Unit 10(Direct & Inverse Proportions)

Multiple Choice Questions

Question. 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) Since, u and v vary directly, i.e. $u / v = k$ (constant)

If $u = 10$ and $v = 15$, then, $\frac{u}{v} = \frac{10}{15} = \frac{2}{3}$

In option (b), $\frac{8}{12} = \frac{2}{3}$

In option (c), $\frac{15}{20} = \frac{3}{4}$

In option (d), $\frac{25}{37.5} = \frac{2}{3}$

So, option (c) is not a possible pair of corresponding values of u and v.

Hence, option (c) is correct.

Question. 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) Since, x and y vary inversely, i.e. $x \times y = k$ (constant)

If $x = 10$ and $y = 6$

$\therefore$ $xy = 10 \times 6 = 60$

In option (a), $12 \times 5 = 60$

In option (b), $15 \times 4 = 60$

In option (c), $25 \times 2.4 = 60$

But in option (d), $45 \times 1.3 = 58.3$

Hence, option (d) is correct.

Question. 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) If land to be uniformly fertile, then the area of land and the yield on it vary directly with each other.
Hence, option (a) is correct.
Note Two quantities x and y are said to be in direct proportion, if they increase or decrease together in such a manner that the ratio of their corresponding values remains constant.

Question. 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) The number of teeth and the age of a person vary sometimes directly and sometimes inversely with each other, we cannot predict about the number of teeth with exactly the age of a person. It change with person-to-person.
Hence, option (d) is correct.

Question. 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) A truck need 54 L of diesel for covering a distance $= 297$ km

$\therefore$ In 1 L, the truck can cover the distance $= \frac{297}{54} = 5.5$ km

Thus, for 550 km, the required diesel of truck $= \frac{550}{5.5} = 100$ L

Hence, option (a) is correct.

Question. 6 By travelling at a speed of 48 km/h, 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) ∵ Speed of the car = 48 km/h

and time taken by car = 10 h

∴ Distance = Speed × Time = 48 × 10 = 480 km

If car need to cover 480 km in 8 h, then

Required speed = $\frac{480}{8}$ = 60 km/h $\left[\because \text{speed} = \frac{\text{distance}}{\text{time}}\right]$

Hence, option (a) is correct.

Question. 7 In which of the following cases, 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. (a) In option (a),

x = 0.5,2, 8, 32 and y = 2, 8, 32,128

If we multiply x with 4, we get the directly required result as same as shown in corresponding y. In this case, as the value of x increases, the value of y also increases. Hence, option (a) is correct.

Question. 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) In option (b),

p	1^2	2^2	3^2	4^2
q	1^3	2^3	3^3	4^3

If we multiply *p* and *q* with 1, 2, 3 and 4, we get the given result. But it is not given inversely.

In option (c),

r	2	5	10	25	50
s	25	10	5	2	0.5

If we multiply *r* with 2.5 and *s* with 2.5, we will get the given result.

In option (d),

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

If $u = 2$, then $v = 18$

If $u = 4$, then $v = 9$

If $u = 6$, then $v = 6$

If $u = 9$, then $v = 4$

and if $u = 12$, then $v = 3$

It show, when *u* increases, then *v* decreases.

Hence, it is inversely with each other.

Question. 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) We know that, when we increases the speed, then the time taken by vehicle decreases.

Hence, speed and time taken vary inversely with each other.

So, option (d) is correct.

Question. 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) If both x arid y are in directly proportion, then $\frac{1}{x}$ and $\frac{1}{y}$ are in inverse proportion.

Hence, option (b) is correct.

Note Two quantities x and y are said to be in inverse proportion, if an increase in x cause a proportional decrease in y and vice-versa.

Question. 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) 20/3 km/h (b) 16 km/h (c) 20 km/h. (d) 15 km/h

Solution.

(c) Given, speed of cycle = 12 km/h

Time taken by Meenakshee through cycle = 20 min

Then, total distance cover $= \frac{12 \times 20}{60} = 4$ km [$\because$ distance = time × speed]

If Meenakshee want to reach her school in 12 min, then her cycle speed should be

$\frac{4}{\frac{12}{60}}$ i.e. 20 km/h. $\left[\because \text{speed} = \frac{\text{distance}}{\text{time}}\right]$

Hence, option (c) is correct.

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

(a) 30 days (b) 96/5 days (c) 120 days (d) 40 days

Solution.

(a) $\because$ 100 persons had food provision for 24 days.

$\therefore$ 1 person had food provision for 24×100 i.e. 2400 days.

If 20 persons left the place, then remaining persons = (100 − 20) = 80

$\therefore$ 80 persons had food provision for $\frac{2400}{80}$ i.e. 30days.

Hence, option (a) is correct.

Question. 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)ix y remains constant

Solution. (a) If two quantities x and y vary directly with each other, then $\frac{x}{y}$ = k = constant. Since, in direct proportion, both x and y increases or decreases together such a manner that the ratio of their corresponding value remains constant. Hence, option (a) is correct.

Question. 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 x q remains constant (d) p – q remains constant

Solution. (c) If two quantities p and q vary inversely with each other, then p x q remains

constant.
Since, in inverse proportion, an increase in p cause a proportional decrease in q and vice-versa.
Hence, option (c) is correct.

Question. 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) 1000m (d) $\frac{500}{3}$ m
Solution.
(d) The distance travelled by a rickshaw in 1h = 10 km
In 1 min, rickshaw covered the distance
$$= \frac{10}{60}\text{ km} = \frac{10 \times 1000}{60}\text{ m} \qquad [\because 1\text{h} = 60 \text{ min and } 1\text{km} = 1000\text{m}]$$
$$= \frac{1000}{6} = \frac{500}{3}\text{ m}$$
Hence, option (d) is correct.

Question. 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) Both x and y vary directly with each other.
i.e. $x \propto y$
If $x = 10$ and $y = 14$
So, $10 \propto 14$ or $5 \propto 7$
This proportion is not follow in option (b) pairs.
Hence, option (b) is correct.

Fill in the Blanks

In questions 17 to 42, fill in the blanks to make the statements true.
Question. 17 If x = 5y, then x and y vary——— with each other.
Solution.
Given, $x = 5y$
Then, $\frac{x}{y} = \frac{5}{1} = k = \text{constant}$
$\therefore$ x and y vary **directly** with each other.

