Quadratic Equations

Exercise 4.4

Q1) (i) $2x^2-3x+5=0$

Here, $a=2$, $b=-3$ and $c=5$.

$\therefore$ Discriminant, $D = b^2-4ac$

$= (-3)^2-4\times2\times5$

$= 9-40=-31<0.$

Hence, the roots are imaginary.

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

Here, $a=3$, $b=-4\sqrt{3}$ and $c=4$.

$\therefore D = b^2-4ac$

$=(-4\sqrt{3})^2-4\times3\times4$

$=48-48=0.$

Hence the ~~equal~~ roots are real and equal

Now using the formula,

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}, \text{ we get :}$$

$$x=\frac{-(-4\sqrt{3})\pm\sqrt{(-4\sqrt{3})^2-4\times3\times\cancel{5}4}}{2\times3}$$

$$=\frac{4\sqrt{3}\pm\sqrt{48-48}}{6}=\frac{4\sqrt{3}}{6}=\frac{\cancel{2}}{\cancel{6}}\cdot\frac{2}{\sqrt{3}}.$$

Hence, the equal roots are $\frac{2}{\sqrt{3}}$ and $\frac{2}{\sqrt{3}}$.

Q2) (i) $2x^2 + kx + 3 = 0$

$a = 2$, $b = k$ and $c = 3$.

$D = b^2 - 4ac$.

$= k^2 - 4 \times 2 \times 3 = k^2 - 24$.

For equal roots,

$\Rightarrow D = 0$

$\Rightarrow k^2 - 24 = 0$

$\Rightarrow k^2 = 24$ or $k = \pm\sqrt{24}$.

$\Rightarrow k = \pm\sqrt{4 \times 6} = \pm 2\sqrt{6}$.

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

$\Rightarrow kx^2 - 2kx + 6 = 0$.

$a = k$, $b = -2k$ and $c = 6$.

$D = b^2 - 4ac$.

$= (2k)^2 - 4 \times k \times 6 = 4k^2 - 24k$.

For equal roots,

$D = 0$

$\Rightarrow 4k^2 - 24k = 0 \Rightarrow k(4k - 24) = 0$.

$\Rightarrow k = 0$ (not possible) or $\Rightarrow 4k - 24 = 0$.

$\Rightarrow 4k = 24$

$\Rightarrow k = \frac{24}{4} = 6$.

Q3) Let breadth of the rectangular be x m.

Then, the length of rectangular will be $2x$ m.

ATQ/ we have,

$l \times b = A$.

$\Rightarrow x \times 2x = 800$

$\Rightarrow 2x^2 = 800 \Rightarrow x^2 = 400 = (20)^2 \Rightarrow x = 20$.

Hence, the rectangular mango grove is possible to design whose breadth is 20m and length is 40m.

Q4) ATQ/

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

$\Rightarrow 16x - x^2 - 64 + 4x = 48.$

$\Rightarrow x^2 - 20x + 112 = 0.$

$\Rightarrow D = b^2 - 4ac.$

$\Rightarrow (-20)^2 - 4 \times 1 \times 112 = 400 - 448 = -48 < 0.$

$\therefore$ since, no real roots exist.

$\Rightarrow$ so, the given situation is not possible.

Q5) let the length of rectangular park be x.

Then, the perimeter of rectangular park = 2 (length + Breadth)

$\Rightarrow 2(x + \text{Breadth}) = 80.$

$\Rightarrow \text{Breadth} = 40 - x.$

$\therefore$ Area of rectangular Park = $L \times B$.

$\Rightarrow x(40-x) = 400$

$\Rightarrow 40x - x^2 = 400$

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

$\Rightarrow x^2 - 20x - 20x + 400 = 0$

$\Rightarrow (x-20)(x-20) = 0$

$\Rightarrow x = 20.$

Thus, the rectangular park is possible to design.

so, length of park = 20m and its breadth = 40-20 = 20m

—x x x—