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FIRST REVISION TEST - 2022

10 - Std

MATHEMATICS

Time : 3.00 Hrs. Marks : 100

Instructions : (1) *Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.*

(2) *Use Blue or Black ink to write and underline and pencil to draw diagram.*

B refers BOOK BACK QUESTION
C refers CREATIVE QUESTION

PART - I

Note : 1) Answer all the questions. 14 X 1 = 14

2) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

1. If A = {1, 2}, B = {1, 2, 3, 4}, C = {5, 6} and D = {5, 6, 7, 8} then, state which of the following statement is true?

B

[✓ a) (A X C) ⊂ (B X D)]

b) (B X D) ⊂ (A X C)

c) (A X B) ⊂ (A X D)

d) (D X A) ⊂ (B X A)

2. The range of the relation R = {(x, x^2) | x is a prime number less then 13} is

B

a) {2, 3, 5, 7}

b) (2, 3, 5, 7, 11}

[✓ c) {4, 9. 25, 49, 121}]

d) (1, 4, 9, 25, 49, 121}

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3. Let n (A) = m and n (B) = n, then the total number of non-empty relations that can be defined from A to B is $2^{mn}-1$

B

a) m^n b) n^m

[✓ c) $2^{mn}-1$] d) 2^{mn}

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4. For any two sets P and Q, $P \cap Q$ is

a) $\{x : x \in P \text{ or } x \in Q\}$

C

b) $\{x : x \in P \text{ and } x \notin Q\}$

[✓ c) $\{x : x \in P \text{ and } x \in Q\}$]

d) $\{x : x \notin P \text{ and } x \in Q\}$

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5. Euclid's division lemma states that for positive integers a and b, there exist unique integers q and r such that a = bq + r, where r must satisfy

B

a) $1 < r < b$

b) $0 < r < b$

[✓ c) $0 \leq r < b$]

d) $0 < r \leq b$

6. Given $F_1 = 1$, $F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_5 is

a) 3 b) 5

B

c) 8 [✓ d) 11]

7. An A.P. consists of 31 terms. If its 16th term is m, then the sum of all the terms of this A.P

a) 16 m b) 62 m

B

[✓ c) 31 m] d) $\frac{31}{2}$ m

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8. The 8th term of the sequence 1, 1, 2, 3, 5, 8, ... is

C

a) 25

b) 24

c) 23

[✓ d) 21]

9. If (x - 6) is the H.C.F. of $x^2 - 2x - 24$ and $x^2 - kx - 6$, then the value of k is

B

a) 3

[✓ b) 5]

c) 6

d) 8

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10. $y^2 + \frac{1}{y^2}$ is not equal to :

B

a) $\frac{y^4+1}{y^2}$

[✓ b) $\left(y+\frac{1}{y}\right)^2$]

c) $\left(y-\frac{1}{y}\right)^2+2$

d) $\left(y+\frac{1}{y}\right)^2-2$

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11. If the roots of the equation $q^2x^2 + p^2x + r^2 = 0$ are the square of the roots of the equation $qx^2 + px + r = 0$, then q, p, r are in ....

a) A.P

B

[✓ b) G.P.]

c) Both A.P. and G.P.

d) Neither A.P. nor G.P.

12. Graph of a quadratic equation is ....

a) Straight line

b) Circle

C

[✓ c) Parabola]

d) Hyperbola

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13. A quadratic equation whose one root is 3 is ....

C

a) $x^2 - 6x - 5 = 0$ $9 - 18 - 5$ ×

b) $x^2 + 6x - 5 = 0$ $9 + 18 - 5$ ×

c) $x^2 - 5x - 6 = 0$ $9 - 15 - 6$ ×

[✓ d)] $x^2 - 5x + 6 = 0$ $9 - 15 + 6 = 15 - 15 = 0$ ✓

14. On dividing $\frac{x^2-25}{x+3}$ by $\frac{x+5}{x^2-9}$ is equal to

C

[✓ a)] (x - 5) (x - 3)

b) (x - 5) (x + 3)

c) (x + 5) (x - 3)

d) (x + 5) (x + 3)

$= \frac{x^2-25}{x+3} \times \frac{x^2-9}{x+5} = \frac{x^2-5^2}{x+3} \times \frac{x^2-3^2}{x+5}$

$= \frac{\cancel{(x+5)}(x-5)\cancel{(x+3)}(x-3)}{\cancel{(x+3)}\cancel{(x+5)}}$

PART - II

Note : Answer any 10 questions.

Question No. 28 is compulsory. 10 X 2 = 20

B 15. If A X B = {(3,2), (3, 4), (5, 2), (5, 4)}, then find A and B .

B 16. A = {m,n} ; B = ϕ then find :

i) A X B ii) A X A iii) B X A

17. If A = {1, 2, 3, 7} and B = {3, 0, -1, 7} and R = {(2, -1), (7, 7), (1, 3)}, then find whether R is a relation from A to B or not?

B

C 18. For the given relation R = {(1, 3) (2, 5), (4, 7), (5, 9), (3, 1)}, write the domain and range.

D={1,2,3,4,5} R={1,3,5,7,9}

B 19. Show that the square of an odd integer is of the form 4q + 1, for some integer q.

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B 20. Find the 19th term of an A.P -11, -15, -19 .... .

B 21. If $a_1 = 1, a_2 = 1$ and $a_n = 2a_{n-1} + a_{n-2}$, $n \geq 3$, $n \in N$ then, find the first six terms of the sequence.

C 22. If $108 = 2^a \times 3^b$, then find the value of a + b.

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B 23. Find the L.C.M. of $9a^3b^2$, $12a^2b^2c$.

B 24. Find the excluded value of $\frac{x+10}{8x}$.

B 25. Simplify : $\frac{x^3}{x-y} + \frac{y^3}{y-x}$.

B 26. Determine the nature of the root of $x^2 - x - 1 = 0$.

B 27. Find the square root of $\frac{144 a^8 b^{12} c^{16}}{81 f^{12} g^4 h^{14}}$.

C 28. Form the quadratic equations whose roots are $7+\sqrt{3}$ and $7-\sqrt{3}$.

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PART - III

Note : Answer any 10 questions.

