6. The diagonal of square plot = 325 cm
Suppose the length of each side of square = a
$\because$ diagonal of square $(d) = \sqrt{2a}$

$$325 = \sqrt{2 \times a}$$

$$(325)^2 = \sqrt{2 \times a^2}$$

$$105625 \text{ cm}^2 = 2 \times a^2$$

$$a^2 = \frac{105625}{2} = 52812.5 \text{ cm}^2$$

Hence, the area of the square is 52812.5 cm^2.

MCQ's

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

Formative Assessment-1

1. (c) **2.** (a) **3.** (a) **4.** (b) **5.** (d) **6.** (d) **7.** (d) **8.** (c) **9.** (b) **10.** (c) **11.** (c) **12.** (d) **13.** (c) **14.** (a) **15.** (c) **16.** (a) **17.** (c) **18.** (c) **19.** (d) **20.** (a).

4. Cube and Cube Root

Exercise 4.1

1. (a) $3 = 3 \times 3 \times 3 = 27$
(b) $12 = 12 \times 12 \times 12 = 1728$
(c) $20 = 20 \times 20 \times 20 = 8000$
(d) $202 = 202 \times 202 \times 202 = 8242408$
(e) $0.1 = 0.1 \times 0.1 \times 0.1 = 0.0001$
(f) $1.2 = 1.2 \times 1.2 \times 1.2 = 1.728$
(g) $0.05 = 0.05 \times 0.05 \times 0.05 = 0.000125$

2. (a) 512

2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$512 = \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2} \times \overline{2 \times 2 \times 2}$

Since, 512 can be grouped into triplet of equal faction.
Hence, it is a perfect cube.

(b) 2744

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

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

Since, 2744 can be grouped into triplet of equal factor.
Hence, it is a perfect cube.

(c) 3375

5	3375
5	675
5	135
3	27
3	9
3	3
	1

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

Since, 3375 can be grouped into triplet of equal factor.
Hence, it is a perfect cube.

(d) 100000

2	100000
2	50000
2	25000
5	12500
5	2500
5	500
2	100
2	50
5	25
	1

$100000 = 2 \times 2 \times \overline{2 \times 2 \times 2} \times 5 \times \overline{5 \times 5 \times 5}$

Since, there are not triplets of 2 and 5.
Hence, 100000 is not perfect cube.

(e) 46656

2	46656
2	23328
2	11664
2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

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

Since 46656 can be grouped two triplet of equal factors.
Hence, it is a perfect cube.

3. (a) 392

The prime factors of

$392 = 2 \times \underline{2 \times 2 \times 2} \times 7 \times 7$

After grouping together.
The triplets of 2 are left with factor 7×7

2	392
2	196
2	98
7	49
7	7
	1

If we multiply 392 by the product will be perfect cube $(14)^3$

$392 \times 7 = 2744$

2744 are perfect cube of 14.

Hence, the required number = 7.

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

(b) 675

The prime factor of $675 = \overline{3 \times 3 \times 3} \times \overline{5 \times 5}$

After grouping together,

The triplets of 3 are left with factor 5×5.

If we multiply 675 by 5 it will be a perfect cube.

$675 \times 5 = 3375$ (it is a perfect cube of 15)

Hence, the required number is 5.

5	675
5	135
3	27
3	9
3	3
	1

(c) 2560

The prime factors of

$2560 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 5$

After grouping together the triplets of 2 are left with factor 5.

If we multiply 2560 $(5)^2$ it will be a perfect cube.

$2560 \times 25 = 64000$

It is a perfect cube of 40.

Hence, the required number it $5 \times 5 = 25$.

2	2560
2	1280
2	640
2	320
2	160
2	80
2	40
2	20
2	10
5	5
	1

(d) 8788

The prime factors of

$8788 = \underline{2 \times 2} \times \underline{13 \times 13 \times 13}$

After the grouping together the triplets of 13 are left with factor 2×2.

If we multiply 8988 by 2 it will b a perfect cube.

$8788 \times 2 = 17576$ It is a perfect cube of 26.

Hence, the required number = 2.

2	8788
2	4394
13	2197
13	169
13	13
	1

4. (a) 540

The prime factor of

$540 = 2 \times 2 \times 5 \times 3 \times 3 \times 3$

After grouping together,

the triplets of 3 are left with factor $2 \times 2 \times 5$

If we divide 540 by $2 \times 2 \times 5$,

the quotient will be a perfect cube.

$\frac{540}{20} = 27$ (It is cube of 3.)

Hence, required number = 20.

2	540
2	270
5	135
3	27
3	9
3	3
	1

(b) 20000

The prime factor of

$2000 = 2 \times \underline{2 \times 2 \times 2} \times \underline{5 \times 5 \times 5}$

After grouping together the triplets

of 2 and 5 are left with factor 2.

If we divide 2000 by 2,

the quotient will be a perfect cube.

$\frac{2000}{2} = 1000$ (It is cube of 10.)

Hence, the required number is 10.

2	2000
2	1000
2	500
2	250
5	125
5	25
5	5
	1

(c) 8640

The prime factor of 8640

$8640 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times 5$

After grouping together,

the triplets of 12 are left with 5.

If we divide 8640, 5,

the quotient will be a perfect cube.

$\frac{8640}{5} = 1728$

(It is cube of 12.)

Hence, the required number is 5.

2	8640
2	4320
2	2160
2	1080
2	540
3	270
3	90
3	30
5	10
2	2
	1

2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

(d) 27648

The prime factors of 27648

$27648 = \underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{3\times3\times3}$

After grouping together,

the triplets of 24 are left with 2.

If we divide 27648 by 2,

the quotient will be a perfect cube.

$\frac{27648}{2} = 13824$ (It is a cube of 24.)

Hence, required number is 2.

2	27648
2	13824
2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

5. (i) $1 = 1 = 1^3$

$3 + 5 = 8 = 2^3$

$7 + 9 + 11 = 27 = 3^3$

$13 + 15 + 17 + 19 = 64 = 4^3$

$21 + 23 + 25 + 27 + 29$

$9^3 = 73 + 75 + 77 + 79 + 81 + 83 + 85 + 87 + 89$

Hence, a consecutive odd numbers will be needed.

(ii) Express 6^3 and 8^3 as the sum of odd numbers.

$6^3 = 31 + 33 + 35 + 37 + 39 + 41$

$8^3 = 57 + 59 + 61 + 63 + 65 + 67 + 69 + 71$.

Exercise 4.2

1. (a) 729

3	729
3	24381
3	27
3	9
3	3
	1

Prime factors of

$729 = \overline{3\times3\times3}\times\overline{3\times3\times3}$

Then $\sqrt[3]{729} = 3\times3 = 9$

(b) 74088

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

Prime factors of

$74088 = \underline{2\times2\times2}\times\underline{3\times3\times3}\times\underline{7\times7\times7}$

Then $\sqrt[3]{74088} = 2\times3\times7 = 42$

(c) 8000

2	8000
2	4000
2	2000
2	1000
2	500
2	250
5	125
5	25
5	5
	1

Prime factors of
$8000 = \underline{2\times 2\times 2}\times \underline{2\times 2\times 2}\times \underline{5\times 5\times 5}$

Then, $\sqrt[3]{8000} = 2\times 2\times 5 = 20$

(d) 35937

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

Prime factors of
$35937 = \overline{3\times 3\times 3}\times 11\times \overline{11\times 11}$

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

(e) 15625

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

Prime factors of 15625
$= 5\times 5\times 5\times 5\times 5\times 5$

then $\sqrt[3]{15625} = 5\times 5 = 25$

(f) 13824

2	13824
2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

Prime factors of 13824
$= \overline{2\times 2\times 2}\times \overline{2\times 2\times 2}\times \overline{3\times 3\times 3}$

then $\sqrt[3]{13824} = 2\times 2\times 2\times 3 = 24$

(g) 42875

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

Prime factors of 42875
$= \overline{5\times 5\times 5}\times \overline{7\times 7\times 7}$

then $\sqrt[3]{42845} = 5\times 7 = 35$

(h) 10^6

$10^6 = 1000000$

2	1000000
2	500000
2	250000
2	125000
2	62500
2	31250
5	15625
5	3125
5	625
5	125
5	25
5	5
	1

Prime factors of 1000000
$= \overline{2\times 2\times 2\times 2\times 2\times 2}\times \overline{5\times 5\times 5}$
$\times \overline{5\times 5\times 5}$

then $\sqrt[3]{10^6} = 2\times 2\times 5\times 5 = 100.$

2. (a) $\dfrac{-343}{729} = \dfrac{-7\times -7\times -7}{3\times 3\times 3\times 3\times 3\times 3}$

$\sqrt[3]{\dfrac{-343}{729}} = \sqrt[3]{\dfrac{-7\times -7\times -7}{3\times 3\times 3\times 3\times 3\times 3}}$

$\sqrt[3]{\dfrac{-343}{729}} = \dfrac{-7}{3\times 3} = \dfrac{-7}{9}.$

7	343
7	49
7	7
	1

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

(b) $\dfrac{3375}{5832} = \dfrac{\overline{5\times 5\times 5}\times \overline{3\times 3\times 3}}{\underline{2\times 2\times 2}\times \underline{3\times 3\times 3}\times \underline{3\times 3\times 3}}$

$\sqrt[3]{\dfrac{3375}{5832}} = \dfrac{15}{18}.$

5	3375
5	675
5	135
3	27
3	9
3	3
	1

$5 \times 3 = 15$

15 cube root of 3375

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

$2 \times 3 \times 3 = 18$

18 cube root of 5832.

(c) $\frac{-4913}{-2197} = \frac{-17 \times -17 \times -17}{13 \times 13 \times 13}$

$\sqrt[3]{\frac{-4913}{-2197}} = \sqrt[3]{\frac{-17 \times -17 \times -17}{-13 \times -13 \times -13}}$

$= \frac{-17}{-13} = \frac{17}{13}.$

17	4913
17	289
17	17
	1

13	2197
13	169
13	13
	1

(d) $10\frac{8}{125} = \frac{1331}{125}$

$= \frac{11 \times 11 \times 11}{5 \times 5 \times 13}$

$\sqrt[3]{\frac{1331}{125}} = \sqrt[3]{\frac{11 \times 11 \times 11}{5 \times 5 \times 5}} = \frac{11}{5}$

11	1331
11	121
11	11
	1

5	125
5	25
5	5
	1

3. (a) $-1331 = -11 \times -11 \times -11$

$\sqrt[3]{-1331} = \sqrt[3]{-11 \times -11 \times -11}$

$= -11$

11	1331
11	121
11	11
	1

(b) 0.000125

$\frac{0.000125}{1.000000} = \frac{125}{1000000}$

$\frac{125}{1000000} = \frac{5 \times 5 \times 5}{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5}$

5	125
5	25
5	5
	1

$$\sqrt[3]{\frac{125}{1000000}} = \sqrt[3]{\frac{1}{2\times2\times2\times2\times2\times2\times5\times5\times5}}$$

$$= \frac{5}{2\times2\times5\times5} = \frac{1}{20} = 0.05$$

Hence 0.05 is cube root of 0.000125.

2	1000000
2	500000
2	250000
2	125000
2	62500
2	31250
5	15625
5	3125
5	625
5	125
5	25
5	5
	1

(c) $(-6)^3 \times (-3)^3 = (-6\times-6-6)\times(-3\times-3\times-3)$

$-216\times-27 = 5832$

$5832 = 2\times2\times2\times3\times3\times3\times3\times3\times3$

$\sqrt[3]{5832} = \sqrt{\underline{2\times2\times2}\times\underline{3\times3\times3}\times\underline{3\times3\times3}}$

$= 2\times3\times3 = 18$

18 is cube of root $(-6)^3 \times (-3)^3$.

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

(d) 0.002197

$$\frac{0.002197}{1.000000} = \frac{2197}{1000000}$$

$$\sqrt[3]{\frac{2197}{1000000}} = \sqrt[3]{\frac{13\times13\times13}{2\times2\times2\times2\times2\times2\times5\times5\times5\times5\times5\times5}}$$

$$\sqrt[3]{\frac{2197}{1000000}} = \frac{13}{2\times2\times5\times5}$$

$$= \frac{0.13\times0.13\times0.13}{0.13} = 0.002197$$

13	2197169
13	169
13	13
	1

2	1000000
2	500000
2	250000
2	125000
2	62500
2	31250
5	15625
5	3125
5	625
5	125
5	25
5	5
	1

$$= \frac{13}{100} = 0.13$$

Hence, cube root of 0.002197 is 0.13.

4. (i) 1.4 m

Volume of cuboidal box $= (\text{edge})^3$

$= (1.4 \text{ m})^3$

$= 1.4 \text{ m} \times 1.4 \text{ m} \times 1.4 \text{ m}$

$= 2.744 \text{ m}^3$.

(ii) 2.1 dm

Volume of cuboidal box $= (\text{edge})^3$

$= (2.1 \text{ m})^3$

$= (2.1 \times 2.1 \times 2.1) \text{ m}^3$

$= 9.261 \text{ m}^3$.

5. (i) 13824 cm^3 give volume is 13824 cm^3

$\text{edge} = \sqrt[3]{\text{Volume}}$

edge of a cuboidal box $= \sqrt[3]{13824}$

edge of a cuboidal box

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

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

$= 24$ cm.

Hence, edge of the cuboidal box is 24 cm.

