of favourable outcomes}}{\text{Total possible outcomes}} = \frac{1}{5}$$

5. Total possible outcomes = 60
 Number of favourable outcomes = 28
 So, probability = $\frac{\text{number of favourable outcome}}{\text{Total possible outcomes}} = \frac{28}{60} = \frac{7}{15}$
6. Total possible outcomes = 6(1, 2, 3, 4, 5, 6)
 a. Number of favourable outcome = 3(1, 2, 3)
 Probability = $\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{3}{6} = \frac{1}{2}$
 b. Total possible outcomes = 6(1, 2, 3, 4, 5, 6)
 Number of favourable outcomes = 2(5, 6)
 Probability = $\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{2}{6} = \frac{1}{3}$
7. Total possible outcomes = 5(A, E, I, O, U)
 a. Number of favourable outcomes = 5
 Probability of getting a vowel
 = $\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{5}{5} = 1$
 b. Total possible outcomes = 5(A, E, I, O, U)
 Number of favourable outcome = 1 (U)
 Probability = $\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{1}{5}$
 c. Total possible outcomes = 5 (A, E, I, O, U)
 Number of favourable outcomes = 2(A or I)
 Probability = $\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{2}{5}$
 d. Total possible outcomes = 5 (A, E, I, O, U)
 Number of favourable outcomes = O
 Probability = $\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{0}{5} = 0$
8. a. Total possible outcomes = 20
 Number of favourable outcomes = 6
 Probability of getting a white ball
 Probability = $\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{6}{20} = \frac{3}{10}$
 b. Total possible outcomes = 20
 Number of favourable outcomes = 6 + 6 = 12
 Probability of getting a non-red ball
 = $\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{12}{20} = \frac{3}{5}$
9. a. Total possible outcomes = 8
 Number of favourable outcome = 2
 Probability of getting a ball
 = $\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{2}{8} = \frac{1}{4}$

- b. Total possible outcomes = 8
 Number of favourable outcomes = 3
 Probability of getting a toy car

$$= \frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{3}{8}$$
- c. Total possible outcomes = 8
 Number of favourable outcome = 7
 Probability =
$$\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{7}{8}$$
10. a. Total possible outcomes = 20
 Number of favourable outcomes = 5
 Probability =
$$\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{5}{20} = \frac{1}{4}$$
- b. Total possible outcomes = 20
 Number of favourable outcome = 0
 Probability =
$$\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{0}{20} = 0$$
- c. Total possible outcomes = 20
 Number of favourable outcome = 5
 Probability =
$$\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{5}{20} = \frac{1}{4}$$
11. Probability =
$$\frac{\text{No. of white balls}}{\text{Total balls}}$$

$$= \frac{2}{9} = \frac{x}{36}$$

$$x = \frac{2 \times 36}{9} = 2 \times 4 = 8$$

$$\text{Yellow balls} = \text{Total balls} - \text{white balls}$$

$$= 36 - 8 = 28$$

($\therefore$ No. of white balls = x)

12. a. 11

b. (i) Total number of M = 2
 So required probability =
$$\frac{2}{11}$$

(ii) Total number of vowels = 4 (a, e, a, i)
 So, required probability =
$$\frac{4}{11}$$

(iii) Number of consonants = 7
 So, required probability =
$$\frac{7}{11}$$

(iv) Number of x = 0
 So, required probability =
$$\frac{0}{11} = 0$$

13. Chances of rain = 70%

$$\therefore \text{Probability of rain} = \frac{70}{100} = \frac{7}{10}$$

Mental Math

1. Row data
2. frequency
3. pictograph
4. different
5. constant
6. $\frac{1}{2}$
7. 1
8. 0
9. 1
10. 6

Revision Time

1. Tabular form of heights

Height	Tally Mark	Number of students
135		2
140		5
144		1
145		3
146		1
150		9
155		3
160		5
165		1
		30

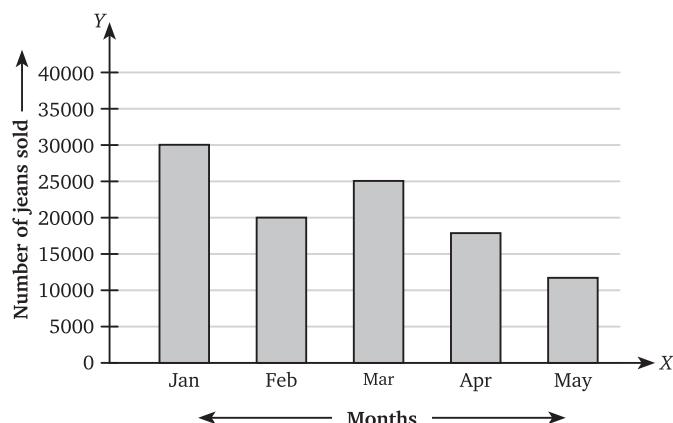
- a. 5 student b. 2

2.  = 10

Food Items	Number of students
Pizza	
Burger	
Patties	
Chowmin	
Veg Rolls	

3. a. Naresh, $15 \times 20 = 300$ baskets b. Rahim, $60 \times 20 = 120$ baskets
c. 20 more baskets

4.



5. a. 120 b. 80 c. class 11 and class V
d. Total students = $100 + 80 + 120 + 100 + 80$
 $= 200 + 200 + 80 = 480$
6. a. Spent on roads = 10% of 20 = $10 = \frac{10}{100} \times 20 = 2$ crores
b. $\frac{\text{Spent on education}}{\text{Spent on road}} = \frac{25}{10} = 2.5$ times
c. Fraction = $\frac{30}{100} = \frac{3}{10} = 3 : 10$
7. a. May or may not b. May or may not c. Impossible
d. Certain happen e. Impossible
8. a. Total possible outcomes = 6 (1, 2, 3, 4, 5, 6)
Number of favourable outcomes = 3 (1, 3, 5)
Probability = $\frac{\text{Number of favourable outcomes}}{\text{Total possible outcomes}} = \frac{3}{6} = \frac{1}{2}$
- b. Total possible outcome = 6 (1, 2, 3, 4, 5, 6)
Number of favourable outcome = 1 (5)
Probability = $\frac{\text{No. of favourable outcomes}}{\text{Total possible outcome}} = \frac{1}{6}$
- c. Total possible outcome = 6 (1, 2, 3, 4, 5, 6)
Number of favourable outcome = 2 (3, 6)
Probability = $\frac{\text{No. of favourable outcomes}}{\text{Total possible outcome}} = \frac{2}{6} = \frac{1}{3}$
- d. Total possible outcomes = 6 (1, 2, 3, 4, 5, 6)
Number of favourable outcome = 0
Probability = $\frac{\text{No. of favourable outcomes}}{\text{Total possible outcome}} = \frac{0}{6} = 0$
- e. Total possible outcomes = 6 (1, 2, 3, 4, 5, 6)
Number of favourable outcomes = 5
Probability = $\frac{\text{No. of favourable outcomes}}{\text{Total possible outcome}} = \frac{5}{6}$

Multiple Choice Questions

1. (b) 2. (d) 3. (c) 4. (d) 5. (c)