Question No. 42 is compulsory. 10 X 5 50

B 29. Let $A = \{x \in W / x < 2\}$, $B = \{x \in N \mid 1 < x \leq 4\}$ and $C = \{3, 5\}$ verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$

B 30. If A = {5, 6}, B = {4, 5, 6}, C = {5, 6, 7} show that $A \times A = (B \times B) \cap (C \times C)$.

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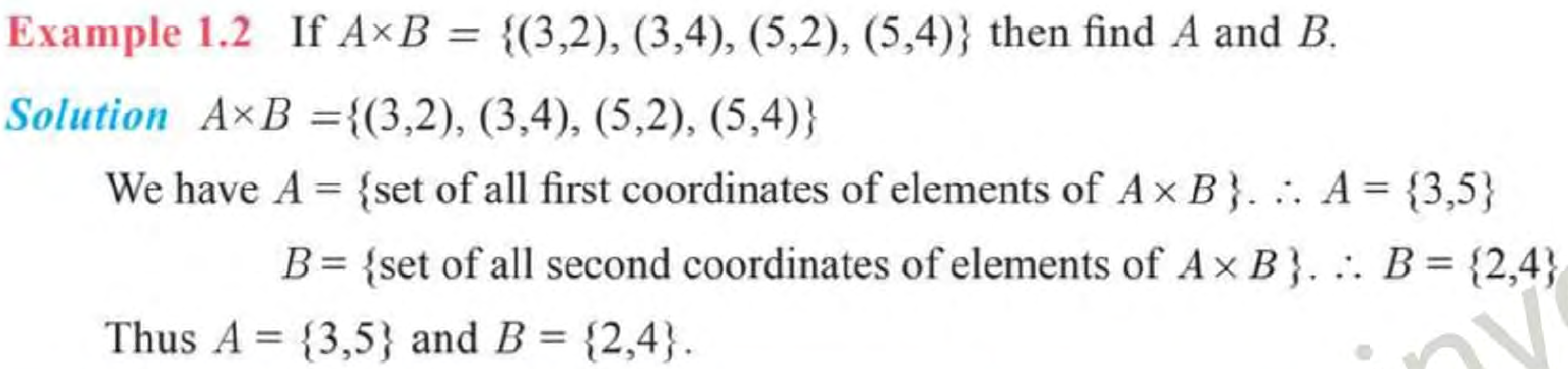
15



Example 1.2 If $A\times B = \{(3,2), (3,4), (5,2), (5,4)\}$ then find A and B.

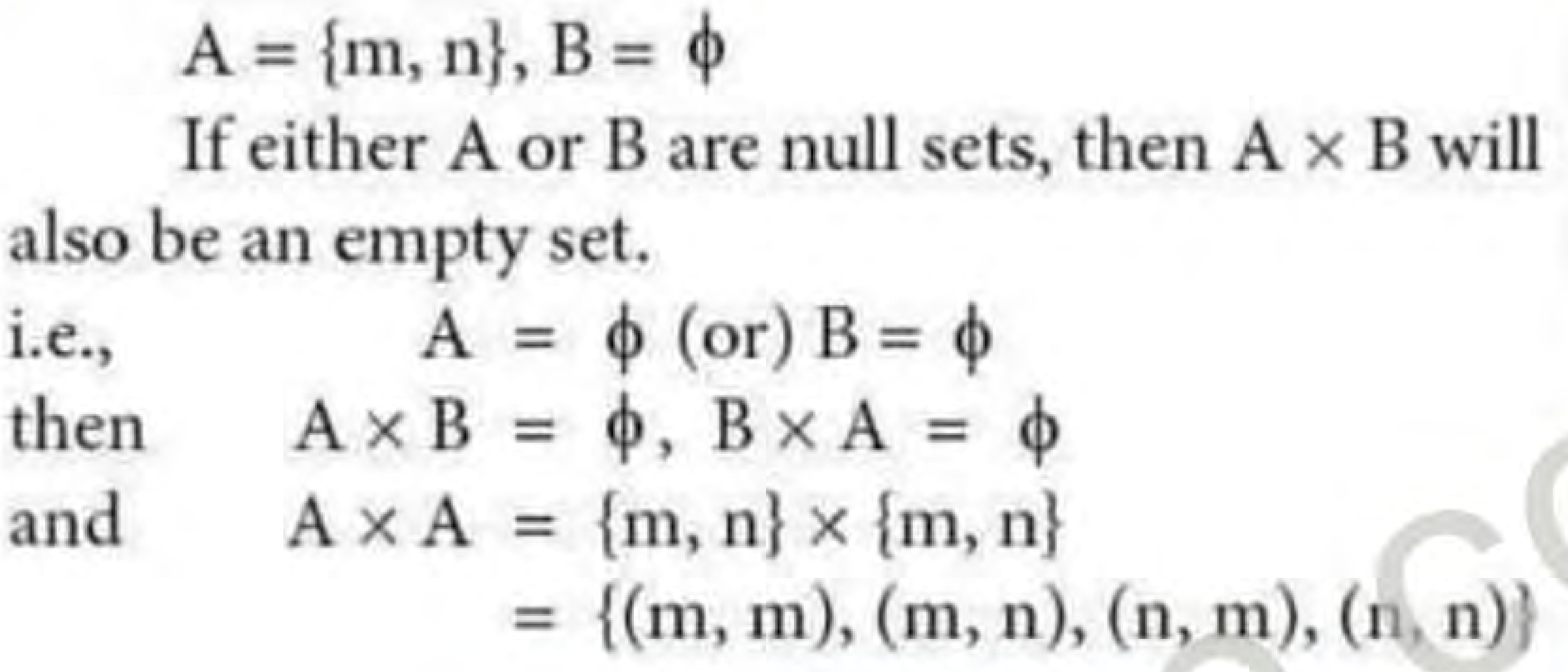
Solution $A\times B = \{(3,2), (3,4), (5,2), (5,4)\}$

We have A = {set of all first coordinates of elements of $A\times B$}. $\therefore A = \{3,5\}$

B = {set of all second coordinates of elements of $A\times B$}. $\therefore B = \{2,4\}$

Thus $A = \{3,5\}$ and $B = \{2,4\}$.

16



$A = \{m, n\}, B = \phi$

If either A or B are null sets, then A × B will also be an empty set.

