

SECTION QUIZ 71

Quantitative Aptitude (Quadratic Equation)

Q.1) If $x^2 + 36y^2 = 25$ and $xy = 2$, $x, y > 0$, then the value of $(216y^3 + x^3)$ is

[A] 105

[B] 115

[C] 91

[D] 75

[E] 81

Q.2) Solve the given equations and find the relation between x and y .

I: $4x^2 + 2ax - 116 = 0$

II: $3y^2 + 3by + 15a = 0$

III: $135\% \text{ of } 480 + a\% \text{ of } 320 = 728$

IV: $464 \div 29 \times 10 + 126 = b + 256$

[A] $x > y$

[B] $x < y$

[C] $x \geq y$

[D] $x \leq y$

[E] Either $x = y$ or the relation cannot be established

Q.3) Solve the given four equations and find the relation between x and y .

I: $4x^2 - 4ax + 120 = 0$

II: $2y^2 - 26y + 7b = 0$

III: $\sqrt{2^a} = (8^3 \times 5^2) \div (200\sqrt{2})$

IV: $b + (1.6)^2 \div (0.8)^2 = [(2.4)^2 \div (0.6)^2]$

[A] $x > y$

[B] $x < y$

[C] $x \geq y$

[D] $x \leq y$

[E] Either $x = y$ or the relation cannot be established

Q.4) Directions: In each of the following questions, read the given statement and compare Quantity I, Quantity II and Quantity III on its basis. (only quantity is to be considered)

$$5A^2 = (4B)^2 = C^2/2$$

Quantity I: $A^2 - B^2 + C^2 - AB \times \sqrt{5}$

Quantity II: $A^2 + B^2 - C^2 - 3BC \times \sqrt{2}$

Quantity III: $B^2 - A^2 + C^2 - 4AC \times \sqrt{2.50}$

[A] Quantity I > Quantity II > Quantity III

[B] Quantity I > Quantity II < Quantity III

[C] Quantity I < Quantity II < Quantity III

[D] Quantity I < Quantity II > Quantity III

[E] Quantity I > Quantity II = Quantity III

Instruction: Directions: In each of the following questions, read the given statement and compare the Quantity I, II and Quantity III on its basis. (Only quantity is to be considered)

Q.5) Quantity I: The roots of the equation $x^2 - 7x + 12 = 0$ are p and q. What is the sum of all possible values of $(p)^q$?

Quantity II: The first and last term of an A.P. is 320 and -160 respectively and the common difference can be -160 or -120 . If the number of terms can be a or b, what is the sum of all possible values of $(a^3 - b^2)$?

Quantity III: Roots of the equation $x^3 - 14x^2 + 35x - 22 = 0$ are e, f and g, (where $e < f < g$). What is the value of $(e + g)^f$?

[A] Quantity I > Quantity II > Quantity III

[B] Quantity I < Quantity II < Quantity III

[C] Quantity I < Quantity II > Quantity III

[D] Quantity I = Quantity II > Quantity III

[E] Quantity I > Quantity II = Quantity III

Q.6) If 'a' and 'b' are the roots of the equation $x^2 + 5x + 6 = 0$, then find out the equation whose roots are '2a' and '2b'.

[A] $x^2 + 8x + 24 = 0$

[B] $x^2 + 12x + 44 = 0$

[C] $x^2 + 10x + 24 = 0$

[D] $x^2 + 16x + 56 = 0$

[E] Can't be determined

Q.7) The equation $x^2 + 30x + C = 0$, has two roots 'a' and 'b' such that $(a - b) = 2$. Find an equation which is equal to thrice of the given equation.

[A] $3x^2 + 90x + 512 = 0$

[B] $3x^2 + 90x + 624 = 0$

[C] $3x^2 + 90x + 712 = 0$

[D] $3x^2 + 90x + 672 = 0$

[E] $3x^2 + 90x + 462 = 0$

Q.8) I. $5x^2 - 18x + 9 = 0$

II. $3y^2 + 5y - 2 = 0$

[A] $x \leq y$

[B] $y > x$

[C] $x = y$ or relation cannot be established

[D] $x > y$

[E] $x \geq y$

Q.9) The equation $x^2 - px - 72 = 0$, has two roots 'a' and 'b' such that $(a - b) = 18$ and $p > 0$. If a series starts with 'p' such that the consecutive terms are 4 more than the preceding term is formed, then find the 4th term of such series.

