

Chapter - 10
Direct and Inverse Proportions

Exercise

In questions 1 to 16, there are four options out of which one is correct. Write the correct answer.

1. Both u and v vary directly with each other. When u is 10, v is 15, which of the following is not a possible pair of corresponding values of u and v?
(a) 2 and 3 (b) 8 and 12 (c) 15 and 20 (d) 25 and 37.5

Solution:

(c) 15 and 20

u and v vary directly,

$$\frac{u}{v} = k \text{ (constant)}$$

Hence,

$$\begin{aligned}\frac{u}{v} &= \frac{10}{15} \\ &= \frac{2}{3}\end{aligned}$$

Now if we observe the options given,

Option (a)

$$\frac{2}{3} = \frac{2}{3}$$

Option (b)

$$\frac{8}{12} = \frac{2}{3}$$

Option (c)

$$\frac{15}{20} = \frac{3}{4}$$

Option (d)

$$\frac{25}{37.5} = \frac{2}{3}$$

Therefore, option (c) is not the possible pair of corresponding values of u and v

2. Both x and y vary inversely with each other. When x is 10, y is 6, which of the following is not a possible pair of corresponding values of x and y?
(a) 12 and 5 (b) 15 and 4 (c) 25 and 2.4 (d) 45 and 1.3

Solution:

(d) 45 and 1.3

Since x and y vary inversely,

So $xy = k$ (constant)

Putting the value of x and y, we get;

$$10 \times 6 = 60$$

Now if we observe the options available;

Option (a)

$$\begin{aligned} 12 \text{ and } 5 &= 12 \times 5 \\ &= 60 \end{aligned}$$

Option (b)

$$\begin{aligned} 15 \text{ and } 4 &= 15 \times 4 \\ &= 60 \end{aligned}$$

Option (c)

$$\begin{aligned} 25 \text{ and } 2.4 &= 25 \times 2.4 \\ &= 60 \end{aligned}$$

Option (d)

$$\begin{aligned} 45 \text{ and } 1.3 &= 45 \times 1.3 \\ &= 58.5 \end{aligned}$$

Therefore, option (d) is not a possible pair of corresponding values of x and y

3. Assuming land to be uniformly fertile, the area of land and the yield on it vary

(a) directly with each other.

(b) inversely with each other.

(c) neither directly nor inversely with each other.

(d) sometimes directly and sometimes inversely with each other.

Solution:

(a) Directly with each other.

4. The number of teeth and the age of a person vary

(a) directly with each other.

(b) inversely with each other.

(c) neither directly nor inversely with each other.

(d) sometimes directly and sometimes inversely with each other.

Solution:

(d) Sometimes directly and sometimes inversely with each other

5. A truck needs 54 litres of diesel for covering a distance of 297 km. The diesel required by the truck to cover a distance of 550 km is
(a) 100 litres (b) 50 litres (c) 25.16 litres (d) 25 litres

Solution:

(a) 100 litres

Distance covered by truck using 54 litres diesel = 297 km

Distance covered by truck using 1 litre diesel = $\frac{297}{54}$
= 5.5 km

Hence, for 550 km, diesel required = $\frac{550}{5.5}$
= 100 litres

6. By travelling at a speed of 48 kilometres per hour, a car can finish a certain journey in 10 hours. To cover the same distance in 8 hours, the speed of the car should be
(a) 60 km/h (b) 80 km/h (c) 30 km/h (d) 40 km/h

Solution:

(a) 60 km/h

Speed of car = 48 km/hr

Time taken = 10 hr

Distance = speed \times time
= 48×10
= 480 km

Speed required by car to cover 480 km in 8 hours = $\frac{480}{8}$
= 60 km/hr.

7. In which of the following case, do the quantities vary directly with each other?

(a)	x	0.5	2	8	32	
	y	2	8	32	128	
(b)	p	1^2	2^2	3^2	4^2	
	q	1^3	2^3	3^3	4^3	
(c)	r	2	5	10	25	50
	s	25	10	5	2	0.5
(d)	u	2	4	6	9	12
	v	18	9	6	4	3

Solution:

Option (a)

In option (a),

The values of x is directly proportional to values of y, such as; $y = 4x$

If we put the values of $x = 0.5, 2, 8$ and 32 , we get the values of y as $2, 8, 32$ and 128 respectively.

8. Which quantities in the previous question vary inversely with each other?

- (a) x and y (b) p and q (c) r and s (d) u and v

Solution:

(d) u and v

u	2	4	6	9	12
v	18	9	6	4	3

In option (d),

We can see when the value of u is increasing, the value of v is decreasing.

Hence, u and v are inversely proportional.

9. Which of the following vary inversely with each other?

- (a) speed and distance covered. (b) distance covered and taxi fare.
(c) distance travelled and time taken. (d) speed and time taken.

Solution:

(d) Speed and time taken.

By the formula of speed we know;
Speed = distance/time

As we can see here, when the time decreases, the speed increases.
Hence, they inversely proportional.

10. Both x and y are in direct proportion, then $\frac{1}{x}$ and $\frac{1}{y}$ are

- (a) in indirect proportion.**
- (b) in inverse proportion.**
- (c) neither in direct nor in inverse proportion.**
- (d) sometimes in direct and sometimes in inverse proportion.**

Solution:

(b) in inverse proportion.

11. Meenakshee cycles to her school at an average speed of 12 km/h and takes 20 minutes to reach her school. If she wants to reach her school in 12 minutes, her average speed should be

- (a) $\frac{20}{3}$ km/h (b) 16 km/h (c) 20 km/h (d) 15 km/h**

Solution:

(c) 20 km/h

Speed = 12km/h

Time taken = 20 minutes
= 20/60 hr
= 1/3 hr

Distance covered = S × T
= 12 × 1/3
= 4km

Speed required to cover 4km in 12 minutes = (4/12)×60
= 20 km/hr

12. 100 persons had food provision for 24 days. If 20 persons left the place, the provision will last for

- (a) 30 days (b) $\frac{96}{5}$ days (c) 120 days (d) 40 days**

Solution:

(a) 30 days

100 persons have food provision for = 24 days
1 person will have food provision for = 24×100
= 2400 days

If 20 persons left the place, then total left = $100 - 20$
= 80 persons

Hence, 80 persons have food provision for = $\frac{2400}{80}$
= 30 days

13. If two quantities x and y vary directly with each other, then

- (a) $\frac{x}{y}$ remains constant. (b) $x - y$ remains constant.
(c) $x + y$ remains constant. (d) $x \times y$ remains constant.

Solution:

(a) $\frac{x}{y}$ remains constant.

