12. Direct and Inverse Proportions

Exercise 12A

1. Question

Answer

Checking the $\frac{x}{y}$ ratio here

(i) $\frac{3}{9} = \frac{1}{3}, \frac{5}{15} = \frac{1}{3}, \frac{8}{24} = \frac{1}{3}, \frac{11}{33} = \frac{1}{3}, \frac{26}{78} = \frac{1}{3}$; all are equal

(ii) $\frac{2.5}{10} = \frac{1}{4}, \frac{4}{16} = \frac{1}{4}, \frac{7.5}{30} = \frac{1}{4}, \frac{10}{40} = \frac{1}{4}, \frac{14}{42} = \frac{1}{3}$; unequal

(iii) $\frac{5}{15} = \frac{1}{3}, \frac{7}{21} = \frac{1}{3}, \frac{9}{27} = \frac{1}{3}, \frac{15}{60} = \frac{1}{4}, \frac{18}{72} = \frac{1}{4}, \frac{25}{75} = \frac{1}{3}$; unequal

2. Question

Answer

We use the relation $\frac{x}{y} = \frac{X}{Y}$ Here $x_1 = 5$, $y_1 = 210$ and $x_2 = 2$

Here, $\frac{3}{72} = \frac{x_1}{120}$

$\Rightarrow x_1 \times 72 = 3 \times 120$

$\Rightarrow x_1 = \frac{3 \times 120}{72} = 5$

Now, $\frac{3}{72} = \frac{x_2}{192}$

$\Rightarrow x_2 \times 72 = 3 \times 192$

$\Rightarrow x_2 = \frac{3 \times 192}{72} = 8$

And $\frac{3}{72} = \frac{10}{y_2}$

$\Rightarrow y_2 \times 3 = 10 \times 72$

$\Rightarrow y_2 = \frac{10 \times 72}{3} = 240$

3. Question

Answer

Distance covered by truck increases, diesel required also increases. So it is a direct proportion.

Let required distance be x km, $\frac{510}{34} = \frac{x}{20}$

$\Rightarrow 34 \times x = 510 \times 20$

$\Rightarrow x = \frac{510 \times 20}{34} = 300$ km

4. Question

Answer

Fare increases as the distance of the journey increases. So it is a direct proportion.

Let required fare be Rs x, $\frac{2550}{150} = \frac{x}{124}$

$\Rightarrow 50 \times x = 2550 \times 124$

$\Rightarrow x = \frac{2550 \times 124}{150} =$ Rs. 2108

5. Question

Answer

At the same speed, more the distance travelled more will be the time taken. So it is a direct proportion.

Let required distance be x km, but unit of time is different so we will write 25 min $= \frac{25}{60} hr$

$\frac{16}{\frac{25}{60}} = \frac{x}{5}$

$\Rightarrow \frac{25}{60} \times x = 16 \times 5$

$\Rightarrow x = \frac{80 \times 60}{25} = 192$ km

6. Question

Answer

More the dolls, more will be the cost. So it is a direct proportion.

Let no. of dolls be x, $\frac{18}{630} = \frac{x}{455}$

$\Rightarrow 630 \times x = 18 \times 455$

$\Rightarrow x = \frac{18 \times 455}{630} = 13$

7. Question

Answer

More the amount of sugar, more will be the cost. So it is a direct proportion.

Let the amount of sugar be x kg, $\frac{9}{238.50} = \frac{x}{371}$

$\Rightarrow 238.50 \times x = 9 \times 371$

$\Rightarrow x = \frac{9 \times 371}{238.50} = 14kg$

8. Question

Answer

More the length of cloth, more will be the cost. So it is a direct proportion.

Let the length of cloth be x metres $\frac{15}{981} = \frac{x}{1308}$

$\Rightarrow 981 \times x = 15 \times 1308$

$\Rightarrow x = \frac{15 \times 1308}{981} = 20$ meters

9. Question

Answer

The length and the height of ship and model should be proportional.

Height of mast of actual ship = 15 m

Height of model ship = 9 m

Length of ship = 35 m

Length of model = x

So,

$$\frac{Height\ of\ ship}{Length\ of\ ship} = \frac{Height\ of\ model}{Length\ of\ model}$$

15/35 = 9/x

Cross multiplying, we get,

x = (9 × 35)/15x = 21 m

Length of model of the ship is 21 m.

10. Question

Answer

More the no. of days, more will be the dust picked by the earth. So it is a direct proportion.