2	13824
2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

(ii) 832.768 cm^3

edge of a cuboid box $= \sqrt[3]{32.768} = \sqrt[3]{\frac{32.768}{1000}}$

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

2	1000
2	500
2	250
5	125
5	25
5	5
	1

$$\therefore \quad \sqrt[3]{\frac{32768}{1000}} = \sqrt[3]{\frac{\underline{2\times2\times2}\times\underline{2\times2\times2}\times\underline{2\times2\times2}\times2}{\underline{2\times2\times2}\times\underline{5\times5\times5}}}$$

$$= \frac{2\times2\times2\times2\times2}{2\times5} = \frac{32}{10} = 3.2$$

6. Ratio of the volumes of two cube = 125 : 725

Ratio of the edge $= \sqrt[3]{\text{Ratio of volumes}}$

$$= \sqrt[3]{\frac{125}{729}} = \sqrt[3]{\frac{5\times5\times5}{3\times3\times3\times3\times3\times3}}$$

Ratio of the edges $= \sqrt[3]{\frac{125}{729}}$

$$= \sqrt[3]{\frac{5\times5\times5}{3\times3\times3\times3\times3\times3}} = \frac{5}{9}$$

Hence, the ratio of the edges of two cubes is 5 : 9.

5	125
5	25
5	5
	1

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

MCQ's

1. (c) **2.** (b) **3.** (b) **4.** (b) **5.** (c) **6.** (c) **7.** (c) **8.** (b) **9.** (b)

5. Playing with Numbers

Exercise 5.1

1. Let the original number be $10a + b$.

When the digits are reversed then the digit a occupies the units place and the digit b occupies the ten place.

So the new number formed is $10b + a$.

It is given that the sum of digits is 8, i.e.,

$$a + b = 8$$

$$\Rightarrow \quad b = 8 - a \qquad \ldots(i)$$

The difference between the old number and the new number is 18.

$$\Rightarrow \quad (10a + b) - (10b + a) = 18$$

$$\Rightarrow \quad 9a - 9b = 18$$

$$\Rightarrow \quad 9(a - b) = 18$$

$$\Rightarrow \quad a - b = 2 \qquad \ldots(ii)$$

Substituting $b = 8 - a$ in (ii), we have

$$a - (8 - a) = 2$$

$$2a - 8 = 2$$

$$2a = 10$$

$$\Rightarrow \quad a = 5$$

$\therefore$ From (i), $b = (8 - 5) = 3$

Hence, the original number $= 10a + b = 10 \times 5 + 3 = 53$

The number formed on reversing the digits = 35.

2. Let two 2-digit numbers be $10a + b$ and $10x + y$

According to question,

$$(10a + b)(10x + y) = 2117 \qquad \ldots(1)$$

$$by = 27 \qquad \ldots(2)$$

$$ax = 14 \qquad \ldots(3)$$

From (i), we get

$$100ax + 10ay + 10bx + by = 2117$$

$$100 \times 14 + 10(ay + bx) + 27 = 2117$$

$$10(ay + bx) = 2117 - 1400 - 27$$

$$10(ay + bx) = 690$$

$$ay + bx = \frac{690}{10} = 69$$

$$ay + bx = 69 \qquad \ldots(4)$$

From (2), $\qquad y = \dfrac{27}{b} \qquad \ldots(5)$

From (3), $\qquad x = \dfrac{14}{a} \qquad \ldots(6)$

Put these values of x and y in equation (4), we get

$$a\left(\frac{27}{b}\right) + b\left(\frac{14}{a}\right) = 69$$

$$\Rightarrow \quad 27a^2 + 14b^2 = 69ab$$

$$\Rightarrow \quad 27a^2 - 69ab + 14b^2 = 0$$

$\Rightarrow \quad 27a^2 - 63ab - 6ab + 14b^2 = 0$

$\Rightarrow \quad 9a(3a - 7b) - 2b(3a - 7b) = 0$

$\Rightarrow \quad (3a - 7b)(9a - 2b) = 0$

When $3a - 7b = 0$

$3a = 7b \quad \Rightarrow \quad \frac{a}{b} = \frac{7}{3}$

$\Rightarrow \quad a = 7, b = 3$

Put $a = 7, b = 3$ in equation (5) and (6),

we get $y = 9, x = 2$

When $9a - 2b = 0$

$9a = 2b \quad \Rightarrow \quad \frac{a}{b} = \frac{2}{9}$

$\Rightarrow \quad a = 2, b = 9$

Put $a = 2, b = 9$ in equation (5) and (6),

we get $y = 3, x = 7$

$\therefore$ The required 2-digit numbers are $(40 \times 7 + 3), (10 \times 2 + 9) = 73, 29$

Or $(10 \times 2 + 9), (10 \times 7 + 3) = 27, 73$

3. Let the 2-digit original number be $10a + b$

Sum of its digit $= a + b$

$\Rightarrow \quad 10a + b = 8(a + b) \quad \Rightarrow \quad 10a + b = 8a + 8b$

$\Rightarrow \quad 2a = 7b \quad \Rightarrow \quad 2a - 7b = 0$

$\Rightarrow \quad 2a = 7b$

$a = \frac{7}{2}b \qquad \ldots(i)$

According to second condition,

$10a + b = 10b + a = 45 \quad \Rightarrow \quad 10ab + b - 10b - a = 45$

$\Rightarrow \quad 9a - 9b = 45 \quad \Rightarrow \quad a - b = \frac{45}{9}$

$\Rightarrow \quad a - b = 5 \qquad \ldots(ii)$

From (i) substituting the value of a in (ii), we have

$\frac{7b}{2} - b = 5 \quad \Rightarrow \quad \frac{7b - 2b}{2} = 5$

$\Rightarrow \quad 5b = 5 \times 2 \quad \Rightarrow \quad b = \frac{5 \times 2}{5} = 2$

Now, put the value of b in (i), we get

$a = \frac{7}{2} \times 2 = 7$

Hence, the number $= 10 \times 7 + 2 = 72$.

4. Let the original two-digit number be $10a + b$

and it's reversing two-digit number be $10b + a$.

Then, according to conditions $10a + b + 10b + a = 110$

$\Rightarrow \quad 11(a + b) = 110$

$\Rightarrow \quad a + b = 10 \qquad \ldots(1)$

and $b - a = 6 \qquad \ldots(2)$

On solving (1) and (2), we get $a = 2, b = 8$

$\therefore$ the original two-digit number $= 10 \times 2 + 8 = 28$.

5. Let the original number be $100a + 10b + 0$,

i.e., $100a + 10b$,

then by the first condition

$$100a + 10b - (100b + 10a) = 180°$$

$$\Rightarrow \quad 100a + 10b - 100b - 10a = 180°$$

$$\Rightarrow \quad 90a - 90b = 180°$$

$$\Rightarrow \quad 90(a - b) = 180°$$

$$\Rightarrow \quad a - b = 2 \qquad \ldots(1)$$

By the second condition,

$$\text{New number} = 100 \times \frac{a}{2} + 0 + b = 50a + b$$

and so $(100a + 10b) - (50a + b) = 454$

$$\Rightarrow \quad 100a + 10b - 50a - b = 454$$

$$\Rightarrow \quad 50a + 9b = 454 \qquad \ldots(2)$$

Multiplying (i) by 9 and adding to (ii), we get

$$9a - 9b + 50a + 9b = 18 + 454$$

$$59a = 472 \quad \Rightarrow \quad a = \frac{\overset{8}{472}}{\underset{1}{59}} = 8$$

From (i), we get

$$8 - b = 2 \quad \Rightarrow \quad 8 - 2 = b$$

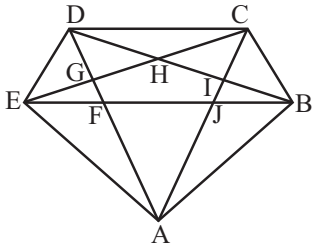
$$\Rightarrow \quad b = 6$$

$\therefore$ The number $= 100 \times 8 + 10 \times 6 = 800 + 60 = 860$

Exercise 5.2

1. Given number $= 1000a + 100b + 10c + d$

$\therefore$ Number of digits in it = 4 (i.e., a, b, c, d)



2. The required number of triangle are 34 i.e.,

$ADC, ACB, AED, AEG, AEF, AEB, AEC, AEJ, AJB, AIB, ADB, AGC, AFJ, AFB,$
$ADI, BDC, BHC, BIC, BJI, BFD, BED, BEH, BJC, CED, CGD, CHD, CHI, CJE, CID,$
$DEG, DEF, DEH, EGF, GDH = 34$

3.

$$\begin{array}{r} \mathbf{4}\ 3\ 5 \\ 8\ \mathbf{2}\ 6 \\ +\ 1\ 4\ \mathbf{7} \\ \hline 1\ 4\ 0\ 8 \end{array}$$

4. (a)

6	**1**	8
7	5	**3**
2	**9**	4

(b)

6	**12**	**13**	9
7	15	**4**	14
11	**11**	10	**8**
16	**2**	13	**3**

5. (a)
$$\begin{array}{r} P\ P\ P \\ +\ A \\ \hline A\ B\ B\ B \end{array} \longrightarrow \begin{array}{r} 9\ 9\ 9 \\ +\ 1 \\ \hline 1\ 0\ 0\ 0 \end{array}$$

(b)
$$\begin{array}{r} X\ Y \\ +\ Y \\ \hline Y\ X \end{array} \longrightarrow \begin{array}{r} 8\ 9 \\ +\ 9 \\ \hline 9\ 8 \end{array}$$

6. $100 - 10 = 90$, $50 - 10 = 40$,
$90 - 10 = 80$, $40 - 10 = 30$
$80 - 10 = 70$, $30 - 10 = 20$
$70 - 10 = 60$, $20 - 10 = 10$
$60 - 10 = 50$, $10 - 10 = 0$

$\therefore$ Total number of times = 10

7.

	29	
83	**25**	**15**
	65	

Exercise 5.3

1. (a)
$$\begin{array}{r} \mathbf{7}\ 2\ 4\ 6 \\ -\ 5\ 2\ \mathbf{4}\ 7 \\ \hline I\ \mathbf{9}\ \mathbf{9}\ \mathbf{9} \end{array}$$

(b)
$$\begin{array}{r} 4\ \mathbf{6}\ 7\ 2 \\ \mathbf{3}\ 8\ 5\ \mathbf{7} \\ +\ 9\ 2\ \mathbf{4}\ 6 \\ \hline \mathbf{1}\ 7\ 7\ 7\ 5 \end{array}$$

(c)
$$\begin{array}{r|l} & \mathbf{2}\ 3 \\ \hline 3\ 7 & \mathbf{8}\ 5\ 1 \\ & 7\ 4\ 0 \\ \hline & 1\ \mathbf{1}\ \mathbf{1} \\ & -\ \mathbf{1}\ \mathbf{1}\ \mathbf{1} \\ \hline & 0 \end{array}$$

(d)
$$\begin{array}{r} 1\ 2\ \mathbf{5} \\ \times\ \mathbf{2}\ 1\ 5 \\ \hline \mathbf{6}\ 2\ 5 \\ \mathbf{1}\ \mathbf{2}\ \mathbf{5}\ 0 \\ 2\ \mathbf{5}\ 0\ 0\ 0 \\ \hline \mathbf{2}\ 6\ 8\ \mathbf{7}\ \mathbf{5} \end{array}$$

2. (a) $563 \xrightarrow{+19} 582 \xrightarrow{+38} 620 \xrightarrow{+57} 677 \xrightarrow{+76} 753 \xrightarrow{+95} 848 \xrightarrow{+114} \mathbf{962}$

(b) $17 \xrightarrow{\times 1} 17 \xrightarrow{\times 3} 51 \xrightarrow{\times 5} 255 \xrightarrow{\times 7} 1785 \xrightarrow{\times 9} 16055 \xrightarrow{\times 11} \mathbf{176715}$

3. (d) From fig. (i), $\sqrt{9} + \sqrt{16} + \sqrt{25} + \sqrt{36} = 8$

$\Rightarrow$ $3 + 4 + 5 + 6 = 18$

From fig. (ii), $\sqrt{25} + \sqrt{64} + \sqrt{1} + \sqrt{16} = 18$

$\Rightarrow$ $5 + 8 + 1 + 4 = 18$

From fig. (iii), $\sqrt{9} + \sqrt{64} + \sqrt{1} + \sqrt{x} = 18$

$\Rightarrow$ $3 + 8 + 1 + \sqrt{x} = 18$ $\Rightarrow$ $12 + \sqrt{x} = 18$

$\Rightarrow$ $\sqrt{x} = 18 - 12$ $\Rightarrow$ $\sqrt{x} = 6$

$\Rightarrow$ $x = 36$

$\therefore$ $x = 36$

4. (c)

$$\begin{array}{r} 2\ 1 \\ 12\overline{)\,2\ 5\ 2} \\ -\ 2\ 4 \\ \hline 1\ 2 \\ -\ 1\ 2 \\ \hline 0 \end{array}$$

$\therefore\ r = 1 \quad s = 2$

5. (a) $2^2 + 87 = 91$

$3^2 + 72 = 81$

$\therefore\ 4^2 + 1 = \mathbf{17}$

6. (d) $0 \times 8 = 0$

$1 \times 8 = 8$

$2 \times 8 = 16 = 1 + 6 = 7$

$3 \times 8 = 24 = 2 + 4 = 6$

$4 \times 8 = 32 = 3 + 2 = 5$

$5 \times 8 = 40 = 4 + 0 = 4$

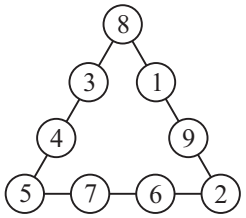
$6 \times 8 = 48 = 4 + 8 = 12 = 1 + 2 = 3$

$7 \times 8 = 56 = 5 + 6 = 11 = 1 + 1 = 2$

$8 \times 8 = 64 = 6 + 4 = 10 = 1 + 0 = 1$

$9 \times 8 = 72 = 7 + 2 = 9$

7.