If x and y vary directly, then $\frac{x}{y} = k$

14. If two quantities p and q vary inversely with each other, then

- (a) $\frac{p}{q}$ remains constant. (b) $p + q$ remains constant.
(c) $p \times q$ remains constant. (d) $p - q$ remains constant.

Solution:

c) $p \times q$ remains constant

If p and q vary inversely, then $p \times q = k$ (constant)

15. If the distance travelled by a rickshaw in one hour is 10 km, then the distance travelled by the same rickshaw with the same speed in one minute is

- (a) $\frac{250}{9}$ m (b) $\frac{500}{9}$ m (c) 1000 m (d) $\frac{500}{3}$ m

Solution:

(d) $\frac{500}{3}$ m

Distance travelled = 10km

Time taken = 1 hr

$$\begin{aligned}\text{In one minute, distance covered} &= \frac{10}{60} \text{ km} \\ &= \frac{10 \times 1000}{60} \text{ m} \\ &= \frac{500}{3} \text{ m}\end{aligned}$$

16. Both x and y vary directly with each other and when x is 10, y is 14, which of the following is not a possible pair of corresponding values of x and y?

- (a) 25 and 35 (b) 35 and 25 (c) 35 and 49 (d) 15 and 21

Solution:

(b) 35 and 25

x and y are directly proportional.

$x \propto y$

If $x = 10$ and $y = 14$, then;

$10 \propto 14$ or $5 \propto 7$

Now, if we compare,

(a) $25 \propto 35 = 5 \propto 7$

(b) $35 \propto 25 = 7 \propto 5$

(c) $35 \propto 49 = 5 \propto 7$

(d) $15 \propto 21 = 5 \propto 7$

Therefore, option (b) is not a possible pair of corresponding values of x and y.

In questions 17 to 42, fill in the blanks to make the statements true:

17. If $x = 5y$, then x and y vary _____ with each other.

Solution:

x and y vary **directly** with each other

18. If $xy = 10$, then x and y vary _____ with each other.

Solution:

x and y vary **inversely** with each other.

19. When two quantities x and y are in _____ proportion or vary _____ they are written as $x \propto y$.

Solution:

When two quantities x and y are in **direct** proportion or vary **directly** they are written as $x \propto y$.

20. When two quantities x and y are in _____ proportion or vary _____ they are written as $x \propto \frac{1}{y}$.

Solution:

When two quantities x and y are in **inverse** proportion or vary **inversely** they are written as $x \propto \frac{1}{y}$.

21. Both x and y are said to vary _____ with each other if for some positive number k, $xy = k$.

Solution:

Both x and y are said to vary **inversely** with each other if for some positive number k, $xy = k$.

22. x and y are said to vary directly with each other if for some positive number k, _____ =k.

Solution:

x and y are said to vary directly with each other if for some positive number k, $\frac{x}{y} = k$.

23. Two quantities are said to vary _____ with each other if they increase (decrease) together in such a manner that the ratio of their corresponding values remains constant.

Solution:

Two quantities are said to vary **directly** with each other if they increase (decrease) together in such a manner that the ratio of their corresponding values remains constant.

24. Two quantities are said to vary _____ with each other if an increase in one causes a decrease in the other in such a manner that the product of their corresponding values remains constant.

Solution:

Two quantities are said to vary **inversely** with each other if an increase in one causes a decrease in the other in such a manner that the product of their corresponding values remains constant.

25. If 12 pumps can empty a reservoir in 20 hours, then time required by 45 such pumps to empty the same reservoir is _____ hours.

Solution:

Time taken by 12 pumps to empty a reservoir = 20 hr

Time taken by 1 pump to empty the reservoir = 20×12
= 240 hr

Hence, time taken by 45 pumps to empty the reservoir = $\frac{240}{45}$
= $\frac{240 \times 60}{45}$
= $\frac{14400}{45}$
= 320 min
= $5 \times 60 + 20$ min
= 5 hour 20 min

26. If x varies inversely as y, then

x	-	60
y	2	10

Solution:

If x varies inversely as y, then;

$$x \times y = k$$

If $x = 60$ and $y = 10$

Then,

$$x \times y = 60 \times 10$$

$$= 600 = k$$

Hence,

$$x \times 2 = 600$$

$$x = \frac{600}{2}$$

$$= 300$$

27. If x varies directly as y, then

x	12	6
y	48	-

Solution:

If x and y varies directly,
then;

$$\frac{x}{y} = k$$

If x=12 and y = 48,

Then,

$$k = 12/48$$

$$= \frac{1}{4}$$

Now, if x =6, and $k = \frac{1}{4}$, then y will be;

$$\frac{6}{y} = \frac{1}{4}$$

$$y = 6 \times 4$$

$$= 24$$

28. When the speed remains constant, the distance travelled is _____ proportional to the time.

Solution:

When the speed remains constant, the distance travelled is **directly** proportional to the time.

29. On increasing a, b increases in such a manner that $\frac{a}{b}$ remains _____ and positive, then a and b are said to vary directly with each other.

Solution:

On increasing a, b increases in such a manner that a/b remains **constant** and positive, then a and b are said to vary directly with each other

30. If on increasing a, b decreases in such a manner that _____ remains _____ and positive, then a and b are said to vary inversely with each other.

Solution:

If on increasing a, b decreases in such a manner that **ab** remains constant and positive, then a and b are said to vary inversely with each other.

31. If two quantities x and y vary directly with each other, then _____ of their corresponding values remains constant.

Solution:

If two quantities x and y vary directly with each other, then **ratio** of their corresponding values remains constant.

32. If two quantities p and q vary inversely with each other then _____ of their corresponding values remains constant.

Solution:

If two quantities p and q vary inversely with each other then **product** of their corresponding values remains constant.

33. The perimeter of a circle and its diameter vary _____ with each other.

Solution:

The perimeter of a circle and its diameter vary **directly** with each other.

34. A car is travelling 48 km in one hour. The distance travelled by the car in 12 minutes is _____.

Solution:

Distance travelled by car in one hour = 48km

Distance travelled in one minute = $\frac{48}{60}$ km

Distance travelled in 12 minute = $(\frac{48}{60}) \times 12$
 $= \frac{48}{5}$
 $= 9.6\text{km}$

35. An auto rickshaw takes 3 hours to cover a distance of 36 km. If its speed is increased by 4 km/h, the time taken by it to cover the same distance is _____.