Let the amount of dust be x kg, $\frac{6.4 \times 10^7}{8} = \frac{x}{15}$

$\Rightarrow 8 \times x = 15 \times 6.4 \times 10^7$

$\Rightarrow x = \frac{15 \times 6.4 \times 10^7}{8} = 12 \times 10^7$ kg $= 1.2 \times 10^8$ kg

11. Question

Answer

Average Speed = $\frac{Total\ Distance}{Total\ Time}$

Let distance be x km, time = $(1 + \frac{12}{60})$ hr = $(1 + \frac{1}{5})$hr = $\frac{6}{5}$ hr

$\Rightarrow$ 50km/hr = $\frac{x}{\frac{6}{5}}$

$\Rightarrow$ x = 50 $\times \frac{6}{5}$ = 60 km

12. Question

Answer

Uniform Speed = $\frac{Total\ Distance}{Total\ Time}$

Let distance be x km, time = $(2 + \frac{24}{60})\ hr = (2 + \frac{2}{5})hr = \frac{12}{5}\ hr$

$\Rightarrow$ 5km/hr = $\frac{x}{\frac{12}{5}}$

$\Rightarrow$ x = 5 $\times \frac{12}{5}$ = 12 km

13. Question

Answer

More the no. of cardboards, more will be the thickness. So it is a direct proportion.

Let the thickness be x mm, $\frac{65}{12} = \frac{x}{312}$

$\Rightarrow$ 12 $\times$ x = 65 $\times$ 312

$\Rightarrow$ x = $\frac{65 \times 312}{12}$ = 1690 mm = 1m 690mm = 1m 69 cm

14. Question

Answer

More the length of the trench, more will be the no. of men required to finish it in a day. So it is a direct proportion.

$6\frac{3}{4}$ m = $\frac{27}{4}$ m

Let the no. of men be x, $\frac{11}{\frac{27}{4}} = \frac{x}{27}$

$\Rightarrow \frac{27}{4} \times x = 27 \times 11$

$\Rightarrow x = \frac{27 \times 11 \times 4}{27}$ = 44 men

15. Question

Answer

More the time, more will be the no. of words typed. So it is a direct proportion.

Half an hour = 30 minutes

Let the no. of words be x, $\frac{540}{30} = \frac{x}{8}$

$\Rightarrow 30 \times x = 540 \times 8$

$\Rightarrow x = \frac{540 \times 8}{30}$ = 144 words

Exercise 12B

1. Question

Answer

Here we check the values of x × y

(i) 6 × 9 = 54, 10 × 15 = 150, 14 × 21 = 294, 16 × 24 = 384 ; unequal

(i) 5 × 18 = 90, 9 × 10 = 90, 15 × 6 = 90, 3 × 30 = 90,45 × 2 = 90; equal

(i) 9 × 4 = 36, 3 × 12 = 36, 6 × 6 = 36, 6 × 9 = 54, 36 × 1 = 36 ;unequal

2. Question

Answer

$8 \times y_1 = 16 \times 5$

$\Rightarrow y_1 = 10$

$x_1 \times 4 = 16 \times 5$

$\Rightarrow x_1 = 20$

$x_2 \times 2 = 16 \times 5$

$\Rightarrow x_2 = 40$

$80\ y_2 = 16 \times 5$

$\Rightarrow y_2 = 1$

3. Question

Answer

More the number of men, lesser the days required. So, it is an inverse proportion.

Let the required no. of days be x.

$\Rightarrow 35 \times 8 = 20 \times x$

$\Rightarrow x = \frac{35 \times 8}{20} = 14$ days

4. Question

Answer

More the number of men, lesser the days required. So, it is an inverse proportion.

Let the required no. of men be x.

$\Rightarrow 12 \times 8 = 6 \times x$

$\Rightarrow x = \frac{12 \times 8}{6} = 16$ men

5. Question

Answer

More the number of cows, lesser the days required to graze a field. So, it is an inverse proportion.

Let the required no. of days be x.

$\Rightarrow 6 \times 28 = 14 \times x$

$\Rightarrow x = \frac{6 \times 28}{14} = 12$ days

6. Question

Answer

More the speed of car, lesser the time required. So, it is an inverse proportion.

Let the required time be x hours.

$\Rightarrow 5 \times 60 = 75 \times x$

$\Rightarrow x = \frac{5 \times 60}{75} = 4$ hours

7. Question

Answer

More the number of machines, lesser the days required to produce a given number of articles. So, it is an inverse proportion.

Let the required no. of machines be x.

$\Rightarrow 42 \times 56 = 48 \times x$

$\Rightarrow x = \frac{42 \times 56}{48} = 49$ machines

8. Question

Answer

More the number of taps, lesser the time required to fill a tank. So, it is an inverse proportion.

Let the required time be x minutes.