8. $1 \times 8 + 1 = 9$

$12 \times 8 + 2 = 98$

$123 \times 8 + 3 = 987$

$1234 \times 8 + 4 = 9876$

$12345 \times 8 + 5 = 98765$

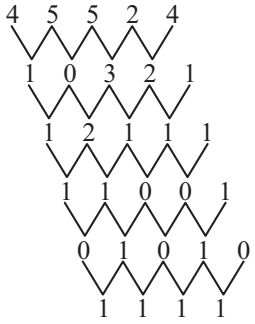
$123456 \times 8 + 6 = 987654$

$1234567 \times 8 + 7 = 9876543$

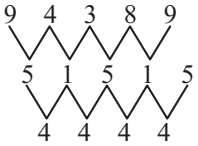
$12345678 \times 8 + 8 = 98765432$

$123456789 \times 8 + 9 = 987654321$

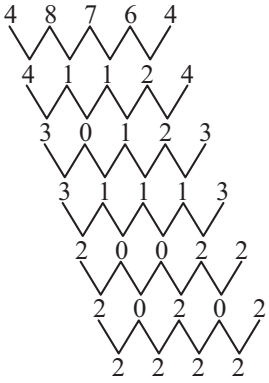
9. (a)



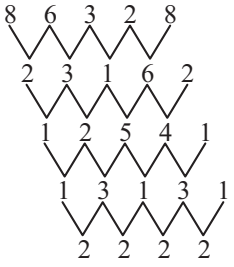
(b)



(c)



(d)



Exercise 5.4

1. We know that a number is divisible by 2 if its units place is divisible by 2.

$34 \div 2 = 17$ $112 \div 2 = 56$

$324 \div 2 = 162$ $698 \div 2 = 349$

$48 \div 2 = 24$

34, 48, 34, 112, 324, 698.

2. We know that a number is divisible by 3, if the sum of its digits is divisible by 3.

Sum of the digits of $42 = 4 + 2 = 6$,
which is divisible by 3, so 42 is divisible by 3.
Sum of the digits $37 = 3 + 3 = 10$
which is not divisible by 3, so 37 is not divisible by 3.
Sum of $96 = 9 + 6 = 15$,
which is divisible by 3, so 96 is divisible by 3.
Sum of the digit $37 = 3 + 3 = 10$
which is not divisible by 3, so 37 is not divisibleby 3.
Sum of $96 = 9 + 6 = 15$,
which is divisible by 3, so 96 is divisible by 3.
Sum of $69 = 6 + 9 = 15$,
which is divisible by 3,so 69 is divisible by 3.
Sum of $24 = 2 + 4 = 6$,
which is divisible by 3, so 24 is divisible by 3.
Sum of $834 = 8 + 3 + 4 = 15$
which is divisible by 3, so 834 is divisible by 3.
Sum of $111 = 1 + 1 + 1 = 3$
which is divisible by 3, so 111 is divisible by 3.
Sum of $243 = 2 + 4 + 3 = 9$
which is divisible by 3, so 243 is divisible by 3.
Sum of $814 = 8 + 1 + 4 = 13$
which is not divisible by 3, so 814 is not divisible by 3.
Sum of $915 = 9 + 1 + 5 = 15$
which is divisible by 3, so 915 is divisible by 3.

3. We know that a number is divisible y 5, if the units of digit is either 0 by 5.
The numbers unit digit 0 and 5 are = 40, 85, 245, 420, 935
So, 40, 85, 245, 420, 935 are divisible by 5.

4. We know that if the sum of digits of a number is divisible by 9 that number will be divisible by 9.

Sum of $36 = 3 + 6 = 9$
which is divisible by 9, so 36 is divisible by 9.
Sum of $90 = 90 + 0 = 9$
which is divisible by 9, so 90 is divisible by 9.
Sum of $156 = 115 + 6 = 12$
which is not divisible by 9, so 156 is not divisible by 9.
Sum of $248 = 2 + 4 + 8 = 14$
which is not divisible by 9, so 248 is not divisible by 9.
Sum of $514 = 5 + 1 = 4 = 10$
which is not divisible by 9, so 514 is not divisible by 9.
Sum of $810 = 8 + 1 + 0 = 9$

which is divisible by 9, so 810 is divisible by 9.
Sum of $723 = 7 + 2 + 3 = 12$
which is not divisible by 9, so 723 is not divisible by 9.
Sum of $936 = 9 + 3 + 6 = 18$
which is divisible by 9, so 936 is divisible by 9.
$\therefore$ 36, 90, 810, 936 are divisible by 9.

5. A number is divisible by 10 if its units place is 0.
So, 140, 320, 930 is divisible by 10.

6. We know that a number is divisible by 3 but not divisible by 9 is the sum of its digits is divisible by 3 but not divisible 9.

$207 = 2 + 0 + 7 = 9$,
which is divisible by 9 & 3.

$105 = 1 + 0 + 5 = 6$,
which is divisible by 3 but not divisible by 9,
so 105 is divisible by 3 but not divisible by 9.

$312 = 3 + 1 + 2 = 6$,
$\therefore$ So 312 is divisible by 3 but not divisible by 9.

$210 = 2 + 1 + 0 = 3$,
210 is divisible by 3 but not divisible by 9.

$576 = 5 + 7 + 6 = 18$,
which is divisible by 3 and also by 9.

$624 = 6 + 2 + 4 = 12$,
which is divisibleby 3 but not divisible 9.

7. (A) Divisible by 3

(a) We know that a number is divisible by 3 if the sum of its digits is divisible by 3.
Let put x in blank place. $\Rightarrow$ 2×2.

$$2 + x + 2 = x + 4 \quad \ldots(i)$$

If we put $x = 2$, in (i) then we get 6, which is smallest integer divisible by 3.
$\therefore$ $2x2 = 222$

(b) $$3 + x + 2 = 5 + x \quad \ldots(i)$$

If we put $x = 1$, then we get 6, which is smallest integer divisible by 3.
$\therefore$ $3x2 \Rightarrow 312$

(c) $$1 + 7 + x = 8 + x \quad \ldots(i)$$

We put $x = 1$, then we get 9, which is the smallest integer divisible by 3.
$\therefore$ $17x = 171$

(d) $$7 + x + 5 = 12 + x \quad \ldots(i)$$

If we put $x = 3$, then we get 15, which is divisible by 3.
$\therefore$ $7x5 = 705$

(B) Divisible by 9

(a) $$2\,?\,2 = 2 + x + 2$$
$$= 4 + x \quad \ldots(i)$$

If we put $x = 5$ in (i), we get , which is the smallest integer divisible by 9.
$\therefore$ $2\,?\,2 = 252$

(b) $$3\,?\,2 = 3 + x + 2 = 5 + x \quad \ldots(i)$$

If we put $x = 4$ in (i), we get 9, which is the smallest integer divisible by 9.
$\therefore$ $3\,?\,2 = 342$

(c) $17?=1+7+x=8+x$ …(i)

If we put $x=1$ in (i), we get 9, which is the smallest integer divisible by 9.

$\therefore$ $17?=171$

(d) $7?25=7+x+5=12+x$ …(i)

If we put $x=6$ in (i), we get 18, which is the smallest integer divisible by 9.

$\therefore$ $7?5=765$

MCQ's

1. (a) **2.** (d) **3.** (d) **4.** (b) **5.** (c)

6. Comparing Quantities

Exercise 6.1

1. (a) $83\% = \frac{83}{100}$ (b) $38\% = \frac{38}{100} = 0.38$

(c) $45\% = \frac{45}{\underset{20}{100}} = \frac{5}{20} = 9:20$

2. (a) 5% of $x = 20$

$$\frac{5}{100} \times x = 20$$

$$5x = 20 \times 100$$

$$x = \frac{20 \times 100}{\underset{1}{5}}$$

$$x = 400$$

(b) 8.5% of $x = 1.615$

$$\frac{8.5}{100} \times x = 1.615$$

$$x = \frac{1.615 \times 100}{8.5} = 19$$

3. Let the number be x.

Then 8.5% of $x = 51$

$$\frac{8.5}{100} \times x = 51$$

$\Rightarrow$ $$x = \frac{51 \times 100}{8.5} = 600$$

4. Let the maximum marks be x.

Bharti scored marks = 410

his percentage of marks = 82%

$\therefore$ 82% of $x = 410$

$\Rightarrow$ $$\frac{82}{100} \times x = 410$$

$\Rightarrow$ $$x = \frac{410 \times 100}{82} = 500$$

5. Anil's per month income = ₹ 18000
he spent on rent = 14%
he spent on other things = 54%
Total spent = 14 + 54 = 68%
he saved = 100 − 68 = 32%
∴ his saves per month = 32% of ₹ 18000

$$= \frac{32}{100} \times 18000 = ₹\ 5760$$

6. Men population = 45%
Women population = 30%
∴ Children population $= 100 - (45 + 30) = 100 - 75 = 25\%$

7. Boys percentage = 60%
Number of girls = 120,
Let total no. of students be x.
∴ 60% of $x + 120 = x$

$$\Rightarrow \frac{60}{100}x + 120 = x \qquad \Rightarrow \frac{3x}{5} + 120 = x$$

$$\Rightarrow 120 = x - \frac{3x}{5} \qquad \Rightarrow 120 = \frac{5x - 3x}{5}$$

$$\Rightarrow 120 = \frac{2x}{5}$$

$$\Rightarrow x = \frac{120 \times 5}{2} = 60 \times 5 = 300.$$

8. An allow contains copper = 20%
Zinc = 35%
rest (Nickel) = 100 − (20 + 35) = 100 − 55 = 45%
∴ quantity of nickel in the allow = 45% of 1.5 kg

$$= \frac{45}{100} \times 1.5 \times 1000 \text{ gm}$$

$$= 45 \times 15 = 675 \text{ gm}.$$

9. Let the school was open for x days in a year.
Vinay went to school for = 260 days
his attendance was = 80%

$$\therefore \quad 80\% \text{ of } x = 260 \qquad \Rightarrow \frac{\overset{4}{80} \times x}{\underset{5}{100}} = 260$$

$$\Rightarrow \frac{4x}{5} = 260 \qquad \Rightarrow x + \frac{5 \times 260}{4} = 325.$$

10. Suppose B's income = ₹ 100
∴ A's income = ₹ (100 − 20) = ₹ 80
If A's income is ₹ 80, then B's income = ₹ 100
If A's income is ₹ 1, then B's income = ₹ $\frac{100}{80}$
If A's income is ₹ 100, then B's income = ₹ $\frac{100}{80} \times 100 = ₹\ 125$
∴ B's income is (125 − 100) = 25% more

11. Suppose the price of the item was = ₹ 2100
Company reduces the price = 5%

New price of the item = $₹\left(100-\frac{100\times 5}{100}\right)=₹\,95$

Then, C.P. of the item for retailer = ₹ 95
Let the percentage be x increase to sell the item for old price.

then $$95+\frac{95\times x}{100}=100$$

or $$\frac{9500+95x}{100}=100$$

or $$95x=10000-980$$

$$x=\frac{500}{95}=\frac{400}{19}=5\frac{50}{90}$$

12. Let third person (C) gets = ₹ x

Then, second person (B) gets = 50% of $x=\frac{50\times x}{100}=₹\,\frac{x}{2}$

and first person (A) gets = 50% of $\frac{x}{2}=\frac{50}{100}\times\frac{x}{2}=₹\,\frac{x}{4}$

$\therefore$ $$x+\frac{x}{2}+\frac{x}{4}=₹\,3500$$

$\Rightarrow$ $$\frac{4x+2x+x}{4}=₹\,3500$$

$\Rightarrow$ $$\frac{7x}{4}=3500$$

$\Rightarrow$ $$x=\frac{3500\times 4}{7}=500\times 4=2000$$

$\therefore$ A gets = $₹\left(\frac{2000}{4}\right)=₹\,500$

B gets = $₹\left(\frac{2000}{2}\right)=₹\,1000$ C gets = ₹ 2000

13. Let there total votes were = x

(i) Winner candidate got = 53% of x

Winner candidate votes = $\frac{53}{100}\times x=\frac{53x}{100}$

His opponent candidate got = 31% of x

$\therefore$ $$\frac{31}{100}x=31000$$

$$x=\frac{31000\times 100}{31}=100000$$

(ii) Winner candidate votes = $\frac{53}{100}\times 100000=53000$

Now, the winning margin = $53000-31000=22000$

14. Let the number = 100

$\therefore$ Number after 40% increase = 100 + 40 = 140

decrease in the new number $= 40\%$ of 140

$$= \frac{40}{100} \times 140 = 56$$

$\therefore$ Final number $= 140 - 56 = 84$

$\therefore$ Net decrease $= 100 - 84 = 16$

Hence, there is a net decrease of 16%.