Solution:

Distance covered by auto rickshaw in 3 hours = 36km

Speed = $\frac{36}{3}$

= 12 km/hr

If we increase the speed by 4km/hr,

Then the total speed becomes = 12+4

= 16km/hr

Now, the time taken by auto rickshaw will be = $\frac{36}{16}$

$$= \frac{36 \times 60}{16}$$

$$= 135 \text{ min}$$

$$= 120 + 15$$

$$= 2 \text{ hour } 15 \text{ min}$$

36. If the thickness of a pile of 12 cardboard sheets is 45 mm, then the thickness of a pile of 240 sheets is _____ cm.

Solution:

Thickness of pile of 12 cardboard sheets = 45mm

Thickness of 1 cardboard sheet = $\frac{45}{12}$ mm

Hence, thickness of a pile of 240 sheets = $\frac{45 \times 240}{12}$

$$= 45 \times 20$$

$$= 900 \text{ mm}$$

$$= \frac{900}{10} \text{ cm}$$

$$= 90 \text{ cm}$$

37. If x varies inversely as y and x = 4 when y = 6, then when x = 3 the value of y is _____.

Solution:

If x varies inversely as y, then

$$x \times y = k$$

$$4 \times 6 = k$$

$$k = 24$$

Now, if x = 3, then y is;

$$y = \frac{k}{x}$$

$$= \frac{24}{3}$$

$$= 8$$

38. In direct proportion, $\frac{a_1}{a_2} = \frac{b_1}{b_2}$

Solution:

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = k$$

39. In case of inverse proportion, $a_2 \propto \frac{1}{b_2}$ –

Solution:

In case of inverse proportion,

$$\frac{a_2}{a_1} = \frac{b_2}{b_1}$$

40. If the area occupied by 15 postal stamps is 60 cm², then the area occupied by 120 such postal stamps will be _____.

Solution:

Area occupied by 15 postal stamps = 60cm²

Area occupied by 1 postal stamps = $\frac{60}{15}$
= 4 cm²

Area occupied by 120 such postal stamps = 4×120
= 480 cm²

41. If 45 persons can complete a work in 20 days, then the time taken by 75 persons will be _____ hours.

Solution:

45 persons complete a work in 20 days

1 person can complete work in = 45×20
= 900 days

Time taken by 75 persons = $\frac{900}{75}$
= 12 days
= 12×24
= 288 hr

42. Devangi travels 50 m distance in 75 steps, then the distance travelled in 375 steps is _____ km.

Solution:

Distance travelled in 75 steps = 50m

Distance covered in 1 step = $\frac{50}{75}$ m

Distance covered in 375 steps = $(\frac{50}{75}) \times 375$

$$\begin{aligned} &= \frac{18750}{75} \\ &= 250\text{m} \\ &= \frac{250}{1000}\text{km} \\ &= 0.25\text{km} \end{aligned}$$

In questions from 43 to 59, state whether the statements are true (T) or false (F).

43. Two quantities x and y are said to vary directly with each other if for some rational number k, $xy = k$.

Solution:

False

44. When the speed is kept fixed, time and distance vary inversely with each other.

Solution:

False

45. When the distance is kept fixed, speed and time vary directly with each other.

Solution:

False

46. Length of a side of a square and its area vary directly with each other.

Solution:

False

47. Length of a side of an equilateral triangle and its perimeter vary inversely with each other.

Solution:

False

48. If d varies directly as t^2 , then we can write $dt^2 = k$, where k is some constant.

Solution:

False

49. If a tree 24 m high casts a shadow of 15 m, then the height of a pole that casts a shadow of 6 m under similar conditions is 9.6 m.

Solution:

True

Height of tree = 24m

Length of shadow of tree = 15m

Let height of pole = x

Length of shadow of pole = 6m

Now,

$$\frac{24}{15} = \frac{x}{6}$$

$$x = \frac{24 \times 6}{15}$$

$$x = 9.6\text{m}$$

50. If x and y are in direct proportion, then $(x - 1)$ and $(y - 1)$ are also in direct proportion.

Solution:

False

x and y are in direct proportion, then;

$$\frac{x}{y} = k$$

if $x = 3$ and $y = 5$, then

$$k = \frac{3}{5}$$

Now,

$$x-1 = 2 \text{ and}$$

$$y-1=4$$

So,

$$\frac{x-1}{y-1} = \frac{2}{4}$$

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

51. If x and y are in inverse proportion, then (x + 1) and (y + 1) are also in inverse proportion.

Solution-

False

52. If p and q are in inverse variation then (p + 2) and (q – 2) are also in inverse proportion.

Solution-

False

53. If one angle of a triangle is kept fixed then the measure of the remaining two angles vary inversely with each other.

Solution-

False

Let's assume a triangle-

Therefore,

Sum of all angles,

$$\angle A + \angle B + \angle C = 180$$

$$\text{If, } \angle A = 50^\circ$$

$$\text{So, } \angle B + \angle C = 180 - 50$$

$$= 130^\circ$$

Angle sum properties of a triangle don't depend on any proportion.

54. When two quantities are related in such a manner that, if one increases, the other also increases, then they always vary directly.

Solution-

True.

55. When two quantities are related in such a manner that if one increases and the other decreases, then they always vary inversely.

Solution-

True.

56. If x varies inversely as y and when x = 6, y = 8, then for x = 8 the value of y is 10.

Solution-

False

If x varies inversely as y

$$xy = k \text{ (constant)}$$

If x = 6 and

$$y = 8$$

$$xy = 6 \times 8$$

$$= 48$$

But if x=8

and y= 10

$$xy = 8 \times 10$$

$$= 80$$

Here $48 \neq 80$

Hence the value of y is not 10.

57. The number of workers and the time to complete a job is a case of direct proportion.

Solution-

False, Indirect Proportion

58. For fixed time period and rate of interest, the simple interest is directly proportional to the principal.

Solution-

True.

59. The area of cultivated land and the crop harvested is a case of direct proportion

Solution-

True,

The quantity of crop harvested depends upon the area cultivated.

In questions 60 to 62, which of the following vary directly and which vary inversely with each other and which are neither of the two?

- 60. (i) The time taken by a train to cover a fixed distance and the speed of the train.**
(ii) The distance travelled by CNG bus and the amount of CNG used.
(iii) The number of people working and the time to complete a given work.
(iv) Income tax and the income.
(v) Distance travelled by an auto-rickshaw and time taken.

Solution-

- (i) Inversely proportional
(ii) Directly proportional
(iii) Inversely Proportional
(iv) Directly proportional
(v) Directly proportional

- 61. (i) Number of students in a hostel and consumption of food.**
(ii) Area of the walls of a room and the cost of white washing the walls.
(iii) The number of people working and the quantity of work.
(iv) Simple interest on a given sum and the rate of interest.
(v) Compound interest on a given sum and the sum invested.