$\Rightarrow 7 \times (60 + 36) = 8 \times x$

$\Rightarrow x = \frac{7 \times 96}{8} = 84$ minutes = 1 hour 24 minutes

9. Question

Answer

More the number of taps, lesser the time required to fill a tank. So, it is an inverse proportion.

Let the required time be x minutes.

$\Rightarrow 8 \times 27 = 6 \times x$

$\Rightarrow x = \frac{8 \times 27}{6} = 36$ minutes

10. Question

Answer

More the number of animals, lesser the days to feed them by given food. So, it is an inverse proportion.

Let the required days be x.

$\Rightarrow 28 \times 9 = 36 \times x$

$\Rightarrow x = \frac{28 \times 9}{36} = 7$ days

11. Question

Answer

More the number of men, lesser the days to feed them by given food. So, it is an inverse proportion.

Let the required days be x.

$\Rightarrow 900 \times 42 = 1400 \times x$

$\Rightarrow x = \frac{900 \times 42}{1400} = 27$ days

12. Question

Answer

More the number of men, lesser the days to feed them by given food. So, it is an inverse proportion.

Let the required days be x.

$\Rightarrow 75 \times 24 = 60 \times x$

$\Rightarrow x = \frac{75 \times 24}{60} = 30$ days

13. Question

Answer

Lesser the number of periods in a day, more the duration of them. So, it is an inverse proportion.

Let the required duration be x.

$\Rightarrow 9 \times 40 = 8 \times x$

$\Rightarrow x = \frac{9 \times 40}{8} = 45$ days

14. Question

Answer

$\Rightarrow 15 \times 6 = 9 \times y$

$\Rightarrow y = \frac{15 \times 6}{9} = 10$

15. Question

Answer

$\Rightarrow 18 \times 8 = x \times 16$

$\Rightarrow x = \frac{18 \times 8}{16} = 9$

Exercise 12C

1. Question

Answer

More the amount of pulses, more will be the cost. So it is a direct proportion.

Let the cost be x, $\frac{882}{14} = \frac{x}{22}$

$\Rightarrow x = \frac{882 \times 22}{14} =$ Rs 1386

2. Question

Answer

More the amount of oranges, more will be the cost. So it is a direct proportion.

Let the amount be x, $\frac{8}{52} = \frac{x}{169}$

$\Rightarrow x = \frac{8 \times 169}{52} =$ Rs 26

3. Question

Answer

More the no of bottles, more will be the time. So it is a direct proportion.

Let the bottles be x, $\frac{420}{3} = \frac{x}{5}$

$\Rightarrow x = \frac{5 \times 420}{3} = 700$

4. Question

Answer

Speed = $\frac{Distance}{Time}$

Let distance be x km, time = $\frac{20}{60}$ hr = $\frac{1}{3}$ hr

$\Rightarrow 75\text{km/hr} = \frac{x}{\frac{1}{3}}$

$\Rightarrow x = 75 \times \frac{1}{3} = 25$ km

5. Question

Answer

More the no of sheets, more will be the weight. So it is a direct proportion.

Let the sheets be x, $\frac{12}{0.04} = \frac{x}{1}$

$\Rightarrow x = \frac{12 \times 1}{0.04} = 300$

6. Question

Answer

More the height, more will be the length of shadow. So it is a direct proportion.

Let the height of tree be x m, $\frac{14}{10} = \frac{x}{7}$

$\Rightarrow x = \frac{14 \times 7}{10} = 9.8\text{m}$

7. Question

Answer

Let the actual length be x cm. When the bacteria is enlarged this much its length becomes 5 cm.

Then, $x \times 50000 = 5.$

$\therefore x = \frac{1}{1000} = \frac{1}{10^4} = 10^{-4}.$

8. Question

Answer

More the no. of pipes, lesser the time to fill the tank. So, it is an inverse proportion.

Let the required duration be x min.

$\Rightarrow 6 \times 120 = 5 \times x$

$\Rightarrow x = \frac{6 \times 120}{5} = 144$ minutes

9. Question

Answer

More the no. of persons, lesser the days to build. So, it is an inverse proportion.

Let the required duration be x days.

$\Rightarrow 3 \times 4 = 4 \times x$

$\Rightarrow x = \frac{3 \times 4}{4} = 3$ days

10. Question

Answer

More the speed, lesser the time to travel. So, it is an inverse proportion.

Let the required time be x hr.

$\Rightarrow 2 \times 60 = 80 \times x$

$\Rightarrow x = \frac{2 \times 60}{80} = 1.5$ hours = 1hour 30 minutes

CCE Test Paper-12

1. Question

Answer

More the no of boxes, more will be the cartons required. So it is a direct proportion.