Exercise 6.2

1. (a) C.P. = ₹ 500, S.P. = ₹ 525 S.P. > C.P., there is profit.

$\therefore$ $P = \text{S.P.} - \text{C.P.} = ₹\ 525 - ₹\ 500 = ₹\ 25$

$$P\% = \frac{P}{\text{C.P.}} \times 100 = \frac{25}{500} \times 100 = \frac{25}{5} = 5\%$$

(b) C.P. = ₹ 650, S.P. = ₹ 715 S.P. > C.P. there is profit.

$\therefore$ $P = \text{S.P.} - \text{C.P.} = ₹\ 715 - ₹\ 650 = ₹\ 65$

$$P\% = \frac{P}{\text{C.P.}} \times 100 = \frac{65}{650} \times 100 = 10\%$$

2. (a) C.P. = ₹ 1000, gain% = 15% S.P. = ?

$$\text{S.P.} = \text{C.P.} \times \left(\frac{100 + \text{gain \%}}{100}\right) = 1000 \times \left(\frac{100 + 15}{100}\right)$$

$$= \frac{1000 \times 115}{100} = ₹\ 1150$$

(b) C.P. = ₹ 750, Loss % = 5% S.P. = ?

$$\text{S.P.} = \text{C.P.} \times \left(\frac{100 - \text{loss \%}}{100}\right) = 750 \times \left(\frac{100 - 5}{100}\right)$$

$$= \frac{750 \times 95}{100} = 712.5 = ₹\ 712.50$$

3. (a) S.P. = ₹ 2000, gain = 10%,

$$\text{C.P.} = \frac{\text{S.P.} \times 100}{(100 + \text{gain \%})} = \frac{2000 \times 100}{(100 + 10)}$$

$$= \frac{2000 \times 100}{110} = ₹\ 1818.18$$

(b) S.P. = ₹ 700, Loss % $= 12\frac{1}{2}\%$ C.P. $= \dfrac{\text{S.P.} \times 100}{(100 - \text{Loss \%})}$

$$= \frac{700 \times 100}{\left(100 - \frac{35}{2}\right)} = \frac{700 \times 100 \times 2}{175} = ₹\ 800$$

4. Purchase = ₹ 60,000

Spent on its repairing = ₹ 10,000

$\therefore$ Total C.P. = ₹ 60,000 + ₹ 10,000 = ₹ 70,000

S.P. = ₹ 77,000

gain = S.P. – C.P.

= ₹ 77,000 – ₹ 70,000

= ₹ 7000

$$\text{gain \%} = \frac{\text{gain}}{C.P.} \times 100 = \frac{7000}{70000} \times 100 = 10\%$$

5. C.P. of T.V. = ₹ 60,000 loss = 15% S.P. of T.V. =?

$$\text{S.P.} = \text{C.P.} \times \left(\frac{100 - \text{loss}\,\%}{100}\right)$$

$$= ₹\,6000 \times \left(\frac{100-15}{100}\right) = ₹\,\frac{6000 \times 85}{100} = ₹\,100$$

6. Let the C.P. of each pen be ₹ 1.

∴ S.P. of 15 pens = C.P. of 12 pens but, C.P. of 12 pens = ₹ 12

∴ S.P. of 15 pens = ₹ 12 so, C.P. of 15 pens = ₹ 15

Here, C.P. > S.P.

so loss = C.P. – S.P. = 15 – 12 = ₹ 3

∴ $\text{loss}\% = \left(\frac{\text{loss}}{\text{C.P.}} \times 100\right)\% = \frac{3}{15} \times 100 = 20\%$

7. Let C.P. of each book be ₹ 1.

∴ S.P. of 16 books = C.P. of 17 books but, C.P. of 17 books = ₹ 17

∴ S.P. of 16 books = ₹ 17 so, C.P. of 16 books = ₹ 16

Here, S.P. > C.P.

so, gain = S.P. – C.P. = 17 – 16 = ₹1

∴ $\text{gain}\% = \frac{\text{gain}}{\text{C.P.}} \times 100 = \frac{1}{10} \times 100 = 6.25\%$

8. Let C.P. of the article = ₹ x

$$\text{loss} = \frac{1}{20} \times x = ₹\left(\frac{x}{20}\right)$$

S.P. = ₹ 6270

by loss = C.P. – S.P.

$$\frac{x}{20} = x - 6270$$

$$6270 = x - \frac{x}{20}$$

$$6270 = \frac{19x}{20}$$

$$x = \frac{6270 \times 20}{19} = ₹\,6600$$

9. C.P. of the wheat = ₹ 35000

Value of spoiled wheat = $\frac{1}{7}$ of $35000 = \frac{35000}{7} = ₹\,5000$

Value of Good wheat = ₹ 35000 – ₹ 5000

$$\text{gain} = \frac{10}{100} \times 30{,}000 = ₹\,3000$$

$$\text{loss} = \frac{25}{100} \times 5000 = ₹\,1250$$

Since, gain > loss

∴ net gain = 3000 – 1250 = ₹1750

∴ $\text{gain}\,\% = \frac{\text{gain}}{\text{C.P.}} \times 100 = \frac{1750}{35000} \times 100 = 5\%$

10. C.P. of 75 kg Mangoes = ₹ 30×75 = ₹ 2250

C.P. of $\frac{1}{3}$ i.e., 25 kg Mango = $\frac{1}{3} \times 2250$ = ₹ 750

C.P. of remaining i.e., 50 kg Mangoes = 2250 − 750 = ₹ 1500

∴ S.P. of 25 kg Mangoes + S.P. of 50 kg Mangoes = S.P. of 75 kg Mangoes.

$$\frac{750 \times (100-5)}{100} + \text{S.P. of 50 kg Mangoes} = \frac{2250 \times (100+10)}{100}$$

$$\text{S.P. of 50 kg Mangoes} = \frac{2250 \times 110}{100} - \frac{750 \times 95}{100}$$

$$= \frac{247500 - 71250}{100} = \frac{176250}{100} = 1762.5$$

∴ S.P. of pe kg i.e., 1 kg Mangoes = $\frac{1762.5}{50}$ = ₹ 35.25

11. S.P. of 6 bananas = C.P. of bananas

Let C.P. of each bananas = ₹ 1

Then C.P. of 5 bananas = ₹ 5

but C.P. of 6 bananas = ₹ 6

Since C.P. > S.P. There is a loss.

∴ loss = C.P. − S.P. = ₹ 6 − ₹ 5 = ₹ 1

$$\text{loss \%} = \frac{\text{loss}}{\text{C.P.}} \times 100 = \frac{1}{6} \times 100 = \frac{50}{3} = 16\frac{2}{3}\%$$

12. Total C.P. of 5 fans = ₹ 4050 + 50 = ₹ 4100 gain = 15%, S.P. = ?

$$\text{S.P. of 5 fans} = \frac{\text{C.P. of 5 Fans} \times (100 + \text{gain \%})}{100}$$

$$= \frac{₹\,4100 \times (100+15)}{100} = ₹\,41 \times 115 = ₹\,4715$$

∴ S.P. of fan $= \frac{₹\,4715}{5}$ = ₹ 943

13. Let C.P. of a ceiling fan = ₹ x

∴ gain = $\frac{1}{8}$ of x = ₹ $\frac{x}{8}$

S.P. of a ceiling fan = ₹ 1152

∴ gain = S.P. − C.P.

$$\Rightarrow \quad \frac{x}{8} = 1152 - x \qquad \Rightarrow \quad \frac{x}{8} + x = 1152$$

$$\therefore \quad \frac{9x}{8} = 1152 \qquad \Rightarrow \quad x = \frac{1152 \times 8}{9} = 128 \times 8 = 1024$$

∴ C.P. of a ceiling fan = ₹ 1024

14. Let C.P. of the article = ₹ x

then, (144% of x − 110% of x) = ₹ 65

$$\Rightarrow \quad \frac{114}{100} \times x - \frac{110}{100} \times x = ₹\,65$$

$$\Rightarrow \quad \frac{144x - 110x}{100} = 65$$

$\Rightarrow \quad 4x = 65 \times 100$

$\Rightarrow \quad x = \dfrac{65 \times 100}{4} = ₹\,1625$

15. Total bought eggs = 200

Broken eggs = 38

Remaining eggs = $200 - 38 = 162$

Let C.P. of each eggs = ₹ 1

then, C.P. of 200 eggs = ₹ 200 and C.P. of 162 eggs = ₹ 162

S.P. of one dozen (i.e., 12) egs = ₹ 48

$\therefore$ S.P. of 1 egg = $₹\,\dfrac{48}{12} = ₹\,4$

and S.P. on 162 egg = $₹\,4 \times 162 = ₹\,648$

gain = 8%

$\therefore \quad \text{C.P.} = \dfrac{\text{S.P.} \times 100}{(100 + P\%)} = \dfrac{648 \times 100}{108} = ₹\,600$

16. Let Rice of the sugar before reduction = ₹ x per kg

Now, price of sugar = $\dfrac{x \times 80}{100} = ₹\left(\dfrac{4x}{5}\right)$ per kg

$\therefore \quad \dfrac{160}{\left(\dfrac{4x}{5}\right)} - \dfrac{160}{x} = 5 \quad \Rightarrow \quad \dfrac{5 \times 160}{4x} - \dfrac{160}{x} = 5$

$\Rightarrow \quad \dfrac{800 - 640}{4x} = 5 \quad \Rightarrow \quad \dfrac{160}{4x} = 5$

$\Rightarrow \quad 160 = 20x \quad \Rightarrow \quad x = \dfrac{160}{20} = 8$

$\therefore$ The reduced price = 80% of 8 kg = $\dfrac{80}{100} \times 8\,\text{kg} = ₹\,6.40$ per kg.

17. P = S.P. of 100 toys – C.P. of 100 toys

$\Rightarrow$ S.P. of 20 toys = S.P. of 100 toys – C.P. of 100 toys

$\Rightarrow$ C.P. of 100 toys = S.P. of 100 toys – S.P. of 20 toys

$\Rightarrow$ C.P. of 100 toys = S.P. of 80 toys

Let C.P. of 1 toys = ₹ 1

$\therefore$ C.P. of 100 toys = ₹ 100 = s.P. of 80 toys

$\Rightarrow$ S.P. of 80 toys = ₹ 100

$\Rightarrow \quad \text{S.P. of 1 toys} = ₹\,\dfrac{100}{800} = ₹\left(\dfrac{5}{4}\right)$

P = S.P. of toy – C.P. of 1 toy

$= ₹\,\dfrac{5}{4} - ₹\,1 = ₹\left(\dfrac{5}{4} - 1\right) = ₹\,\dfrac{1}{4}$

$P\% = \left(\dfrac{P}{C.P.} \times 100\right)\% = \dfrac{\left(\dfrac{1}{4}\right)}{1} \times 100 = 25\%$

18. Let the merchant mixes 3 kg and 2 kg of rice of both respectively.

$\therefore$ Total weight = 3 kg + 2 kg = 5 kg

C.P. of 5 kg rice = $₹\,(35 \times 3 + 45 \times 2) = ₹\,195$

S.P. of 5 kg rice = ₹ (41.60 × 5) = ₹ 208

So, P = S.P. – C.P. = ₹ 208 – ₹ 195 = ₹ 13

$$P\% = \left(\frac{P}{\text{C.P.}} \times 100\right)\% = \frac{13}{95} \times 100 = \frac{1300}{195} = 6.66\%$$

19. **Given :** Loss = C.P. of 45 apples – S.P. of 45 apples

$\Rightarrow$ S.P. of 3 apples = C.P. of 45 apples – S.P. of 45 apples

$\Rightarrow$ S.P. of 48 apples = C.P. of 45 apples

Let C.P. of each apples = ₹ 1

$\Rightarrow$ S.P. of 48 applse = ₹ 45

$\therefore$ Loss = C.P. – S.P. = ₹ 48 – ₹ 45 = ₹ 3

$$\text{Loss \%} = \frac{\text{Loss}}{\text{C.P.}} \times 100 = \frac{3}{48} \times 100 = \frac{100}{16} = 6.25\%$$

20. Correct weight = 1 kg = 1000 gm

False weight = 900 gm

$\therefore$ error = 1000 – 900 = 100 gm

$$P = \left(\frac{\text{errors}}{\text{correct wt.} - \text{error}} \times 100\right)\%$$

$$= \left(\frac{100 \times 100}{1000 - 100}\right) = \frac{100 \times 100}{900} = \frac{100}{9} = 11\frac{1}{9}\%$$

21. $\text{S.P.} = 200\left(\frac{100 - 10}{100}\right) = \frac{200 \times 90}{100} = ₹ 180$

After 5% further reduction, the new S.P. $= 180 \times \left(\frac{100 - 5}{100}\right) = \frac{180 \times 95}{100} = ₹ 171$

22. Let C.P. = ₹ x, S.P. = ₹ 78

then P = S.P. – C.P. = ₹ $(78 - x)$

$$P\% = \left(\frac{78 - x}{x}\right) \times 100$$

When S.P. = ₹ 69 and $P\% = 2P$

Then, we have $2P = \left(\frac{69 - x}{x}\right) \times 100\, 2\left(\frac{69 - x}{x}\right) \times 100 = \left(\frac{78 - x}{x}\right) \times 100$

$$2(69 - x) = (78 - x)$$
$$138 - 2x = 78 - x$$
$$138 - 78 = 2x - x$$
$$60 = x$$

Hence, C.P. of the articles is ₹ 60.