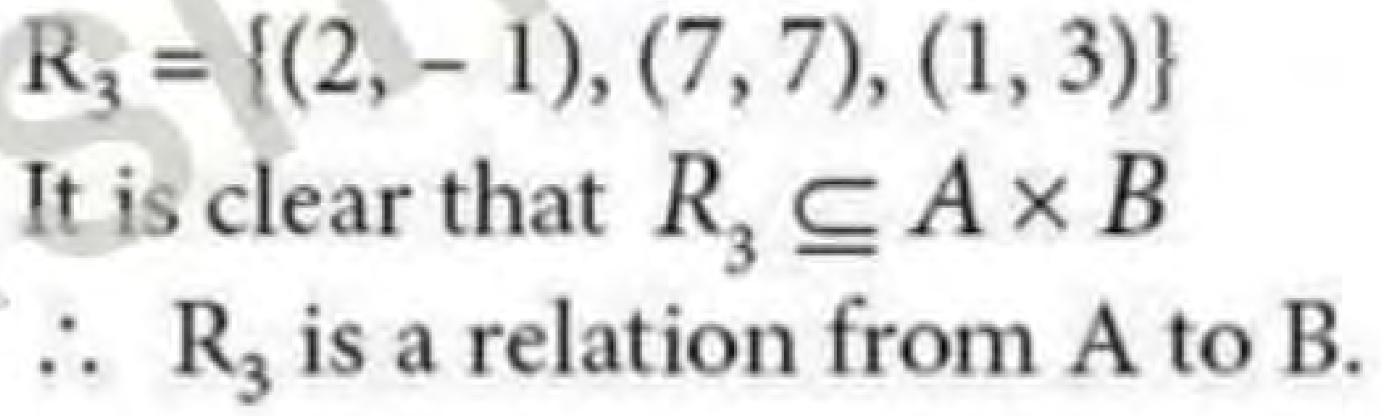
i.e., $A = \phi$ (or) $B = \phi$

then $A\times B = \phi,\ B\times A = \phi$

and $A\times A = \{m, n\}\times\{m, n\}$

$= \{(m, m), (m, n), (n, m), (n, n)\}$

17



$R_3 = \{(2, -1), (7, 7), (1, 3)\}$

It is clear that $R_3 \subseteq A\times B$

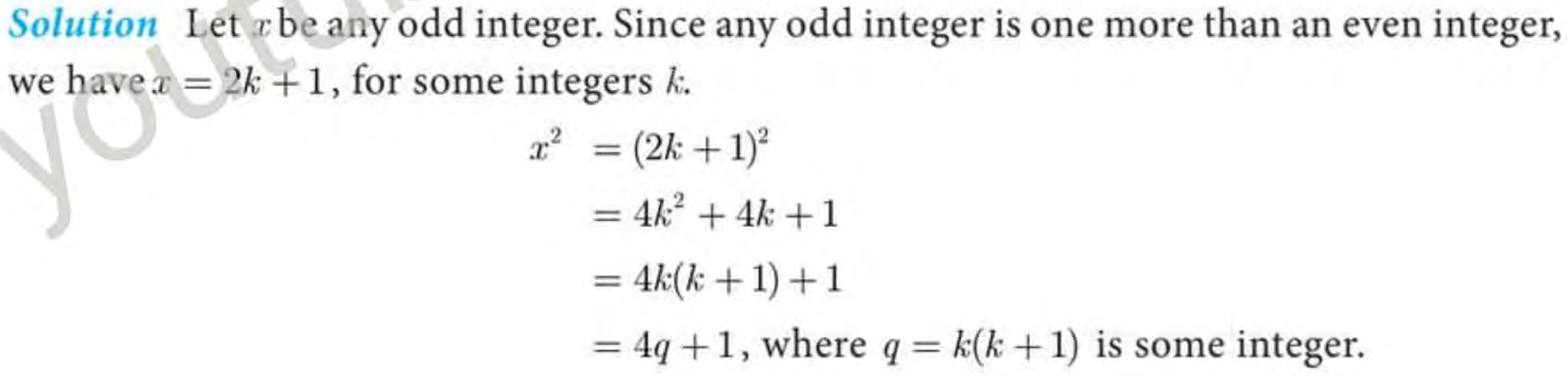
$\therefore$ R_3 is a relation from A to B.

18

Domain = {1,2,3,4,5}

Range = {1,3,5,7,9}

19



Solution Let x be any odd integer. Since any odd integer is one more than an even integer, we have $x = 2k+1$, for some integers k.

$$\begin{aligned} x^2 &= (2k+1)^2 \\ &= 4k^2+4k+1 \\ &= 4k(k+1)+1 \\ &= 4q+1, \text{ where } q = k(k+1) \text{ is some integer.} \end{aligned}$$

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20 **Sol :** Given the A.P. – 11, – 15, – 19,....

Here First term $a = -11$

Common difference $d = t_2 - t_1 = -15 - (-11)$

$= -15 + 11$

$d = -4$

$\therefore$ n^{th} term of an A.P. is $t_n = a + (n-1)d$

19^{th} term $(t_{19}) = -11 + (19-1)(-4)$

$= -11 + 18(-4)$

$= -11 + (-72) = -83$

$\therefore$ 19^{th} term of –11, – 15, – 19,...-is – 83.

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21 **Sol :** Given first two terms of the sequence.

$a_1 = 1$ and $a_2 = 1$

For $n \geq 3$ $a_n = 2a_{n-1} + a_{n-2}$

When n = 3 $a_3 = 2a_{3-1} + a_{3-2} = 2a_2 + a_1$

$a_3 = 2 + 1 = 3$

When n = 4, $a_4 = 2a_{4-1} + a_{4-2} = 2a_3 + a_2$

$a_4 = 2 \times 3 + 1 = 6 + 1 = 7$

When n = 5 $a_5 = 2a_{5-1} + a_{5-2} = 2a_4 + a_3$

$a_5 = 2 \times 7 + 3 = 14 + 3 = 17$

When n = 6 $a_6 = 2a_{6-1} + a_{6-2} = 2a_5 + a_4$

$a_6 = 2(17) + 7 = 34 + 7 = 41$

$\therefore$ First 6 terms of the sequence are 1, 1, 3, 7, 17, 41

22) $108 \rightarrow 2^a \times 3^b$

$$\begin{array}{r|l} 2 & 108 \\ \hline 2 & 54 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline & 3 \end{array}$$

$108 = 2 \times 2 \times 3 \times 3 \times 3$

$= 2^2 \times 3^3$

$a = 2$; $b = 3$

$a + b = 5$

23)

$9a^3b^2, 12a^2b^2c$

LCM of (9, 12) = 36

LCM of (a^3b^2, a^2b^2c) = a^3b^2c

$\therefore$ LCM of ($9a^3b^2, 12a^2b^2c$) = $36a^3b^2c$

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24 $\frac{x+10}{8x}$

The expression $\frac{x+10}{8x}$ is undefined when $8x = 0$ or $x = 0$. Hence the excluded value is 0.