Question. 18 If xy = 10, then x and y vary————with each other.
Solution.
Given, $xy = 10$
$\therefore$ $x = \frac{10}{y}$
Hence, x and y vary **inversly** with each other.
Note *Since, in case, if y_1, y_2 are the values of y corresponding to the values x_1, x_2 of x, respectively, then*
$$x_1 y_1 = x_2 y_2 \quad or \quad \frac{x_1}{x_2} = \frac{y_1}{y_2}$$

Question. 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 $x \propto y$ [see definition of direct proportion]

Question. 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 $x \propto \frac{1}{y}$ [see definition of inverse proportion]

Question. 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. [see condition of inverse proportion]

Question. 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 wifh'ether, if for some positive number k, $\frac{x}{y}$=k.

Question. 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.

Question. 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 increase in one cause a decrease in the other in such a manner that the product of their corresponding values remains constant.

Question. 25 If 12 pumps can empty a reservoir in 20 hours, then time required by 45 such pumps to empty the same reservoir in—-hours.
Solution.
$\because$ 12 pumps can empty a reservoir in 20 h.
$\therefore$ 1 pump can empty in 20×12 i.e. 240 h.
Then, 45 pumps can empty the same reservoir in

$$\frac{240}{45}\text{h} = \frac{240 \times 60}{45}\text{ min} \qquad [\because 1\text{ h} = 60\text{ min}]$$
$$= \frac{14400}{45} = 320\text{ min}$$
$$= 5 \times 60 + 20$$
$$= \mathbf{5h\ 20\ min}$$

Question. 26 If x varies inversely as y then

x	–	60
y	2	10

Solution.

If x varies inversely as y, then

$$xy = k \text{ (constant)} \quad \ldots(\text{i})$$

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

$\therefore \quad xy = 60 \times 10 = 600$

$\Rightarrow \quad k = 600$

When $y = 2$, then from Eq. (i),

$$x \times 2 = k$$

$\Rightarrow \quad 2x = 600 \quad$ [putting the value of k]

$\Rightarrow \quad x = \mathbf{300}$

Question. 27 If x varies directly as y, then

x	12	6
y	48	–

Solution.

If x varies directly as y, then

$$\frac{x}{y} = k \text{ (constant)} \quad \ldots(\text{i})$$

If $x = 12$ and $y = 48$, then

$$\frac{x}{y} = \frac{12}{48} = \frac{1}{4}$$

$\Rightarrow \quad k = \frac{1}{4}$

When $x = 6$, then from Eq. (i),

$$\frac{6}{y} = k$$

$\Rightarrow \quad \frac{6}{y} = \frac{1}{4} \quad$ [putting the value of k]

$\Rightarrow \quad 6 \times 4 = y \times 1 \quad$ [by cross-muliplication]

$\Rightarrow \quad y = \mathbf{24}$

Question. 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.

e.g. If 10 km cover in 10 min with uniform speed, then 20 km cover in 20 min with same speed.

Question. 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 $\frac{a}{b}$ remains constant and positive, then a and b are said to vary directly with each other.

Question. 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. [see definition of inverse proportion]

Question. 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. [see definition of direct proportion]

Question. 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.

Question. 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.
Perimeter of a circle $= 2\pi r$
Diameter of a circle $= 2 \times r$
$\Rightarrow$ Perimeter $= \pi \times$ Diameter [$\because \pi =$ constant]

Question. 34 A car is travelling 48 km in one hour. The distance travelled by the car in 12 minutes is ———.
Solution.
A car travelling in 1h = 48 km
So, car travelled in 1 min $= \frac{48}{60}$ km [$\because$ 1 h = 60 min]
Similarly, car travelled in 12 min $= \frac{48}{60} \times 12 = \frac{48}{5} =$ **9.6 km**

Question. 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.
An auto rickshaw takes 3 h to cover a distance of 36 km.
Then, its speed $= \frac{36}{3} = 12$ km/h $\left[\because \text{speed} = \frac{\text{distance}}{\text{time}}\right]$
If its speed increases 4 km/h, then
New speed = 12 + 4 = 16 km/h
Now, time taken by auto rickshaw to cover 36 km in $\frac{36}{16}$h $= \frac{36 \times 60}{16} = 135$ min
[$\because$ 1h = 60 min]
$= 2 \times 60 + 15 =$ **2 h 15 min**

Question. 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.
The thickness of a pile of 12 cardboard sheets = 45 mm
$\therefore$ The thickness of a pile of 1 cardboard sheet $= \frac{45}{12}$ mm
So, the thickness of a pile of 240 cardboard sheets $= \frac{45}{12} \times 240$ mm $= 45 \times 20 = 900$ mm
$= \frac{900}{10}$ cm = **90**cm $\left[\because 1 \text{ mm} = \frac{1}{10} \text{cm}\right]$

Question. 37 If x varies inversely as y and x = 4 when y = 6, when x = 3, then value of y is—.
Solution.
x varies inversely as y.
In inverse proportion, $xy = k$ (constant)
If $x = 4$ and $y = 6$, then $k = 4 \times 6 = 24$
Now, when $x = 3$, then $y = \frac{k}{x}$
$\Rightarrow$ $y = \frac{24}{3} =$ **8**

Question. 38 In direct proportion $\frac{a1}{b_1}$ ——————- $\frac{a2}{b_2}$

Solution.

In direct proportion,

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

where, $\frac{a_1}{a_2} = k$ (constant)

Question. 39 In case of inverse proportion,

$\frac{a_2}{-} = \frac{b_2}{-}$.

Solution.

In inverse proportion,

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

$\Rightarrow$ $a_2 b_1 = a_1 b_2$

Question. 40 If the area occupied by 15 postal stamps is 60 cm^2, then the area occupied by 120 such postal stamps will be———.

Solution.

$\because$ The area occupied by 15 postal stamps = 60 cm^2.

$\therefore$ The area occupied by 1 postal stamp $= \frac{60}{15} = 4$ cm^2

Similarly, the area occupied by 120 such postal stamps = 4×120 = **480 cm^2**

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

Solution.

$\because$ 45 persons can complete a work in 20 days.

$\therefore$ 1 person can complete a work in 45×20 i.e. 900 days.

Similarly, 75 persons can complete the same work in $\frac{900}{75} = 12$ days

$= 12 \times 24 =$ **288** h [$\because$ 1 day = 24 h]

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

Solution.

$\because$ Devangi covers the distance in 75 steps = 50 m

So, she cover the distance in 1 step $= \frac{50}{75}$ m

In 375 steps, she will cover

$$= \frac{50}{75} \times 375$$

$$= \frac{18750}{75} = 250\text{m}$$

$$= \frac{250}{1000}\text{ km}$$ [$\because$ 1 km = 1000m]

= **0.25** km

True/False

In questions from 43 to 59, state whether the statements are True or False.

