CHAPTER 11 DIRECT AND INVERSE VARIATION

Question 1: Explain the concept of direct variation.

Solution:

If the values of two quantities depend on each other in such a way that if we increase the value of one quantity the value of the other quantity also increase, similarly if we decrease the value of one quantity the value of other quantity also decreases, therefore if the ratio between the two variables remains constant, it is said to be in direct variation.

Question 2: Which of the following quantities vary directly with each other?

(i) Number of articles (x) and their price (y).

(ii) Weight of articles (x) and their cost (y).

(iii) Distance x and time y, speed remaining the same.

(iv) Wages (y) and number of hours (x) of work.

(v) Speed (x) and time (y) distance covered remaining the same).

(vi) Area of a land (x) and its cost (y).

Solution:

(i) Number of articles (x) and their price (y)

The number of articles is directly proportional to their price, therefore, when the number of articles increase, then the cost of article will also increase. So it is a case of direct proportion. (ii) Weight of articles (x) and their cost (y).

The weight (x) of the articles is directly proportional to their cost (y), therefore, If weight of the article is increasing then the cost of article will also increase. So it is a case of direct proportion. *(iii)* Distance x and time y, speed remaining the same.

On increasing the distance between objects, the time required to cover them will also increase, therefore, on constant speed, time increases when distance increases. So it is a case of direct proportion

(iv) Wages (y) and number of hours (x) of work.

If the workers work for more hours, they will be paid more wages, therefore, wages increases if the number of working hours increase. So it is a case of direct proportion

(v) Speed (x) and time (y) distance covered remaining the same.

Time is inversely proportional to distance, that is, keeping the same distance, the time taken will reduce if speed is increased, here one quantity is decreasing when we are increasing the other. So it is not a case of direct proportion.

(vi) Area of a land (x) and its cost (y).

On increasing the area of the land available, its cost will also increase and multiply. So it is a case of direct proportion

Question 3: In which of the following tables x and y vary directly?

(i)

а	7	9)	1	3	2	1	2	5
b	21	2	7 3		9	6	3	7	5
(ii)									
а	10	2	0	3	0	4	0	4	6
b	5	1	0	1	5	2	0	2	3
(iii)									
а	2	3	4	4	ł	5	(6	
b	6	9	1	2	1	7	2	0	
(iv)									
а	12	2	2	3	2	4	2	5	2
b	13	2	3	3	3	4	3	5	3

Solution:

(i) Directly proportional.

If we clearly notice the values in the table, then the value in column b is thrice the value of column a. Therefore, the rows 'a' and 'b' are directly proportional, in this case.

(ii) Directly proportional.

If we clearly notice the values in the table, then the value in column b is half the value of column a. Therefore, 'a' and 'b' are directly proportional, in this case.

(iii) Not directly proportional.

If we clearly notice the values in the table, then the value in column b is thrice the value of column a, only in first three columns and not in others. Therefore, 'a' and 'b' are not directly proportional, in this case.

(iv) Not directly proportional.

If we clearly notice the values in the table, then the value in column b differ by different constant amounts with respect to values in column a. Therefore, 'a' and 'b' are not directly proportional, in this case. Question 4: Fill in the blanks in each of the following so as to make the statement true: (i) Two quantities are said to vary.... with each other, if they increase (decrease) together in such a way that the ratio of the corresponding values remains same.

(ii) x and y are said to vary directly with each if for some positive number k, $\dots = k$. (iii) if u = 3v, then u and v vary... with each other.

Solution:
(i) directly
(ii) k = x/y where k is a positive number.
(iii) directly

Question 5. Complete the following tables given that x varies directly as y.