23. loss = 70% (given/S.P. of 1 kg of sugar = ₹ 5.58

C.P. of 1 kg of sugar = S.P. of 1 kg of $\frac{\text{sugar} \times 100}{(100 - \text{loss})}$

$$= \frac{5.58 \times 100}{(100 - 1)} = \frac{558}{93} = 6$$

Now, $\text{S.P.} = \text{C.P.} \times \left(\frac{100 + \text{gain \%}}{100}\right) = \frac{6 \times 107}{100} = \frac{642}{100} = ₹ 6.42$

$\therefore$ It must be sold at ₹ 6.42.

24. S.P. of the first chair = ₹ 1200

Gain % = 10%

$\therefore$ C.P. of the first chair $= \left\{\frac{100}{100+g\%} \times \text{S.P.}\right\}$

$= ₹\left\{\frac{100\times 1200}{(100+10)}\right\} = ₹\left(\frac{100+1200}{110}\right) = ₹\left(\frac{12000}{11}\right)$

S.P. of the Second chair = ₹ 1200 Loss % = 10%

$\therefore$ C.P. of the second chair $= \left\{\frac{100\times 1200}{100-10}\right\} = \frac{100\times \overset{40}{1200}}{90} = ₹\left(\frac{400}{3}\right)$

Total C.P. of the two chairs $= ₹\left(\frac{12000}{11}+\frac{4000}{3}\right) = ₹\left(\frac{36000+44000}{33}\right)$

$= ₹\left(\frac{800000}{33}\right) = ₹\ 2424.24$

Total S.P. of the two chairs = ₹ (1200 + 1200) = ₹ 2400

Since S.P. < C.P.,

There is a loss in the whole transaction.

Loss = ₹ (2424.24 − 2400) = ₹ 24.24

$\text{Loss \%} = \left(\frac{\text{Loss}}{\text{C.P.}} \times 100\right)\%$

$= \frac{24.24}{2424.24} \times 100 = \frac{2424}{2424.24} = 0.999 \cong 1\%$

25. S.P. of a radio = ₹ 500 loss = 10%

$\therefore$ $\text{C.P.} = \left(\frac{\text{S.P.}\times 100}{100-l\%}\right) = \frac{500\times 100}{100-10} = \frac{500\times 100}{90} = ₹\ 555.55$

Now, C.P. = ₹ 555.55, gain % = 8%

$\text{S.P.} = \text{C.P.} \times \left(\frac{100+g\%}{100}\right) = \frac{555.55\times 108}{100} = ₹\ 599.99 \cong 2600.$

26. Let C.P. of the camera = ₹ x given, S.P. = ₹ 1080, gain = ₹ $\frac{x}{8}$

$\therefore$ by gain = S.P. – C.P.

$\Rightarrow \quad \frac{x}{8} = 1080 - x \quad \Rightarrow \quad \frac{x}{8} + x = 1080$

$\Rightarrow \quad \frac{9x}{8} = 1080 \quad \Rightarrow \quad x = \frac{\overset{120}{1080}\times 8}{9} = 120\times 8$

$\Rightarrow \quad x = 960$

$\therefore$ Hence C.P. of the camera = ₹ 960.

Exercise 6.3

1. Let the C.P. be ₹ 100.

Then M.P. = ₹ 100 × 20% of ₹ 100 = 100 + 20 = ₹ 120

Discount = 10% of M.P. $= ₹\ 120 \times \frac{10}{100} = ₹\ 12$

$\therefore$ S.P. = M.P. – discount = ₹ 120 – 12 = ₹ 108

gain = S.P. – C.P. = ₹ 108 – 100 = ₹ 8

$$\text{gain \%} = \frac{\text{gain}}{\text{C.P.}} \times 100 = \frac{8}{100} \times 100 = 8\%.$$

2. Let C.P. be ₹ x.

Then after 10% loss,

$$\text{S.P.} = x - x \times \frac{10}{100} = \frac{90x}{100},$$

But, given S.P. = ₹ 5.4 per kg

$$\Rightarrow \quad \frac{90x}{100} = 5.4 \qquad \Rightarrow \qquad x = \frac{5.4 \times 100}{90} = ₹\ 6$$

To earn a profit of 20%, the new S.P. would be

$$\text{S.P.} = \text{C.P.} + P = x + x \times \frac{20}{100}$$

$$= \frac{120x}{100} = \frac{120}{100} \times 6 = \frac{72}{10} = ₹\ 7.20$$

3. Let M.P. = ₹ x

then S.P. = ₹ 126 90% of $x = 126$

$$90\% \text{ of } x = 126$$

$$\frac{90}{100} \times x = 126$$

$$x = \frac{126 \times 100}{90} = ₹\ 140$$

Hence, M.P. = 40% above C.P.

4. Let M.P. = ₹ 100

then S.P. = ₹ 90

Now, S.P. = ₹ 90, $P = 20\%$

$$\text{C.P.} = \frac{100}{120} \times 90 = ₹\ 75$$

New discount = ₹ 15

$\therefore$ New S.P. = ₹ 85 P = S.P. – C.P. = 85 – 75 = ₹ 10

$\therefore$ New $P\% = \frac{P}{\text{C.P.}} \times 100 = \frac{10}{75} \times 100 = \frac{40}{3} = 13.33\%$

5. Let M.P. = ₹ x

$(80\% x) - (75\% \text{ of } x) = ₹\ 500$

$$5\% \text{ of } x = 500 \, x = \frac{500 \times 100}{5} = ₹\ 10{,}000$$

$\therefore$ Cost price = 80% of 10,000

$$= \frac{80}{100} \times 10{,}000 = ₹\ 8000.$$

6. Given, $d = 5\%$, Let M.P. = ₹ x

$$\text{S.P.} = \text{M.P.} - d = x - x \times \frac{5}{100} = x - \frac{x}{20} = \frac{19x}{20}$$

C.P. = ₹ 23.75

$\therefore \quad \frac{19x}{20} = 23.75$

$$x = \frac{20 \times 23.75}{19} = 25$$

Hence, M.P. = ₹ 25.

7. Let C.P. ₹ x

Then $\quad \text{M.P.} = x + \frac{20x}{100} = ₹\frac{120x}{100}$

$d = 15\%$

$$\text{S.P.} = m\left(1 - \frac{d\%}{100}\right) = \left(\frac{120x}{100}\right)\left(\frac{100-15}{100}\right)$$

$$= \frac{120x}{100} \times \frac{85}{100} = ₹ 1.02x$$

$$P = \text{S.P.} - \text{C.P.} = ₹ (1.02x - x) = ₹ 0.02x$$

$$P\% = \frac{P}{\text{C.P.}} \times 100 = \frac{0.02x}{x} \times 100 = 2\%$$

8. Let the shopkeeper paid ₹ x for it.

$\Rightarrow \quad 80 = \left(x + x \times \frac{15}{100}\right) + 11 \quad \Rightarrow \quad 80 - 11 = \frac{115x}{100}$

$\Rightarrow \quad 69 = \frac{115x}{100} \quad \Rightarrow \quad x = \frac{69 \times 100}{115} = \frac{\overset{60}{6900}}{\underset{1}{115}} = 60$

$\Rightarrow \quad x = ₹ 60$

9. Let M.P. = ₹ x

$d_1 = 5\%, d_2 = 7\%$

$$d_1 = ₹\left(\frac{5x}{100}\right) \qquad \ldots(1)$$

$$\text{S.P.}_1 = \text{M.P.} - d = x - \frac{5x}{100} = \frac{95x}{100}$$

$$P_1 = SP_1 - \text{C.P.} = \frac{95x}{100} - \text{C.P.}$$

$$d_2 = \frac{7x}{100} \qquad \ldots(2)$$

$\therefore \quad SP_2 = MP - d_2 = x - \frac{7x}{100} = \frac{93x}{100}$

$$P_2 = SP_2 - CP = \frac{93x}{100} - CP \text{ Now, } P_2 = P_1 - 15$$

$\Rightarrow \quad \left(\frac{95x}{100} - d\right) - 15 = \frac{93x}{100} - CP \quad \Rightarrow \quad \frac{95x}{100} - \frac{93x}{100} = 15$

$\Rightarrow \quad \frac{2x}{100} = 15$

$$x = \frac{15 \times 100}{2} = 750$$

Hence, the M.P. of the article is ₹ 750.

10. Let C.P. of the table be ₹ x.

$\Rightarrow \quad 625 = \left(x + \frac{x \times 20}{100}\right) + 25 \quad \Rightarrow \quad 625 - 25 = \frac{120x}{100}$

$\Rightarrow \quad 600 - 25 = \frac{120x}{100} \quad \Rightarrow \quad 600 = \frac{120x}{100}$

$\Rightarrow \quad x = \frac{600 \times 100}{120} \quad \Rightarrow \quad x = 500$

Hence, C.P. of the table is ₹ 500.

11. C.P. of the stationary = ₹ 900

sale tax on it = 6%

$\therefore$ Sale tax = 6% of ₹ 900

$= \frac{6}{100} \times 900 = ₹\ 54$

Hence, Rachit paid ₹ 900 + 54 = ₹ 954 to the shopkeeper.

12. Let printed price of the book = ₹ 100

Then, S.P. = ₹ 90

Now, S.P. = ₹ 90, $P = 12\%$

$\therefore \quad \text{C.P.} = \frac{90 \times 100}{112} = ₹\ \frac{1125}{14}$

$\therefore \quad \text{C.P. : M.P.} = \frac{1125}{14} : 100$

$= 1125 : 1400 = 45 : 56.$

13. Given, M.P. of 2 set of bowls = ₹ 399, $P = 14\%$

Let C.P. of one set of bowls = ₹ x

M.P. of 1 set of bowls = $₹\ \frac{399}{2} = ₹\ 199.5$

$\Rightarrow \quad x + x \times \frac{14}{100} = ₹\ 199.5$

$\Rightarrow \quad \frac{114x}{100} = ₹\ 199.5$

$\Rightarrow \quad x = \frac{199.5 \times 100}{114} = \frac{19950}{114} = 1150$

Hence, the shopkeeper paid ₹ 1150 for one set of bowls.

14. Let S.P. (without tax) = ₹ x

$\Rightarrow \quad x + x \times \frac{8}{100} = ₹\ 1242$

$\Rightarrow \quad \frac{108x}{100} = 1242$

$\Rightarrow \quad x = \frac{1242 \times 100}{108} = \frac{2300}{2} = ₹\ 1150$

Hence, the S.P. (without tax) = ₹ 1150.

15. Let M.P. = ₹ x, $d = 5\%$, $g = 10\%$, C.P. = ₹ 950

$\therefore \quad \text{S.P.} = \text{C.P.} \times \left(\frac{100 + g\%}{100}\right) = \frac{950 \times 110}{100} = 95 \times 11 = ₹\ 1045$

but, S.P. = M.P. $- d = MP\left(1 - \frac{d\%}{100}\right)$

$\Rightarrow \quad 1045 = x\left(1 - \frac{5}{100}\right)$

$\Rightarrow \quad 1045 = \frac{95x}{100}$

$\Rightarrow \quad x = \frac{1045 \times 100}{95} = 11 \times 100$

$\Rightarrow \quad x = 1100$

Hence, M.P. of a saree is ₹ 1100.

Exercise 6.4

1. Principal for the first year = ₹ 6000, $R = 12\%$, $T = 2$ years

$\therefore$ Interest for the first year $= \frac{PRT}{100} = \frac{6000 \times 12 \times 1}{100} =$ ₹ 720

Amount after the end of first year = ₹ 6000 + 720 = ₹ 6720

Principal for the second year = ₹ 6720, $R = 12\%$

Interest for the second year $= \frac{6720 \times 12 \times 1}{100} =$ ₹ 806.4

Amount at the end of second year = ₹ 6720 + 806.4 = ₹ 7526.4

$\therefore$ C.I. = Final amount – Principal

= 7526.4 − 6000 = ₹ 1526.40

2. Principal for the first year = ₹ 20,000, $R = 15\%$ p.a., $T = 3$ years

$\therefore$ Interest for the first year $= \frac{PRT}{100} = \frac{20{,}000 \times 15 \times 1}{100} =$ ₹ 3000

Amount at the end of 1st year = ₹ 20,000 + ₹ 3000 = ₹ 23000 …(1)

Principal for the 2nd year = ₹ 23,000, $R = 15\%$ p.a.

$\therefore$ Interest for the 2nd year $= \frac{PRT}{100} = \frac{23000 \times 15 \times 1}{100} =$ ₹ 3450

Amount at the end of 2nd year = ₹ 23000 + ₹ 3450 = ₹ 26450 …(2)

Principal for the 3rd year = ₹ 26450, $R = 15\%$ p.a.

$\therefore$ Interest for the 3rd year $= \frac{PRT}{100} = \frac{26450 \times 15 \times 1}{100} =$ ₹ 396.7.50

$\therefore$ Amount at the end of 3rd year = ₹ 26450 + ₹ 3967.50 = ₹ 30417.5

$\therefore$ C.I. = Final amount – Principal

= 30417.5 − 20,000 = 10417.5

3. Principal for the first year = ₹ 5000, $R = 10\%$ p.a., $T = 3$ years

Interest for the 1st year $= \frac{PRT}{100} = \frac{5000 \times 10 \times 1}{100} =$ ₹ 500

Amount after the end of 1st year = ₹ 5000 + ₹ 500 = ₹ 5500

Principal for the 2nd year = ₹ 5500, $R = 10\%$ p.a.

