

## Chapter-4 Direct and Inverse variation

Direct variation  $\rightarrow$  Two quantities are related in such a way an increase in one quantity results in corresponding increase in other quantity and vice-versa

$$\frac{x}{y} = \text{Constant}$$

Inverse variation  $\rightarrow$  Two quantities are related in such a way, an increase in one quantity and vice-versa

$$xy = \text{constant}$$

WS-1

Q1(c)

x	6	8	12	
y	18			63

Since x and y vary directly

$$\frac{6}{18} = \frac{8}{\square}$$

$$6 \times \square = 8 \times 18$$

$$\square = \frac{8 \times 18}{6} = 24$$

and  $\frac{6}{18} = \frac{18}{\square}$

$$= 6 \times \square = 18 \times 12$$

$$= \square = \frac{18 \times 12}{6} = 36$$

and  $\frac{6}{18} = \frac{\square}{63}$

$$= 18 \times \square = 6 \times 63$$

$$= \square = \frac{6 \times 63}{18} = 21$$

(10)

x	10		30	46
y	5	10		

Since x and y vary directly

$$\frac{10}{5} = \frac{\square}{10}$$

$$5 \times \square = 10 \times 10$$

$$\square = \frac{10 \times 10}{5}$$

$$= 20$$

And  $\frac{10}{5} = \frac{30}{\square}$

$$10 \times \square = 5 \times 30$$

$$\square = \frac{5 \times 30}{10}$$

$$= 15$$

$$\text{and } 10 = 46$$

$$5 \quad \square$$

$$10 \times \square = 5 \times 46$$

$$\square = \frac{5 \times 46}{10} = 23$$

$$= 23$$

Q2:

No. of bags	5	x
wt (kg)	150	900

Let req. no. be x

This is direct variation

$$\begin{array}{l} 5 \rightarrow x \\ 150 \rightarrow 900 \end{array}$$

$$x \times 150 = 5 \times 900$$

$$x = \frac{5 \times 900}{150}$$

$$x = 30$$

So req. bags are 30

Q3: Let req. no. be x

cost (₹)	105	x
wt (kg)	3	15

This is direct variation

$$\begin{array}{l} 105 \rightarrow x \\ 3 \rightarrow 15 \end{array}$$

$$3 \times x = 105 \times 15$$

$$x = \frac{105 \times 5}{81}$$

$$x = 525$$

So req. cost is ₹ 525

Q4: Let req. no be  $x$

Distance (km)	20	$x$
Time (hrs)	4	7

This is direct variation

$$\frac{20}{4} = \frac{x}{7}$$

$$4 \times x = 20 \times 7$$

$$x = \frac{20 \times 7}{4}$$

$$x = 35$$

Distance covered is 35 km

Q5: Let req. no. be  $x$

Petrol (l)	30	7
Distance (km)	210	$x$

This is direct variation

$$\frac{30}{210} = \frac{7}{x}$$

$$30 \times x = 210 \times 7$$

$$x = \frac{210 \times 7}{30}$$

$$x = 49$$

So distance covered is 49 km.

Q6: Let req. no. be  $x$

No. of women	12	20
cloth (m)	15	$x$

This is direct variation

$$\frac{12}{15} = \frac{20}{x}$$

$$12 \times x = 15 \times 20$$

$$x = \frac{15 \times 20}{12}$$

$$x = 25$$

$$x = 25$$

So length of the cloth is 25 m

Q7:

