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missiongyan

CLASS – 10

MATHEMATICS

Chapter – 4

QUADRATIC EQUATIONS

Part – 4

Exercise – 4.2

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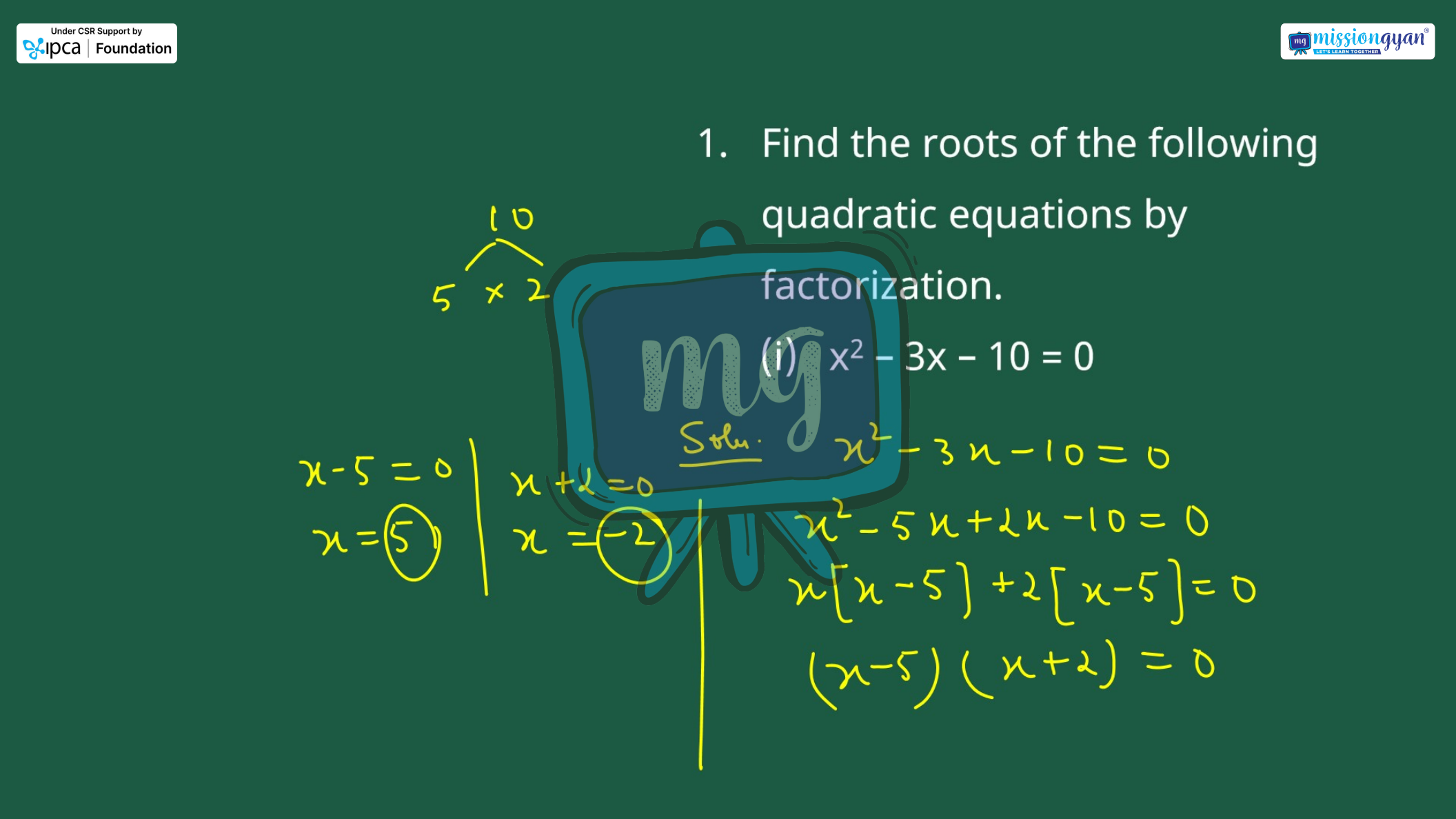
EXERCISE – 4.2