[A] 18

[B] 12

[C] 10

[D] 16

[E] 14

Q.10) If one of the roots of the equation given as $x^2 + \{130x^2/\sqrt{(180x^2 + 144x^2)}\} - 4k = 0$, is $16/9$. Find the value of 'k'.

- [A] 8
 - [B] -4
 - [C] 4
 - [D] -8
 - [E] None of these
-

Instruction: In the questions, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

Q.11) I.) $x^3 = 2744$

II.) $11y^2 = 3x + 2$

- [A] $x > y$
 - [B] $x < y$
 - [C] $x = y$ or the relationship cannot be established
 - [D] $x \geq y$
 - [E] $x \leq y$
-

Instruction: In the questions, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

Q.12) I.) $3x^2 + 26x = -16$

II.) $y^2 + 20y + 100 = 0$

- [A] $x > y$
 - [B] $x < y$
 - [C] $x = y$ or the relationship cannot be established
 - [D] $x \geq y$
 - [E] $x \leq y$
-

Instruction: In the questions, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

Q.13) I.) $x^3 = 729$

II.) $y^4 - 1296 = 0$

[A] $x > y$

[B] $x < y$

[C] $x = y$ or the relationship cannot be established

[D] $x \geq y$

[E] $x \leq y$

Instruction: In the questions, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

Q.14) I.) $(x + y)^2 + (x - y)^2 = 0$

II.) $(x - 2)^2 = 0$

[A] $x > y$

[B] $x < y$

[C] $x = y$ or the relationship cannot be established

[D] $x \geq y$

[E] $x \leq y$

Instruction: In the questions, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

Q.15) I.) $(5/x^2) + (6/x) = (3/x^2) + (11x)$

II.) $y^2 + 7y - 260 = 0$

[A] $x > y$

[B] $x < y$

[C] $x = y$ or the relationship cannot be established

[D] $x \geq y$

[E] $x \leq y$

Q.16) In the questions two columns are given. You are required to solve the equations given in the "equations" column and match them with the correct statement given about the desired equation in the "conditions" column.

Equations	Conditions
(a) $2x^2 - 11x + 12 = 0$	(d) Product of roots is negative
(b) $5x^2 - 21x - 20 = 0$	(e) Product of roots is completely divisible by 6
(c) $x^2 - 17x + 72 = 0$	(f) Sum of both roots is positive

[A] (a) – (e) and (f), (b) – (d), (c) – (e)

[B] (a) – (e) and (f), (b) – (d) and (f) and (c) – (e) and (f)

[C] (a) – (e) and (f), (b) – (d) and (f) and (c) - (d) and (f)

[D] (a) – (f), (b) – (d) and (e), (c) – (e) and (f)

[E] None of these

Instruction: Directions: Answer the questions based on the information given below.

In the given table there are two columns I and II. Column I contains three equations and column II contains the roots of the equation given in column I, not necessarily in the same order. Study the given table carefully and answer the questions accordingly.

Column I	Column II
I. $x^2 - 5x - 104 = 0$	a.) 12, -17
II. $y^2 + 5y - 204 = 0$	b.) 19, -9
III. $z^2 - 10z - 171 = 0$	c.) 13, -8

Q.17) Find the correct relation between 'x' and 'y'.

[A] $x > y$

[B] $x < y$

[C] $x = y$ or no relationship can be established

[D] $x \geq y$

[E] $x \leq y$

Instruction: Directions: Answer the questions based on the information given below.

In the given table there are two columns I and II. Column I contains three equations and column II contains the roots of the equation given in column I, not necessarily in the same order. Study the given table carefully and answer the questions accordingly.

Column I	Column II
I. $x^2 - 5x - 104 = 0$	a.) 12, -17
II. $y^2 + 5y - 204 = 0$	b.) 19, -9
III. $z^2 - 10z - 171 = 0$	c.) 13, -8

Q.18) Which of the following relation is correct?

[A] I-b, II-c, III-a

[B] I-c, II-a, III-b

[C] I-b, II-a, III-c

[D] I-a, II-c, III-b

[E] I-c, II-b, III-c

Q.19) In the given table there are two columns I and II. Column I contains three equations and column II contains their roots not necessarily in the same order. Study the given table carefully and answer the questions given.