---

25 $\frac{x^3}{x-y} + \frac{y^3}{y-x}$

$$= \frac{x^3}{x-y} - \frac{y^3}{x-y}$$

$$= \frac{x^3 - y^3}{x-y}$$

$$= \frac{(x-y)(x^2+xy+y^2)}{x-y}$$

$$= x^2 + xy + y^2$$

26 **(ii)** $x^2 - x - 1 = 0$

Comparing with $ax^2 + bx + c = 0$

$a = 1, b = -1, c = -1$

$b^2 - 4ac = (-1)^2 - 4(1)(-1)$

$= 1 + 4 = 5 > 0$

$\therefore$ Roots are real and unequal.

27

$$\sqrt{\frac{144a^8b^{12}c^{16}}{81f^{12}g^4h^{14}}} = \frac{4}{3}\left|\frac{a^4b^6c^8}{f^6g^2h^7}\right|$$

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28 The roots are $7+\sqrt{3}, 7-\sqrt{3}$

Sum of the roots $= 7+\sqrt{3}+7-\sqrt{3} = 14$

Product of roots $= (7+\sqrt{3})(7-\sqrt{3}) = 49 - 3 = 46$

The required equation is

$x^2 -$ (Sum of the roots) $x +$ Product of roots $= 0$

$x^2 - 14x + 46 = 0$

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31. A company has four categories of employees given by Assistants (A), Clerks (C), Manager (M) and an Executive Officer (E). The company provide Rs. 10,000, Rs. 25,000, Rs. 50,000 and Rs. 1,00,000 as salaries to the people who work in the categories A, C, M and E respectively. If A_1, A_2, A_3, A_4 and A_5 were Assistants; C_1, C_2, C_3, C_4 were Clerks; M_1, M_2, M_3 were Managers and E_1, E_2 were Executive Officers and if the relation R is defined by xRy, where x is the salary given to person y, express the relation R through and ordered pair and an arrow diagram.

B

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32. Use Euclid's Division Algorithm to find the Highest Common Factor (HCF) of 84, 90 and 120.

B

33. If $p_1^{x_1} X p_2^{x_2} X p_3^{x_3} X p_4^{x_4} = 113400$ where p_1, p_2, p_3, p_4 are primes in ascending order and x_1, x_2, x_3, x_4 are integers, find the value of p_1, p_2, p_3, p_4 and x_1, x_2, x_3, x_4.

B

34. A mother divides Rs. 207 into three parts such that the amounts are in A.P. and gives it to her three children. The product of the two least amounts that the children had is 4623. Find the amount received by each child.

B

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35. Find the G.C.D. of the given polynomials :

B $x^4 + 3x^3 - x - 3, x^3 + x^2 - 5x + 3.$

36. Find the LCM and GCD for the following polynomial :

B $(x^3 - 1)(x + 1), (x^3 + 1)$ and verify that $f(x) \times g(x) = \text{L.C.M} \times \text{G.C.D.}$

B 37. Simplify : $\frac{b^2 + 3b - 28}{b^2 + 4b + 4} \div \frac{b^2 - 49}{b^2 - 5b - 14}$.

38. Find the values of m and n if the following polynomials are

B perfect squares $x^4 - 8x^3 + mx^2 + nx + 16.$

39. The roots of the equation $x^2 + 6x - 4 = 0$ are α, β. Find the

B quadratic equation whose roots are :

1) $\frac{2}{\alpha}$ and $\frac{2}{\beta}$ 2) $\alpha^2\beta$ and $\beta^2\alpha$

40. If the roots of $(a - b)x^2 + (b - c)x + (c - a) = 0$ are real and

B equal, then prove that b, a, c are in arithmetic progression.

41. The ratio fo 6th and 8th term of a A.P. is 7 : 9. Find the ratio

B of 9th term and 13th term.

42. The base of a triangle is 4cm longer than its altitude. If

C the area of a triangle is 48sq.cm., then find its base and altitude.

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29

$$A\times(B\cup C) = (A\times B)\cup(A\times C)$$

$$B\cup C = \{2, 3, 4, 5\}$$

$$A\times(B\cup C) = \{0, 1\}\times\{2, 3, 4, 5\}$$

$$=\{(0,2),(0,3),(0,4),(0,5),(1,2),(1,3),(1,4),(1,5)\} \ldots (1)$$

$$A\times B = \{0, 1\}\times\{2, 3, 4\}$$

$$= \{(0,2),(0,3),(0,4),(1,2),(1,3),(1,4)\}$$

$$A\times C = \{0, 1\}\times\{3, 5\}$$

$$= \{(0,3),(0,5),(1,3),(1,5)\}$$

$$(A\times B)\cup(A\times C) = \{(0,2),(0,3),(0,4),(0,5),(1,2),(1,3),(1,4),(1,5)\}\ldots.(2)$$

From (1) × (2), it is clear that

$$A\times(B\cup C) = (A\times B)\cup(A\times C)$$

Hence verified.

30

Sol : $A = \{5, 6\}$, $B = \{4, 5, 6\}$, $C = \{5, 6, 7\}$

LHS: $A\times A = \{5, 6\}\times\{5, 6\}$

$$= \{(5,5),(5,6),(6,5),(6,6)\}$$

$$B\times B = \{4, 5, 6\}\times\{4, 5, 6\}$$

$$= \{(4,4),(4,5),(4,6),(5,4),(5,5),(5,6),(6,4),(6,5),(6,6)\}$$

RHS:

$$C\times C = \{5, 6, 7\}\times\{5, 6, 7\}$$

$$= \{(5,5),(5,6),(5,7),(6,5),(6,6),(6,7),(7,5),(7,6),(7,7)\}$$

$$(B\times B)\cap(C\times C) = \{(5,5),(5,6),(6,5),(6,6)\}$$

$\therefore$ LHS = RHS

$$A\times A = (B\times B)\cap(C\times C)$$

Hence proved.