1. Find the roots of the following quadratic equations by factorization.

(i) $x^2 - 3x - 10 = 0$



$2 \times 6 = 12$

$4 \quad 3$

(ii) $2x^2 + x - 6 = 0$

$2x^2 + 4x - 3x - 6 = 0$

$2x[x+2] - 3[x+2] = 0$

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

$x + 2 = 0$

$x = -2$

$2x - 3 = 0$

$2x = 3$

$x = 3/2$

$\frac{5\sqrt{2 \times \sqrt{2}}}{5 \times 2}$

(iii) $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$

$\sqrt{2}x^2 + 2x + 5x + 5\sqrt{2} = 0$

$\sqrt{2}x[x + \sqrt{2}] + 5[x + \sqrt{2}] = 0$

$[x + \sqrt{2}][\sqrt{2}x + 5] = 0$

$x + \sqrt{2} = 0$

$x = -\sqrt{2}$

$\sqrt{2}x + 5 = 0$

$x = -5/\sqrt{2}$

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

(iv) $2x^2 - x + \frac{1}{8} = 0$

16

4 4

$\frac{16x^2 - 8x + 1}{8} = 0$

$16x^2 - 8x + 1 = 0$

$16x^2 - 4x - 4x + 1 = 0$

$4x[4x-1] - 1[4x-1] = 0$

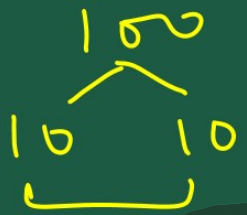
$(4x-1)(4x-1) = 0$

$4x - 1 = 0$

$x = 1/4$

$4x - 1 = 0$

$x = 1/4$



(v) $100x^2 - 20x + 1 = 0$

Soln. $100x^2 - 10x - 10x + 1 = 0$

$10x(10x-1) - 1(10x-1) = 0$

$(10x-1)(10x-1) = 0$

$10x - 1 = 0$

$x = \frac{1}{10}$

$10x - 1 = 0$

$x = \frac{1}{10}$

2. Solve the problems given in Example 1.

Represent the following situations mathematically:

(i) John and Jivanti together have 45 marbles. Both of them lost 5 marbles each, and the product of the number of marbles they now have is 124. We would like to find out how many marbles they had to start with.

John = x

Jivanti = y

$x + y = 45$ — (1)