No. of sheets	5	$x$
wt. of sheets	20	2500

Let no. of sheets be  $x$

$$\frac{5}{20} = \frac{x}{2500}$$

$$= 20 \times x = 5 \times 2500$$

$$x = \frac{5 \times 2500}{20}$$

$$x = 625$$

So no. of sheets are 625

Q8: Let time be  $x$

Time (min)	4	$x$
No. of words	600	3150

This is direct variations

$$\frac{4}{600} = \frac{x}{3150}$$

$$4 \times 3150 = 600 \times x$$

$$x = \frac{4 \times 3150}{600}$$

$$x = 21$$

Time took is 21 min

Q9: Let distance covered be  $x$  m

No. of steps	14	150
distance (m)	2.8 m	$x$

$$\frac{14}{2.8} = \frac{150}{x}$$

$$14 \times x = 2.8 \times 150$$

$$x = \frac{2.8 \times 150}{14} = \frac{28 \times 150}{14 \times 10}$$

$$x = 30$$

Distance covered is 30 m

Q10: Let no. of cartons be  $x$

No. of oil cans	48	216
No. of cartons	8	$x$

$$\frac{48}{8} = \frac{216}{x}$$

$$48 \times x = 8 \times 216$$

$$x = \frac{8 \times 216}{48} = 36$$

$$x = 36$$

So no. of cartons are 36

Q11: Let the cost of newspaper be ₹x

Cost of newspaper	₹ 37.50	x
No. of newspapers	15	25

$$\frac{37.50}{15} = \frac{x}{25}$$

$$15x = 37.50 \times 25$$

$$x = \frac{3750 \times 25}{10 \times 15}$$

$$x = 625$$

So cost of 25 newspapers are ₹625

Q12: Let no. of days be x

No. of days	9	x
Salary	₹675	₹900

$$\frac{9}{675} = \frac{x}{900}$$

$$675x = 9 \times 900$$

$$\cancel{675} x = \frac{9 \times 900}{\cancel{675} 75} 12$$

$$x = 12$$

WS-1 (HW)

Q 1 (iii)

x	6	8	10	16
y	15	20	25	40

Since x and y vary directly

$$\frac{6}{15} = \frac{10}{\square}$$

$$6 \times \square = 15 \times 10$$

$$\square = \frac{15 \times 10}{6 \times 1}$$

$$= 25$$

and  $\frac{6}{15} = \frac{\square}{40}$

$$15 \times \square = 6 \times 40$$

$$\square = \frac{6 \times 40}{15 \times 1}$$

$$= 16$$



WS-2

Q1: (i)

a	7		28
b	8	4	

Since a and b vary inversely

$$x \times 4 = 7 \times 8$$

$$x = \frac{7 \times 8 \cancel{2}}{4 \cancel{1}}$$

$$x = 14$$

$$28 \times y = 7 \times 8$$

$$y = \frac{7 \times 8 \cancel{2}}{28 \cancel{1}}$$

$$y = 2$$

(ii)

a	2.5	4	0.5
b	8		

Since a and b vary inversely

$$4 \times x = 2.5 \times 8$$

$$x = \frac{2.5 \times 8 \cancel{2}}{4 \cancel{1}} = 5$$

$$x = 5$$

$$0.5 \times y = 2.5 \times 8$$

$$y = \frac{2.5 \times 8}{0.5}$$

$$y = \frac{5 \times 8 \times 10}{10 \times 5 \cancel{1}}$$

$$y = 40$$

(iii)

a	10		12
b	6	15	

Since a and b vary inversely

$$\frac{10}{6} = \frac{x}{15}$$

$$x \times 15 = 10 \times 6$$

$$x = \frac{10 \times 6}{15}$$

$$x = 4$$

$$\frac{10}{6} = \frac{12}{x}$$

$$x \times 12 = 10 \times 6$$

$$x = \frac{10 \times 6}{12}$$

$$x = 5$$

Q2: Let req. no. of student be  $x$

No. of students	10	$x$
No. of days	3	2

This is inverse variation

$$x \times 2 = 10 \times 3$$

$$x = \frac{10 \times 3}{2}$$

$$x = 15$$

So, req. no. of students are 15

Q3: Let req. time be  $x$  hrs

Speed km/hr	40	45
Time (hr)	$\frac{9}{2}$	$x$

This is inverse variation

$$45 \times x = 40 \times \frac{9}{2}$$

$$x = \frac{204}{45} = \frac{40 \times 9}{45 \times 1}$$

$$x = 4 \text{ hrs}$$

So req. time is 4 hrs

Q4: Let req. average speed be  $x$

Speed km/h	12	$x$
Time (hrs)	$\frac{20}{60} = \frac{1}{3}$	$\frac{15}{60} = \frac{1}{4}$