Solution-

- (i) Directly proportional
(ii) Directly proportional
(iii) Directly proportional
(iv) Directly proportional
(v) Directly proportional

- 62. (i) The quantity of rice and its cost.**
(ii) The height of a tree and the number of years.
(iii) Increase in cost and number of shirts that can be purchased if the budget remains the same.
(iv) Area of land and its cost.
(v) Sales Tax and the amount of the bill.

Solution-

- (i) Directly Proportional
(ii) Neither directly not inversely
(iii) Inversely Proportional
(iv) Directly Proportional
(v) Directly proportional

Solve the following:

63. If x varies inversely as y and x = 20 when y = 600, find y when x = 400.

Solution-

If x varies inversely with y,

$$xy = k \text{ (constant)}$$

....(i)

If x = 20 and

$$y = 600$$

$$xy = 20 \times 600$$

$$= 12000$$

$$k = 12000$$

When x = 400 then from equation-(i),

$$y \times 400 = k$$

$$y \times 400 = 12000$$

$$y = 30$$

64. The variable x varies directly as y and x = 80 when y is 160. What is y when x is 64?

Solution-

If x varies directly as y

$$\frac{x}{y} = k$$

If x = 80 and y = 160

$$\frac{x}{y} = \frac{80}{160}$$

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

When x = 64,

$$\frac{64}{y} = \frac{1}{2}$$

$$y = 128$$

65. l varies directly as m and l is equal to 5, when $m = \frac{2}{3}$. Find l when $m = \frac{16}{3}$.

Solution-

If l varies directly as m,

$$\frac{l}{m} = k$$

$$\text{If } l = 5, m = \frac{2}{3}$$

$$\begin{aligned}\frac{l}{m} &= \frac{5}{\frac{2}{3}} \\ &= \frac{15}{2}\end{aligned}$$

$$\text{When } m = \frac{16}{3},$$

$$\begin{aligned}\frac{l}{m} &= \frac{15}{2} \\ \frac{l}{\frac{16}{3}} &= \frac{15}{2} \\ l &= 40\end{aligned}$$

66. If x varies inversely as y and y = 60 when x = 1.5. Find x. when y = 4.5.

Solution-

If x varies inversely as y

$$xy = k$$

....(i)

if x = 1.5 and y = 60

$$xy = 1.5 \times 60$$

$$= 90$$

$$k = 90$$

When y = 4.5 then from eq. (i),

$$4.5 \times y = k$$

$$4.5 \times y = 90$$

$$y = 20$$

67. In a camp, there is enough flour for 300 persons for 42 days. How long will the flour last if 20 more persons join the camp?

Solution-

300 people can have = 42d

1 person can have = 42×300

20 more man, so,

$$\begin{aligned}
 320 \text{ men can have} &= \frac{42 \times 300}{320} \\
 &= \frac{3}{8} \text{ days}
 \end{aligned}$$

68. A contractor undertook a contract to complete a part of a stadium in 9 months with a team of 560 persons. Later on, it was required to complete the job in 5 months. How many extra persons should he employ to complete the work?

Solution-

560 people complete it partially in 9 months

1 person completes it in $9 \times 560 = 5040$

$$\begin{aligned}
 \text{In 5 months the work can be completed} &= \frac{5040}{5} \\
 &= 1008 \text{ persons}
 \end{aligned}$$

69. Sobi types 108 words in 6 minutes. How many words would she type in half an hour?

Solution-

1 hour = 60 minutes

Half hour = 30 minutes

In 6 minutes Sobi can type = 108 words

$$\text{In 1 minute she can type} = \frac{108}{6}$$

$$\begin{aligned}
 \text{In 30 minutes she can type} &= \frac{108}{6} \times 30 \\
 &= 540
 \end{aligned}$$

70. A car covers a distance in 40 minutes with an average speed of 60 km/h. What should be the average speed to cover the same distance in 25 minutes?

Solution-

A car covers a distance in 40 min with an average speed = 60 km/h

$$= \frac{60 \times 1000}{60} \text{ m/min}$$

$$\begin{aligned}
 \text{In 1 min, the same distance can be cover with speed} &= \frac{60 \times 1000 \times 40}{60} \\
 &= 4000 \text{ m/min}
 \end{aligned}$$

$$\text{In 25 min, the same distance can be cover with speed} = \frac{4000}{25}$$

$$\begin{aligned}
&= 1600 \text{ m/min} \\
&= \frac{1600 \times 60}{1000} \\
&= 16 \times 6 \\
&= 96 \text{ km/hr}
\end{aligned}$$

71. It is given that l varies directly as m.

(i) Write an equation which relates l and m.

(ii) Find the constant of proportion (k), when l is 6 then m is 18.

(iii) Find l, when m is 33.

(iv) Find m when l is 8.

Solution:

Since l vary directly as m,

(a) Equation related to l and m is $\frac{l}{m} = k$ (constant)

(b) If $l = 6$ and $m = 18$,

Then,

$$k = \frac{6}{18} = \frac{1}{3}$$

(c) If $m = 33$, then

$$\frac{l}{m} = \frac{1}{3}$$

$$\frac{l}{33} = \frac{1}{3}$$

$$l = 11$$

(d) If $l = 8$,

$$\frac{l}{m} = \frac{1}{3}$$

$$\frac{8}{m} = \frac{1}{3}$$

$$m = 24$$

72. If a deposit of Rs 2,000 earns an interest of Rs 500 in 3 years, how much interest would a deposit of Rs 36,000 earn in 3 years with the same rate of simple interest?

Solution:

If deposit of Rs 2000 earns in 3yr with an interest = Rs 500

Then, a deposit of Rs1000 earns in 3yr with an interest = $\frac{500}{2} = 250$

Similarly,

Deposit of Rs 3600 which is Rs. 36×1000 earns in 3yr with an interest = 250×36
= Rs 9000

73. The mass of an aluminium rod varies directly with its length. If a 16 cm rod has a mass of 192 g, find the length of the rod whose mass is 105 g.

Solution-

In direct proportion,

$$\frac{m}{l} = \frac{192}{16}$$
$$= 12$$

$$k = 12$$

If mass of the rod = 105g

Then,

$$\frac{m}{l} = k$$
$$\frac{105}{l} = 12$$

$$l = 8.75 \text{ cm}$$

74. Find the values of x and y if a and b are in inverse proportion:

a. 12 x 8

b. 30 5 y

Solution-

Given,

a	12	x	8
b	30	5	y

In part a, the value of x:

$$x = 12 \times 6$$
$$= 72$$

In part b the value of y:

$$y = 5 \times 9$$
$$= 45$$

75. If Naresh walks 250 steps to cover a distance of 200 metres, find the distance travelled in 350 steps.

Solution:

250 steps covers a distance = 200 meter

$$1 \text{ step covers} = \frac{200}{250}$$

$$\begin{aligned} 350 \text{ steps cover} &= \frac{200}{250} \times 350 \\ &= 280\text{m} \end{aligned}$$

76. A car travels a distance of 225 km in 25 litres of petrol. How many litres of petrol will be required to cover a distance of 540 kilometres by this car?