$(x-5)(y-5) = 124$

$(x-5)(45-x-5) = 124$

$(x-5)(40-x) = 124$

$$(x-5)(40-x) = 124$$

$$40x - x^2 - 200 + 5x = 124$$

$$-x^2 + 45x - 200 = 124$$

$$x^2 - 45x + 200 + 124 = 0$$

$$x^2 - 45x + 324 = 0$$

$$x^2 - 36x - 9x + 324 = 0$$

$$x[x-36] - 9[x-36] = 0$$

$$(x-36)(x-9) = 0$$

$x - 36 = 0$

$x = 36$

$x - 9 = 0$

$x = 9$

$x = 36$

$y = 9$

$x = 9$

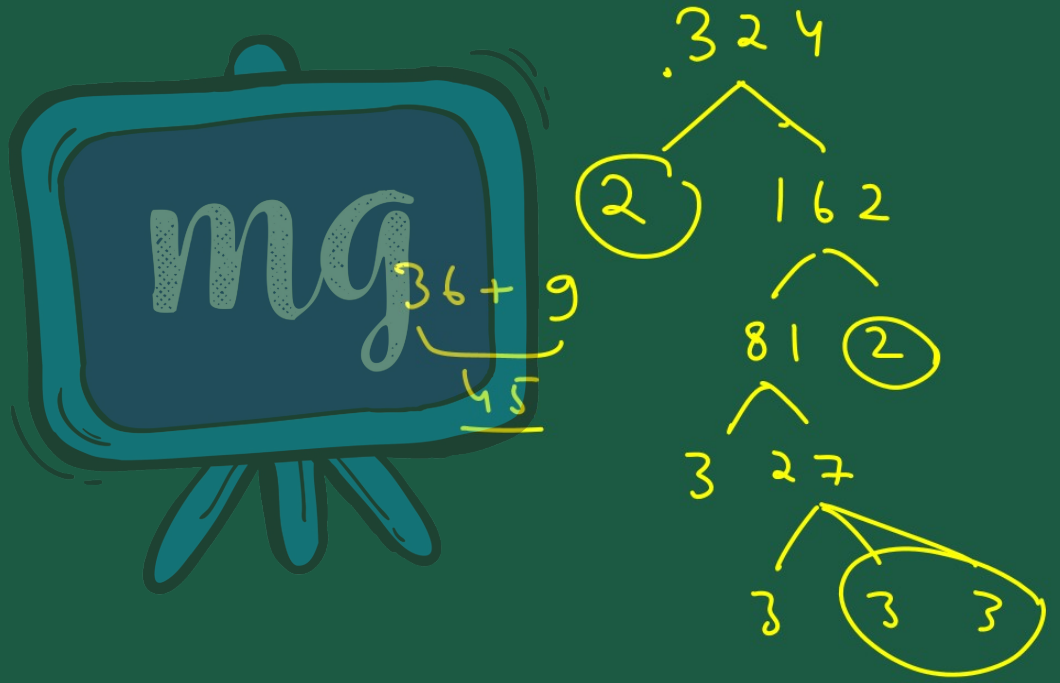
$y = 36$

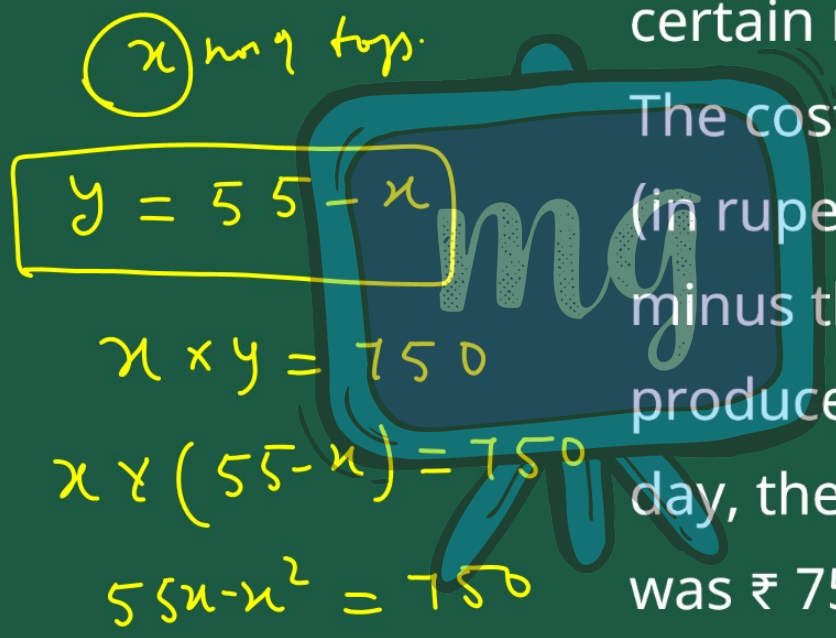
John has 36 marbels

and Jivanti has 9 marbel

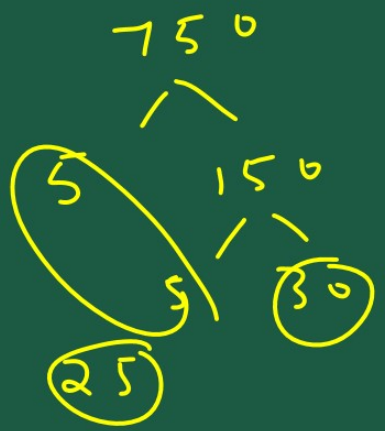
John — 9 marbels

Jivanti — 36 marbels.





(ii) A cottage industry produces a certain number of toys in a day. The cost of production of each toy (in rupees) was found to be 55 minus the number of toys produced in a day. On a particular day, the total cost of production was ₹ 750. We would like to find out the number of toys produced on that day.



$y = 55 - 30$

$y = 25$

$55x - x^2 = 750$

$x^2 - 55x + 750 = 0$

$x^2 - 30x - 25x + 750 = 0$

$x[x-30] - 25[x-30] = 0$

$(x-30)(x-25) = 0$

$x - 30 = 0$ | $x - 25 = 0$

$x = 30$ | $x = 25$

$y = 55 - 25$

$y = 30$

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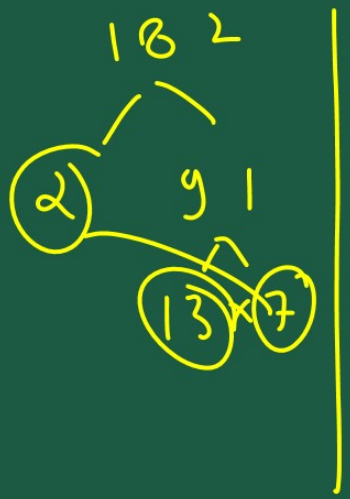
if 25 toys have produced then the cost of product is 30 Rs.

if 30 toys are produced then the cost of production is 25 Rs.

