

EXERCISE 4.4

1. Find the nature of roots of the following quadratic equations. If the real roots exist, find them:-

(i) $2x^2 - 3x + 5 = 0$

Ans:- $a = 1$ $b = -3$ $c = 5$

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

$$(-3)^2 - 4 \times 1 \times 5$$

$$9 - 20$$

$$= -11 < 0 \quad \text{Real roots,}$$

(ii) $3x^2 - 4\sqrt{3}x + 4 = 0$

Ans: $a = 3$ $b = -4\sqrt{3}$ $c = 4$

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

$$(-4\sqrt{3})^2 - 4 \times 3 \times 4$$

$$48 - 48 = 0 \text{ Equal roots}$$

$$-b \pm \sqrt{(b)^2 - 4ac}$$

$$\frac{-(-4\sqrt{3}) \pm \sqrt{(-4\sqrt{3})^2 - 4 \times 3 \times 4}}{2 \times 3}$$

$$\frac{4\sqrt{3} \pm \sqrt{48 - 48}}{6} = \frac{4\sqrt{3} \pm 0}{6}$$

$$\frac{4\sqrt{3} + 0}{6} = \frac{2}{\sqrt{3}}$$

(iii) $2x^2 - 6x + 3 = 0$

Ans: $a = 2$ $b = -6$ $c = 3$

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

$$(-6)^2 - 4 \times 2 \times 3$$

$$36 - 24$$

$$= 12$$

$$0 < 12$$

Two distinct roots.

Q Find the values of k for each of the following quadratic equations, so they have two equal roots.

(i) $2x^2 + kx + 3 = 0$

Ans: $(b)^2 - 4ac$

$$(4)^2 - 4 \times 2 \times 3$$
$$4^2 - 24 = 0$$

$$4 = \sqrt{24} = 2 \times 2 \times 3 = 2\sqrt{6}$$

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

Ans: $kx^2 - 2kx + 6 = 0$

$$a = k \quad b = -2k \quad c = 6$$

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

$$(-2k)^2 - 4 \times k \times 6$$

$$4k^2 - 24k$$

$$k(4k - 24) = 0$$

$$4(4k) = 24$$

$$k(4) = \frac{24}{4} = 6$$

3. It is possible to design a rectangular groove whose length is twice its breadth and the area is 800 m^2 ? If so, find its length and breadth.

Ans: Let the breadth be x . Area = 800 m^2

Length be $2x$

Area of rectangle = $l \times b$

$$2x \times x = 800$$

$$2x^2 = 800$$

$$x^2 = \frac{800}{2} = 400$$

$$x = \sqrt{400} = 20$$

So, length of rectangle = $2 \times 20 = 40 \text{ m}$

Breadth of rectangle = 20 m

Q4 is to 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.

Ans: Age of friend A be x
friend B be $20-x$
4 years ago friend A age = $x-4$
4 years ago friend B age = $20-x-4$
= $16-x$

$$(x-4)(16-x) = 48$$
$$16x - x^2 - 64 + 4x = 48$$
$$-x^2 + 20x - 64 - 48 = 0$$
$$-x^2 + 20x - 112 = 0$$

$$(b)^2 - 4ac$$
$$(20)^2 - 4 \times 1 \times -112$$
$$400 - 224$$
$$176 > 0 \text{ No real roots.}$$

5 It is possible to design rectangular park
of perimeter 30m area 400m²? If so
find its length and breadth.

Ans: Let the length be l
Breadth be b
Perimetre of rectangle = $2(l+b) = 30$
 $l+b = \frac{30}{2} = 15$
 $b = 15-l$
 $l \times b = 400$
 $l \times (15-l) = 400$

$$\begin{aligned}
 &-(l^2 + 40l + 400) = 0 \\
 &= \frac{-40 \pm \sqrt{(-40)^2 - 4 \times 1 \times 400}}{2 \times 1} \\
 &\quad \frac{40 \pm \sqrt{1600 - 1600}}{2} \\
 &\quad \frac{40 \pm 0}{2} = 20 \\
 &20 - 0 = 20
 \end{aligned}$$

So, the length is 20 m and breadth is 20 m.