This is inverse variation

$$x \times \frac{1}{4} = 12 \times \frac{1}{3}$$

$$x = \frac{4}{1} \times \frac{1}{3} = \frac{1 \times 12 \times 4}{3 \times 1}$$

$$x = 16$$

So speed is 16 km/hr

Q5: Let req. no. of days be  $x$

No. of men	15	9
No. of days	24	$x$

This is inverse variation

$$9 \times x = 15 \times 24$$

$$x = \frac{15 \times 24}{9} = 40$$

$$x = 40$$

So req. no. of days are 40

Q6: Let req. no. of goats be  $x$

No. of Goats	30	$x$
No. of day	15	10

This is inverse variation

$$10x = 30 \times 15$$

$$x = \frac{30 \times 15}{10}$$

$$x = 45$$

So no. of goats are 45

Q7: Let req. no. of men be  $x$

No. of men	420	$x$
No. of Months	9	7

This is inverse variation

$$7x = 420 \times 9$$

$$x = \frac{420 \times 9}{7}$$

$$x = 540$$

So req. no. of men are 540

Q8: Let req. no. of days be  $x$

No. of Pages	18	15
No. of Days	25	$x$

This is inverse variation

$$15x = 18 \times 25$$

$$x = \frac{18 \times 25}{15}$$

$$x = 30$$

So req. no. of days are 30

Q9: Cost of each book = ₹125

Discount on each book = ₹25

Cost of book after discount = ₹100

No. of book	40	x
Cost of each book	125	100

$$100x = 40 \times 125$$

$$x = \frac{40 \times 125}{100}$$

$$x = 50$$

So no. of books are 50

Q10: Let req. time be x min

No. of Pumps	6	4
Time (min)	28	x

This is inverse variation

$$4x = 6 \times 28$$

$$x = \frac{6 \times 28}{4}$$

$$x = 42$$

So time taken is 42 min

Q11: Let req. speed be  $x$  km/hr

Speed km/hr	75	$x$
Time hrs	4.8	3

This is inverse variation

$$x \times 3 = 75 \times 4.8$$

$$x = \frac{75 \times 4.8}{3}$$

$$x = 120$$

So req. speed is 120 km/hr

Q12: Let req. no. of days be  $x$

Total men in the beginning = 120

No. of men at the end of 5 days =  $120 + 5$   
= 125

Days left = 25

No. of men	120	125
No. of days	25	$x$

This is inverse variation

$$125 \times x = 120 \times 25$$

$$x = \frac{120 \times 25}{125}$$

$$x = 24$$

So req. days are 24

\* Note - To change km/hr to m/s multiply by  $\frac{5}{18}$

To change m/s to km/hr multiply by  $\frac{18}{5}$

WS-3

Q1: Let req. hours be  $x$

No. of days	25	20
No. of hrs	8	$x$

This is inverse variation

$$20x = 25 \times 8$$

$$x = \frac{25 \times 8}{20}$$

$$x = 10$$

So req. time is 10 hrs

Q2: Let req. amount of work be  $x$

Days	10	8
Amount of work	1	$x$

This is direct variation

$$10x = 8$$

$$x = \frac{8}{10} = \frac{4}{5}$$

$$x = \frac{4}{5}$$

So req. amount is  $\frac{4}{5}$

Q5: Length of Train = 280m

$$\begin{aligned} \text{Speed} &= 42 \text{ km/hr} \\ &= \frac{42 \times 5}{18} = \frac{35}{3} \end{aligned}$$

$$\text{Speed} = \frac{35}{3} \text{ m/sec}$$

So distance travelled = length of the train  
= 280 m

$$\text{Time} = \frac{D}{S} = \frac{280 \times 3}{35} = 24 \text{ sec}$$

$$= 24 \text{ sec}$$

Q3: Let no. of days be  $x$

No. of men	20	12
No. of days	9	$x$

$$12x = 20 \times 9$$

$$x = \frac{20 \times 9}{12}$$

$$x = 15$$

So no. of days are 15

Q4: Let no. of days be  $x$

No. of Baskets	20	120
No. of days	30	$x$



$$120 \times x = 120 \times 30$$

$$x = \frac{120 \times 30}{120} \quad x = \frac{60}{20} \times 120$$

$$x = 180$$

Q6: Length of train = 350 m

Time taken = 28 sec

Since train has to cross an electric pole. So Distance

$$\begin{aligned} \text{Distance} &= \text{Length of train} \\ &= 350 \text{ m} \end{aligned}$$

$$\text{Speed} = \frac{D}{T} = \frac{350}{28} \text{ m/sec} = \frac{25}{2} \text{ m/sec}$$