Solution-

225 km travels in = 25 litres

$$1 \text{ km travel} = \frac{25}{225}$$

$$\begin{aligned} 540 \text{ km will require} &= \frac{25}{225} \times 540 \\ &= 60 \text{ litres} \end{aligned}$$

77. From the following table, determine if x and y are in direct proportion or not.

(a)

x	3	6	15	20	30
y	12	24	45	60	120

(b)

x	4	7	10	16
y	24	42	60	96

(c)

x	1	4	9	20
y	1.5	6	13.5	30

Solution-

For table (a),

$\frac{x}{y}$ ratio is not equal.

Therefore, (a) is not in direct proportion

For table (b),

$\frac{x}{y}$ ratio is equal.

Therefore (b) is in direct proportion.

For table (c),

$\frac{x}{y}$ ratio is equal.

Therefore (c) is also in direct proportion.

78. If a and b vary inversely to each other, then find the values of p, q, r ; x, y, z and l, m, n.

(i)

a	6	8	q	25
b	18	p	39	r

(ii)

a	2	y	6	10
b	x	12.5	15	z

(iii)

a	l	9	n	6
b	5	m	25	10

Solution-

For inverse proportion,
 $xy = \text{constant}$

(i) If,
 $a = 6$ and $b = 18$
So,
 $ab = 108$
 $k = 108$

When $a = 8$ and $b = p$, then
 $ab = k$
 $8 \times p = 108$
 $p = 27/2$

Also, When $a = q$ and $b = 39$, then
 $ab = k$
 $q \times 39 = 108$
 $q = 36/13$

And, When $a = 25$ and $b = r$, then
 $ab = k$
 $25 \times r = 108$
 $r = 108/25$

(ii)

If, $a = 6$ and $b = 15$ then

So,

$$ab = 90$$

$$k = 90$$

When $a = 2$ and $b = x$, then

$$ab = k$$

$$2 \times x = 90$$

$$x = 45$$

Also, When $a = y$ and $b = 12.5$, then

$$ab = k$$

$$y \times 12.5 = 90$$

$$y = 7.2$$

And, When $a = 10$ and $b = z$, then

$$ab = k$$

$$10 \times z = 90$$

$$z = 9$$

(iii)

If,

$$a = 6 \text{ and } b = 10$$

So,

$$ab = 60$$

$$k = 60$$

So,

$$l \times 5 = 60$$

$$l = 12$$

Also,

$$9 \times m = 60$$

$$m = 20/3$$

And,

$$n \times 25 = 60$$

$$n = 12/5$$

79. If 25 metres of cloth costs Rs 337.50, then

(i) What will be the cost of 40 metres of the same type of cloth?

(ii) What will be the length of the cloth bought for Rs 810?

Solution-

$$25 \text{ meter cloth costs} = \text{Rs. } 337.50$$

$$\begin{aligned} 1 \text{ meter cloth cost} &= \frac{337.5}{25} \\ &= \text{Rs. } 13.5 \end{aligned}$$

(i) 40 meter cloth cost = 13.5×40
= Rs. 540

(ii) In Rs. 13.5 cloth can be purchased = 1 meter

In Rs 810 cloth can be purchased = $\frac{1}{13.5} \times 810$
= 60meter

80. A swimming pool can be filled in 4 hours by 8 pumps of the same type. How many such pumps are required if the pool is to be filled in $2\frac{2}{3}$ hours?

Solution-

To fill the tank in 1 hour total pumps required = 4×8
= 32

In $2\frac{2}{3} = \frac{8}{3}$ hours,

Total pumps required = $\frac{32}{\frac{8}{3}}$
= 4×3
= 12 pumps

81. The cost of 27 kg of iron is Rs 1,080, what will be the cost of 120 kg of iron of the same quality?

Solution-

27 kg iron costs = Rs 1080

1 kg iron cost = $\frac{1080}{27}$
= Rs. 40

120 kg iron will cost = 120×40
= Rs. 4800

82. At a particular time, the length of the shadow of Qutub Minar whose height is 72 m is 80 m. What will be the height of an electric pole, the length of whose shadow at the same time is 1000 cm?

Solution-

Length of Qutub Minar = 72m

At a particular time its shadow = 80m

Shadow of the electric pole has a length of = 1000cm
= 10m

Length of electric pole = $\frac{72}{80} \times 10$

$$= 9m$$

83. In a hostel of 50 girls, there are food provisions for 40 days. If 30 more girls join the hostel, how long will these provisions last?

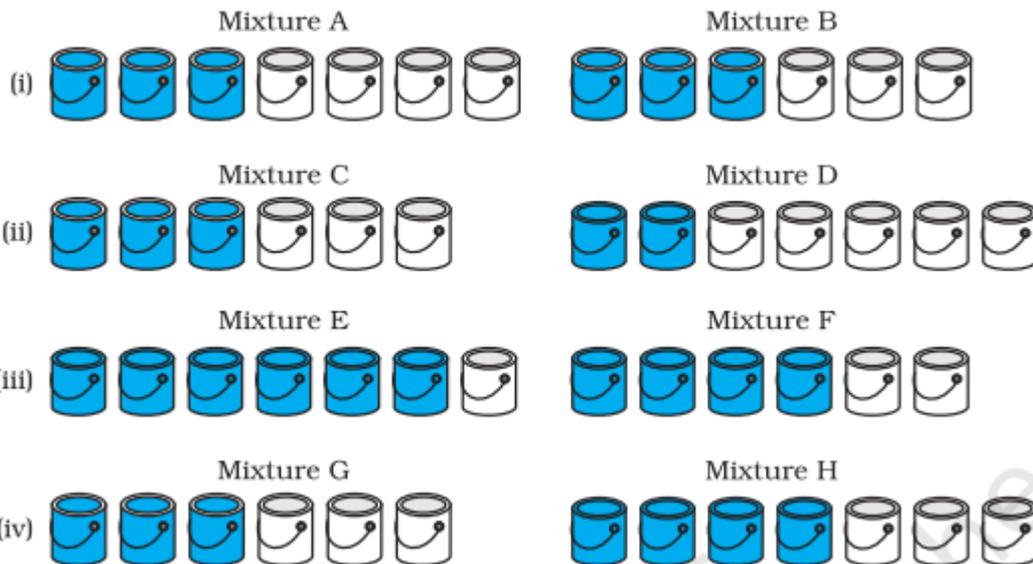
Solution-

50 girls can have the food = 40 days

1 girl can have the food = 50×40
= 2000 days

(50+30)80 girls can have = $\frac{2000}{80}$
= 25 days

84. Campus and Welfare Committee of school is planning to develop a blue shade for painting the entire school building. For this purpose various shades are tried by mixing containers of blue paint and white paint. In each of the following mixtures, decide which is a lighter shade of blue and also find the lightest blue shade among all of them.



