Mathematics

Quadratic Equations

Exercise- 4.2

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

(iv) $2x^2 - x + 1/8 = 0$ (……Contd)

The given quadratic equation is

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

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

$$x(2x - \frac{1}{2}) - \frac{1}{4}(2x - \frac{1}{2}) = 0$$

$$(2x - \frac{1}{2})(x - \frac{1}{4}) = 0$$

$$2x - \frac{1}{2} = 0 \text{ or } x - \frac{1}{4} = 0$$

$$x = 1/4 \text{ or } x = \frac{1}{4}$$

$$x = \frac{1}{4}, \frac{1}{4}$$

So, this root is repeated twice

Therefor both roots of the

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

are $\frac{1}{4}$

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

The given quadratic equation is

$100x^2 - 20x + 1 = 0$

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

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

$10x - 1 = 0$ *or* $10x - 1 = 0$

$x = 1/10$ *or* $x = 1/10$

$x = 1/10, 1/10$

So, this root is repeated twice

Therefor both roots of the

Qudratic equation $100x^2 - 20x + 1 = 0$ *are* $\frac{1}{10}$

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

Soln:- Let one number = $27 - x$

(Sum of two number is 27)

Therefor their product = $x(27-x)$

According to the question.

$x(27-x) = 182$

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

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

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

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

$x - 13 = 0$ *or* $x - 14 = 0$

$x = 13, 14$

$27x = 14, 13$

So, the required two numbers are 13 and 14

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

Soln. let the Consecutive positive integers be x and $x + 1$ *(Two consecutive positive integers differ by 1)*

Then the sum of their squares

$X^2 + (x+1)^2$

$X^2 + x^2 + 2x + 1$

$2x^2 + 2x + 1$

According to the question

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

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

$x^2 + x - 182 = 0$ *(Dividing throughout by 2)*

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

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

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

$X+14=0$ *or* $x-13=0$

$x = -14$ *or* $x = 13$

$x = -14, 13$

x is positive integer

$\therefore$ x = -14 is unadmissible

So x = 13

Hence the required two consecutive positive integers 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.

Soln:- Let the base of the right triangle be x cm

Then the height of the right triangle= $(x - 1)$ cm

By pythagotas theorem

$(\text{Base})^2 + (\text{Height})^2 = (\text{Hypotenuse})^2$

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

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

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

$x^2 - 7x - 60 = 0$ *(Dividing throughout by 2)*

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

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

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

$x - 12 = 0$ *or* $x + 5 = 0$

$x = 12$ *or* $x = -5$

$x = 12, -5$

$x = -5$ *is inadmissible*

(x is the length of the base of the right triangle and length can not be negative)

$x = 12$

$x - 7 = 12 - 7 = 5$

Therefore the lengths of the other two side are 5cm and 12 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 Rs 90, find the number of articles produced and the cost of each article

Soln:- Let the number of articles produced on that day be x

Then the cost of production of each article on that day= Rs $(2x+3)$

Therefore totle cost of production on that day= Number of articles produced on that day x cost of production of each article on that day = $x(2x-3)$

According to the Question

$x(2x + 3) = 90$

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

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

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

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

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

$2x + 15 = 0$ *or* $x - 6 = 0$

$x = -15/2$ *or* $x = 6$ *(Contd….)*