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

Solution. False

Two quantities x and y are said to vary directly with each other, if $\frac{x}{y}$ = k (constant)

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

Solution. False

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

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

Solution. False

When the distance is kept fixed, speed and time vary indirectly/inversely with each other. Since, if we increase speed, then taken time will less and vice-versa.

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

Solution. False

Length of a side of a square and its area does not vary directly with each other, e.g. Let a be length of each side of a square.

So, area of the square = $Side^2$ = a^2

So, if we increase the length of the side of a square, then their area increases but not directly.

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

Solution. False

Length of a side of an equilateral triangle and its perimeter vary directly with each other, e.g. Let a be the side of an equilateral triangle. So, perimeter = 3 x (Side) = 3 x a = 3a . So, if we increase the length of side of the equilateral triangle, then their perimeter will also increases.

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

Solution. False

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

Since, two quantities x and y are said to be in Inverse proportion, if an increases in x cause a proportional decreases in y and vice-versa, in such a manner that the product of their corresponding values remains constant.

Question. 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 a tree = 24 m

Then, its shadow = 15 m

With the similar condition, if a pole has a shadow of length = 6 m

Let the height of pole = x m

Since, length and shadow vary directly.

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

$15 \times x = 24 \times 6$ [by cross-multiplication]

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

$\Rightarrow x = 9.6$ m [∵ height and shadow ratio are same]

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

Solution.

False

If x and y are in direct proportion, then,

$\frac{x}{y} = k$ (constant)

e.g. Let $x = 4$ and $y = 6$

$\therefore \quad \frac{x}{y} = \frac{4}{6} = \frac{2}{3}$

Now, $x - 1 = 4 - 1 = 3$ and $y - 1 = 6 - 1 = 5$

$\therefore \quad \frac{x-1}{y-1} = \frac{3}{5}$ [not in direct proportion]

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

Solution. False

If x and y are in inverse proportion, then xy = k (constant) e.g. Let x= 2 and y = 3

.-. xy = 2 x 3= 6. Now, x + 1=2 + 1 = 3 and y+ 1 = 3 + 1 = 4

Then, (x + 1)(y+1) = 3 x 4 = 12 [not in inverse proportion]

Hence, (x+ 1)and (y + 1) cannot be in inverse proportion.

Question. 52 If p and q are in inverse proportion, i.e. pq = k (constant), then (p + 2)and (q – 2) are also in inverse proportion.

Solution. False

If p and q are in inverse proportion, then

xy = k (constant)

e.g. Let p = 3andq = 4

Then, pq = 3×4 = 12

Now, p+ 2 = 3+ 2 = 5 and q-2 = 4-2 =2

(p + 2) (q – 2) = 5 x 2 = 10 [not in inverse proportion]

Henc, (p+2) and (q -2)cannot be in inverse proportion.

Question. 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

If one angle of a triangle is kept fixed, then the measure of the remaining two angles can't vary inversely with each other.

e.g. In ΔABC, $\angle A + \angle B + \angle C = 180°$ [$\because$ sum of all angles of a triangle is $180°$]

If $\angle A = 50°$, then $\angle B + \angle C = 180° - 50° = 130°$

So, it is not depend on any proportion by applying angle sum properties of a triangle.

Question. 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

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

Above statement is correct for direct proportion. It is a basic properties of direct proportion.

Question. 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

When, two quantities are related in such a manner that if one increases and the other decreases, then they always vary inversely. Above statement is correct for inverse proportion. It is a basic properties of inverse proportion.

Question. 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, i.e. $xy = k$ (constant)

If $x = 6$ and $y = 8$

$\therefore$ $xy = 6 \times 8 = 48$

But if $x = 8$ and $y = 10$

$\therefore$ $xy = 8 \times 10 = 80$

Here, $48 \neq 80$

Hence, the value of y is not 10.

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

Solution. False

The number of workers and the time to complete a job is a case of indirect proportion, e.g. If 60 workers can complete a work in 10 days.

Then, 120 workers can complete the same work in 5 days.

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

Solution.

True

For fixed time period (T) and rate of interest (R), the simple interest is directly proportional to the principal.

We know that, $\text{SI} = \frac{P \times R \times T}{100}$

$\Rightarrow$ $\frac{\text{SI}}{P} = \frac{R \times T}{100} = \text{constant}$ (as R and T are constants)

$\therefore$ Simple interest is directly proportional to the principal.

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

Solution. True

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

Since, the quantities of crop harvested is depend upon area of cultivated land.

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 ?

Question. 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) The time taken by a train to cover a fixed distance and the speed of the train are inversely proportional. ‘

e.g. Let a train cover 100 km in 1 h with speed 100 km/h.

Then, the same train cover 100 km in 30 min with speed 200 km/h.

(ii) The distance travelled by CNG bus and the amount of CNG used are directly proportional.

e.g. Let a CNG bus can travelled 10 km in 1 kg of CNG.

Then, the same CNG bus travelled 20 km in 2 x 1 = 2 kg of CNG.

(iii) The number of people working and the time to complete a given work are inversely proportional to each other.

e.g. Let 20 workers can complete a work in 1day.

Then, 10 workers can complete the same work in 2 days.

(iv) Income tax and the income are directly proportional to each other, e.g. Let Mr X have 4.5 lakh annual income.
Then, he pay 10% income tax on his income.
But if Mr X have 5.5 lakh annual income, then he has to pay 30% income tax on his salary/income.
(v) Distance travelled by an auto rickshaw and time taken are directly proportional to each other.
e.g. Let an auto rickshaw takes 2 h to travel 10 km.
Then, it will take 4 h to travel 20 km.

Question. 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) Number of students in a hostel and consumption of food are directly proportional to each other.
e.g. Let 200 students in a hostel can consume 100 kg of rice in a month.
Then, 400 students in a hostel can consume 200 kg of rice in a month.
(ii) Area of the walls of a room and the cost of white washing the walls are directly proportional to each other.
e.g. Let ₹ 1000 required for white washing a room with (12×8) m size.
Then, ₹ 2000 required for white washing a room with (12×16) m size.
(iii) The number of people working and the quantity of work are directly proportional to each other.
e.g. Let 20 workers can complete 20% of a work. Then, 40 workers can complete 40% of the same work.
(iv) Simple interest on a given sum and the rate of interest are directly proportional to each other.
e.g. Let $P =$ ₹ 1000, $R = 10\%$ and $T = 1$ yr

$$\therefore \quad SI = \frac{P \times R \times T}{100} = \frac{1000 \times 10 \times 1}{100} = ₹\ 100$$

But if $P = 1000$, $R = 20\%$ and $T = 1$ yr

$$\therefore \quad SI = \frac{P \times R \times T}{100} = \frac{1000 \times 20 \times 1}{100} = ₹\ 200$$

(v) Compound interest on a given sum and the sum invested are neither depend directly nor inversely.