Interest for the 2nd year $= \frac{PRT}{100} = \frac{5500 \times 10 \times 1}{100} =$ ₹ 550

Amount a the end of 2nd year = ₹ 5500 + ₹ 550 = ₹ 6050

Principal for the 3rd year = ₹ 6050, $R = 10\%$ p.a.

Interest for the 3rd year $= \frac{PRT}{100} = \frac{6050 \times 10 \times 1}{100} = ₹\ 605$

$\therefore$ Amount at the end of 3rd year = ₹ 6050 + ₹ 605 = ₹ 6655

$\therefore$ C.I. = Final amount – Principal

= ₹ 6655 – ₹ 5000 = ₹ 1655

4. Principal for the first year = ₹ 96000, $R = 6\%$ p.a., $T = 3$ years

Interest for the 1st year $= \frac{PRT}{100} = \frac{96000 \times 6 \times 1}{100} = ₹\ 5760$

Amount at the end of 1st year = ₹ 96000 + ₹ 5760 = ₹ 101760

Principal for the 2nd year = ₹ 101760, $R = 6\%$ p.a.

Interest for the 2nd year $= \frac{PRT}{100} = \frac{101760 \times 6 \times 1}{100} = ₹\ 6105.6$

Amount at the end of 2nd year = ₹ 101760 + ₹ 6105.6 = ₹ 107865.6

Principal for the 3rd year = ₹ 107865.6, $R = 6\%$

Interest for the 3rd year $= \frac{PRT}{100} = \frac{107865.6 \times 6 \times 1}{100} = ₹\ 471.936$

Amount at the end of 3rd year = ₹ 107865.6 + ₹ 6471.93 = ₹ 114337.53

$\cong$ 114338.

5. Principal for the 1st year = ₹ 8000, $R = 8\%$, $T = 2$ year

Interest for the 1st year $= \frac{PRT}{100} = \frac{8000 \times 8 \times 1}{100} = ₹\ 640$

Amount at the end of the 1st year = ₹ 8000 + ₹ 640 = ₹ 8640

Principal for the2nd year = ₹ 8640, $R = 8\%$

Interest for the 2nd year $= \frac{PRT}{100} = \frac{8640 \times 8 \times 1}{100} = ₹\ 691.2$

Amount at the end of 2nd year = ₹ 8640 + ₹ 691.2 = ₹ 9331.2

$\therefore$ Pramod has to pay = ₹ 9331.20.

6. Principal for the 1st year = ₹ 5000. $R = 4\%$, $T = 2$ year

Interest for the 1st year $= \frac{PRT}{100} = \frac{5000 \times 4 \times 1}{100} = ₹\ 200$

Amount at the end of 1st year = ₹ (500 + 200) = ₹ 5200

Principal for the 2nd year $= \frac{PRT}{100} = \frac{5200 \times 4 \times 1}{100} = ₹\ 208$

$\therefore$ Amount at the end of second half year = ₹ (5200 + 208) = ₹ 5408

$\therefore$ Ajay will pay ₹ 5408 after 2 years.

7. Principal for first six months (First half year) = ₹ 10,000, $R = 10\%$ p.a., $T = 1$ half year

Rate for the first half you $= \left(\frac{10}{2}\right)\% = 5\%$

Interest $= \frac{PRT}{100} = \frac{10{,}000 \times 5 \times 1}{100} = ₹\ 500$ (For 1st half year)

Amount at the end of 1st half year = ₹ 10,000 + ₹ 1000 = ₹ 11,000

Principal for the second six months (second half year) = ₹ 11,000

Rate for the second half year $= \left(\frac{10}{2}\right)\% = 5\%$

Time = 1 half year

Interest for the second year $= \frac{PRT}{100} = \frac{11000 \times 5 \times 1}{100} =$ ₹ 550

$\therefore$ Amount at the end of second half year = ₹ 11,000 + ₹ 550 = ₹ 11550.

8. Principal for first six months (First half year) = ₹ 16,000

Rate for the first half year $= \left(\frac{10}{2}\right)\% = 5\%$

Time = 1 half year

Interest $= \frac{PRT}{100} = \frac{16000 \times 5 \times 1}{100} =$ ₹ 800 (for 1st half year)

Amount at the end of 1st half year = ₹ 16,000 + ₹ 800 = ₹ 16800

Principal for the second six months (second half year) = ₹ 16800

Rate for the second half year $= \left(\frac{10}{2}\right)\% = 5\%$

Time = 1 half year

Interest for the second year $= \frac{PRT}{100} = \frac{1600 \times 5 \times 1}{100} = 168 \times 5 =$ ₹ 840

Amount at the end of 2nd half year = ₹ 16800 + ₹ 840 = ₹ 17640

Principal for the 3rd six months (third half year) = ₹ 17640

Rate $= \left(\frac{10}{2}\right)\% = 5\%$,

Time = 1 half year

Interest $= \frac{PRT}{100} = \frac{17640 \times 5 \times 1}{100} =$ ₹ 882

Amount at the end of third half year = ₹ 17640 + ₹ 882 = ₹ 18522

Final amount to be paid = ₹ 18522

C.I. $= A - P =$ ₹ 18522 − ₹ 16000 = ₹ 2522

9. Six months = Two quarters

$R = 8\%$ p.a. $= \left(\frac{8}{4}\right)\%$ per quarter = 2% per quarter

Principal for 1st quarter = ₹ 25000

Interest for 1st quarter $= \frac{PRT}{100} = \frac{25000 \times 2 \times 1}{100} =$ ₹ 500

Amount at the end of 1st quarter = ₹ 25000 + ₹ 500 = ₹ 25500

Principal for the 2nd quarter = ₹ 25500

Interest for the 2nd quarter $= \frac{PRT}{100}$

$= \frac{25500 \times 2 \times 1}{100} = 255 \times 2 =$ ₹ 510

Amount at the end of 2nd quarter = ₹ 225500 + ₹ 510 = ₹ 26010

$\therefore$ C.I. = Final amount – Original Principal

= ₹ 26010 = ₹ 25000 = ₹ 1010

Also, note that, C.I. = Interest for (Ist + 2nd) quarter

= ₹ (500 + 510) = ₹ 1010

10. given, $P = ₹\ 8000$, $T = 9$ months, $R = 20\%$ p.a.

9 months = three quarters.

$R = 20\%$ p.a. $= \left(\frac{20}{4}\right)\%$ per quarter = 5% per quarter.

Principal for 1st quarter = ₹ 8000

Interest for 1st quarter $= \frac{PRT}{100} = \frac{8000 \times 5 \times 1}{100} = 80 \times 5 = ₹\ 400$

Amount at the end of 1st quarter = ₹ 8000 + ₹ 400 = ₹ 8400

Principal for 2nd quarter = ₹ 8400

Interest for 2nd quarter $= \frac{PRT}{100} = \frac{8400 \times 5 \times 1}{100} = 84 \times 5 = ₹\ 420$

Amount at the end of 2nd quarter = ₹ 8400 + ₹ 420 = ₹ 8820

Principal for 3rd quarter = ₹ 8820

Interest for 3rd quarter $= \frac{PRT}{100} = \frac{8820 \times 5 \times 1}{100} = ₹\ 441$

$\therefore$ Amount at the end of 3rd quarter = ₹ 8820 + ₹ 441 = ₹ 9261.

11. Given : $P = ₹\ 25600$, $T = 9$ months, $R = 10\%$ p.a.

9 months = Three quarters.

$R = 10\%$ p.a. $= \left(\frac{10}{4}\right)\%$ per quarter $= \left(\frac{5}{2}\right)\%$ per quarter.

Principal for 1st quarter = ₹ 25600

Interest for 1st quarter $= \frac{PRT}{100} = \frac{25600 \times 5 \times 1}{100 \times 2} = 128 \times 5 = ₹\ 640$

Amount at the end of 1st quarter = ₹ 25600 + ₹ 640 = ₹ 26240

Principal for 2nd quarter = ₹ 26240

Interest for 2nd quarter $= \frac{PRT}{100} = \frac{26240 \times 5 \times 1}{100 \times 2} = ₹\ 656$

Amount at the end of 2nd quarter = ₹ 26240 + ₹ 656 = ₹ 26896

Principal for 3rd quarter = ₹ 26896

Interest for 3rd quarter $= \frac{PRT}{100} = \frac{26896 \times 5 \times 1}{100 \times 2} = ₹\ 672.40$

Amount at the end of 3rd quarter = ₹ 26896 + ₹ 672.40 = ₹ 27568.40

C.I. = Final amount – Original Principal

= 27568.40 – 25600 = ₹ 968.40

12. Given : $P = ₹\ 4000$, $T = 9$ months, $R = 6\%$ p.a.

9 months = Three quarters

$R = 6\%$ p.a. $= \left(\frac{6}{4}\right)\%$ per quarter $= \left(\frac{3}{2}\right)\%$ per quarter

Principal for 1st quarter = ₹ 4000

Interest for 1st quarter $= \frac{PRT}{100} = \frac{4000 \times 3 \times 1}{100 \times 2} = 20 \times 3 = ₹\ 60$

Amount at the end of 1st quarter = ₹ 4000 + ₹ 60 = ₹ 4060

Principal for 2nd quarter = ₹ 4060

Interest for 2nd quarter $= \frac{PRT}{100} = \frac{4060 \times 3 \times 1}{100 \times 2} = \frac{203 \times 3}{10} = \frac{609}{10} = ₹\ 60.9$

Amount at the end of 2nd quarter = ₹ 4060 + ₹ 60.9 = ₹ 4120.9
Principal for 3rd quarter = ₹ 4120.9

Interest for 3rd quarter $= \frac{PRT}{100} = \frac{4120.9 \times 3 \times 1}{100 \times 2} = ₹\ 61.81$

∴ Interest = Interest for (1st + 2nd + 3rd) quarter
= ₹ 60 + ₹ 60.9 + ₹ 61.81 = ₹ 182.71.

13. Given : $P = ₹\ 64000, T = 1\frac{1}{2}$ year $= \frac{3}{2}$ year, $R = 5\%$ p.a.

$1\frac{1}{2}$ years = 3 half years

$R = 5\%$ p.a. $= \left(\frac{5}{2}\right)\%$ per half year

Principal for 1st half year = ₹ 64000

Interest for 1st half year $= \frac{PRT}{100} = ₹\ \frac{64000 \times 5 \times 1}{100 \times 2} = ₹\ 1600$

Amount at the end of 1st half year = ₹ (64000 + 1600) = ₹ 65,000
Principal for the 2nd half year = ₹ 65,000

Interest for the 2nd half year $= \frac{65600 \times 5 \times 1}{100 \times 2} = ₹\ 1640$

Amount at the end of 2nd half year = ₹ 65600 + ₹ 1640 = ₹ 67240
Principal for the 2rd half year = ₹ 67240

Interest for the 3rd half year $= \frac{67240 \times 5 \times 1}{100 \times 2} = ₹\ 1681$

Amount at the end of 3rd half year = ₹ (67240 + 1681) = ₹ 68921
∴ C.I. = Final Amount – Principal
= ₹ 68921 – 64000 = ₹ 4921.

14. $P = ₹\ 32768, R = 12\frac{1}{2}$ p.a, $T = 9$ months

Time = 9 months = 3 quarters,

$R = \frac{25}{2}\%$ p.a. $= \left(\frac{25}{2 \times 4}\right)\%$ per quarter

$= \frac{25}{8}\%$ per quarter

Principal for 1st quarter = ₹ 32768

Interest for 1st quarter $= \frac{32768 \times 25 \times 1}{100 \times 8} = ₹\ 1024$

Amount at the end of 1st quarter = ₹ (32768 + 1024) = ₹ 33792
Principal for 2nd quarter = ₹ 33792

Interest for 2nd quarter $= \frac{33792 \times 25 \times 1}{100 \times 8} = ₹\ 1056$

Amount at the end of 2nd quarter = ₹ 33792 + ₹ 1056 = ₹ 34848
Principal for 3rd quarter = ₹ 34848

Interest for 3rd quarter $= \dfrac{34848 \times 25 \times 1}{100 \times 8} = ₹\,1089$

Amount at the 3rd quarter = ₹ 34848 + ₹ 1089 = ₹ 35924

15. $P = ₹\,24000$,

$R = 20$ paise a rupee p.a. $= \dfrac{20}{100}$ p.a. = 20% p.a. $= \left(\dfrac{20}{4}\right)\%$ per quarter,

$T = 9$ months = 3 quarters = 5% per quarter

Principal for 1st quarter = ₹ 24000

Interest for 1st quarter $= \dfrac{PRT}{100} = \dfrac{24000 \times 5 \times 1}{100} = ₹\,1200$

Amount at the end of 1st quarter = ₹ 24000 + ₹ 1200 = ₹ 25200

Principal for 2nd quarter = ₹ 25200

Interest for 2nd quarter $= \dfrac{25200 \times 5 \times 1}{100} = ₹\,1260$

Amount at the end of 2nd quarter = ₹ 25200 + ₹ 1260 = ₹ 26460

Principal for 3rd quarter = ₹ 26460

Interest for 3rd quarter $= \dfrac{26460 \times 5 \times 1}{100} = ₹\,1323$

Amount at the end of 3rd quarter = ₹ 26460 + ₹ 1323 = ₹ 27783

C.I. = Final Amount – Principal = ₹ 27783 – 24000 = ₹ 3783.