$$\frac{5}{2} \times 18 \text{ km/h}$$

$$= 45 \text{ km/h}$$

So req. speed is 45 km/h

Q7: Length of <sup>bridge</sup> train be  $x$  m

Length of train = 150 m

Since train has to cross a bridge so

$$\text{Distance} = (150 + x) \text{ m}$$

$$\text{Speed} = 72 \text{ km/h}$$

$$\text{Time} = 13 \text{ sec}$$

$$\frac{4}{18} \times 5 \text{ m/s}$$

$$20 \text{ m/s}$$

$$D = S \times T$$

$$150 + x = 20 \times 13$$

$$\Rightarrow 150 + x = 260$$

$$x = 260 - 150$$

$$x = 110 \text{ m}$$

So length of bridge is 110 m

Q8: Length of train = 120 m

Length of Platform = 130 m

Since train has to cross platform so

$$\text{Distance} = 120 + 130$$

$$= 250 \text{ m}$$

$$\text{Speed} = 50 \text{ km/h}$$

$$= \frac{50}{18} \times \frac{5}{9}$$

$$= \frac{125}{9} \text{ m/s}$$

$$\text{Time} = \frac{D}{S}$$

$$= \frac{250 \times 9}{125}$$

$$= 18 \text{ sec}$$

So req. time is 18 sec

Q9: Length of train = 210 m

Length of Tunnel = 90 m

Since train has to cross a tunnel so

$$\begin{aligned} \text{Distance} &= 210 + 90 \\ &= 300 \text{ m} \end{aligned}$$

$$\text{Time} = 12 \text{ sec}$$

$$\text{Speed} = \frac{D}{T}$$

$$\text{Speed} = \frac{300}{12} \text{ m/s}$$

$$= 25 \text{ m/s}$$

So req. <sup>speed</sup> time is 25 m/s

$$\text{Q10: Length of train} = 270 \text{ m}$$

$$\text{Length of Platform} = 130 \text{ m}$$

~~Since train has to cross a platform~~

~~$$\text{Distance} = (270 + 130) \text{ m}$$~~

~~$$= 400 \text{ m}$$~~

~~$$\text{Speed} = 80 \text{ km/h}$$~~

~~$$= \frac{80 \times 5}{18}$$~~

~~$$= \frac{200}{9} \text{ m/s}$$~~

$$\text{Time} = \frac{D}{S}$$

$$= \frac{400 \times 9}{200}$$

$$= 18 \text{ sec}$$

## Value Based

Q1: a)

No. of Children	2	3
No. of Slices	3	$x$

This is inverse variation

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

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

$$x = 2$$

So each will get 2 slices

b) No, because it is not good for health.

Q2: a)

Time (min)	30	20
Distance (m)	2000	$x$

$$\frac{20}{x} = \frac{30}{2000}$$

$$3x = 20 \times 2000$$

$$x = \frac{20 \times 2000}{3} = 4000 \text{ m}$$

Brain TeasersQ1(A) Tick

d)  $x = 24$

$y = ?$

Constant = 3

Since  $x$  and  $y$  vary directly

$$\frac{x}{y} = \text{Constant}$$

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

$$y = 8$$

B. Answer the following

a) Let req. value be  $x$ 

$l$	5	$x$
$m$	$\frac{2}{3}$	$\frac{16}{3}$

Since  $l$  and  $m$ 

$$\frac{5 \times 3}{2} = \frac{x \times 3}{16}$$

$$5 \times 3 \times 16^8 = x$$

$$2 \times 3$$

$$x = 40$$

So req. value of  $l$  is 40

b) speed = 36 km/h

$$\frac{36 \times 5}{18}$$

$$= 10 \text{ m/s}$$

Distance = 20m

$$\text{Time} = \frac{D}{S} = \frac{20}{10} \text{ sec}$$

So req. time is 2 sec

c. Let req. no. of sweets be  $x$

No. of Sweets	4	$x$
No. of Children	50	40

$$x \times 40 = 4 \times 50$$

$$x = \frac{4 \times 50}{40}$$

$$x = 5$$

So each will get 5 sweets.

d.