Question. 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) The quantity of rice and its cost are directly proportional to each other, e.g. Let 1 kg of rice price = Rs 40
Then, 2 kg of rice price = Rs 2 x 40 = Rs 80
(ii) The height of a tree and the number of years are neither directly nor inversely proportional to each other.
(iii) Increase in cost and number of shirts that can be purchased, if the budget remains the same are inversely proportional to each other, e.g. Let 2 shirts price = Rs 800 After increasing in price of each shirt,
1 shirt price became Rs 800
where budget = Rs 800

(iv) Area of land and its cost are directly proportional to each other.

e.g. Let 200 m^2 land cost = ₹ 5000

Then. 400 m^2 land cost = ₹ 10000

(v) Sales tax and the amount of the bill are directly proportional to each other.

e.g. Let bill amount = ₹ 1000

Sales tax = 10%

Then, sales tax = $\frac{10}{100} \times 1000 =$ ₹ 100

But if, bill amount = 2000

Sales tax = 10%

Then, sales tax = $\frac{10}{100} \times 2000 = 10 \times 20 =$ ₹ 200

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

Solution.

If x varies inversely as y.

$\therefore \quad xy = k$ (constant) ...(i)

If $\quad x = 20$ and $y = 600$

$\therefore \quad xy = 20 \times 600 = 12000$

$\Rightarrow \quad k = 12000$

When $x = 400$, then from Eq. (i),

$y \times 400 = k$

$\Rightarrow \quad y \times 400 = 12000$ [putting the value of k]

$\Rightarrow \quad y = \frac{12000}{400} = 30$

Question. 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.

$\therefore \quad x/y = k$ (constant) ...(i)

If $\quad x = 80$ and $y = 160$

$\therefore \quad \frac{x}{y} = \frac{80}{160} = \frac{1}{2} \Rightarrow k = \frac{1}{2}$

When $x = 64$, then from Eq. (i),

$\frac{64}{y} = \frac{1}{2}$ [putting the value of k]

$\Rightarrow \quad y = 64 \times 2 = 128$

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

Solution.

If l varies directly as m.

$\therefore \quad l/m = k =$ (constant)

If $\quad l = 5$ and $m = \frac{2}{3}$

$$\therefore \quad \frac{l}{m} = \frac{5}{2/3}$$

$$= \frac{5}{1} \times \frac{3}{2} = \frac{15}{2}$$

$$\Rightarrow \quad k = \frac{15}{2}$$

When $m = \frac{16}{3}$, then from Eq. (i),

$$\frac{l}{16/3} = \frac{15}{2} \quad \text{[putting the value of } k\text{]}$$

$$\Rightarrow \quad l = \frac{15}{2} \times \frac{16}{3} = 40$$

Question. 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.

$$\therefore \quad xy = k \text{ (constant)} \quad \text{...(i)}$$

If $\quad x = 1.5$ and $y = 60$

$$\therefore \quad xy = 1.5 \times 60 = 90$$

$$\Rightarrow \quad k = 90$$

When $y = 4.5$, then from Eq. (i),

$$4.5 \times y = k$$

$$\Rightarrow \quad 4.5 \times y = 90 \quad \text{[putting the value of } k\text{]}$$

$$\Rightarrow \quad y = \frac{90}{4.5} = 20$$

Question. 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.

$\because$ For 300 persons flour is enough for 42 days.

$\therefore$ For 1 person flour enough $= 300 \times 42 = 12600$ days

Now, 20 more persons join the camp.

So, total persons $= 300 + 20 = 320$

$\therefore$ For 320 persons flour enough $= \frac{12600}{320} = \frac{3}{8}$ days

Question. 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.

$\because$ In 9 months, a part of stadium can complete by 560 persons.

$\therefore$ In 1 month, the work can be complete by $9 \times 560 = 5040$ persons

$\because$ In 5 months, the work can be complete by $\frac{5040}{5} = 1008$ persons

Now, number of extra persons required to complete the work in 5 months

$= 1008 - 560 = 448$

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

Solution.

Sobi can types 108 words in 6 min.

In 1 min, she can type $= \frac{108}{6} = 18$ words

Thus, in 30 min, she can type $= 18 \times 30 = 540$ words

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

In 1 min, the same distance can be cover with speed $= \frac{60 \times 1000 \times 40}{60} = 40000$ m/min

In 25 min, the same distance can be cover with speed $= \frac{40000}{25} = 1600$ m/min

$$= \frac{1600}{1000} \times 60 = 16 \times 6 = 96 \text{ km/h} \qquad \left[\because 1\text{m} = \frac{1}{1000}\text{ km and } 1\text{min} = \frac{1}{60}\text{ h}\right]$$

Question. 71 It is.given that l varies directly as m.
(a) Write an equation which relates l and m.
(b) Find the constant of proportion (k), when l is 6, then m is 18.
(c) Find l, when m is 33.
(d) Find m, when l is 8.
Solution.

Since, l varies 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

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

$$\Rightarrow \quad \frac{l}{33} = \frac{1}{3} \Rightarrow l = \frac{33}{3} = 11$$

(d) If $l = 8$

$$\therefore \quad \frac{l}{m} = k \Rightarrow \frac{8}{m} = \frac{1}{3} \qquad \left[\because k = \frac{1}{3}\right]$$

$$\Rightarrow \quad m = 8 \times 3 = 24$$

Question. 72 If a deposit of Rs 2000 earns an interest of Rs 500 in 3 years, how much interest would a deposit of Rs 36000 earn in 3 years with the same rate of simple interest?
Solution.

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

Then, a deposit of ₹1000 earns in 3 yr with an interest $= \frac{500}{2} =$ ₹250

Similarly, deposit of ₹ 3600 i.e. ₹36×1000 earns in 3 yr with an interest $= 250 \times 36 =$ ₹ 9000

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

According to the question, the mass (m) of an aluminium rod varies directly with its length (l). Here, we use the direct proportion.