If one container has one litre paint and the building requires 105 litres for painting, how many container of each type is required to paint the building by darkest blue shade?

Solution-

(i) In mixture A

Ratio of blue and white = $3/4$

In mixture B

Ratio of blue and white = $3/3$

$$= 1$$

Clearly mixture A will have a lighter shade.

(ii) In mixture C

$$\begin{aligned}\text{Ratio of blue and white} &= 3/3 \\ &= 1\end{aligned}$$

In mixture D

$$\begin{aligned}\text{Ratio on blue and white} &= 2/5 \\ &= 0.4\end{aligned}$$

Clearly mixture D will have a lighter shade.

(iii) In mixture E

$$\begin{aligned}\text{Ratio of blue and white} &= 6/1 \\ &= 6\end{aligned}$$

In mixture F

$$\begin{aligned}\text{Ratio of blue and white} &= 4/2 \\ &= 1\end{aligned}$$

Clearly mixture F will have a lighter shade.

(iv) In mixture G

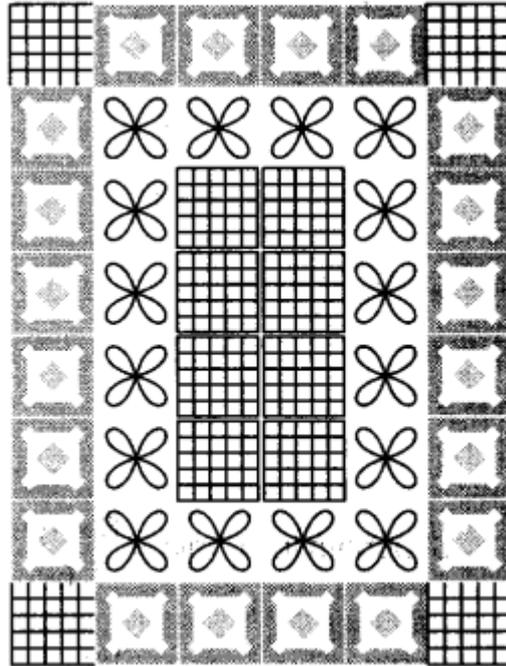
$$\begin{aligned}\text{Ratio of blue and white} &= 3/3 \\ &= 1\end{aligned}$$

In mixture H

$$\begin{aligned}\text{Ratio of blue and white} &= 4/3 \\ &= 1.33\end{aligned}$$

Clearly mixture G will have a lighter shade.

85. Posing a question Work with a partner to write at least five ratio statements about this quilt, which has white, blue, and purple squares.



How many squares of each colour will be there in 12 such quilts?

Solution-

Purple = 12,

Blue = 20 and

White = 16

Total squares = $12+20+16$
 $= 48$

Statement I Purple:

Total = 12:48

= 5:12

Statement II Blue:

Total = 20:48

=1:3

Statement III White:

Total = 16:48

=1:3

Statement IV

Purple: Blue= 12:20

=3:5

Statement V Purple:

White = 12:16

= 3:4

86. A packet of sweets was distributed among 10 children and each of them received 4 sweets. If it is distributed among 8 children, how many sweets will each child get?

Solution-

10 children received = 4 sweets

1 child receives = 10×4

$$= 40$$

8 children receive = $\frac{40}{8}$

$$= 5 \text{ sweets}$$

87. 44 cows can graze a field in 9 days. How many less/more cows will graze the same field in 12 days?

Solution-

9 days take to graze the field by = 44 cows

1 day will take more cows to graze = 44×9

12 days will take fewer cows to graze = $\frac{44 \times 9}{12}$
 $= 33 \text{ cows}$

Decreased number of cows = $44 - 33$
 $= 11$

88. 30 persons can reap a field in 17 days. How many more persons should be engaged to reap the same field in 10 days?

Solution-

17 days need to reap the field by = 30 persons

1 day need to reap the field by more man = 30×17
 $= 510$

10 days need to reap field by less men = $\frac{510}{10}$
 $= 51 \text{ men}$

89. Shabnam takes 20 minutes to reach her school if she goes at a speed of 6 km/h. If she wants to reach school in 24 minutes, what should be her speed?

Solution-

20 minutes time Shabnam takes to reach with the speed = 6 km/hr

1 minute time will take a speed = 6×20
= 120 km/hr

24 minutes time will take with a speed = $\frac{120}{24}$
= 5 km/hr

90. Ravi starts for his school at 8:20 a.m. on his bicycle. If he travels at a speed of 10 km/h, then he reaches his school late by 8 minutes but on travelling at 16 km/h he reaches the school 10 minutes early. At what time does the school start?

Solution:

Let the total distance = x km

Time taken = t min

With speed of bicycle 10 km/hr, then he reaches by 8 min,

$$\frac{x}{10} = t + \frac{8}{60}$$

$$\frac{x}{10} = t + \frac{2}{15} \quad \dots(i)$$

With speed 16 km/hr then reaches his school 10 min early:

$$\frac{x}{16} = t - \frac{10}{60}$$

$$\frac{x}{16} = t - \frac{1}{6} \quad \dots(ii)$$

On subtracting (ii) from (i),

$$\frac{x}{10} - \frac{x}{16} = \frac{2}{15} + \frac{1}{6}$$

On solving,

$$x = 8$$

Now, put $x=8$ in eq. (i), we get,

$$\frac{8}{10} = t + \frac{2}{15}$$

$$t = \frac{2}{3} h$$

$$t = \frac{2}{3} \times 60$$

$$t = 40 \text{ min}$$

So, Timing of the school = $8:20 + 40 \text{ min} = 9:00 \text{ am}$

91. Match each of the entries in Column I with the appropriate entry in Column II

Column I	Column II
1. x and y vary inversely to each other	A. $\frac{x}{y} = \text{Constant}$
2. Mathematical representation of inverse variation of quantities p and q	B. y will increase in proportion
3. Mathematical representation of direct variation of quantities m and n	C. $xy = \text{Constant}$
4. When x = 5, y = 2.5 and when y = 5, x = 10	D. $p \propto \frac{1}{q}$
5. When x = 10, y = 5 and when x = 20, y = 2.5	E. y will decrease in proportion
6. x and y vary directly with each other	F. x and y are directly proportional
7. If x and y vary inversely then on decreasing x	G. $m \propto n$
8. If x and y vary directly then on decreasing x	H. x and y vary inversely
	I. $p \propto q$
	J. $m \propto \frac{1}{n}$

