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HW// Exercise 4.4.

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

here, $a = 2$, $b = -3$ & $c = 5$.

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

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

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

$\therefore$ hence, the roots are imaginary.

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

here, $a = 3$

$b = -4\sqrt{3}$.

$c = 4$.

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

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

$= 48 - 48 = 0$.

$\therefore$ the roots are real & equal.

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

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

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

$\therefore$ Hence, the equal roots are $\frac{2}{\sqrt{3}}$ & $\frac{2}{\sqrt{3}}$

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

here $a = 2$.

$b = -6$.

$c = 3$.

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

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

$= 36 - 24 = 12 > 0$.

$\therefore$ the roots are distinct & real.

$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$.

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

Q1 (iii) $\frac{6 \pm \sqrt{36-24}}{4} = \frac{6 \pm \sqrt{12}}{4}$.

$= \frac{6 \pm 2\sqrt{3}}{4} = \frac{3 \pm \sqrt{3}}{2}$.

i.e, $x = \frac{3+\sqrt{3}}{2}$ or $x = \frac{3-\sqrt{3}}{2}$.

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

This is of form $ax^2 + bx + c = 0$.

$a = 2$.

$b = k$.

$c = 3$.

$D = b^2 - 4ac$.

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

for equal Roots,

$D = 0$.

$\Rightarrow k^2 - 24 = 0$.

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

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

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

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

This is the form $ax^2 + bx + c = 0$.

$a = k$.

$b = -2k$.

$c = 6$.

$D = b^2 - 4ac$.

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

$D = 0$.

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

$\Rightarrow k = 0$ or $4k - 24 = 0$.

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

Q3. Let breadth of the rectangular be x m.

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

Length $\times$ Breadth = Area.

$\Rightarrow x \times 2x = 800$.

$\Rightarrow 2x^2 = 800$.

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

$\Rightarrow x = 20$.

$\therefore$ the rectangular Mango grove is possible is design whose breadth is 20 cm & length is 40cm.

Q4. Let the present age of one friend be x years.
Then, the present age of other friend be $(20-x)$.
4 years ago, one friend's age was $(x-4)$ years.
4 years ago, other friend's age was $(20-x-4) = (16-x)$ years.

$\Rightarrow (x-4)(16-x) = 48.$
$\Rightarrow 16x - x^2 - 64 + 4x = 48.$
$\Rightarrow x^2 - 20x + 112 = 0.$
This is of ~~friend~~ form $ax^2 + bx + c = 0$, where $a = 1$.
$b = -20.$
$c = 112.$

$D = b^2 - 4ac.$
$= (20)^2 - 4 \times 1 \times 112 = 400 - 448 = -48 < 0.$
So, no real roots exist.
So, the given situation is not possible.

Q5. Let the length of park be x.
the perimeter of Rectangular park $= 2(l+b)$.
$\Rightarrow 2(x+b) = 80.$
$\Rightarrow B = 40 - x.$
$\therefore$ Area of rectangular park $= l \times b.$
$\Rightarrow x(40-x) = 400.$
$\Rightarrow 40x - x^2 = 400.$
$\Rightarrow x^2 - 40x + 400 = 0.$
$\Rightarrow x^2 - 20x - 20x + 400 = 0.$
$\Rightarrow (x-20)(20-x) = 0.$
$\Rightarrow x = 20.$
$\therefore$ Thus, the rectangular park is possible to design.
length of park $= 20m$. & its breadth $= 40 - 20 = 20m$.