Mathematics

Quadratic Equations

Exercise- 4.3

3) Is it possible to design a rectangular mango grove whose length is twice its breadth, and the area is 800 m^2? If so, find its length and breadth.

Soln:- *(………..Contd)*

Therefore, $x = 20$

$2x = 2(20) = 40$

Hence, it is possible to design the rectangular mango grove and its length and breadth are 40m and 20m respectively.

4) Is the following situation possible? If so, determine their present ages. The sum of the ages of two friends is 20 years. Four years ago, the product of their ages in years was 48.

Soln:- Let the age of first friend be x years

Then the age of second friend = (20-x)

(the sum of the ages of the two friends is 20 years)

Four years ago

Age of first friend =(x-4) years

Age of second friend = (20-x-4)years

$= (x-4)(16-x)$

Therefore, product of their ages

$= (x - 4)(16 - x)$

According to the question

$(x - 4)(16 - x) = 48$

$16x - x2 - 64 + 4x = 48$

$x^2 - 20x + 112 = 0$

Here

a = 1 b = -20 c = 112

Therefor, discrimination = b^2-4ac

= (-20)2-4(1)112)

= 400-448

= -48

Hence the quadratic equation (1) has no real roots

5) Is it possible to design a rectangular park of perimeter 80 m and area 400 m2 ? If so, find length and breadth?

Soln:- Let the breadth of the rectangular park be x m

Perameter of the rectangular park = 80m

2 (Length + breadth) = 80

Length+breadth = 80/2 = 40

Length + x = 40

Length = (40 - x)m

According to the question

$(40 - x)x = 400$

$40x - x^2 = 400$

$x^2 - 40x + 400 = 0$

Here

a = 1 b = - 40 c = 400

Therefor, discrimination = b^2 - 4ac

= $(-40)^2$ - 4(1)(400)

= 1600 - 1600 = 0

So, the quadratic equation(1) has equal real root and it is possible to design the rectangular park

$$\text{Each root} = -\frac{b}{2a} = \frac{-(-40)}{2(1)} = 20$$

Hence the Length and breadth of the rectangular park are 20m and 20m respectively

Summary

you have studied the following points:

1. A quadratic equation in the variable x is of the form $ax^2 + bx + c = 0$, where a, b, c are real numbers and $a \neq 0$.

2. A real number α is said to be a root of the quadratic equation $ax^2 + bx + c = 0$, etc

3. If we can factorise $ax^2 + bx + c$, $a \neq 0$, into a product of two linear factors, then the roots of the quadratic equation $ax^2 + bx + c = 0$ can be found by equating each factor to zero.

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Arithmetic Progression

<u>Arithmetic Progression</u> – It is a list of numbers in which each term is obtained by adding a fixed number to the preceding term except the first term.

The fixed number is called the common difference of the A.P. It can be positive, negative or zero.

Let the A.P be $a_1, a_2, a_3, \ldots\ldots\ldots, a_n$.

and so $d = a_2 - a_1;\ a_3 - a_2 = \ldots\ldots = a_n - a_{n-1}$

The general form of an A.P is

$a,\ a + d,\ a + 2d,\ a + 3d, \ldots\ldots\ldots\ldots\ldots\ldots$

Problems

1) For the A.P $\frac{3}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{3}{2}$ find the first term 'a' and the common difference *d*.

Soln:- The given A.P $\frac{3}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{3}{2}$

$a = \frac{3}{2}$ $\quad d = \frac{1}{2} - \frac{3}{2} = -1$

2) **For the A.P** $\frac{1}{3}, \frac{5}{3}, \frac{9}{3}, \frac{13}{3}, \ldots\ldots\ldots\ldots\ldots\ldots$ **find the first term 'a' and the common difference *d*.**

Soln:- The given A.P

$\frac{1}{3}, \frac{5}{3}, \frac{9}{3}, \frac{13}{3}, \ldots\ldots\ldots\ldots\ldots\ldots$

$a = \frac{1}{3}$

$d = \frac{5}{3} - \frac{1}{3} = \frac{5-1}{3} = \frac{4}{3}$

3) For the A.P 0.6, 1.7, 2.8, 3.9, ……… find the first term 'a' and the common difference d.

Soln:- The given A.P 0.6, 1.7, 2.8, 3.9, ………

$a = 0.6$

$d = 1.7 - 0.6 = 2.8 - 1.7$

$= 1.1$

4) Write the first four terms of the A.P, when the first term a and the common difference d are given:

(i) a = 10, d = 10

(ii) a = -2, d = 0

(iii) a = -1, d = ½

Soln:- (i) a = 10, d = 10

The general form of an A.P is

$a,\ a + d,\ a + 2d,\ a + 3d, \ldots\ldots\ldots$

10, **10 + 10**, 10 + 2(10), **10 + 3(10),** …………

10, 20, 30, 40,…………

Soln :– (ii) $a = -2,\ d = 0$

The general form of A.P is

$a,\ a + d,\ a + 2d,\ a + 3d, \ldots\ldots\ldots\ldots$

$-2, -2 + 0, -2 + 0, -2 + 0, \ldots\ldots\ldots$

$-2, -2, -2, -2 \ldots\ldots\ldots$

(Contd)