31

Sol :

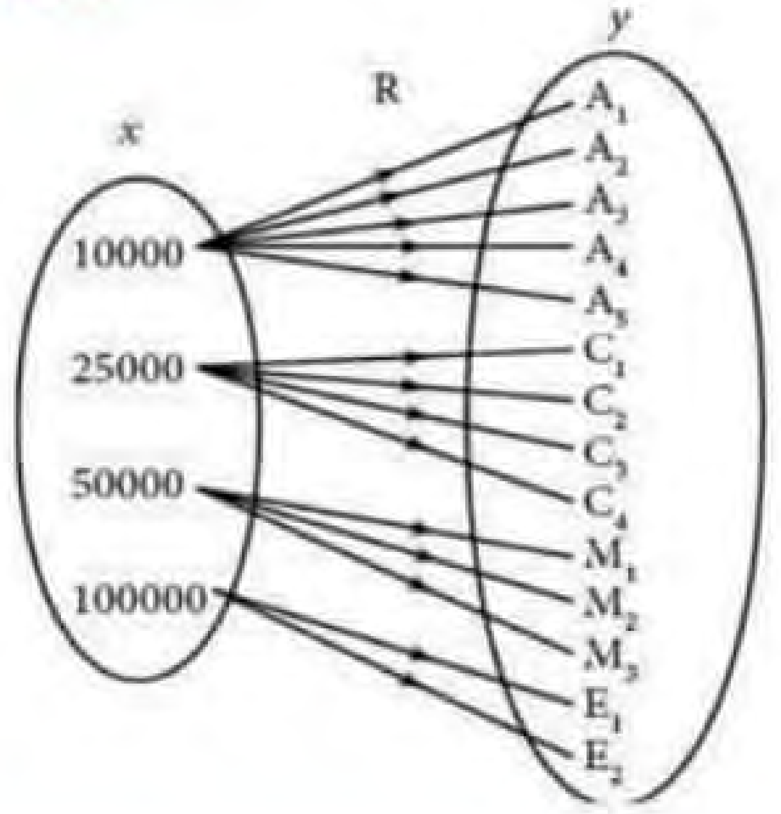
Ordered Pair : The Domain of the relation is about the salaries given to person.

Relation is $R = \{(10000, A_1), (10000, A_2), (10000, A_3), (10000, A_4), (10000, A_5), (25000, C_1), (25000, C_2), (25000, C_3), (25000\ C_4), (50000, M_1), (50000, M_2), (50000, M_3), (100000, E_1), (100000, E_2)\}$

Relation R defined by x R y

'x' is the salary given to person 'y'.

Arrow diagram



32

84, 90 and 120

First we will find the H.C.F. of 84 and 90.

H.C.F. (90, 84)

Applying Euclid's Division Algorithm until we get remainder zero.

$$90 = 84(1) + 6$$

$$84 = 6(14) + 0$$

Remainder = 0

$\therefore$ H.C.F. (90, 84) = 6

Now finding H.C.F. (120, 6) we have

$$120 = 6(20) + 0$$

Remainder = 0

$\therefore$ H.C.F. is 6.

So H.C.F. of 84, 90 and 120 is 6.

33

2	113400
2	56700
2	28350
3	14175
3	4725
3	1575
3	525
5	175
5	35
7	7
	1

The number 113400 can be factorized as

$113400 = 2^3\times 3^4\times 5^2\times 7^1$ where

2, 3, 5, 7 are primes in ascending order.

$\therefore$ Comparing

$$p_1^{x_1}\times p_2^{x_2}\times p_3^{x_3}\times p_4^{x_4} = 2^3\times 3^4\times 5^2\times 7^1$$

$p_1 = 2$; $p_2 = 3$; $p_3 = 5$; $p_4 = 7$

$x_1 = 3$; $x_2 = 4$; $x_3 = 2$; $x_4 = 1$.

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34 Let the amount received by the three children be in the form of A.P. is given by $a-d$, a, $a+d$. Since, sum of the amount is ₹207, we have

$$(a-d)+a+(a+d)=207$$

$$3a=207 \Rightarrow a=69$$

It is given that product of the two least amounts is 4623.

$$(a-d)a=4623$$

$$(69-d)69=4623$$

$$d=2$$

Therefore, amount given by the mother to her three children are

₹(69–2), ₹69, ₹(69+2). That is, ₹67, ₹69 and ₹71.

35

$x^4+3x^3-x-3,\ x^3+x^2-5x+3$

Let us divide the highest degree polynomial by least degree polynomial and

$$\text{Let } f(x) = x^4+3x^3-x-3$$

$$g(x) = x^3+x^2-5x+3$$

Now, dividing f (x) by g (x).

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35

$$\begin{array}{r|ll}
 & x+2 & \\
\hline
x^3+x^2-5x+3 & x^4+3x^3+0x^2-x-3 & \\
 & x^4+x^3-5x^2+3x & (-) \\
\cline{2-2}
 & 2x^3+5x^2-4x-3 & \\
 & 2x^3+2x^2-10x+6 & (-) \\
\cline{2-2}
 & 3x^2+6x-9 &
\end{array}$$

$$=3(x^2+2x-3)\neq 0$$

Since '3' is not the divisor of g (x), let us divide g (x) by x^2+2x-3

$$\begin{array}{r|ll}
 & x-1 & \\
\hline
x^2+2x-3 & x^3+x^2-5x+3 & \\
 & x^3+2x^2-3x & (-) \\
\cline{2-2}
 & -x^2-2x+3 & \\
 & -x^2-2x+3 & (-) \\
\cline{2-2}
 & 0 &
\end{array}$$

Since, the Remainder is zero, the GCD is x^2+2x-3.

36

$$\begin{aligned}
f(x) &= (x^3-1)(x+1) \\
&= (x-1)(x^2+x+1)(x+1) \\
g(x) &= x^3+1=(x+1)(x^2-x+1) \\
\text{GCD} &= x+1 \\
\text{LCM} &= (x+1)(x-1)(x^2+x+1) \\
&\qquad (x^2-x+1) \\
f(x)\times g(x) &= (x^3-1)(x+1)(x^3+1) \\
&= (x+1)((x^3)^2-(1)^2) \\
&= (x+1)(x^6-1) \\
\text{LCM}\times\text{GCD} &= (x+1)(x-1)(x^2+x+1) \\
&\qquad (x^2-x+1)(x+1) \\
&= (x+1)(x^2-x+1)(x-1) \\
&\qquad (x^2+x+1)(x+1) \\
&= (x^3+1)(x^3-1)(x+1) \\
&= (x^6-1)(x+1) \\
\therefore\ f(x)\times g(x) &= \text{LCM}\times\text{GCD}
\end{aligned}$$

Hence verified.