In direct proportion, $\frac{m}{l} = k$ (constant)

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

$$\Rightarrow \quad k = 12$$

If mass of the rod = 105 g

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

$$\Rightarrow \quad \frac{105}{l} = 12$$

$$\Rightarrow \quad l = \frac{105}{12} = 8.75 \text{ cm}$$

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

(a) 12 x 8 (b) 305 y

Solution.

In an inverse proportion,

When we multiply the first quantity by any constant k, then the another quantity is divided by the same constant k.

Given,

a	12	x	8
b	30	5	y

Here, we see that in part, (b) when we divide 30 by 6, we will get 5.

So in part (a), we will get the value of x,

i.e. $$x = 12 \times 6 = 72$$

Similarly, in part (a), when we divide x i.e. 72 by 9, we will get 8.

So in part (b), we will get the value of y.

i.e. $$y = 5 \times 9 = 45$$

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

Solution.

$\because$ Naresh walks 250 steps to cover distance $= 200$ m

$\therefore$ In 1 step, he covers the distance $= \frac{200}{250}$ m

$\because$ In 350 steps, he covers $= \frac{200}{250} \times 350 = \frac{20 \times 350}{25}$

$$= \frac{7000}{25} = 280 \text{ m}$$

Question. 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.

A car travels 225 km distance in 25 L of petrol.

$\because$ For 1 km, petrol required $= \frac{25}{225}$ L

$\therefore$ For 540 km, the petrol required $= \frac{25}{225} \times 540 = 60$ L

Question. 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.

In direct proportion, $\frac{x}{y} = k$ (constant)

For table (a),

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

$\Rightarrow \quad \frac{x}{y} = \frac{3}{12}, \frac{6}{24}, \frac{15}{45}, \frac{20}{60}, \frac{30}{120}$

i.e. $\quad \frac{1}{4}, \frac{1}{4}, \frac{1}{3}, \frac{1}{3}, \frac{1}{4}$

So, (a) is not in direct proportion.

For table (b),

x	4	7	10	16
y	24	42	60	96

$\Rightarrow \quad \frac{x}{y} = \frac{4}{24}, \frac{7}{42}, \frac{10}{60}, \frac{16}{96}$

i.e. $\quad \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}$

So, (b) is in direct proportion.

For table (c),

x	1	4	9	20
y	1.5	6	13.5	30

$\Rightarrow \quad \frac{x}{y} = \frac{1}{1.5}, \frac{4}{6}, \frac{9}{13.5}, \frac{20}{30}$

i.e. $\quad \frac{1}{1.5}, \frac{1}{1.5}, \frac{1}{1.5}, \frac{1}{1.5}$

So, (c) is in direct proportion.

Question. 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.

(a)

a	6	8	q	25
b	18	p	39	r

(b)

a	2	y	6	10
b	x	12.5	15	z

(c)

a	l	9	n	6
b	5	m	25	10

Solution.

It a and b are vary inversely to each other.

i.e. $ab = k$ (constant)

For table (a),

a	6	8	q	25
b	18	p	39	r

If $a = 6$ and $b = 18$

Then; $a \times b = 6 \times 18 = 108$

$\Rightarrow$ $k = 108$

When $a = 8$ and $b = p$, then

$$ab = k$$

$\Rightarrow$ $8 \times p = 108$ [putting the value of k]

$\Rightarrow$ $p = \dfrac{27}{2}$

When $a = q$ and $b = 39$, then

$$ab = k$$

$\therefore$ $q \times 39 = 108$ [putting the value of k]

$\Rightarrow$ $q = \dfrac{108}{39} = \dfrac{36}{13}$

When $a = 25$ and $b = r$, then

$$ab = k$$

$\Rightarrow$ $25 \times r = 108$ [putting the value of k]

$\Rightarrow$ $r = \dfrac{108}{25}$

For table (b),

a	2	y	6	10
b	x	12.5	15	z

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

$$a \times b = 6 \times 15 = 90$$

$\Rightarrow$ $k = 90$

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

$$ab = k$$

$\Rightarrow$ $2 \times x = 90$ [putting the value of k]

$\Rightarrow$ $x = 45$

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

$$ab = k$$

$\Rightarrow$ $y \times 12.5 = 90$ [putting the value of x]

$\Rightarrow$ $y = \dfrac{90}{12.5} = 7.2$

When $a = 10$ and $y = z$, then

$$ab = k$$

$\Rightarrow$ $10 \times z = 90$ [putting the value of x]

$\Rightarrow$ $z = 9$

For table (c),

a	l	9	n	6
b	5	m	25	10

If $a = 6$ and $b = 10$, then

$$ab = 6 \times 10 = 60$$

$\Rightarrow$ $k = 60$

When $a = l$ and $b = 5$, then

$$ab = k$$

$\Rightarrow$ $l \times 5 = 60$ [putting the value of k]

$\Rightarrow$ $l = 12$

When $a = 9$ and $b = m$, then

$$ab = k$$

$\Rightarrow$ $9 \times m = 60$ [putting the value of k]

$\Rightarrow$ $m = \frac{20}{3}$

When $a = n$ and $b = 25$, then

$$ab = k$$

$\Rightarrow$ $n \times 25 = 60$ [putting the value of k]

$\Rightarrow$ $n = \frac{60}{25}$

$\Rightarrow$ $n = \frac{12}{5}$

Question. 79 If 25 metres of cloth costs Rs 337.50, then
(a) what will be the cost of 40 metres of the same type of cloth? (b) what will be the length of the cloth bought for Rs 810?
Solution.

According to the question,

$\because$ 25 m of cloth cost = ₹ 337.50

$\therefore$ 1 m of cloth cost = ₹$\frac{337.50}{25}$

(a) Cost of 40 m of the same type of cloth $= \frac{337.50}{25} \times 40 = \frac{13500}{25} =$ ₹ 540

(b) The length of cloth bought for ₹ 810 $= \frac{810 \times 25}{337.50} = \frac{20250}{337.50} = 60$ cm

Question. 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.

A swimming pool can be filled in 4 hours by 8 pumps.

If we want to fill the swimming pool in 1 h, we required $4 \times 8 = 32$ pumps

In $2\frac{2}{3}$ i.e. $\frac{8}{3}$ h, the number of pumps required $= 32 \div \frac{8}{3} = \frac{32 \times 3}{8} = 4 \times 3 = 12$ pumps

Question. 81 The cost of 27 kg of iron is ? 1080, what will be the cost of 120 kg of iron of the same quality?
Solution.

