Hw
26.6.21

Ex-4.4

1. Find the nature of the roots of following quadratic equation. If the real roots exists find them

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

A. $a = 2, b = -3, c = 5$

$D = b^2 - 4ac$

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

$= 9 - 40$

$= -31$

$D < 0$

There no real roots

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

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

$D=b^2-4ac$

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

$D=(-4\sqrt{3}\times-4\sqrt{3})-4\times3\times4$

$D=(-4\times-4\times\sqrt{3}\times\sqrt{3})-4\times3\times4$

$D=48-48$

$D=0$

$D=0$

It has two equal real roots

$x=\frac{-b\pm\sqrt{D}}{2a}$

$x=\frac{-(-4\sqrt{3})\pm\sqrt{0}}{2\times3} \Rightarrow x=\frac{4\sqrt{3}+0}{6} \Rightarrow x=\frac{4(\sqrt{3})}{6}$

$x=\frac{2\sqrt{3}}{3}$

So, $x=\frac{2\sqrt{3}}{3}$ & $x=\frac{2\sqrt{3}}{2}$ are roots of equations.

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

A. $a=2,\ b=-6,\ c=3$

$D=b^2-4ac$

$=(-6)^2-4\times2\times3$

$=(-6)\times(-6)-4\times2\times3$

$=36-24 \quad =12$

$D>0$ There are 2 distinct real roots

$x=\frac{-b\pm\sqrt{D}}{2a}$

$x=\frac{-(-6)\pm\sqrt{12}}{2\times2} \Rightarrow x=\frac{+6\pm\sqrt{12}}{4} \Rightarrow x=\frac{6\pm\sqrt{4\times3}}{4}$

$x=\frac{6\pm\sqrt{4}\times\sqrt{3}}{4} \Rightarrow x=\frac{2(3\pm\sqrt{3})}{4} \Rightarrow x=\frac{3\pm\sqrt{3}}{2}$

So roots of equation are $\frac{3+\sqrt{3}}{2}$ & $x=\frac{3-\sqrt{3}}{2}$

2. And the values of k for each of following quadratic equations, so that they have two equal roots

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

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

$D = 0$ ∴ It has 2 equal roots

$b^2 - 4ac = 0$

$k^2 - 4 \times 2 \times 3 = 0$

$k^2 - 24 = 0$

$k^2 = 24$

$k^2 = \pm\sqrt{24}$

$k = \pm\sqrt{6 \times 4}$

$k = \pm\sqrt{6} \times \sqrt{4}$ ⇒ $k = \pm\sqrt{6} \times \sqrt{2^2}$ ⇒ $k = \pm\sqrt{6} \times 2$

$k = \pm 2\sqrt{6}$

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

A. $kx - 2kx + 6 = 0$

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

$D = 0$ ∴ Equation has 2 equal roots

$b^2 - 4ac = 0$

$(-2k)^2 - 4 \times k \times 6 = 0$

$4k^2 - 24k = 0$

$4k(k-6) = 0$

$4k = 0$	$k - 6 = 0$
$k = \frac{0}{4} = 0$	$k = 6$

for $k = 0$

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

$0 - 0 + 6 = 0$

$6 = 0$

$k = 0$ not possible

for $k = 6$

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

$k = 6$ is possible

3. Is it possible to design a rectangular mango grove whose length is twice its breadth, & the area is 800 m². If so, find its length & breadth.

A Area = 800 m²

Let breadth be x

So length = $2x$

Area = $l \times b$

$\Rightarrow 800 = 2x^2$

$\Rightarrow 2x^2 = 800$

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

$\Rightarrow x^2 = 400$

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

$x = 20$ or $x = -20$

x can't be negative

Breadth = $x = 20$ m

length = $2x = 2(20) = 40$ m

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

A Let present age of 1st friend = x

Present age of 1st friend + present age of 2nd friend = 20

x + Present age of 2nd friend = 20

Present age of 2nd friend = $20 - x$

four yrs ago

Age of 1st friend = $x - 4$

" " 2nd " = $(20 - x) - 4 = 16 - x$

Product of their ages 4 yrs ago was 48

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

$\Rightarrow 2(16-x)-4(16-x)=48$

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

$\Rightarrow 16x-x^2-64-14x-48=0$

$\Rightarrow -x^2+16x+4x-64-48=0$

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

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

$a=1, b=-20, c=112$

$D=b^2-4ac$

$D=(-20)^2-(4\times1\times112) \Rightarrow D=(-20\times-20)-(4\times1\times112)$

$D=400-448 \Rightarrow D=-48$

$D<0$

The equation has no real root

Given situation is not possible

5. It is possible to design a rectangular park of perimeter 80m & area 400m^2? If so, find its length & breadth.

A Let the rectangular park be x m

Breadth be y m

Also perimeter = 80m $\Rightarrow 2(l+b)=80m \Rightarrow 2(x+y)=80$

$\Rightarrow x+y=40 \Rightarrow y=40-x$

i.e; Breadth $=(40-x)$ m

Area $=400$

$\Rightarrow l\times b=400 \Rightarrow x(40-x)=400$

$40x-x^2=40$

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

$a=1, b=-40, c=400$

$D=b^2-4ac$

$=(-40)^2-4(1)(400)=1600-1600=0 \quad D=0$

It has equal roots & it is possible to design a rectangular park.

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$$x = -\frac{b \pm \sqrt{D}}{2a}$$

$$= -\frac{(-40) \pm \sqrt{D}}{2 \times 1} = \frac{40}{2} = 20$$

$l = 20\ m$

$b = (40 - x)\ m = 40 - 20 = 20\ m$