37

$$\frac{b^2+3b-28}{b^2+4b+4} \div \frac{b^2-49}{b^2-5b-14}$$

$$=\frac{b^2+3b-28}{b^2+4b+4} \times \frac{b^2-5b-14}{b^2-49}$$

$$=\frac{(b+7)(b-4)}{(b+2)^2} \times \frac{(b-7)(b+2)}{(b-7)(b+7)}$$

$$=\frac{b-4}{b+2}$$

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38

$$\begin{array}{r|l}
 & x^2 - 4x + \left(\frac{m-16}{2}\right) \\
\hline
x^2 & x^4 - 8x^3 + mx^2 + nx + 16 \\
 & x^4 \qquad\qquad\qquad\qquad (-) \\
\hline
2x^2 - 4x & -8x^3 + mx^2 \\
 & -8x^3 + 16x^2 \qquad\qquad (-) \\
\hline
2x^2 - 8x + \left(\frac{m-16}{2}\right) & (m-16)x^2 + nx + 16 \\
 & (m-16)x^2 - 4(m-16)x + \left(\frac{m-16}{2}\right) \quad (-) \\
\hline
 & [n + 4(m-16)]x + 16 - \left(\frac{m-16}{2}\right)^2
\end{array}$$

Since the polynomial is a perfect square,

$$n + 4(m - 16) = 0$$

$$\text{and } 16 - \frac{(m-16)^2}{4} = 0$$

$$\therefore\ 64 - (m - 16)^2 = 0$$

$$(m - 16)^2 = 64$$

$$m - 16 = 8$$

$$m = 8 + 16 = 24$$

$$m = 24$$

$$\therefore\ n + 4(24 - 16) = 0$$

$$n + 4(8) = 0$$

$$n + 32 = 0$$

$$n = -32$$

$$\therefore\ m = 24, n = -32$$

39

Given roots are $\frac{2}{\alpha}$ and $\frac{2}{\beta}$

$$\text{Sum of the roots} = \frac{2}{\alpha} + \frac{2}{\beta}$$

$$= \frac{2(\alpha+\beta)}{\alpha\beta}$$

$$= \frac{2(-6)}{-4} = 3$$

$$\text{Product of the roots} = \left(\frac{2}{\alpha}\right)\left(\frac{2}{\beta}\right)$$

$$= \frac{4}{\alpha\beta} = \frac{4}{-4} = -1$$

$\therefore$ Quadratic equation is

x^2 – (Sum of the roots) x + Product of the roots = 0

$$x^2 - 3x - 1 = 0$$

Given roots are $\alpha^2\beta$ and $\beta^2\alpha$

$$\text{Sum of the roots} = \alpha^2\beta + \beta^2\alpha$$

$$= \alpha\beta(\alpha+\beta)$$

$$= (-4)(-6) = 24$$

$$\text{Product of the roots} = (\alpha^2\beta)(\beta^2\alpha)$$

$$= \alpha^3\beta^3 = (\alpha\beta)^3$$

$$= (-4)^3 = -64$$

$\therefore$ Quadratic equation is

x^2 – (Sum of the roots) x + Product of the roots = 0

$$x^2 - 24x - 64 = 0$$

40

$$(a - b)x^2 + (b - c)x + (c - a) = 0$$

$$A = a - b,$$

$$B = b - c,$$

$$C = c - a$$

Given that roots are real and equal

$$B^2 - 4AC = 0$$

$$(b - c)^2 - 4(a - b)(c - a) = 0$$

$$b^2 - 2bc + c^2 - 4(ac - a^2 - bc + ab) = 0$$

$$b^2 - 2bc + c^2 - 4ac + 4a^2 + 4bc - 4ab = 0$$

$$4a^2 + b^2 + c^2 - 4ab - 2bc - 4ac = 0$$

$$(2a)^2 + (-b)^2 + (-c)^2 + 2(2a)(-b)$$
$$+ 2(-b)(-c) + 2(2a)(-c) = 0$$

$$(2a - b - c)^2 = 0$$

$$2a - b - c = 0$$

$$2a = b + c$$

$$a = \frac{b+c}{2}$$

b, a and c are in arithmetic progression.

41

Given in an A.P. 6th term : 8th term = 7 : 9

$$a + (6 - 1)d : a + (8 - 1)d = 7 : 9$$

$$a + 5d : a + 7d = 7 : 9$$

Product of the extremes = product of the means.

$$9(a + 5d) = 7(a + 7d)$$

$$9a + 45d = 7a + 49d$$

$$9a - 7a = 49d - 45d$$

$$2a = 4d$$

$$a = 2d$$

To find the ratio of 9th term : 13th term

$$a + (9 - 1)d : a + (13 - 1)d = a + 8d : a + 12d$$

$$= 2d + 8d : 2d + 12d$$

$$= 10d : 14d$$

$$= 5 : 7.$$

The ratio of 9th term to 13th term is 5 : 7.

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PART - IV

Note : Answer the following questions. 2 X 8 = 16

43. a) Let X = {1, 2, 3, 4, 5}, Y = {1, 3, 5, 7, 9}, which of the following are relation from X to Y?

C

i) R_1 = {(1, 3) (2, 4) (3, 5) (4, 6) (5, 7)} ✗

ii) R_2 = {(1, 1) (2, 1) (3, 3) (4, 3) (5, 5)} ✓

iii) R_3 = {(1, 1) (1, 3) (3, 5) (3, 7) (5, 7)} ✓

iv) R_4 = {(1, 3) (2, 5) (4, 7) (5, 9) (3, 1)} ✓

(OR)

B

b) There are 12 pieces of five, ten and twenty rupees currencies whose total value is Rs. 105. When first 2 sorts are interchanged in their numbers its value will be increased by Rs. 20. Find the number of currencies in each sort.

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B

44. a) Draw the graph of $x^2 - 8x + 16 = 0$ and state the nature of their solution.

(OR)

B

b) Draw the graph of $y = x^2 + 3x + 2$ and use it to solve $x^2 + 2x + 1 = 0$.

product of the two least amounts that the children had is

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42 Let the altitude of the triangle be x cm.