Solution-

Column I	Column II
1. x and y vary inversely to each other	$xy = \text{Constant}$
2. Mathematical representation of inverse variation of quantities p and q	$p \propto 1/q$
3. Mathematical representation of direct variation of quantities m and n	$m \propto n$
4. When x = 5, y = 2.5 and when y = 5, x = 10	x and y are directly proportional
5. When x = 10, y = 5 and when x = 20, y =	x and y vary inversely

2.5	
6. x and y vary directly with each other	$\frac{x}{y} = \text{Constant}$
7. If x and y vary inversely then on decreasing x	y will increase in proportion
8. If x and y vary directly then on decreasing x	y will decrease in proportion

92. There are 20 grams of protein in 75 grams of sauted fish. How many grams of protein is in 225 gm of that fish?

Solution-

75 gm fish holds protein = 20gm

1 gm of fish will hold = $\frac{20}{75}$

225 gm of fish will hold;

$$= \frac{20}{75} \times 225$$

$$= 60g$$

93. Ms. Anita has to drive from Jhareda to Ganwari. She measures a distance of 3.5 cm between these villages on the map. What is the actual distance between the villages if the map scale is 1 cm = 10 km?

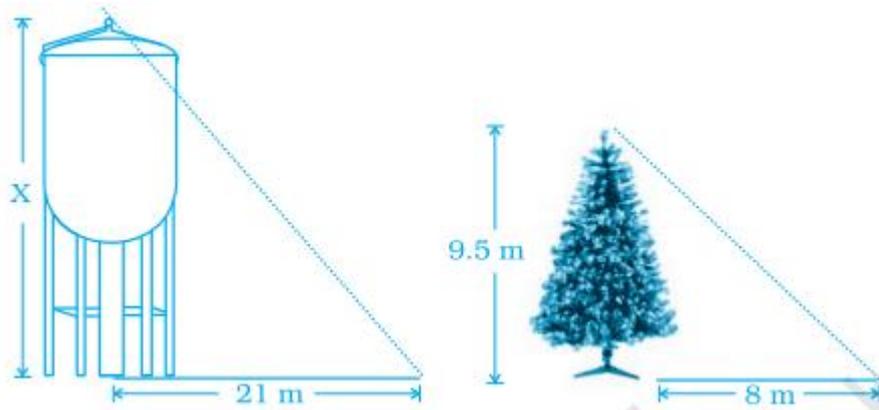
Solution-

Distance between jhareda to ganwari in the map = 3.5cm

Given scale 1cm = 10km

So actual distance between the villages = 35×10
= 35km

94. A water tank casts a shadow 21 m long. A tree of height 9.5 m casts a shadow 8 m long at the same time. The lengths of the shadows are directly proportional to their heights. Find the height of the tank.



Solution-

Height of the tree = 9.5m

Shadow of the tree = 8m

The shadows are directly proportional,

So,

$$\frac{8}{9.5} = \frac{21}{x}$$

$$x = 24.9m$$

95. The table shows the time four elevators take to travel various distances. Find which elevator is fastest and which is slowest.

	Distance (in m)	Time (in s)
Elevator A	435	29
Elevator B	448	28
Elevator C	130	10
Elevator D	85	5

How much distance will be travelled by elevators B and C separately in 140 sec? Who travelled more and by how much?

Solution-

$$\text{Distance covered by elevator A in 1 sec} = \frac{435}{29} = 15m$$

$$\text{Distance covered by elevator B in 1 sec} = \frac{448}{28} = 16m$$

$$\text{Distance covered by elevator C in 1 sec} = \frac{130}{10} = 13m$$

Therefore, Elevator C is slowest.

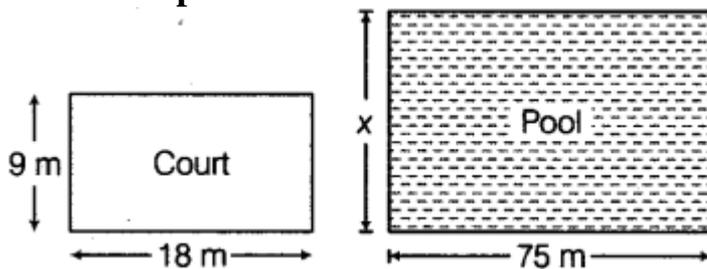
$$\text{Distance covered by elevator B in 140s} = 140 \times 16$$

$$=2240\text{m}$$

Distance covered by elevator C in 140s = 140×13
 $=1820\text{m}$

Elevator B covers more distance than C = $2240 - 1820$
 $=420\text{m}$

96. A volleyball court is in a rectangular shape and its dimensions are directly proportional to the dimensions of the swimming pool given below. Find the width of the pool.



Solution-

Length of the volleyball court = 18m

Breadth of volleyball court = 9m

Length of pool = 75m

Let's assume length of the swimming pool = x m

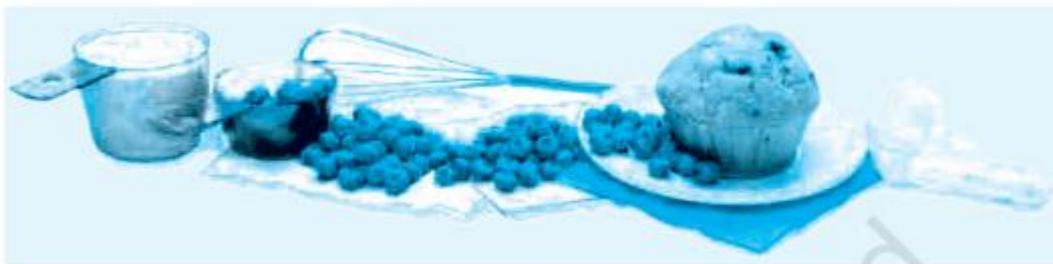
So,

$$\frac{9}{18} = \frac{x}{75}$$

$$x = \frac{9 \times 75}{18}$$

$$x = 37.5\text{m}$$

97. A recipe for a particular type of muffins requires 1 cup of milk and 1.5 cups of chocolates. Riya has 7.5 cups of chocolates. If she is using the recipe as a guide, how many cups of milk will she need to prepare muffins?



