EXERCISE - 4.4

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

$D = b^2 - 4ac$
$= (-3)^2 - 4(2)(5)$
$= 9 - 40$
$= (-31)$

$b^2 - 4ac < 0$

(ii) $3x^2 - 4\sqrt{3}x + 4 = 0$
Here, $a = 3$, $b = (-4\sqrt{3})$ and $c = 4$
$D = b^2 - 4ac$

$= (-4\sqrt{3})^2 - 4(3)(4)$
$= 48 - 48 = 0$

$\therefore b^2 - 4ac = 0$

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

Here, $a = 2$, $b = (-6)$, $c = 3$.

$D = (-6)^2 - 4(2)(3)$
$= 36 - 24$
$= 12$

$\therefore b^2 - 4ac > 0$

(2) (i) $2x^2 + Kx + 3$

Here, $x = 2$, $b = K$, $c = 3$
$D = b^2 - 4ac$
$(K)^2 - 24$
$K = \pm\sqrt{24}$
$K = \pm 2\sqrt{6}$

Therefore, the value of 'K' in this equation is $\pm 2\sqrt{6}$

(ii) $Kx(x-2) + 6 = 0$
$Kx^2 - 2Kx + 6$
Here, $a = K$, $b = (-2K)$, $c = 6$
Therefore, $D = b^2 - 4ac$
$\Rightarrow (-2K)^2 - 4(K)(6)$
$\Rightarrow 4K(K-6) = 0$
$= K - 6 = \frac{0}{4K}$

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$\Rightarrow K = 0 + 6$
$\Rightarrow K = 6$
Therefore the value of 'K' is 6 or 0.

(3) Let the breadth of the rectangular mango groove be 'x'.

The length of the rectenglar mango groove be $= 2 \times x$ (length is twice its breadth)

The area of the rectangular mango groove $= 800 \, m^2$

The length and breadth =

$A = l \times b$
$\Rightarrow 800 \, m^2 = 2x \times x$

$\Rightarrow x^2 = \frac{800}{2}$
$\Rightarrow x = \sqrt{400} = 20m$
Yes, the breadth of the rectangular mango groove is 20 m and the length is $(2x) = 20 \times 2$
$= 40 \, m$.

(4) Let the age of one friend be x'

The age of other feeling $= (20 - x)$ yrs.

The age of one friend 4yrs age $=$ $(x-4)$

The age of another friend 4 yrs ago = $(20 - x - 4)$
$= (16 - x)$ yrs

The product of their ages =
$(x-4) \times (16-x) = 48$
$\Rightarrow x(16-x) - 4(16-x) = 48$

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

$\Rightarrow -x^2 + 20x - 64 = 48$
$\Rightarrow 48 + 64 - 20x + x^2$
$\Rightarrow \boxed{x^2 - 20x + 112 = 0}$

Here, $a = 1$, $b = (-20)$, $c = (112)$

$D = b^2 - 4ac$
$= (-20)^2 - 4(1)(112)$
$= 400 - 448$
$= (-48)$

As $b^2 - 4ac < 0$

Therefore, no real root is possible for this eq. and hence this is not possible.

(5) Let the length be 'l' and breadth be 'b' of a rectangular park
We know that
The perimeter of a rectangle = $2(l+b)$

In this case,

$$2(l+b) = 80$$
$$l + b = \cancel{80}\ 40$$
$$b = (40 - l)\, m \quad \text{—— (i)}$$

Given, the area of rectangular park = $400 m^2$

We know that area of a rectangle = $l \times b$

In this case,
$$l \times b = 400 \quad \text{—— (ii)}$$

Putting the value of 'b' from the above case is -

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

$$\Rightarrow 40l - l^2 = 400$$
$$\Rightarrow -(40l - l^2 = 400)$$

$$\boxed{l^2 - 40l + 400 = 0}$$

$$a = 1,\ b = (-40),\ c = 400$$

Therefore, $D = b^2 - 4ac$

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

If $b^2 - 4ac = 0$

So, they have equal real roots.

Here, $l = \frac{-b}{2a}$

$= \frac{-(-40)}{2 \times 1} = \frac{40}{2} = 20\,m$

As, length is 20 m than breadth is $(40 - l)$

$= 40 - 20$

$= 20\,m$

Yes, it is possible to design a rectangular park of perimeter 80 m and area 400 m² with length and breadth both 20 m respectively.