Exercise 6.5

1. (a) Given : $P = ₹\,8000$, $R = 5\%$, $n = 3$ years

$$A = P\left(1+\frac{r}{100}\right)^n$$

$$= 8000\left(1+\frac{5}{100}\right)^3 = 8000\left(1+\frac{1}{20}\right)^3$$

$$= \frac{8000 \times 21 \times 21 \times 21}{20 \times 20 \times 20} = 21 \times 21 \times 21 = ₹\,9261.$$

C.I. $= A - P$

$= ₹\,9261 - ₹\,8000 = ₹\,1261.$

(b) $P = ₹\,625$, $r = 15\%$, $n = 2$ years

$$A = P\left(1+\frac{r}{100}\right)^n = 625\left(1+\frac{15}{100}\right)^2$$

$$= \frac{\overset{25}{625} \times 115 \times 115}{\underset{4}{100} \times \underset{4}{100}} = \frac{115 \times 115}{4 \times 4}$$

$$= \frac{13225}{16} = ₹\,826.56$$

(c) $P = ₹\,6225$,, $r = 13\dfrac{3}{4}\%$ $n = 2$ year, $r = \dfrac{55}{4}\%$

$$A = P\left(1+\frac{r}{100}\right)^n \quad A = 6225\left(1+\frac{55}{4 \times 100}\right)^2$$

$$= 6225 \times \left(\frac{455}{400}\right)^2 = \frac{\overset{249}{6225} \times 455 \times \overset{18.2}{455}}{\underset{16}{400} \times \underset{16}{400}}$$

$$= \frac{249 \times 455 \times 18.2}{16 \times 15} = ₹\ 8054.56$$

C.I. $= A - P$

$= ₹\ 8054.56 - ₹\ 6225 = ₹\ 1829.56$

(d) $P = ₹\ 4800, r = 7\frac{1}{2}\% = \frac{15}{2}\%\ T = 1\frac{1}{2}$ years $= q\frac{m}{n}$

$\therefore \quad q = 1, \frac{m}{n} = \frac{1}{2}$

$\therefore \quad$ by, $\quad A = P\left(1 + \frac{r}{100}\right)^q \cdot \left(1 + \frac{\frac{m}{n} \cdot r}{100}\right)$

$$= 4800\left(1 + \frac{15}{2 \times 100}\right)^1 \cdot \left(1 + \frac{2 \times 15}{2 \times 100}\right)$$

$$= 4800\left(\frac{215}{200}\right) \times \left(1 + \frac{15}{400}\right)$$

$$= 4800\left(\frac{215}{200}\right) \times \left(\frac{415}{400}\right) = \frac{24 \times 89225}{400}$$

$$= \frac{2141400}{400} = \frac{21414}{4} = ₹\ 5353.50$$

C.I. $= A - P = ₹\ 5353.50 - ₹\ 4800 = ₹\ 553.50.$

2. $P = ₹\ 1600, r = 7\frac{1}{4}\%$ p.a. $= \frac{29}{4}\%\ n = 2$ years

$$A = P\left(1 + \frac{r}{100}\right)^n = \left(1 + \frac{29}{4 \times 100}\right)^2 = 1600\left(\frac{429}{400}\right)^2$$

$$= \frac{1600 \times 429 \times 429}{400 \times 400} = ₹\ 1840.41$$

$\therefore$ C.I. $= A - P = ₹\ 1840.41 - ₹\ 1600 = ₹\ 240.41$

3. Given : $P = ₹\ 25{,}000$

$r_1 = 10\%, r_2 = 12\%, r_3 = 15\%$

$$A = P\left(1 + \frac{r_1}{100}\right)\left(1 + \frac{r_2}{100}\right)\left(1 + \frac{r_3}{100}\right)$$

$$= 25000\left(1 + \frac{10}{100}\right)\left(1 + \frac{12}{100}\right)\left(1 + \frac{15}{100}\right)$$

$$= 25000 \times \frac{110}{100} \times \frac{112}{100} \times \frac{115}{100}$$

$$= \frac{11 \times 112 \times 115}{4} = 1265 \times 28 = ₹\ 35420$$

C.I. $= A - P$

$= ₹\ 35420 - ₹\ 25000 = ₹\ 10240.$

4. Given : $P = ₹\,12500$, $r = 8\%$ p.a. Time $= 1\frac{1}{4}$ years C.I. = ?

$\therefore \quad q = 1, \qquad \frac{m}{n} = \frac{1}{4}$

$$A = P\left(1+\frac{r}{100}\right)^{q}.\left[1+\frac{\frac{m}{n}\times 4}{100}\right]$$

$$A = 12500\left(1+\frac{108}{100}\right)^{1}.\left[1+\frac{\frac{1}{4}\times 8}{100}\right]$$

$$A = \frac{\overset{27}{5}\times 108\times 102}{\underset{1}{4}} = ₹\,13770$$

C.I. $= A - P = ₹\,13770 - ₹\,12500 = ₹\,1270.$

5. $P = ₹\,1625$, $r = 12\%$ p.a. $T = 1\frac{1}{4}$ years $= q\frac{m}{n}$ years

$\therefore \quad q = 1, \qquad \frac{m}{n} = \frac{1}{4}$

$$A = P\left(1+\frac{r}{100}\right)^{1}.\left[1+\frac{\frac{m}{n}\times r}{100}\right]$$

$$= 1625\times\left(1+\frac{12}{100}\right)^{1}.\left[1+\frac{\frac{1}{4}\times 12}{100}\right]$$

$$= 1625\times\frac{112}{100}\times\frac{103}{100} = \frac{65\times 28\times 103}{100}$$

$$= \frac{187460}{100} = ₹\,1874.6$$

C.I. $= A - P = ₹\,1874.60 - ₹\,1625 = ₹\,249.60$

6. **Given :** $T = 3$ years, $r = 5\%$ p.a. S.I. $= ₹\,2400$, C.I. = ? P = ?

$\therefore$ Amount after 3 years Sum $= \frac{100\times \text{S.I.}}{R\times T} = \frac{100\times 2400}{5\times 3} = ₹\,16000$

$\therefore \quad P = ₹\,16000\, r = 5\%, T = 3$ years

$$= P\left(1+\frac{r}{100}\right)^{T} = 16000\left(1+\frac{5}{100}\right)^{3}$$

$$= 16000\times\left(\frac{105}{100}\right)^{3}$$

$$= \frac{16000\times 105\times 105\times 105}{100\times 100\times 100} = ₹\,18522$$

C.I. $= A - P$

$= ₹\,18522 - ₹\,16000 = ₹\,2522$

7. $P = ₹\,57600,\ r = 12\frac{1}{2}\%$ p.a.

$T = 1\frac{1}{2}$ years $= \frac{25}{2}\%$ p.a. $= \frac{3}{2}$ years $= \left(\frac{25}{2\times 2}\right)$ per half year

$= \left(\frac{3}{2}\times 2\right)$ half years $= \frac{25}{4}\%$ per half year = 3 half year

$\therefore \quad A = P\left(1+\frac{r}{100}\right)^T = 57600\left(1+\frac{25}{4\times 100}\right)^3 = 57600\times\left(\frac{17}{16}\right)^3$

$= \frac{57600\times 17\times 17\times 17}{16\times 16\times 16} = \frac{225\times 4913}{16} = \frac{1105425}{16} = ₹\,9089.06$

8. $P = ₹\,8000\ r = 20\%$ p.a. $= \left(\frac{20}{4}\right)\%$ per quarter = 5% per quarter

$n = 9$ months $= \frac{9}{12}$ year $= \frac{9}{12}\times 4 = 3$ quarter

$A = P\left(1+\frac{r}{100}\right)^n = 8000\left(1+\frac{5}{100}\right)^3 = 8000\left(\frac{121}{20}\right)^3$

$= \frac{8000\times 21\times 21\times 21}{20\times 20\times 20} = ₹\,9261.$

9. $P = ₹\,12800,\ n = 3$ years $r = 6\frac{1}{2}\%$ p.a. $= \frac{13}{2}\%$ p.a. C.I. = ?

$A = P\left(1+\frac{r}{100}\right)^n = 12800\left(1+\frac{13}{2\times 100}\right)^3$

$= 12800\times\left(\frac{213}{200}\right)^3$

$= \frac{12800\times 213\times 213\times 213}{200\times 200\times 200} = ₹\,15461.75$

$\therefore$ C.I. $= A - P = ₹\,15461.75 - ₹\,12800 = ₹\,2661.75$

10. $P = ₹\,500,\ n = 3$ years, $r_1 = 10\%,\ r_2 = 12\%,\ r_2 = 14\%$

$A = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)\left(1+\frac{r_3}{100}\right)$

$= 5000\times\left(1+\frac{10}{100}\right)\left(1+\frac{12}{100}\right)\left(1+\frac{14}{100}\right)$

$= 5000\times\frac{110}{100}\times\frac{112}{100}\times\frac{114}{100}$

$= \frac{5\times 110\times 12768}{1000} = ₹\,7022.40$

$\therefore$ C.I. $= A - P$

$= ₹\,7022.40 - ₹\,5000 = ₹\,2022.40$

11. $P = ₹\,2000,\ r = 10\%$ p.a., $n = 1\frac{1}{2} = \frac{3}{2}$ years

Since interest is credited half-yearly

$\therefore \quad r = \left(\frac{10}{2}\right)\% = 5\%$ per half year and $n = \frac{3}{2} \times 2 = 3$ half-years

Now, $A = P.\left(1+\frac{r}{100}\right)^n = 2000 \times \left(1+\frac{5}{100}\right)^3 = 2000 \times \left(\frac{21}{20}\right)^3$

$= \frac{2000 \times 21 \times 21 \times 21}{20 \times 20 \times 20} = \frac{9261}{4} = ₹\ 2315.25$

12. $P = ₹\ 50000$, $r = 10\%$ p.a., $n = \frac{1}{2} = \frac{3}{2}$ years

Since interest is credited half-yearly

$\therefore \quad r = \left(\frac{10}{2}\right)\% = 5\%$ per half year and $n = \frac{3}{2} \times 2 = 3$ half years

Now, $A = P.\left(1+\frac{r}{100}\right)^n = 50000\left(1+\frac{5}{100}\right)^3 = 50000 \times \left(\frac{21}{20}\right)^3$

$= \frac{50000 \times 21 \times 21 \times 21}{20 \times 20 \times 20} = \frac{25 \times 9261}{4}$

$= \frac{231525}{4} = 57881.25$

Exercise 6.6

1. Let the su be $= ₹\ P$ $n_1 = 2$ years $A_1 = ₹\ 2100$, $r = 10\%$ p.a.

$n_2 = 3$ years $A_2 = ₹\ 13310$

Then, $A = P\left(1+\frac{r}{100}\right)^n$

$12100 = P\left(1+\frac{10}{100}\right)^2$ …(1)

and, $13310 = P\left(1+\frac{10}{100}\right)^3$ …(2)

Now, the value of P can be find out by any of two equations given above.

From (1), we have

$12100 = P \times \left(\frac{11}{10}\right)^2$

$12100 = P \times \frac{121}{100}$

$P = \frac{12100 \times 100}{121}$

$P = 100 \times 100$

$P = ₹\ 10000$

2. Given : $P = ₹\ 16000$, $n = 3$ years C.I. $= ₹\ 6781.25$ $r\% = ?$

by C.I. $= A - P$

$A = \text{C.I.} + P$

$= ₹\ 16000 + 6781.25$

$= ₹\ 22781.25$

Now, by $A = P\left(1+\frac{r}{100}\right)^n$

$$22781.25 = 16000\left(1+\frac{r}{100}\right)^3$$

$$\frac{22781.25}{160000}\times 100\times 100\times 100 = (100-r)^3$$

$$\frac{2278125}{16} = (100+r)^3$$

$$1423828.125 = (100+r)^3$$

$$\sqrt[3]{1423828.125} = \sqrt[3]{(100+r)^3}$$

$$112.5 = 100 + r$$

$$112.5 - 100 = r$$

$$12.5 = r$$

$\therefore \quad r = 12.5\%$

3. Given : $P = ₹\,20{,}000$, $n = 3$ years $r_1 = 5\%$, $r_2 = 6\%$, $r_3 = 8\%$

$$\therefore \quad A = P\cdot\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)\left(1+\frac{r_3}{100}\right)$$

$$= 20{,}000\left(1+\frac{5}{100}\right)\left(1+\frac{6}{100}\right)\left(1+\frac{8}{100}\right)$$

$$= 20{,}000\times\frac{105}{100}\times\frac{106}{100}\times\frac{108}{100} = \frac{1202040}{50} = ₹\,24040.80$$

4. Given : Time (T) or $n = 2$ years $r = 15\%$ p.a.

difference (i.e. C.I. − S.I.) = ₹ 144

Let the principal be ₹ P

$$\text{S.I.} = \frac{PRT}{100} = \frac{P\times 15\times 2}{100} = \frac{30P}{100} \qquad \ldots(1)$$

$$\text{C.I.} = P\left[\left(1+\frac{r}{100}\right)^n - 1\right] = P\cdot\left[\left(1+\frac{15}{100}\right)^2 - 1\right] = P\cdot\left[\left(\frac{115}{100}\right)^2 - 1\right]$$

$$= P\cdot\left[\frac{(115)^2-(100)^2}{(100)^2}\right] = P\cdot\left(\frac{3225}{100\times 100}\right)$$

$$= P\cdot\left(\frac{129}{100\times 4}\right) = \frac{129}{400}P \qquad \ldots(2)$$

$\therefore$ C.I. − S.I. = 144

$\Rightarrow \quad \frac{129P}{400} - \frac{30P}{100} = 144 \quad \Rightarrow \quad \frac{129P-120P}{400} = 144$

$\Rightarrow \quad 9P = 144\times 400 \quad \Rightarrow \quad P = \frac{144\times 400}{9}$

$\Rightarrow \quad P = 16\times 400 \quad \Rightarrow \quad P = ₹\,6400$

Hence, the required sum is ₹ 6400.