Solution-

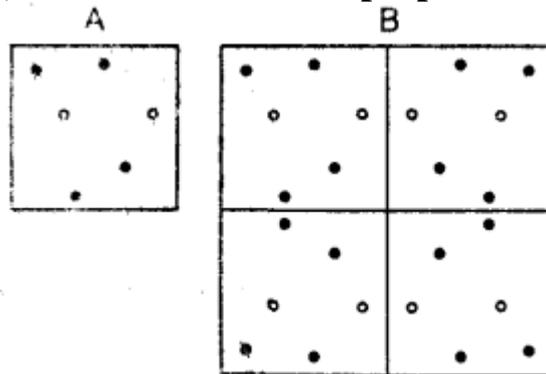
Muffin requires 1 cup of milk and 1.5 cups of chocolates
 Riya has 7.5 cups of chocolates.

The number of cups of milk required for 7.5 cups of chocolate;

$$= \frac{7.5}{1.5}$$

$$= 5 \text{ cups}$$

98. Pattern B consists of four tiles like pattern A. Write a proportion involving red dots and blue dots in pattern A and B. Are they in direct proportion? If yes, write the constant of proportion.



Solution-

No. of red dots = 4

No. of blue dots = 2

Pattern B consists of four tiles like pattern A

Pattern A \times 4 = Pattern B

Proportion of pattern;

$$= \frac{2}{6}$$

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

Proportion of red dots and blue dots in pattern B;

$$= \frac{8}{32}$$

$$= \frac{1}{4}$$

99. A bowler throws a cricket ball at a speed of 120 km/h. How long does this ball take to travel a distance of 20 metres to reach the batsman?

Solution-

Speed of the cricket ball = 120km/hr

$$120\text{km/hr} = \frac{120 \times 1000}{60} \text{ m/min}$$

$$= 2000\text{m/min}$$

Now,

$$\text{Speed in m/s} = \frac{2000}{60}$$

$$= \frac{100}{3}$$

$$\text{So, 20m can be covered in} = \frac{20}{\frac{100}{3}}$$

$$= 0.6 \text{ sec}$$

100. The variable x is inversely proportional to y. If x increases by p%, then by what per cent will y decrease?

Solution-

$$xy = k(\text{constant})$$

The variable x is inversely proportional to y.

If an increase causes a decrease in y and vice-a-versa this is called as inverse proportion.

101. Here is a key board of a harmonium:

(a) Find the ratio of white keys to black keys on the keyboard.



(b) What is the ratio of black keys to all keys on the given keyboard?

(c) This pattern of keys is repeated on larger keyboard. How many black keys would you expect to find on a keyboard with 14 such patterns.

Solution:

Following details can be taken from the given figure-

(a) Total no. Of keys = 7

No of white keys = 10

$$\text{Their ratio} = \frac{10}{7}$$

(b) No of all keyboard = $10+7$
 $=17$

$$\text{Ratio of black keys to all keys} = \frac{7}{17}$$

(c) Black keys in 1 keyboard = 7

$$\text{Black keys in 14 such keyboards} = 14 \times 7$$

$$= 98 \text{ keys}$$

102. The following table shows the distance travelled by one of the new eco-friendly energy-efficient cars travelled on gas.

Litres of gas	1	0.5	2	2.5	3	5
Distance (km)	15	7.5	30	37.5	45	75

Which type of properties are indicated by the table? How much distance will be covered by the car in 8 litres of gas?

Solution.

On the basis of given table,

The distance travelled by one of the new eco-friendly energy-efficient cars travelled on gas.

The car travelled 15 km in 1 L of gas.

The car travelled 7.5 km in 0.5 L of gas.

The car travelled 30 km in 2 L of gas.

This rate shows direct proportion between litres of gas and the distance cover.

The car can cover the distance in 8 L of gas = 8×15
 $= 120$ km

103. Kritika is following this recipe for bread. She realises her sister used most of sugar syrup for her breakfast. Kritika has only $\frac{1}{6}$ cup of syrup, so she decides to make a small size of bread. How much of each ingredient shall she use?

Bread recipe

1 cup quick cooking oats

2 cups bread flour

$\frac{1}{3}$ cup sugar syrup

1 tablespoon cooking oil

$1\frac{1}{3}$ cups water

3 tablespoons yeast

1 teaspoon salt

Solution-

$$\text{Remaining sugar} = \frac{1}{6}$$

Used sugar,

$$= 1 - \frac{1}{6}$$

$$= \frac{5}{6}$$

Sugar syrup needed for 1 piece of bread = $\frac{1}{3}$

New portion of the ingredients will be = $\frac{1}{2}$

New recipe will look like as follows-

$\frac{1}{2}$ Cup quick cooking oats

1 cup bread flour

$\frac{1}{6}$ Cup sugar syrup

$\frac{1}{2}$ Tablespoon cooking oil

$\frac{3}{2}$ Cup water

$\frac{2}{3}$ Tablespoon yeast

$\frac{1}{2}$ Tablespoon salt

104. Many schools have a recommended students-teacher ratio as 35:1. Next year, school expects an increase in enrolment by 280 students. How many new teachers will they have to appoint to maintain the students-teacher ratio?

Solution-

Ratio of students and teacher = 35:1

This implies that for every 35 students 1 teacher is necessary

Total number of teachers required for 280 students = $\frac{280}{35}$ teachers
= 8 teachers

105. Kusum always forgets how to convert miles to kilometres and back again. However she remembers that her car's speedometer shows both miles and kilometres. She knows that travelling 50 miles per hour is same as travelling 80 kilometres per hour. To cover a distance of 200 km, how many miles Kusum would have to go?

Solution-

50 miles/hour = 80km/hour

1 km = $\frac{50}{80} = \frac{5}{8}$ miles

To cover a distance of 200 km;

$$\begin{aligned} &= \frac{5}{8} \times 200 \\ &= 125 \text{ miles} \end{aligned}$$

106. The students of Anju's class sold posters to raise money. Anju wanted to create a ratio for finding the amount of money her class would make for different numbers of posters sold. She knew they could raise Rs 250 for every 60 posters sold.

- (a) How much money would Anju's class make for selling 102 posters?**
(b) Could Anju's class raise exactly Rs 2,000? If so, how many posters would they need to sell? If not, why?

Solution-

60 posters help Anju's class to raise =Rs 250

$$1 \text{ poster will help} = \frac{250}{60} = \frac{25}{6} \text{ Rs}$$

$$\begin{aligned} \text{By selling 102 posters they collect} &= \frac{25}{6} \times 102 \\ &= 17 \times 25 \\ &= \text{Rs } 425 \end{aligned}$$

$$\text{(b) On selling 1 poster anju's class make} = \text{Rs } \frac{25}{6}$$

$$\begin{aligned} \text{To raise 2000 they need to sell} &= 2000 \times \frac{6}{25} \\ &= 480 \text{ poster} \end{aligned}$$