$\because$ The cost of 27 kg of iron = ₹ 1080

$\therefore$ Cost of 1 kg of iron $= \frac{1080}{27} =$ ₹40

$\therefore$ The cost of 120 kg = 40 ´20 = ₹ 4800

Hence, the cost of 120 kg of iron is ₹ 4800.

Question. 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.

$\because$ Length of Qutub Minar = 72 m

and its shadow at particular time = 80 m

Length of shadow of electric pole = 1000 cm = 10m $\left[\because 1 \text{ cm} = \frac{1}{100} \text{ m}\right]$

$\therefore$ Length of electric pole = $\frac{72}{80} \times 10 = 9$ m

Question. 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?

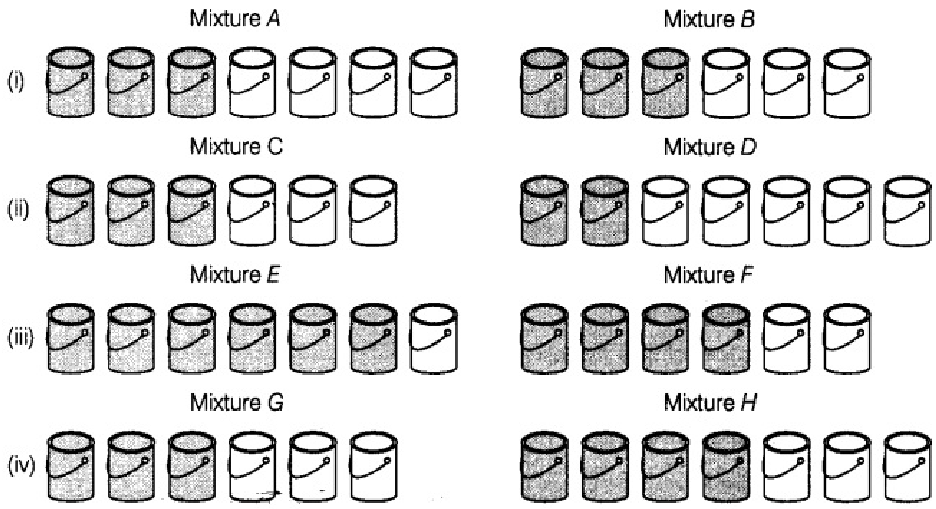
Solution.

In a hostel of 50 girls, food are available = 40 days

For 1 girl, food provisions = $50 \times 40 = 2000$ days

Now, for (50 + 30) girls i.e 80 girls, the food provision = $\frac{2000}{80} = \frac{200}{8} = 25$ days

Question. 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 lightest blue shade?

Solution.

(i) In mixture A,

The number of blue containers = 3

The number of white containers = 4

$\therefore$ Ratio of blue and white $= \frac{3}{4} = 0.75$

In mixture B,

The number of blue containers = 3

The number of white containers = 3

$\therefore$ Ratio of blue and white $= \frac{3}{3} = 1$

Clearly, mixture A would be lighter shade.

(ii) In mixture C,

The number of blue containers = 3

The number of white containers = 3

$\therefore$ Ratio of blue and white $= \frac{3}{3} = 1$

In mixture D,

The number of blue containers = 2

The number of white containers = 5

$\therefore$ Ratio of blue and white $= \frac{2}{5} = 0.4$

Clearly, mixture D would be lighter shade, since for lighter shade white container should be more than blue container.

(iii) In mixture E,

The number of blue containers = 6

The number of white containers = 1

$\therefore$ Ratio of blue and white $= \frac{6}{1} = 6$

In mixture F,

The number of blue containers = 4

The number of white containers 2

$\therefore$ Ratio of blue and white $= \frac{4}{2} = 2$

Clearly, mixture F would be lighter shade, since for lighter shade white container should be equal or more than or nearest number of blue container.

(iv) In mixture G,

The number of blue containers = 3

The number of white containers = 3

$\therefore$ Ratio of blue and white $= \frac{3}{3} = 1$

In mixture H,

The number of blue containers = 4

The number of white containers = 3

$\therefore$ Ratio of blue and white $= \frac{4}{3} = 1.33$

Clearly, mixture G would be lighter shade, since for lighter shade white container should be more than blue container.

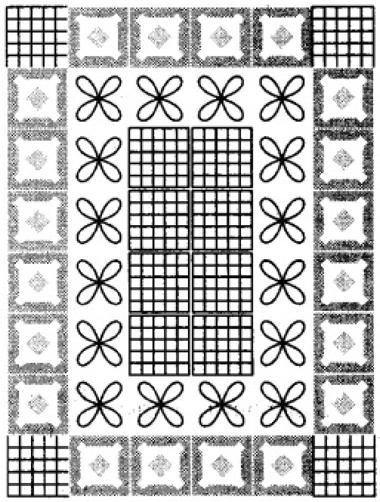
From the above all mixtures, mixture D is lightest among them.

$\therefore$ The total number of containers required for painting = 105

$\therefore$ Number of blue containers required for painting $= \frac{2}{7} \times 105 = 2 \times 15 = 30$

$\therefore$ Number of white containers required for painting $= \frac{5}{7} \times 105 = 5 \times 15 = 75$

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



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

Solution.

On the basis of given figure in which white, blue and purple squaes are given.

$\therefore$ Purple = 12, Blue = 20 and White = 16

Total squares = 12 + 20 + 16 = 48

Statement I Purple : Total = 12 : 48 = 1 : 4

Statement II Blue : Total = 20 : 48 = 5 : 12

Statement III White : Total = 16 : 48 = 1 : 3

Statement IV Purple : Blue = 12 : 20 = 3 : 5

Statement V Purple : White = 12 : 16 = 3 : 4

Question. 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. The total number of children = 10

If each children received 4 sweets, then The total number of sweets = 10 x 4 = 40 sweets

If 40 sweets distributed between 8 children, then each get 40/8 i.e. 5 sweets.

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

Solution.

44 cows can graze a field = 9 days

The number of cows that can graze the same field in 1 day = 44×9 cows

In 12 days, the number of cows required $= \frac{44 \times 9}{12} = \frac{44 \times 3}{4} = 11 \times 3 = 33$ cows

Hence, (44 – 33) i.e. 11 cows less required for graze the same field in 12 days.

Question. 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.

$\because$ 30 persons can reap a field in 17 days.

1 person can reap the same field in 30×17 i.e. 510 days.