Column 1	Column II
I. $x^2 - 28x + 132 = 0$	a.) 12, 12
II. $y^2 + 25x + 100 = 0$	b.) -20, -5
III. $z^2 - 24x + 144 = 0$	c.) 22, 6

Which of the following is correct?

[A] I-b, II-c, III-a

[B] I-c, II-b, III-a

[C] I-b, II-a, III-c

[D] I-a, II-c, III-b

[E] I-c, II-a, III-b

Q.20) In the given table there are two columns I and II. Column I contains three equations and column II contains their roots not necessarily in the same order. Study the given table carefully and answer the questions given.

Column I	Column II
I. $x^2 - 5x - 6 = 0$	a.) 32, -32
II. $y^2 + 11y + 30 = 0$	b.) 6, -1
III. $z^2 - 1024 = 0$	c.) -5, -6

Which of the following is correct?

[A] I-b, II-c, III-a

[B] I-c, II-a, III-b

[C] I-b, II-a, III-c

[D] I-a, II-c, III-b

[E] I-c, II-b, III-a

Q.21) I. $(625)^{\frac{1}{4}}x + \sqrt{1225} = 155$

II. $\sqrt{196y} + 13 = 279$

[A] $x \leq y$

[B] $y > x$

[C] $x = y$ or relation cannot be established

[D] $x > y$

[E] $x \geq y$

Q.22) I. $12x^2 + 11x + 12 = 10x^2 + 22x$

II. $13y^2 - 18y + 3 = 9y^2 - 10y$

[A] $x \leq y$

[B] $y > x$

[C] $x = y$ or relation cannot be established

[D] $x > y$

[E] $x \geq y$

Q.23) **In the given question, two equations numbered I and II are given. Solve both the equations and mark the appropriate answer.**

I. $x^2 + 4x - 5 = 0$

II. $y^2 + 7y - 8 = 0$

[A] $X > Y$

[B] $X \geq Y$

[C] $Y > X$

[D] $Y \geq X$

[E] $X = Y$ or relationship between x and y cannot be established

Instruction: In the questions, two equations I and II are given. You have to solve both the equations to establish the correct relation between x and y and choose the correct option.

Q.24) I. $x^2 + 5x = 500$

II. $y^2 + 240 = 32y$

[A] $x = y$ or the relationship cannot be established

[B] $x < y$

[C] $x > y$

[D] $x \geq y$

[E] $x \leq y$

Q.25) The root of the quadratic equation $x^2 - 33x + 270 = 0$, are the running speeds of person A and B in km/hr. If A's speed is lower than B's then the time taken by A to travel 240 km and B to travel 342 km can be represented by the root of quadratic equation.

[A] $x^2 - 35x + 294 = 0$

[B] $x^2 - 35x + 300 = 0$

[C] $x^2 - 35x + 304 = 0$

[D] $x^2 - 35x + 276 = 0$

[E] $x^2 - 35x + 306 = 0$

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Answers

Quantitative Aptitude (Quadratic Equation)

Q.1)C Q.2)E Q.3)D Q.4)B Q.5)C Q.6)C Q.7)D Q.8)D Q.9)A Q.10)C Q.11)A Q.12)A

Q.13)A Q.14)D Q.15)C Q.16)B Q.17)C Q.18)B Q.19)B Q.20)A Q.21)D Q.22)E Q.23)E

Q.24)A Q.25)C

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Explanations

Quantitative Aptitude (Quadratic Equation)

Q.1) Explanation:

Detailed Solution:

$$x^2 + 36y^2 = 25$$

$$(x)^2 + (6y)^2 + 2(x)(6y) - 2(x)(6y) = 25$$

$$(x+6y)^2 = 25 + 12xy$$

$$(x+6y)^2 = 25 + 12 \times 2$$

$$(x+6y)^2 = 49$$

$$(x+6y) = 7 \text{ (Not } -7 \text{ as } x, y > 0 \text{)}$$

$$(x+6y)^3 = x^3 + 216y^3 + 3(x)(6y)(x+6y)$$

$$216y^3 + x^3 = (x+6y)^3 - 18xy(x+6y)$$

$$216y^3 + x^3 = (7)^3 - 18(2)(7)$$

$$216y^3 + x^3 = 91$$

Q.2) Explanation:

Detailed Solution:

$$\text{III: } 135\% \text{ of } 480 + a\% \text{ of } 320 = 728$$

$$648 + a \times 3.20 = 728$$

$$a = \frac{(728-648)}{3.2} = 25$$

$$\text{IV : } 464 \div 29 \times 10 + 126 = b + 256$$

$$160 + 126 = b + 256$$

$$b = 30$$

Now put these values in I and II:

$$\text{I: } 4x^2 + 2ax - 116 = 0$$

$$4x^2 + 2 \times 25x - 116 = 0$$

$$2x^2 + 25x - 58 = 0$$

$$2x^2 + 29x - 4x - 58 = 0$$

$$x = -\frac{29}{2} \text{ and } \frac{4}{2} = -14.50 \text{ and } 2$$

$$\text{II: } 3y^2 + 3by + 15a = 0$$

$$3y^2 + 3 \times 30y + 15 \times 25 = 0$$

$$y^2 + 30y + 125 = 0$$

$$y^2 + 25y + 5y + 125 = 0$$

$$y = -25 \text{ and } -5$$

So the relation cannot be established

Q.3) Explanation:

Detailed Solution:

$$\text{III: } \sqrt{2^a} = (8^3 \times 5^2) \div (200\sqrt{2})$$

$$2^{a \times \frac{1}{2}} = \frac{2^{3 \times 3} \times 25}{25 \times 2^{3 + \frac{1}{2}}}$$

$$a \times \frac{1}{2} = 3 \times 3 - (3 + \frac{1}{2})$$

$$a = 11$$

$$\text{IV: } b + (1.6)^2 \div (0.8)^2 = [(2.4)^2 \div (0.6)^2]$$

$$b + \frac{(1.6 \times 1.6)}{(0.8 \times 0.8)} = \frac{(2.4 \times 2.4)}{(0.6 \times 0.6)}$$

$$b + 4 = 16$$

$$b = 12$$

$$\text{I: } 4x^2 - 4ax + 120 = 0$$

$$x^2 - 11x + 30 = 0$$

$$x^2 - 5x - 6x + 30 = 0$$

$$x = 5 \text{ and } 6$$

$$\text{II: } 2y^2 - 26y + 7b = 0$$

$$2y^2 - 14y - 12y + 84 = 0$$

$$y = \frac{14}{2} \text{ and } \frac{12}{2} = 7 \text{ and } 6$$

$$\text{so } x \leq y$$

Q.4) Explanation:

Detailed Solution:

$$5A^2 = (4B)^2 = \frac{C^2}{2}$$

$$A^2 : B^2 : C^2 = \frac{1}{5} : \frac{1}{16} : 2$$

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

$$A = \sqrt{\frac{x}{5}}$$

$$B^2 = \frac{x}{16}$$

$$B = \sqrt{\frac{x}{16}}$$

$$C^2 = 2x$$

$$C = \sqrt{2x}$$

$$\text{Quantity: } A^2 - B^2 + C^2 - AB \times \sqrt{5}$$

$$\frac{x}{5} - \frac{x}{16} + 2x - \sqrt{\frac{x}{5}} \times \sqrt{\frac{x}{16}} \times \sqrt{5}$$

$$\frac{x}{5} - \frac{x}{16} + 2x - \frac{x}{4} = \frac{151x}{80}$$

$$\text{Quantity II: } A^2 + B^2 - C^2 - 3BC \times \sqrt{2}$$

$$\frac{x}{5} + \frac{x}{16} - 2x - 3 \times \sqrt{\frac{x}{16}} \times \sqrt{2x} \times \sqrt{2}$$

$$\frac{x}{5} - \frac{x}{16} - 2x - 3 \times \frac{x}{2} = -\frac{269x}{80}$$

$$\text{Quantity III: } B^2 - A^2 + C^2 - 4AC \times \sqrt{2.50}$$

$$\frac{x}{16} - \frac{x}{5} + 2x - 4 \times \sqrt{\frac{x}{5}} \times \sqrt{2x} \times \sqrt{2.50}$$

$$\frac{x}{16} - \frac{x}{5} + 2x - 4x = -\frac{171x}{80}$$

$$\text{Quantity I} > \text{Quantity II} < \text{Quantity III}$$

Q.5) Explanation:

Detailed Solution:

Quantity I:

$$x^2 - 7x + 12 = 0$$

$$(x - 3)(x - 4) = 0$$

$$x = 3, 4$$

$$p, q = 3, 4$$

Possible values of $(p)^q = 3^4$ and 4^3

$$\text{Sum} = 3^4 + 4^3 = 81 + 64 = 145$$

Quantity II:

$$a = 320$$

$$a + (n - 1)d = -160$$

$$(n - 1)d = -480$$

$$n = -\frac{480}{d} + 1$$

$$n = \frac{-480}{-160} + 1 = 4$$

or

$$n = \frac{-480}{-120} + 1 = 5$$

a, b = 4 or 5

Possible values of $(a^3 - b^2) = 4^3 - 5^2 = 39$

or

$$= 5^3 - 4^2 = 109$$

$$\text{Sum} = 39 + 109 = 148$$

Quantity III:

$$x^3 - 14x^2 + 35x - 22 = 0$$

Putting $x = 1$ will satisfy the equation,

so one root is $(x-1)$

Dividing the equation by $(x-1)$ we get

$$x^3 - 14x^2 + 35x - 22 = 0$$

Putting $x = 1$ will satisfy the equation,

so one root is $(x-1)$

Dividing the equation by $(x-1)$ we get

$$x^3 - 14x^2 + 35x - 22 = 0 = (x-1)(x^2 - 13x + 22)$$

$$= (x-1)(x-2)(x-11)$$

roots are 1, 2, 11

$$1 < 2 < 11$$

$$e = 1, f = 2, g = 11$$

$$(e + g)^f = (1 + 11)^2 = 144$$

Quantity I < Quantity II > Quantity III

Q.6) Explanation:

Detailed Solution:

$$x^2 + 5x + 6 = 0$$

$$x^2 + 3x + 2x + 6 = 0$$

$$x(x + 3) + 2(x + 3) = 0$$

$$(x + 2)(x + 3) = 0$$

$$x = -2, -3$$

So, roots of the other equation = $2 \times (-2)$ and $2 \times (-3) = -4, -6$

The equation whose roots are -4 and -6 is,

$$x^2 - (-4 - 6)x + (-4) \times (-6) = 0$$

$$x^2 + 10x + 24 = 0$$

Q.7) Explanation:

Detailed Solution:

Given, $x^2 + 30x + C = 0$

Since, sum of roots of the equation = $-30/1$

Therefore, $a + b = -30$ (1)

And, $a - b = 2$ (2)

On solving equation (1) and (2), we get

$$a = -14 \text{ and } b = -16$$

$$\text{Desired equation} = (x + 14)(x + 16) = 0$$

$$\text{Or, } x^2 + 30x + 224 = 0$$

$$\text{So, } 3 \times (x^2 + 30x + 224) = 0$$

$$\text{Or, } 3x^2 + 90x + 672 = 0$$

Q.8) Explanation:

Explanation-

$$\text{I. } 5x^2 - 18x + 9 = 0$$

$$\Rightarrow 5x^2 - 15x - 3x + 9 = 0$$

$$\Rightarrow 5x(x - 3) - 3(x - 3) = 0$$

$$\Rightarrow (5x - 3)(x - 3) = 0$$

$$\Rightarrow x = 3/5 \text{ or } 3$$

$$\text{II. } 3y^2 + 5y - 2 = 0$$

$$\Rightarrow 3y^2 + 6y - y - 2 = 0$$

$$\Rightarrow 3y(y + 2) - 1(y + 2)$$

$$\Rightarrow (3y - 1)(y + 2) = 0$$

$$\Rightarrow y = 1/3 \text{ or } -2$$

Clearly $x > y$.