3. Find two numbers whose sum is 27 and product is 182.



Sol^{n}

$x + y = 27$

$x \times y = 182$

$x(27 - x) = 182$

$27x - x^2 = 182$

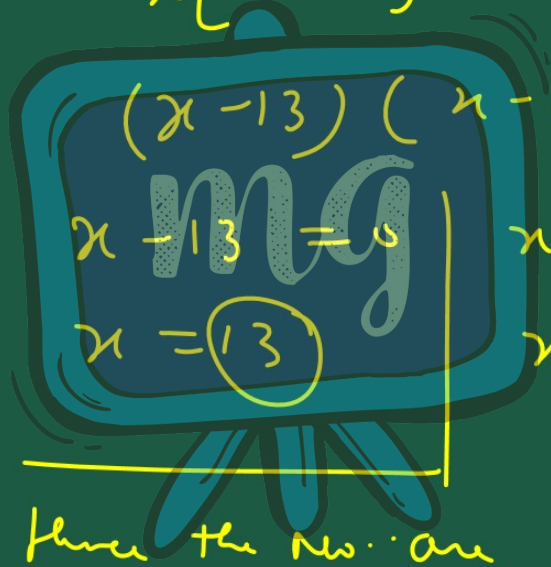
$x^2 - 27x + 182 = 0$

$x^2 - 13x - 14x + 182 = 0$

$x^2 - 13x - 14x + 182 = 0$

$x[x-13] - 14[x-13] = 0$

$(x-13)(x-14) = 0$

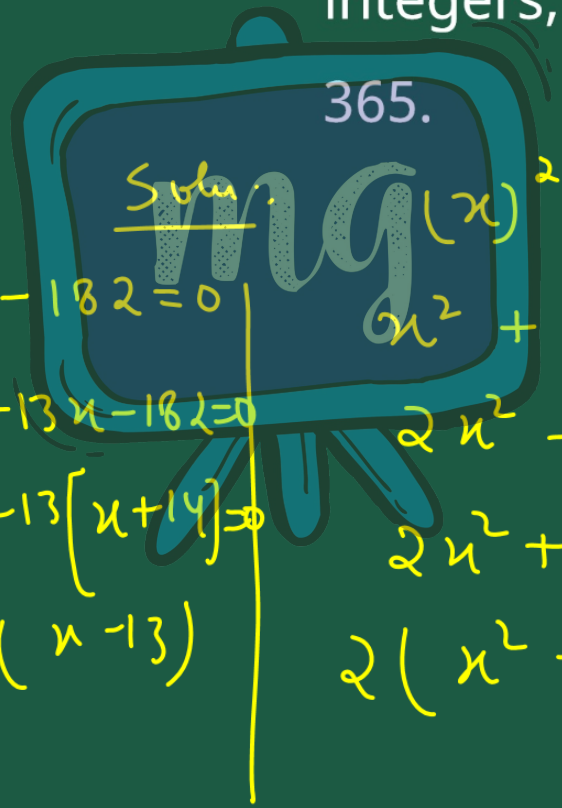


$x - 13 = 0$ | $x - 14 = 0$

$x = 13$ | $x = 14$

Hence the No. are 13 and 14

4. Find two consecutive positive integers, sum of whose squares is 365.



Sum.