In 10 days, the number of persons required $= \frac{510}{10} = 51$ persons

Question. 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.

Shabnam's speed $= 6\,\text{km/h} = \frac{6 \times 1000}{60}$ m/min

$\therefore$ Total distance covered by Shabnam in 20 min $= \frac{6 \times 1000}{60} \times 20$

[$\because$ distance = speed $\times$ time]

$$= \frac{1000}{10} \times 20 = 100 \times 20$$

$$= 2000\,\text{m}$$

If she want to reach the school in 24 min, then she should maintain the speed $= \frac{2000}{24}$

$$= \frac{1000}{12} = \frac{500}{6}\ \text{m/min}$$

$$= \frac{500 \times 60}{1000 \times 6} = 5\,\text{km/h} \qquad \left[\because 1\text{km}\ \frac{1}{1000} \text{ and } 1 \text{ h} = 60 \text{ min}\right]$$

Question. 90 Ravi starts for his school at 8 : 20 am 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

Let the time taken by Ravi to reach the school at sharp time $= t$ min

If the speed of the bicycle is 10 km/h, then he reach his school late by 8 min.

$$\therefore \quad \frac{x}{10} = t + \frac{8}{60} \qquad \left[\because 1\text{min} = \frac{1}{60}\text{h}\right] \ldots\text{(i)}$$

$$\Rightarrow \quad \frac{x}{10} = t + \frac{2}{15}$$

If the speed of the bicycle is 16 km/h, then he reach his school 10 min early.

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

$$\Rightarrow \quad \frac{x}{16} = t - \frac{1}{6} \qquad \ldots\text{(ii)}$$

On solving Eqs. (i) and (ii), we get

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

$$\Rightarrow \quad \frac{8x - 5x}{80} = \frac{4+5}{30}$$

$$\Rightarrow \quad \frac{3x}{80} = \frac{9}{30}$$

$$\Rightarrow \quad x = \frac{9 \times 80}{30 \times 3} = 8\,\text{km} \qquad \text{[by cross-multiplication]}$$

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

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

$$\Rightarrow \quad t = \frac{8}{10} - \frac{2}{15} = \frac{24-4}{30}$$

$$\Rightarrow \quad t = \frac{20}{30} = \frac{2}{3}\,\text{h}$$

$$= \frac{2}{3} \times 60 = 40\,\text{min} \qquad [\because 1\text{h}=60 \text{ min}]$$

Hence, starting time of school is 8 : 20 + 40 min i.e. 9 : 00 am.

Question. 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.	$\frac{x}{y}$ = 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 = 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
x and y vary inversely to each other	xy = constant
Mathematical representation of inverse variation of quantities p and q	$p \propto \frac{1}{q}$
Mathematical representation of direct variation of quantities m and n	$m \propto n$
When $x=5$, $y=2.5$ and when $y=5$, $x=10$	x and y are directly proportional $\left[\because \frac{5}{2.5}=2 \text{ and } \frac{10}{5}=2\right]$
When $x=10$, $y=5$ and when $x=20$, $y=2.5$	x and y vary inversely $[\because 10\times5=50 \text{ and } 20\times2.5=50]$
x and y vary directly with each other	$\frac{x}{y}$ = constant
If x and y vary inversely, then on decreasing x	y will increase in proportion
If x and y vary directly, then on decreasing x	y will decrease in proportion

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

Solution.

In 20 g of sauted fish, protein is 75g

$\therefore$ In 1 g of souted fish, protein is $\frac{20}{75}$g

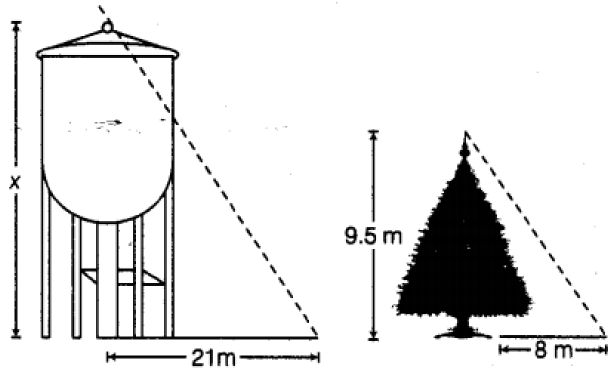
In 225 g of sauted fish, protein $= \frac{20}{75} \times 225 = 20 \times 3 = 60$ g

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

Solution. The distance between Jhareda to Ganwari in the map = 3.5 cm Given scale, 1 cm = 10 km

So, actual distance between the villages = 35 x 10 = 35 km

Question. 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 length of the shadows are directly proportional to their heights. Find the height of the tank.



Solution.

The height of the tree = 9.5 m

The shadow of the tree = 8 m

According to the given condition in the question, the lenghts of the shadows are in direct proportion.

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

$\Rightarrow \quad x = \frac{21 \times 9.5}{8} = \frac{199.5}{8} = 24.9375 \approx 24.9 \text{ m}$

Hence, height of the water tank is 24.9 m.

Question. 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 elevators B and C separately in 140 sec? Who travelled more and by how much?

Solution.

On the basis of given table,

Elevator *A* takes 29 s to cover 435 m.

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

Elevator *B* takes 28 s to cover 448 m.

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

Elevator *C* takes 10 s to cover 130 m.

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

Elevator *D* takes 5 s to cover 85 m.

$\therefore$ Distance covered by elevator *D* in 1 s $= \frac{85}{5} = 17 \text{ m}$

Hence, in 1s, elevator *D* covers more distance as compare to elevators *A*, *B* and *C*. So, elevator *D* is fastest, while elevator *C* covers least. Hence, elevator *C* is slowest.

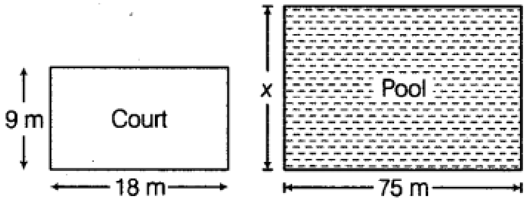
Now, elevator *B* covers distance in 140 s $= 140 \times 16 = 2240 \text{ m}$ [$\because$ distance = speed $\times$ time]

Elevator *C* covers distance in 140s $= 140 \times 13 = 1820 \text{ m}$

$\therefore$ Elevator *B* covers more distance than $C = 2240 - 1820$

$= 420 \text{ m}$

Question. 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.