Q.9) Explanation:

Detailed solution:

$$\text{Given, } x^2 + px - 72 = 0$$

Since, sum of roots = $-\frac{(-p)}{1}$

So, $a + b = p$

Since, product of roots of the equation = $-\frac{72}{1}$

Therefore, $ab = -72 \dots \dots (1)$

Or, $b = \frac{-72}{a}$

And, $a - b = 18 \dots \dots (2)$

Putting the value of 'b' in equation (2), we get $a^2 - 18a + 72 = 0$

$$a^2 - 12a - 6a + 72 = 0$$

$$\text{Or, } a(a - 12) - 6(a - 12) = 0$$

$$\text{Or } (a - 12)(a - 6) = 0$$

$$\text{Or, } a = 12, 6$$

When $a = 12$, then $b = -6\left(\frac{-72}{12}\right)$ (by using equation 1)

And, when $a = 6$, then $b = -12\left(\frac{-72}{6}\right)$

Therefore, $a + b = 12 + (-6) = 6 = p$

Therefore, series will be 6, 10, 14, 18

Fourth term = 18

Q.10) Explanation:

Detailed solution:

$$x^2 + \{130x^2/\sqrt{180x^2 + 144x^2}\} - 4k = 0$$

$$\text{So, } x^2 + (130x^2/18x) - 4k = 0$$

$$\text{Or, } x^2 + (65x/9) - 4k = 0$$

$$\text{Or, } 9x^2 + 65x - 36k = 0$$

Let second root of the equation be 'b'.

$$\text{So, sum of roots of the equation} = -(65/9) = -65/9$$

$$\text{Or, } b + (16/9) = -65/9$$

$$\text{Or, } b = \{(-65 - 16)/9\} = -9$$

$$\text{And product of roots} = -36k/9 = -4k$$

$$\text{So, } -4k = (16/9) \times (-9)$$

$$\text{Or, } -4k = -16$$

$$\text{Or, } k = 4$$

Q.11) Explanation:

Detailed solution:

From I:

$$x^3 = 2744$$

$$x = 14$$

From II:

$$11y^2 = 3x + 2$$

Putting the value of 'x' from (1)

$$11y^2 = 42 + 2$$

$$y^2 = 44/11 = 4$$

$$y = \pm 2$$

x	Relation	y
14	>	2
14	>	-2

So, $x > y$.

Q.12) Explanation:

Detailed solution:

From I:

$$3x^2 + 26x = -16$$

$$\text{Or, } 3x^2 + 26x + 16 = 0$$

$$\text{Or, } 3x^2 + 24x + 2x + 16 = 0$$

$$\text{Or, } 3x(x + 8) + 2(x + 8) = 0$$

$$\text{Or, } x = -8, -2/3$$

From II:

$$y^2 + 20y + 100 = 0$$

$$(y + 10)^2 = 0$$

$$y = -10, -10$$

x	Relation	y
-8	>	-10
-2/3	>	-10

So, $x > y$

Q.13) Explanation:

From I:

$$x^3 = 729$$

$$x = 9$$

From II:

$$y^4 - 1296 = 0$$

$$y = \pm 6$$

x	Relation	y
9	>	6
9	>	-6

So, $x > y$

Q.14) Explanation:

From I:

$$(x + y)^2 + (x - y)^2 = 0$$

$$\text{Or, } 2x^2 + 2y^2 = 0$$

$$\text{Or, } x = 0 \text{ or } y = 0$$

From II:

$$(x - 2)^2 = 0$$

$$x - 2 = 0$$

$$x = 2$$

x	Relation	y
0	=	0
2	>	0

So, $x \geq y$

Q.15) Explanation:

Detailed solution:

From I:

$$(5/x^2) + (6/x) = (3/x^2) + (11/x)$$

$$(5/x^2) - (3/x^2) = (11/x) - (6/x)$$

$$(2/x^2) = (5/x)$$

$$5x^2 - 2x = 0$$

$$x(5x - 2) = 0$$

$$x = 0, 2/5$$

From II:

$$y^2 + 7y - 260 = 0$$

$$y^2 + 20y - 13y - 260 = 0$$

$$y(y + 20) - 13(y + 20) = 0$$

$$(y - 13)(y + 20) = 0$$

$$y = 13, -20$$

x	Relation	y
0	<	13
0	>	-20
2/5	<	13
2/5	>	-20

So, the relation between x and y cannot be established

Q.16) Explanation:

Detailed solution:

For (a):

$$2x^2 - 11x + 12 = 0$$

$$\text{Or, } 2x^2 - 8x - 3x + 12 = 0$$

$$\text{Or, } 2x(x - 4) - 3(x - 4) = 0$$

$$\text{Or, } (2x - 3)(x - 4) = 0$$

$$\text{Or, } x = 3/2 \text{ or } x = 4$$

$$\text{Sum of roots} = (3/2) + 4 = 11/2 \text{ (positive)}$$

$$\text{Product of roots} = (3/2) * 4 = 6 \text{ (positive)}$$

Since, $6/6 = 1$

So, larger root is completely divisible by '6'.