$(x)^2 + (x+1)^2 = 365$

$x^2 + x^2 + 2x + 1 = 365$

$2x^2 + 2x - 1 - 365 = 0$

$2x^2 + 2x - 364 = 0$

$2(x^2 + x - 182) = 0$

$x^2 + x - 182 = 0$

$x^2 + 14x - 13x - 182 = 0$

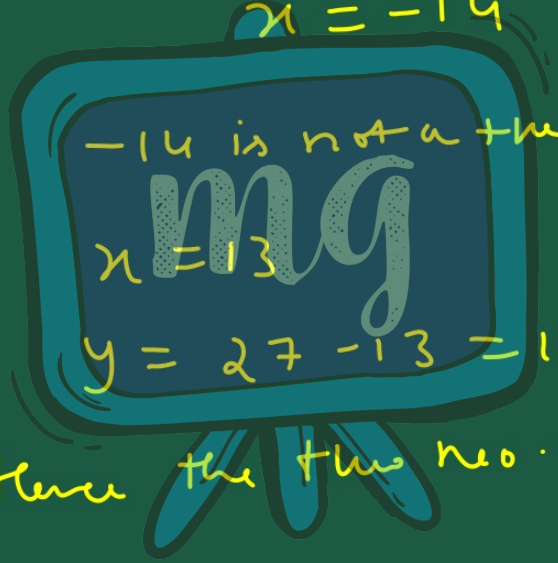
$x(x+14) - 13(x+14) = 0$

$(x+14)(x-13)$

$x + 14 = 0$ | $x - 13 = 0$

$x = -14$ | $x = 13$

-14 is not a +ve integer

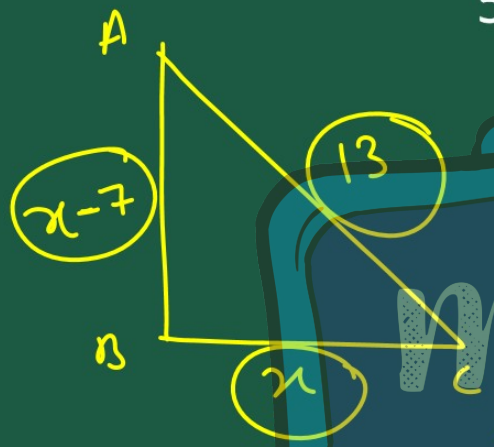


$x = 13$

$y = 27 - 13 = 14$

Hence the two no. are 13 and 14.

5. The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, find the other two sides.



Solu.. By Pyth Thm.

$P^2 + B^2 = H^2$

$(x-7)^2 + (x)^2 = 13^2$

$x^2 - 14x + 49 + x^2 = 169$

$2x^2 - 14x + 49 = 169$

$2x^2 - 14x + 49 - 169 = 0$

$2x^2 - 14x - 120 = 0$

$2[x^2 - 7x - 60] = 0$

$$x^2 - 7x - 60 = 0$$

$$x^2 - 12x + 5x - 60 = 0$$

$$x[x-12] + 5[x-12] = 0$$

$$[x-12](x+5) = 0$$

$x - 12 = 0$

$x = 12$

$x + 5 = 0$

$x = -5$

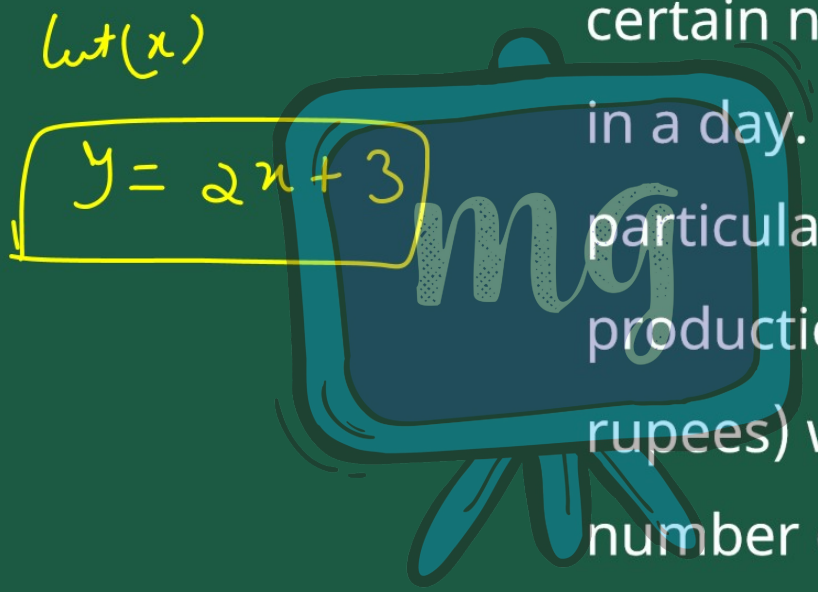
-5 can't be a side of a Δ.

60

5×12

Base = 12 cm.

Here the altitude is 12 - 7 = 5 cm.



6. A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that the cost of production of each article (in rupees) was 3 more than twice the number of articles produced on that day.

If the total cost of production on that day was ₹ 90, find the number of articles produced and the cost of each article.

Soln:

$x \times y = 90$

$x(2x+3) = 90$

$2x^2 + 3x = 90$

$2x^2 + 3x - 90 = 0$

$$2x^2 + 3x - 90 = 0$$

$$2x^2 + 15x - 12x - 90 = 0$$

$$x[2x+15] - 6[2x+15] = 0$$

$$(2x+15)(x-6) = 0$$

$$2x + 15 = 0$$

$$x = \frac{-15}{2}$$

$-\frac{15}{2}$ can't be the article produced

$$x - 6 = 0$$

$$x = 6$$

$x = 6$

$y = 2x + 3$

$y = 2 \times 6 + 3 = 15$

Hence the No. of article produced is 6 and the cost of production is 15 Rs.