4	20	1.25
$\frac{1}{x}$	$\frac{1}{2}$	$\frac{1}{x}$

$$\text{So } \frac{1.25 \times x}{1} = \frac{20 \times 2}{1}$$

$$\Rightarrow x = \frac{40}{1.25}$$

$$\Rightarrow x = \frac{40 \times 100}{125}$$

$k = 32$

So  $k = 32$

e.

$\frac{l}{\sqrt{m}}$	$\frac{6}{\sqrt{4} = 2}$	$\frac{4}{\sqrt{m}}$
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$$4 \times \sqrt{m} = 6 \times 2$$

$$\sqrt{m} = \frac{6 \times 2}{4}$$

$$\sqrt{m} = 3$$

~~Squaring both sides~~

$$(\sqrt{m})^2 = 3^2$$

$$m = 9$$

Q2: On Book

Q3:

$x$	25	15
$y$	3	$p$

~~Since  $x$  and  $y$  vary inversely~~

$$15 \times p = 25 \times 3$$

$$p = \frac{25 \times 3}{15}$$

$$p = 5$$

So req. value is 5

Q4:  $y = 45$

Constant = 9

Since  $x$  and  $y$  vary inversely

So  $x \times y = \text{Constant}$

$$x \times 45 = 9$$

$$x = \frac{9}{45}$$

$$\text{So } x = \frac{1}{5}$$

Q5: Let cost of 8 oranges be ₹x

No. of Oranges	36	8	3 dozen = 36
Cost (₹)	54	x	

This is direct

$$\frac{36}{54} = \frac{8}{x}$$

$$\Rightarrow 36 \times x = 8 \times 54$$

$$\Rightarrow x = \frac{8 \times 54}{36}$$

$$\Rightarrow x = 12$$

So req. cost is ₹12

Q6: Let req. time be x hrs

Distance (km)	60	100
Time (hrs)	$\frac{3}{2}$	x

$$1 \text{ hr } 30 \text{ min} = \frac{1}{2} \text{ hr}$$

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

This is direct

$$\frac{60 \times 2}{3} = \frac{100}{x}$$



$$\frac{40}{1} = \frac{100}{x}$$

$$40x = 100$$

$$x = \frac{100}{40}$$

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

So req. time is  $2\frac{1}{2}$

Q7: Let req. weight be  $x$  kg

Weight (kg)	75	$x$
Extension (cm)	1.4	9.8

This is direct

$$\frac{75}{1.4} = \frac{x}{9.8}$$

$$= 1.4x = 75 \times 9.8$$

$$\Rightarrow x = \frac{75 \times 9.8}{1.4}$$

$$\Rightarrow x = \frac{75 \times 98 \times 10}{10 \times 14}$$

$$x = 525$$

So req. weight is 525 kg.

Q8: Let req. dust be  $x$  pounds

No. of days	25	15
Dust (Pounds)	$6 \times 10^8$	$x$

This is direct

$$\frac{25}{6 \times 10^8} = \frac{15}{x}$$

$$25x = 15 \times 6 \times 10^8$$

$$\Rightarrow x = \frac{15 \times 6 \times 10^8}{25}$$

$$x = \frac{18 \times 10^8}{5}$$

$$x = 3.6 \times 10^8 \text{ pounds}$$

### HOTS

Q1: speed of car = 50 km/h

Time Original time = 90 min

Let req. speed be  $x$  km/h

when he is late by 15 min than time taken = 1 hour 15 min = 75 min

Speed km/h	50	$x$
Time (min)	90	75

This is inverse

$$x \times 75 = 50 \times 90$$

$$x = \frac{50 \times 90}{75} = 60$$

$$x = 60$$

So req. speed is 60 km/h

$$\text{Distance} = S \times T$$

$$50 \times \frac{1}{2}$$

$$\frac{50 \times 3}{2}$$

$$= 75 \text{ km}$$

So total distance covered daily by Hamit =  $2 \times 75$

$$= 150 \text{ km}$$

## Chapter-4

WS-2

Q9. Total books = 40

Cost of each book = ₹125

discount = 25%.

Cost of each book after discount =  $125 - 25$   
 $= ₹100$

Let req. no. of book after discount be  $x$ 

No. of books	40	$x$
Cost of each book	125	100

This is inverse variation

$$x \times 100 = 40 \times 125$$

$$x = \frac{40 \times 125}{100}$$

$$x = 50$$

So req. no. of books are 50.