No. 31

QUADRATIC EQUATIONS

- **Finding Value of k when roots are equal**

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

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

Sol: $\boxed{2}x^2 + \boxed{k}x + \boxed{3}$

On comparing wi

we get; a = $\boxed{2}$, b = $\boxed{k}$,

Since, roots of the qua

are real and equal.

$\therefore \boxed{b}^2 - 4\boxed{a}\boxed{c} = 0$

$\therefore (k)^2 - 4(2)(3) = 0$

$\therefore k^2 - 24 = 0$

$\therefore k^2 = 24$

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

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

So th

have t

equal roots

Is it in a standard form

d to

find the values

of a,b &

Yes

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

Sol: $kx(x - 2) + 6$

$\boxed{k}x^2 \boxed{-2k}x + \boxed{6}$

On comparing wi

we get; a = $\boxed{k}$, b

Since, roots of th

equation are real and equal.

$\therefore \boxed{b}^2 - 4\boxed{a}\boxed{c} = 0$

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

$\therefore 4k^2 - 24k = 0$

$\therefore 4k(k - 6) = 0$

$\therefore 4k = 0$ or $k - 6 = 0$

$\therefore k = 0$ or $k = 6$

But $k \neq 0$ $(\because a \neq 0)$

$\therefore \boxed{k = 6}$

So that we have two equal roots

find the values of a,b & c

No

No. 32

QUADRATIC EQUATIONS

- **Finding Value of k when roots are equal**

Find the value of k for which given equation has real and equal roots.

iii) $(k-12)x^2 + 2(k-12)x + 2 = 0$

Sol: The given quadrati[c equation is]

$(k-12)x^2 + 2(k-$ ...

Comparing with $ax^2 + bx + c = 0$

We have a = $k-1$...

The given information is $b^2-4ac = 0$

So we need to find the values of a, b & c

$\because$ The roots of given equation are real and equal.

For that the equation should be in a standard form

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

$\therefore\ [2(k-12)]^2 - 4(k-12)(2) = 0$

$\therefore\ 4(k-12)^2 - 8(k-12) = 0$

$\therefore$ Dividing throughout by 4,

$(k-12)^2 - 2(k-12) = 0$

Is it in a standard form ?

... $-2) = 0$

$\therefore\ (k-12)(k-14) = 0$

Yes

...ow that in $ax^2 + bx + c = 0$

$a \neq 0$

... $= k - 12$

... $-12 \neq 0$

$\therefore\ k - 14 = 0$

$\therefore\ k = 14$

$\therefore$ **The value of k is 14.**

No. 33

QUADRATIC EQUATIONS

- **Finding Value of k when roots are equal**

Find the value of k for which given equation has real and equal roots.

iv) $\mathbf{k^2x^2 - 2(k-1)x + 4 = 0}$

Sol: The given quadratic equation is

$\boxed{k^2}x^2 \boxed{-2(k-1)}x + \boxed{4} = 0$

Comparing with $\boxed{a}x^2$

We have $a = \boxed{k^2}$, b =

$\because$ The roots of given eq
and equal.

$\therefore \boxed{b}^2 - 4\boxed{ac} = 0$

$\therefore [-2(k-1)]^2 - 4(k^2)(4)$

$\therefore 4(k-1)^2 - 16k^2 =$

$\therefore$ Dividing throughout by 4, we get

$(k-1)^2 - 4k^2 = 0$

$\therefore (k-1)^2 - (2k)^2 = 0$

$(k-1+2k)(k-1-2k) = 0$

$= 0$

$-1 = 0$ or $-k-1 = 0$

$3k = 1$ or $-k = 1$

or $\mathbf{k = -1}$

The given informa
is b^2-4ac = 0

Is it in a standard form ?

So we need to find
values of a, b & c

Yes

For that the equation should be in a standard form

No. 34

QUADRATIC EQUATIONS

- **Finding Value of m when there is only one root**

Q. Find m, if the quadratic equation $(m - 1)x^2 - 2(m - 1)x + 1 = 0$ has only one root.

Sol : $(m - 1)x^2 - 2(m - 1)x$ ...

On comparing with $ax^2 + bx$ ...

$a = m - 1$, $b = -2(m$ ...

Since the given qua... has only one root

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

$\therefore [-2(m - 1)]^2 - 4(m$ ...

$\therefore 4(m - 1)^2 - (4)(m$ ...

Dividing throughout by 4, we get

$\therefore (m - 1)^2 - (m - 1) = 0$

$\therefore (m - 1)^2 - m + 1 = 0$

$\therefore m^2 - \underline{2m} + 1 - \underline{m} + 1 = 0$

$\therefore m^2 - 3m + 2 = 0$

1 2

$(m - 2) - 1 (m - 2) = 0$

$(m - 2)(m - 1) = 0$

$m - 2 = 0$ or $m - 1 = 0$

$m = 2$ or $m = 1$

... is the coefficient ... $1) \neq 0$]

... of m is 2

Means the re... real...