(i) x 2.5 15 y 5 8 12 ... (ii) x 5 ... 10 35 25 ... y 8 12 32 (iii) x 6 8 10 ... 20 y 15 20 ... 40 ... (iv) x 4 9 ... 3 ... y 16 ... 48 36 ... 4 (v) x 3 5 7 9 y ... 20 28 ... Solution: (i) We know k = x/y2.5/5 = x1/8By cross-multiplying $8(2.5) = 5 \times 1$ 20 = 5x1x1 = 20/5= 4 We know k = x/y4/8 = x2/12By cross-multiplying 12(4) = 8x248 = 8x2 $x^2 = 48/8$ = 6 We know k = x/y6/12 = 15/y1

By cross-multiplying 6y1 = 15(12)6y1 = 180 y1 = 180/6= 30 x 2.5 4 6 15 y 5 8 12 30 *(ii)* We know k = x/y5/8 = x1/12By cross-multiplying 12(5) = 8x160 = 8x1x1 = 60/8= 7.5 We know k = x/y7.5/12 = 10/y1By cross-multiplying 7.5y1 = 10(12)7.5y1 = 120y1 = 120/7.5= 16 We know k = x/y $10/16 = 35/y^2$ By cross-multiplying 10y2 = 35(16)10y2 = 560 $y^2 = 560/10$ = 56 We know k = x/y35/56 = 25/y3By cross-multiplying 35y3 = 56(25)35y3 = 1400*y*3 = 1400/35 = 40 We know k = x/y25/40 = x2/32By cross-multiplying 25(32) = 40x2800 = 40x2 $x^2 = 800/40$ = 20 x 5 7.5 10 35 25 20 y 8 12 16 56 40 32 (iii)

We know k = x/y8/20 = 10/y1 By cross-multiplying 8y1 = 10(20)8v1 = 200 y1 = 200/8= 25 We know k = x/y10/25 = x1/40By cross-multiplying 10(40) = 25x1400 = 25x1x1 = 400/25= 16 We know k = x/y $16/40 = 20/y^2$ By cross-multiplying 16y2 = 20(40)16y2 = 800 $y^2 = 800/16$ = 50 x 6 8 10 16 20 y 15 20 25 40 50 (iv) We know k = x/y4/16 = 9/y1By cross-multiplying 4y1 = 9(16)= 144 v1 = 144/4= 36 We know k = x/y9/36 = x1/48By cross-multiplying 9(48) = 36x1432 = 36x1x1 = 432/36= 12 We know k = x/y12/48 = x2/36By cross-multiplying 12(36) = 48x2432 = 48x2 $x^2 = 432/48$ = 9 We know k = x/y

9/36 = 3/y2 By cross-multiplying 9y2 = 3(36)= 108 $v^2 = 108/9$ = 12 We know k = x/y3/12 = x3/4By cross-multiplying 3(4) = 12x312 = 12x3x3 = 12/12= 1 x 4 9 12 9 3 1 y 16 36 48 36 12 4 (v) We know k = x/y3/y1 = 5/20By cross-multiplying 3(20) = 5y160 = 5y1y1 = 60/5= 12 We know k = x/y $7/28 = 9/y^2$ By cross-multiplying 7y2 = 9(28)= 252 $y^2 = 252/7$ = 36 x3579 y 12 20 28 36

Question 6. Find the constant of variation from the table given below

X	3	4	7	9	
у	12	20	28	36	

Set up table and solve the following problems. Use unitary method to verify the answer. **Solution:**

Dividing the second column values by first column values, y/x we get the corresponding ratios

	C1	C2	C3	C4
y/x	12/3 = 4	20/5 = 4	28/7 = 4	36/9 = 4

Therefore, for all the columns y is four times x. .: The constant of variation in the given table is x/y = 1/4. Question 7. Rohit bought 12 registers for Rs 156, find the cost of 7 such registers. Solution: Cost of 12 registers = Rs 156 Cost of 1 register = Rs 156/12 = Rs 13 (Taking 12 to RHS) Cost of 7 registers = Cost of 1 register * number of req. registers

=> Rs 13 × 7 => Rs 91

Therefore, 7 registers cost Rs 91.