From the given figures,

Length of volleyball court = 18 m

Breadth of volleyball court = 9 m

Length of pool = 75 m

Let the width of swimming pool = x m

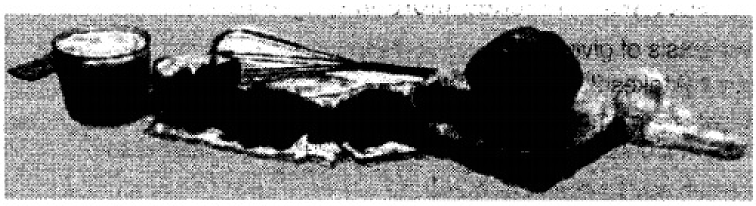
According to the question, the size of volleyball court and swimming pool are in direct proportion to each other.

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

$\Rightarrow \qquad x = \frac{75 \times 9}{18} = \frac{75}{2} = 37.5\,\text{m}$ [by cross-multiplication]

Hence, the width of the swimming pool is 37.5 m.

Question. 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.

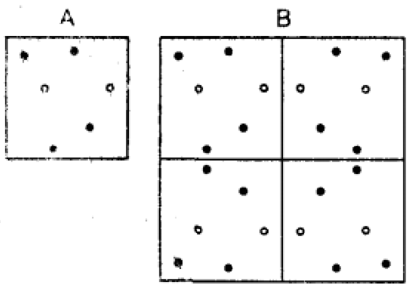
A particular type of muffins requires 1 cup of milk and 1.5 cups of chocolates.

Riya has 7.5 cups of chocolates.

The number of cups of milk required for 7.5 cups of chocolates $= \frac{7.5}{1.5} = 5$ cups

[since, number of cups of milk and chocolates are indirect proportion]

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



Solution.

The number of red dots in pattern $A(\bullet) = 4$

The number of blue dots in pattern $A(\circ) = 2$

Pattern B consists of four tiles like pattern A i.e.

Pattern $A \times 4$ = Pattern B

$\therefore$Proportion in pattern $= \frac{2}{6} = \frac{1}{3}$ [$\because$ total number of dots = 4 + 2 = 6]

Now, proportion of blue dots and red dots in pattern $B = \frac{8}{32} = \frac{1}{4}$

Question. 99 A Fowler throws a cricket ball at a speed of 120 km/h. How long does this ball take to travel distance of 20 m to each the batsman?

Solution.

The speed of the cricket ball = 120 km/h

$= \frac{120 \times 1000}{60}$ m/min [$\because$ 1 km = 1000 m and 1 h = 60 min]

$= 2 \times 1000$

$= 2000$ m/min

Now, speed in m/s $= \frac{2000}{60} = \frac{200}{6} = \frac{100}{3}$ m/s [$\because$ 1 min = 60 s]

So, 20 m can be cover in $\frac{20}{\frac{100}{3}} = \frac{60}{100} = 0.6$ s $\left[\because \text{time} = \frac{\text{distance}}{\text{speed}}\right]$

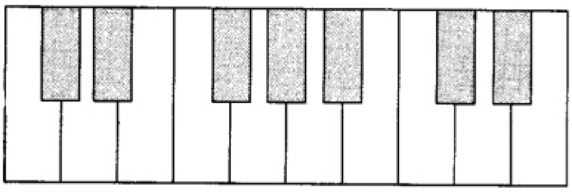
Question. 100 The variable x is inversely proportional to y. If x increases by p%, then by what per cent will y decwsose?

Solution. The variable x is inversely proportional to y. xy = k (constant)

Since, we know that two quantities x and y are said to be in inverse proportion, if an increase in * cause a proportional decrease in y and vice-versa.So, we can say y decrease by p%.

Question. 101 Here is a keyboard 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.

According to the given figure,

(a) The total number of black keys = 7

The total number of white keys = 10

Hence, the ratio of white keys to black keys on the keyboard = $\frac{10}{7}$

(b) The total number of all keys = 10 + 7 = 17

The ratio of black keys to all keys on the given keyboard = $\frac{7}{17}$

(c) Black keys in 1 keyboard = 7

Black keys in 14 such keyboards = $14 \times 7 = 98$ keys

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

Litres of gas	1	0.5	2	2.5	3	5
Distance (in 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 earns 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 x 15 = 120 km

Question. 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 tablespoon salt
Solution.

After used of most of sugar syrup for her breakfast, the remaining sugar is $\frac{1}{6}$ cup of sugar syrup. Thus, its means $1-\frac{1}{6}=\frac{5}{6}$ has been used. She need $\frac{1}{3}$ cup of sugar syrup for one piece of bread. So, new quantity of ingredient will be in proportion of $\frac{1}{2}$.

Now, the bread recipe will be look like
$\frac{1}{2}$ cup quick cooking oats 1 cup bread flour
$\frac{1}{6}$ cup sugar syrup $\frac{1}{2}$ tablespoon cooking oil
$\frac{2}{3}$ cup water $\frac{3}{2}$ tablespoons yeast
$\frac{1}{2}$ tablespoon salt

Question. 104 Many schools have a recommended students-teachers ratio as 35:1. Next year, school expects an increase in enrollment by 280 students. How many new teachers will they to appoint to maintain the students-teachers ratio?
Solution.
Students-teachers ratio = 35 : 1
It show every 35 students-one teacher should available in the school.
In the school, number of students increases = 280 students
The number of teachers required for 280 students $=\frac{280}{35}=8$ teachers

Question. 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 per hour is same as travelling 80 km per hour.
So, 1 km covers distance in 1 h to $\frac{50}{80}$ miles.
To cover a distance of 200 km $=\frac{50}{80}\times 200=\frac{5\times 200}{8}=125$ miles
Hence, 125 miles Kusum has to go for 200 km.

Question. 106 The student 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 2000? If so, how many posters would they need to sell? If not, why?

Solution.

(a) Every 60 posters, Anju's class students raise = ₹ 250

So, from 1 poster, Anju's class students raise

$$= \frac{250}{60} = ₹\frac{25}{6}$$

If Anju's sell 102 posters, then they raise

$$= \frac{25}{6} \times 102$$

$$= 17 \times 25$$

$$= ₹\ 425$$

Hence, Anju's class make ₹ 425 for selling of 102 posters.

(b) Since, by selling 1 poster, Anju's class raise = ₹ $\frac{25}{6}$

For raise exactly ₹ 2000, they needs to sell

$$= 2000 \div \frac{25}{6}$$

$$= 2000 \times \frac{6}{25}$$

$$= 480 \text{ posters}$$