5. Let the principle be ₹ P Then amount $(A) = \frac{9P}{4}$ $n = 2$ years $r\% = ?$

by, $A = P\left(1+\frac{r}{100}\right)^n$ $\Rightarrow$ $\frac{9}{4}P = P.\left(1+\frac{r}{100}\right)^2$

$\Rightarrow$ $\frac{9}{4} = \left(1+\frac{r}{100}\right)^2$ $\Rightarrow$ $\sqrt{\frac{9}{4}} = \sqrt{\left(1+\frac{r}{100}\right)^2}$

$\Rightarrow$ $\frac{3}{2} = 1+\frac{r}{100}$ $\Rightarrow$ $\frac{3}{2}-1 = \frac{r}{100}$

$\Rightarrow$ $\frac{3-2}{2} = \frac{r}{100}$ $\Rightarrow$ $\frac{1}{2} = \frac{r}{100}$

$\Rightarrow$ $r = \frac{100}{2} = 50$ $\therefore$ $r = 50\%$

6. Given : Time (T) or, $n = 2$ years

S.I. = ₹ 100, $r\% = ?$

C.I. = ₹ 104

C.I. for two years = ₹ 104 S.I. for two years = ₹ 100

$\therefore$ S.I. for 1st year = ₹ $\frac{100}{2}$ = ₹ 50

We know that S.I. and C.I. for 1st year are equal, therefore

C.I. for 1st year = ₹ 50

$\Rightarrow$ C.I. for 2nd year = ₹ 104 − ₹ 50 = ₹ 54

Thus, S.I. on ₹ 50 for 1st year = ₹ 54 − ₹ 50 = ₹ 4

Now, P = ₹ 50, $T = 1$ year, S.I. = ₹ 4

$\therefore$ $3R = \frac{S.I. \times 100}{PT} = \frac{4 \times 100}{50 \times 1} = 8\%$

7. Let the principle be ₹ 'P'

C.I. − S.I. = ₹ 1.50 $r = 5\%$, $n = 2$ years

$$\text{S.I.} = \frac{PRT}{100} = \frac{P \times 5 \times 2}{100} = \frac{10P}{100} \quad \ldots(1)$$

$$\text{C.I.} = P.\left[\left(1+\frac{r}{100}\right)^n - 1\right]$$

$$= P.\left[\left(1+\frac{r}{100}\right)^n - 1\right] = P.\left[\left(\frac{105}{100}\right)^2 - 1\right]$$

$$= P.\left[\frac{(105)^2 - (100)^2}{(100)^2}\right] = P.\left(\frac{205 \times 5}{100 \times 100}\right) = P.\left(\frac{41}{400}\right) \quad \ldots(2)$$

$$\text{C.I.} - \text{S.I.} = P.\left(\frac{41}{400}\right) - \frac{10P}{100}$$

$\Rightarrow$ $1.50 = \frac{41P - 40P}{400}$ $\Rightarrow$ $1.50 = \frac{P}{400}$

$\Rightarrow$ $P = 1.50 \times 400$ $\Rightarrow$ P = ₹ 600

Hence the required sum is ₹ 600.

Exercise 6.7

1. A can do a piece of work in = 10 day

$\therefore$ Work done by A in 1 day $= \frac{1}{10}$

Similarly, work done by B in 1 day $= \frac{1}{15}$

work done by $(A + B)$ together in 1 day $= \frac{1}{10} + \frac{1}{15} = \frac{3+2}{30} = \frac{5}{30}$

$\therefore$ $(A + B)$ will do the work together in $= \frac{1}{\left(\frac{1}{6}\right)} = 6$ days.

2. A can finish a work in = 18 days

B can finish a work in $= \frac{A}{2}$ day $= \frac{18}{2}$ days = 9 days

$\therefore$ Work done by A in 1 day $= \frac{1}{18}$

Work done by B in 1 day $= \frac{1}{9}$

Work done by $(A + B)$ together in 1 day $= \frac{1}{18} + \frac{1}{9} = \frac{1+2}{18} = \frac{3}{18} = \frac{1}{6}$

$\therefore$ They can finish together $\frac{1}{6}$ part of the work in a day.

3. Man can do a piece of work in = 5 days

(Man + Son) together can do the same work in = 3 days

$\Rightarrow$ Work done by man in 1 day $= \frac{1}{5}$ part

$\Rightarrow$ Work done by (Man + Son) in 1 day $= \frac{1}{3}$

$\therefore$ Work done in only son in 1 day $= \frac{1}{3} - \frac{1}{5} = \frac{5-3}{15} = \frac{2}{15}$

$\therefore$ Son can do the work in $= \frac{1}{\left(\frac{2}{15}\right)} = \frac{15}{2} = 7\frac{1}{2}$ days

4. A can do a job in = 16 days

B can do the same job in = 12 days

$A + B + C$ can do the job = 4 days

$\Rightarrow$ Work done by A in day $= \frac{1}{16}$ Work done by B in 1 day $= \frac{1}{12}$

Work done by $(A + B + C)$ in 1 day $= \frac{1}{4}$

$\therefore$ Work done by 6 in 1 day

$= $ Work done by $(A + B + C)$ in 1 day – work done by $(A + B)$ in 1 day

$= \frac{1}{4} - \left(\frac{1}{16} + \frac{1}{12}\right) = \frac{12-3-4}{48} = \frac{12-7}{48} = \frac{5}{48}$

$\therefore$ C alone can do the job $= \dfrac{1}{\left(\dfrac{5}{48}\right)} = \dfrac{48}{5}$ days

$= 9\dfrac{3}{5}$ days.

5. $\dfrac{1}{4}$ part of the work done by P in = 10 days

$\Rightarrow$ Whole part, i.e. 1 work done by P completely in $= 10 \times 4 = 40$ days

40% part of the work done by Q in = 15 days

$\Rightarrow$ Whole part i.e. 1 work done by Q completely in $= \dfrac{15 \times 100}{40} = 37\dfrac{1}{2}$ days.

$\dfrac{1}{3}$ part of the work done by $Q = 13$ days

$\Rightarrow$ Whole part i.e., 1 work done by R in $= 13 \times 3 = 39$ days

Since Q takes less time (i.e., number of days) to complete the work therefore, Q will complete the work first.

6. No. of pages that Ronald type in 6 hours = 32

No. of pages 1 War type in hours $= \dfrac{32}{6}$

No. of page that Elan type in 5 hours = 40

No. of 1 hour type in 5 hours $= \dfrac{40}{5}$

$\therefore$ No. of pages that they type together in 1 hour $= \dfrac{160 + 240}{30} = \dfrac{400}{30} = \dfrac{400}{3}$

Time taken by both to type $\dfrac{40}{3}$ pages = 1 hour

Time taken by both 1 page $= \dfrac{3}{40}$ hours

and time taken by both 110 pages $= \dfrac{3}{40} \times 110$ hours $= \dfrac{33}{4} = 8\dfrac{1}{4}$ hours.

7. Work done by $(A + B)$ in 1 day $= \dfrac{1}{72}$ part

Work done by $(B + C)$ in 1 day $= \dfrac{1}{120}$ part

Work done by $(C + A)$ in 1 day $= \dfrac{1}{90}$ part

Work done by $2(A + B + C)$ in 1 day $= \dfrac{1}{72} + \dfrac{1}{120} + \dfrac{1}{90} = \dfrac{5 + 3 + 4}{360}$

$= \dfrac{12}{360} = \dfrac{1}{30}$ part

Work done by $(A + B + C)$ in 1 day $= \dfrac{1}{2 \times 30} = \dfrac{1}{60}$ part

Work done by A in 1 day $= \dfrac{1}{60} - \dfrac{1}{120} = \dfrac{2 - 1}{120} = \dfrac{1}{120}$

$\therefore$ A will complete the work in $= \dfrac{1}{\left(\dfrac{1}{120}\right)} = 120$ days.

Work done by B in 1 day $= \dfrac{1}{60} - \dfrac{1}{90} = \dfrac{3-2}{180} = \dfrac{1}{180}$ part

$\therefore$ B will complete the work in $= \dfrac{1}{\left(\dfrac{1}{180}\right)} = 180$ days

Work done by C in 1 day $= \dfrac{1}{60} - \dfrac{1}{72} = \dfrac{6-5}{360} = \dfrac{1}{360}$ part

$\therefore$ C will complete the work in $= \dfrac{1}{\left(\dfrac{1}{360}\right)} = 360$ days.

8. Work done by A in 1 day $= \dfrac{1}{15}$ part

Work done by B in 1 day $= \dfrac{1}{20}$ part

Work done by $(A + B)$ together in 1 day $= \dfrac{1}{15} + \dfrac{1}{20} = \dfrac{4+3}{60} = \dfrac{7}{60}$ part

Work done by $(A + B)$ together in 4 days $= \dfrac{7}{60} \times 4 = \dfrac{7}{15}$ part

$\therefore$ Remaining part $= 1 - \dfrac{7}{15} = \dfrac{8}{15}$ part

$\therefore$ $\dfrac{8}{15}$ part of the work is left working together for 4 days.

9. Work done by A in 5 days $= \dfrac{1}{3}$ part

Work done by A in 1 day $= \dfrac{1}{3 \times 5} = \dfrac{1}{15}$ part

Work done by B in 10 days $= \dfrac{2}{3}$ part

Work done by B in 1 day $= \dfrac{2}{3 \times 10} = \dfrac{2}{30} = \dfrac{1}{15}$ part

$\therefore$ Work done by $(A + B)$ in 1 day $= \dfrac{1}{15} + \dfrac{1}{15} = \dfrac{2}{15}$

$\therefore$ $(A + B)$ both can do the work in $= \dfrac{1}{\left(\dfrac{2}{15}\right)} = \dfrac{15}{2}$ days $= 7\dfrac{1}{2}$ days.

10. A pipe can fill the tank in 1 hour $= \dfrac{1}{16}$

Work done by (pipe + leak) in 1 hour $= \dfrac{1}{24}$

$\therefore$ Work done by leak to empty the tank in 1 hour $= \dfrac{1}{16} - \dfrac{1}{24} = \dfrac{3-2}{48} = \dfrac{1}{48}$

$\therefore$ Time taken by leak to empty the filled tank $= \dfrac{1}{\left(\dfrac{1}{48}\right)} = 48.$

11. Number of tank that a tap can fill in 6 hour = 1 tank

Number of tank that a tap can fill in 1 hour $= \dfrac{1}{6}$ tank

After half the tank is filled three more similar taps are opened
So, there are 4 taps

Part of tank then 1 tap can fill in hour $= \dfrac{1}{6}$

Part of 4 tap can fill in hour $= \dfrac{1}{6} \times 4 = \dfrac{4}{6} = \dfrac{2}{3}$ part

Then, time taken by 4 taps to fill $\dfrac{2}{3}$ part of tank = 1 hour

Time taken by 4 taps to 11 part of tank

$$= \frac{1}{2} \times 3 \text{ time taken by 4 taps to } \frac{1}{2} \text{ part of tank}$$

$$= \frac{3}{2} \times \frac{1}{2} = \frac{3}{4} \text{ hours.}$$

7. Algebraic Expressions and Identities

Exercise 7.1

1. (a) $3\sqrt{y} + 4y + 7y^2 = 3(y)^{1/2} + 4y + 7y^2$ not polynomial

(b) $\sqrt{2x} + x^2 + x^3$ It is a polynomial in variable x.

(c) $\dfrac{2}{3}x^2 - 4x + 12$ It is a polynomial in veriable x.

(d) $2x^{-2} + 3x^{-1} + 5 + 4x = \dfrac{2 \times 1}{x} + \dfrac{3 \times 1}{x} + 5 + 4x$ not possible.

(e) $\sqrt{ax^{1/2}} + ax + 7x^2 + 5$ not polynomial.

(f) $x^3 + x^{-3} = x^3 + \dfrac{1}{x^3}$ not polynomial.

2. (a) $y^2 + 3y + 5 + 2y^5$

We know that to write the polynomial in their standard form, we write it in descending order.

Standard form $= 2y^5 + y^2 + 3y + 5$ Degree of polynomial = 5.

(b) $(a^3 - 1)(a^3 - 7)$

Standard form $= a^3 \times a^3 - 7a^3 - a^3 + 7 = a^6 - 8a^3 + 7$

Degree of polynomial = 6.

3. (a) $-56x^2y^3$ by $8xy^2$

$$-56x^2y^3 \div 8xy^2 = \frac{-56x^2y^3}{8xy^2} = \frac{-\overset{7}{56} \times x \times x \times y \times y \times y}{8 \times x \times y \times y} = -7xy.$$