$8 > 4$

By the given condition, the base of the triangle is (x + 4) cm.

Now, the area of the triangle = $\frac{1}{2}(base) \times (height)$

By the given condition $\frac{1}{2}(x+4)(x) = 48$

$\rightarrow x^2 + 4x - 96 = 0 \rightarrow (x+12)(x-8) = 0$

$\rightarrow x = -12$ or 8

But x = 12 - is not possible (since the length should be positive)

Therefore, x = 8 and hence, $x + 4 = 12$. ✓

Thus, the altitude of the triangle is 8 cm and the base of the triangle is 12 cm.

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43 a) Let X = {1, 2, 3, 4, 5}, Y = {1, 3, 5, 7, 9}, which of the following are relation from X to Y?

i) R_1 = {(1, 3) (2, 4) (3, 5) (4, 6) (5, 7)} $(2,4) \& (4,6) \notin X \times Y$ not a relation

✓ ii) R_2 = {(1, 1) (2, 1) (3, 3) (4, 3) (5, 5)} $R_2 \subseteq A \times B$ is a relation

✓ iii) R_3 = {(1, 1) (1, 3) (3, 5) (3, 7) (5, 7)} $R_3 \subseteq A \times B$ is a relation

✓ iv) R_4 = {(1, 3) (2, 5) (4, 7) (5, 9) (3, 1)} $R_4 \subseteq A \times B$ is a relation

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43.b. Let the number of five, ten and twenty rupee currencies be x, y and z respectively.

$$\therefore \text{ Given } \quad x + y + z = 12 \qquad \ldots (1)$$
$$5x + 10y + 20z = 105 \qquad \ldots (2)$$
$$10x + 5y + 20z = 125 \qquad \ldots (3)$$

Consider (2) and (3)

$$5x + 10y + 20z = 105 \qquad \ldots (2)$$
$$10x + 5y + 20z = 125 \qquad \ldots (3)$$
$$(2) - (3) \Rightarrow -5x + 5y = -20 \qquad \ldots (4)$$

Consider (1) and (2)

$$(1) \times 20 \Rightarrow 20x + 20y + 20z = 240 \qquad \ldots (5)$$
$$(2) \times 1 \Rightarrow 5x + 10y + 20z = 105 \qquad \ldots (2)$$
$$(5) - (2) \Rightarrow 15x + 10y = 135 \qquad \ldots (6)$$

Consider (4) and (6)

$$(4) \times 3 \Rightarrow -15x + 15y = -60 \qquad \ldots (7)$$
$$15x + 10y = 135 \qquad \ldots (6)$$
$$25y = 75$$
$$y = \frac{75}{25} = 3$$

Substituting y = 3 in (4)

$$-5x + 5(3) = -20$$
$$-5x = -20 - 15$$
$$-5x = -35$$
$$x = \frac{35}{5} = 7$$

Substituting x = 7, y = 3 in (1)

$$7 + 3 + z = 12$$
$$z = 12 - 10 = 2$$

∴ The number of five rupee currencies 7
The number of ten rupee currencies 3
The number of twenty rupee currencies 2

44.a.

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$$x^2 - 8x + 16 = 0$$

Step 1: Prepare the table of values for the equation $y = x^2 - 8x + 16$

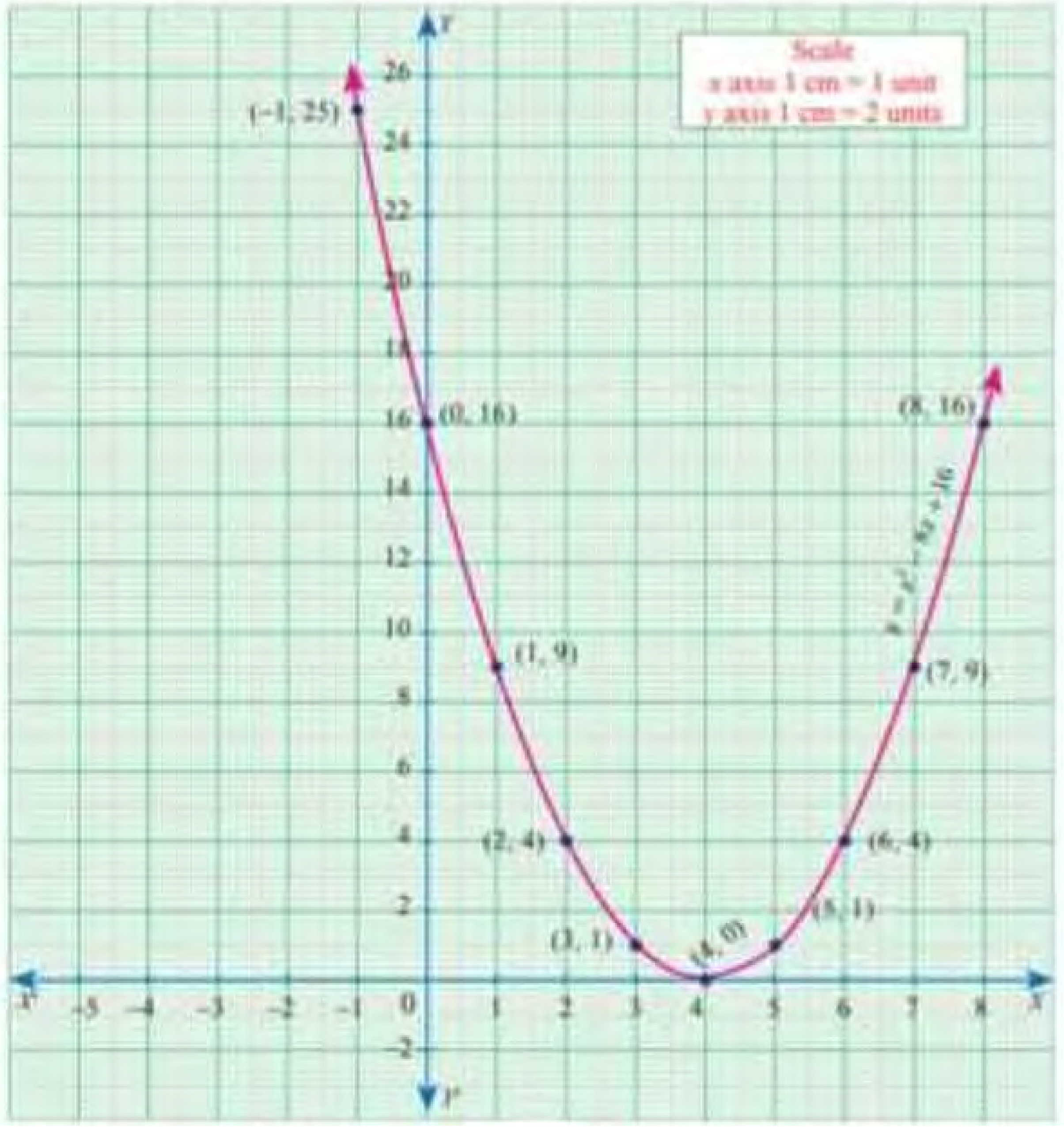
x	−1	0	1	2	3	4	5	6	7	8
y	25	16	9	4	1	0	1	4	9	16