So, equation (a) satisfies the condition given in (e) as well as (f).

For (b):

$$5x^2 - 21x - 20 = 0$$

$$\text{Or, } 5x^2 - 25x + 4x - 20 = 0$$

$$\text{Or, } 5x(x - 5) + 4(x - 5) = 0$$

$$\text{Or, } (5x + 4)(x - 5) = 0$$

$$\text{Or, } x = -4/5 \text{ or } x = 5$$

$$\text{Sum of roots} = (-4/5) + 5 = 21/5 \text{ (positive)}$$

$$\text{Product of roots} = -4/5 \times 5 = -4 \text{ (negative)}$$

Since, $21/5$ is not completely divisible by '6'.

So, equation (b) satisfies the condition given in (d) and (f).

For (c):

$$x^2 - 17x + 72 = 0$$

$$\text{Or, } x^2 - 8x - 9x + 72 = 0$$

$$\text{Or, } x(x - 8) - 9(x - 8) = 0$$

$$\text{Or, } (x - 9)(x - 8) = 0$$

$$\text{Or, } x = 9 \text{ or } x = 8$$

$$\text{Sum of roots} = 9 + 8 = 17 \text{ (positive)}$$

$$\text{Product of roots} = 9 \times 8 = 72 \text{ (positive)}$$

$$\text{Since, } 72 \text{ is completely divisible by } 72 \text{ i.e. } 72/6 = 12$$

So, equation (c) satisfies the condition given in (e) and (f)

Q.17) Explanation:

Detailed solution:

From I:

$$x^2 - 5x - 104 = 0$$

$$x^2 - 13x + 8x - 104 = 0$$

$$x(x - 13) + 8(x - 13) = 0$$

$$(x - 13)(x + 8) = 0$$

$$x = 13, -8$$

From II

$$y^2 + 5y - 204 = 0$$

$$y^2 - 12y + 17y - 204 = 0$$

$$y(y - 12) + 17(y - 12) = 0$$

$$(y - 12)(y + 17) = 0$$

$$y = 12, -17$$

From III

$$z^2 - 10z - 171 = 0$$

$$z^2 - 19z + 9z - 171 = 0$$

$$z(z - 19) = 9(z - 19) = 0$$

$$(z - 19)(z + 9) = 0$$

$$z = 19, -9$$

Using the common solution,

X	Relation	Y
-8	>	-17
-8	<	12
13	>	-17
13	>	12

So no relationship can be established between 'x' and 'y'.

Q.18) Explanation:

Detailed solution:

From I:

$$x^2 - 5x - 104 = 0$$

$$x^2 - 13x + 8x - 104 = 0$$

$$x(x - 13) + 8(x - 13) = 0$$

$$(x - 13)(x + 8) = 0$$

$$x = 13, -8$$

From II

$$y^2 + 5y - 204 = 0$$

$$y^2 - 12x + 17x - 204 = 0$$

$$y(y - 12) + 17(y - 12) = 0$$

$$(y - 12)(y + 17) = 0$$

$$y = 12, -17$$

From III

$$z^2 - 10z - 171 = 0$$

$$z^2 - 19z + 9z - 171 = 0$$

$$z(z - 19) = 9(z - 19) = 0$$

$$(z - 19)(z + 9) = 0$$

$$z = 19, -9$$

Q.19) Explanation:

Detailed Solution:

From I:

$$x^2 - 28x + 132 = 0$$

$$x^2 - 22x - 6x + 132 = 0$$

$$x(x - 22) - 6(x - 22) = 0$$

$$(x - 22)(x - 6) = 0$$

$$x = 22, 6$$

From II:

$$y^2 + 25y + 100 = 0$$

$$y^2 + 20y + 5y + 100 = 0$$

$$y(y + 20) + 5(y + 20) = 0$$

$$(y + 5)(y + 20) = 0$$

$$y = -5, -20$$

From III:

$$z^2 - 24z + 144 = 0$$

$$(z - 12)^2 = 0$$

$$z = 12, 12$$

Q.20) Explanation:

Detailed Solution:

From I:

$$x^2 - 5x - 6 = 0$$

$$x^2 - 6x + x - 6 = 0$$

$$x(x - 6) + 1(x - 6) = 0$$

$$(x + 1)(x - 6) = 0$$

$$x = -1, 6$$

From II:

$$y^2 + 11y + 30 = 0$$

$$y^2 + 5y + 6y + 30 = 0$$

$$y(y + 5) + 6(y + 5) = 0$$

$$(y + 5)(y + 6) = 0$$

$$y = -5, -6$$

From III:

$$z^2 - 1024 = 0$$

$$z^2 = 1024$$

$$z = \pm 32$$

Q.21) Explanation:

Explanation-

$$\text{I. } (625)^{\frac{1}{4}}x + \sqrt{1225} = 155$$

$$\Rightarrow (5^4)^{\frac{1}{4}}x + 35 = 155$$

$$\Rightarrow 5x = 155 - 35 \Rightarrow 5x = 120$$

$$\Rightarrow x = 120/5 = 24$$

$$\text{II. } \sqrt{196y} + 13 = 279$$

$$\Rightarrow 14y = 279 - 13 = 266$$

$$\Rightarrow y = 266/14 = 19$$

Clearly $x > y$

Q.22) Explanation:

Explanation-

$$\text{I. } 12x^2 + 11x + 12 = 10x^2 + 22x$$

$$\Rightarrow 2x^2 - 11x + 12 = 0$$

$$\Rightarrow 2x^2 - 8x - 3x + 12 = 0$$

$$\Rightarrow 2x(x - 4) - 3(x - 4) = 0$$

$$\Rightarrow (x - 4)(2x - 3) = 0$$

$$\Rightarrow x = 4 \text{ or } 3/2$$

$$\text{II. } 13y^2 - 18y + 3 = 9y^2 - 10y$$

$$\Rightarrow 4y^2 - 8y + 3 = 0$$

$$\Rightarrow 4y^2 - 6y - 2y + 3 = 0$$

$$\Rightarrow 2y(2y - 3) - 1(2y - 3) = 0$$

$$\Rightarrow y = 1/2 \text{ or } 3/2$$

Clearly $x \geq y$.

Q.23) Explanation:

Detailed solution:

$$\text{I. } x^2 + 4x - 5 = 0$$

$$\Rightarrow x^2 - x + 5x - 5 = 0$$

$$\Rightarrow x(x - 1) + 5(x - 1) = 0$$

$$\Rightarrow (x - 1)(x + 5) = 0$$

$$x = 1, -5$$

$$\text{II. } y^2 + 7y - 8 = 0$$

$$\Rightarrow y^2 - y + 8y - 8 = 0$$

$$\Rightarrow y(y - 1) + 8(y - 1) = 0$$

$$\Rightarrow (y + 8)(y - 1) = 0$$

$$y = -8, 1$$

X	Y	Relation
1	-8	$X > y$
1	1	$X = y$
-5	-8	$X > y$
-5	1	$X < y$

: - $X = Y$ or the relationship between x and y cannot be established.

Q.24) Explanation:

Detailed solution:

From I:

$$x^2 + 5x = 500$$

$$x^2 + 5x - 500 = 0$$

$$x^2 + 25x - 20x - 500 = 0$$

$$x(x+25) - 20(x+25) = 0$$

$$(x-20)(x+25) = 0$$

$$\text{so, } x = 20 \text{ or } x = -25$$

From II:

$$y^2 + 240 = 32y$$

$$y^2 - 32y + 240 = 0$$

$$y^2 - 20y - 12y + 240 = 0$$

$$y(y-20) - 12(y-20) = 0$$

$$(y-12)(y-20) = 0$$

$$y = 12 \text{ or } y = 20$$

'x';	Relationship	'y'
20	>	12

-25	<	12
20	=	20
-25	<	20

Therefore, the relationship cannot be established.

Q.25) Explanation:

Explanation-

$$x^2 - 33x + 270 = 0$$

$$(x-15)(x-18) = 0$$

Given, A's speed < B's speed. So,

Speed of A = 15 km/hr

Speed of B = 18 km/hr

Time taken by A to travel 240 km = $240/15 = 16$ hrs

Time taken by B to travel 342 km = $342/18 = 19$ hrs

The required equation is

$$(x - 16)(x - 19) = 0$$

$$x^2 - 35x + 304 = 0$$