Let the boxes be x, $\frac{350}{25} = \frac{x}{16}$

$\Rightarrow x = \frac{16 \times 350}{25} = 224$

2. Question

Answer

More the no of tennis balls, more will be the cost. So it is a direct proportion.

Let the cost be Rs x, $\frac{4900}{140} = \frac{x}{2 \times 12}$

$\Rightarrow x = \frac{24 \times 4900}{140}$ = Rs 840

3. Question

Answer

More the distance, more will be the fare. So it is a direct proportion.

Let the fare be Rs x, $\frac{183}{61} = \frac{x}{53}$

$\Rightarrow x = \frac{183 \times 53}{61}$ = Rs 159

4. Question

Answer

More the no. of people, lesser the days. So, it is an inverse proportion.

Let the required time be x days.

$\Rightarrow 10 \times 6 = 4 \times x$

$\Rightarrow x = \frac{10 \times 6}{4}$ = 15 days

5. Question

Answer

More the no. of men, lesser the days. So, it is an inverse proportion.

Let the required time be x days.

$\Rightarrow 30 \times 28 = 21 \times x$

$\Rightarrow x = \frac{30 \times 28}{21}$ = 40 days

6. Question

Answer

More the no. of men, lesser the days for which food last. So, it is an inverse proportion.

200 men had provisions for 45 days. After 15 days,200 men had provisions for 30days.

Now,

i) Number of men (x_1) = 200 Provisions finished (y_1) = 30 days

ii) after 15 days number of men joined are 40. Therefore,

Number of men after 15 days (x_2) = 240

Let food last in number of days = y_2

$y_2 = \frac{200 \times 30}{240}$

= 25 days

7. Question

Answer

It is an inverse proportion.

If 6 pipes can do it in 24 minutes

Then time taken by 1 pipe = 24 × 6 = 144 minutes

8. Question

Answer

It is an inverse proportion.

If 14 workers can do it in 42 days.

Then time taken by 1 worker = 14 × 42 = 588 days

9. Question

Answer

More the no. of men, lesser the days required. So, it is an inverse proportion.

Let the required no. be x days.

⇒ 35 × 8 = 20 × x

⇒ $x = \frac{35 \times 8}{20}$ = 14 days

10. Question

Answer

Average Speed = $\frac{Total\ Distance}{Total\ Time}$

Let distance be x km, time = $(1 + \frac{12}{60})$ hr = $(1 + \frac{1}{5})$hr = $\frac{6}{5}$hr

$\Rightarrow$ 60 km/hr = $\frac{x}{\frac{6}{5}}$

$\Rightarrow$ x = 60 $\times \frac{6}{5}$ = 72 km

11. Question

Answer

More the time, more will be the no. of words typed. So it is a direct proportion.

Half an hour = 30 minutes

Let the no. of words be x, $\frac{510}{30} = \frac{x}{10}$

$\Rightarrow$ 30 $\times$ x = 510 $\times$ 10

$\Rightarrow$ x = $\frac{510 \times 10}{30}$ = 170 words

12. Question

Answer

We use the relation $\frac{x}{y} = \frac{X}{Y}$ Here $x_1 = 3$, $y_1 = 36$ and $y_2 = 96$

Here, $\frac{3}{36} = \frac{x_1}{96}$

$\Rightarrow x_1 \times 36 = 3 \times 96$

$\Rightarrow x_1 = \frac{3 \times 96}{36} = 8$

13. Question

Answer

$\Rightarrow 15 \times 6 = 9 \times y$

$\Rightarrow y = \frac{15 \times 6}{9} = 10$

14. Question

Answer

(i) By Inverse proportion

$3 \times 4 = 4 \times$ (no. of days required)

(No. of days required) $= \frac{3 \times 4}{4} = 3$ days

(ii) By Inverse proportion

$5 \times 144 = 6 \times$ (time required)

(Time required) $= \frac{5 \times 144}{6} = 120$ minutes

(iii) By Inverse proportion

90 minutes $\times$ 60 km/hr = 45 km/hr $\times$ (time taken in minutes)

(No. of days required) $= \frac{90 \times 60}{45} = 120$ minutes $= 2$ hours

(iv) More the oranges more will be the cost. So it is a direct proportion.

Let the cost be Rs x, $\frac{20.80}{8} = \frac{x}{5}$

$\Rightarrow 8 \times x = 20.80 \times 5$

$x = \frac{20.80 \times 5}{8}$ = Rs 13

(v) More the no. of sheets more will be the weight of them. So it is a direct proportion.

Let the no. of sheets be x, $\frac{12}{50} = \frac{x}{500}$

$50 \times x = 500 \times 12$

$x = \frac{500 \times 12}{50}$ = 120 sheets