Step 2: Plot the points for the above ordered pairs (x, y) on the graph using suitable scale.

Step 3: Draw the parabola and mark the coordinates of the parabola which intersect with the X axis.

Step 4: The roots of the equation are the x coordinates of the intersecting points of the parabola with the X axis (4,0) which is 4.

Since there is only one point of intersection with X axis, the quadratic equation $x^2 - 8x + 16 = 0$ has real and equal roots.



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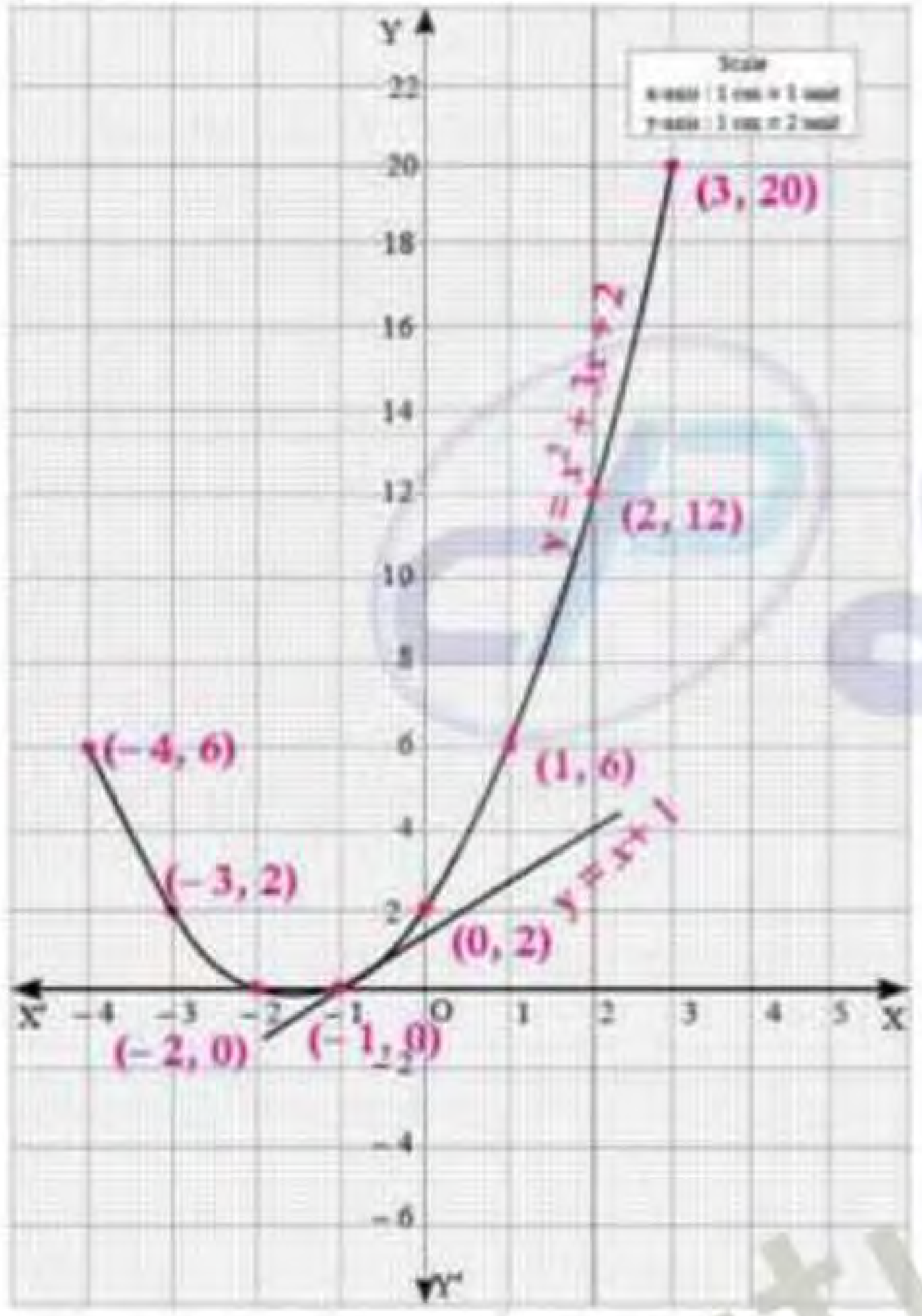
44.b.

$y = x^2 + 3x + 2$

Table of Points:

x	−4	−3	−2	−1	0	1	2	3
x^2	16	9	4	1	0	1	4	9
3x	−12	−9	−6	−3	0	3	6	9
2	2	2	2	2	2	2	2	2
y	6	2	0	0	2	6	12	20

Points to be plotted in the graph are (− 3, 2), (− 2, 0) (− 1, 0), (0, 2), (1, 6), (2, 12) and (3, 20)



Now, Subtracting $y = x^2 + 3x + 2$ and $x^2 + 2x + 1 = 0$, we get

$$\begin{array}{ll} y = x^2 + 3x + 2 & \\ \underline{0 = x^2 + 2x + 1} & (-) \\ \underline{y = x + 1} & \text{is a straight line.} \end{array}$$

Table of points

x	0	−1	1
y	1	0	2

The curve $y = x^2 + 3x + 2$ and the line $y = x + 1$ intersects at (−1, 0)

Hence the solution of $x^2 + 2x + 1 = 0$ is $x = -1, -1$

Roots are real and equal.

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