Ge... atic Equation:- ... ere a,b and c are real numbers and and $a \neq 0$

$(a-b)^2 = a^2 - 2ab + b^2$

Now the co-efficient of x^2 becomes 0

... ma... 0

For the given information ... to find the values ... f a, b & c

So $(m-1) = (1-1) = 0$

For that the equation should be in a standard form

No. 35

QUADRATIC EQUATIONS

- **Proof based on concept of equal roots**

If the roots of the equation $(b - c)x^2 + (c - a)x + (a - b) = 0$ are equal, then prove that $2b = a + c$.

Sol. $(b - c)x^2 + (c - a)x + (a - b) = 0$

On comparing with $Ax^2 + Bx + C = 0$, we get

$A = (b - c)$, $B = (c - a)$, $C = (a - b)$

Since, given equation has equal roots

$\therefore \quad B^2 - 4AC = 0$

$\therefore \quad (c - a)^2 - 4(b - c)(a - b) = 0$

$\therefore \quad c^2 - 2ac + a^2 - 4(ab - b^2 - ac + bc) = 0$

$\therefore \quad c^2 - 2ac + a^2 - 4ab + 4b^2 + 4ac -$

$\therefore \quad c^2 + 2ac + a^2 - 4ab + 4$

$\therefore \quad a^2 + 2ac + \quad 4b^2$

$\therefore \quad (a + c)^2 + (2b)^2 - 4b(a + c) = 0$

$\therefore \quad [(a + c) - (2b)]^2 = 0$

Taking square roots on both sides

$\therefore \quad (a + c) - (2b) = 0$

$\therefore \quad \mathbf{a + c = 2b}$

Hence proved

Means

We know $a^2 + 2ac + c^2 = (a + c)^2$

$4b^2 = (2b)^2$

$x^2 - 2xy + y^2 = (x - y)^2$

$x = (a + c)$

$y = 2b$

Take $-4b$

x^2 **y^2** **$-2(a + c)2b$** **$-2xy$**

No. 36

QUADRATIC EQUATIONS

- **Word Problem based on Mango Grove**

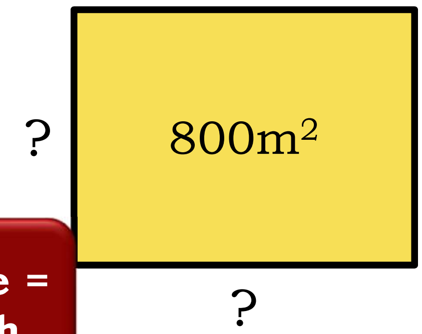
1. Is it possible to design a rectangular mango grove whose length is twice its breadth, and the area is $800m^2$? If so, find its length and breadth.

Sol. Let the $\boxed{\text{breadth}}$ of mango grove = $\boxed{x}$ m

$\therefore$ $\boxed{\text{Length}}$ of mango grove = $\boxed{2x}$ m

$\therefore$ According to the given condition,

Area of rectangular mango grove = 800 m^2



Area of a rectange = Length × Breadth

$$(2x)(x) = 800$$
$$\therefore \ 2x^2 = 800$$
$$\therefore \ x^2 = 400$$
$$\therefore \ x = \pm 20$$
$$\therefore \ x = 20 \quad \text{or} \quad x = -20$$

But breath cannot be negative,

So neglecting $x = -20$, we get $\therefore \ x = 20$

and $2x = 2 \times 20 = 40$

Yes it is possible to design a rectangular mango grove whose length is twice its breadth and the area is $800m^2$

Breadth of mango grove is 20 m and length of mango grove is 40m.

No. 37

QUADRATIC EQUATIONS

- **Word problem based on Age**

2. Is 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.

Sol. Let first friend's age $= x$ years

$\therefore$ Second friend's age $= (20 - x)$ years

$\therefore$ Four years ago,

First friend's age $= \boxed{(x - 4)}$ years

Second friend's age $= (20 - x - 4)$ years

$= \boxed{(16 - x)}$ years

According to the given condition,

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

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

$$\therefore \quad -x^2 + 20x - 64 - 48 = 0$$

$$\therefore \quad -x^2 + 20x - 112 = 0$$

$$\therefore \quad \boxed{1}x^2 \boxed{-20}x + \boxed{112} = 0$$

On comp... Calculation ... $\boxed{b}x + \boxed{c} = 0$,

1st F...

We don't get two factors in such a way that by adding we get middle number 20

Since it is not possible to factorise the equation. Let us use the formula method

Let us do the prime factorization of 112

$\therefore$ $b^2 -$ ...

$\therefore$ The ...

Thank You