SHIKSHA CLASSES

Sub. : Maths. | **Answer Paper** | **Total Marks : 30**

Std. X (CBSE) | **2 : Polynomials.**

Section : A (Each 1 Mark)

Multiple choice Questions (MCQs).

Q.1 : The quadratic polynomial whose sum of zeroes is 3 and product of zeroes is –2 is :

Ans. : d) $x^2 - 3x - 2$

Q.2 : The zeroes of $x^2 - 2x - 8$ are:

Ans. : b) $(4, -2)$

Q.3 : If the zeroes of the quadratic polynomial $ax^2 + bx + c = 0, a \neq 0$ are equal, then

Ans. : d) c and a have same signs

Q.4 : If p(x) is a polynomial of degree one and p(a) = 0, then a is said to be:

Ans. : a) Zero of p(x)

Q.5 : If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is

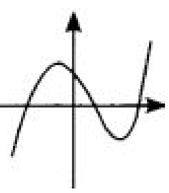
Ans. : b) -10

Q.6 : If one of the zeroes of the quadratic polynomial $(k - 1)x^2 + kx + 1$ is -3, then the value of k is

Ans. : a) $\frac{4}{3}$

Q.7 : Which of the following is not the graph of quadratic polynomial?

Ans. : d)



Q.8 : If $x^3 + 11$ is divided by $x^2 - 3$, then the possible degree of remainder is

Ans. : d) less than 2

Q.9 : The number of polynomials having zeroes as -2 and 5 is.

Ans. : d) more than 3

For question number 10 to 11 two statements are given one labeled Assertion and other labeled Reason select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below

Q.10 : Assertion: $x^2 + 7x + 12$ has no real zeroes.

Reason: A quadratic polynomial can have at the most two zeroes.

Ans. : d) Assertion (A) is false but reason (R) is true.

Q.11 : Assertion: If one zero of polynomial $p(x) = (k^2 + 4)x^2 + 13x + 4k$ is reciprocal of the other, then k = 2.

Reason: If (x-a) is a factor of p(x), then p(a) = 0 i.e., a is a zero of p(x).

Ans. : b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

Section : B (Each 2 Marks)

Q.12 : Find the zeroes of polynomial $x^2 - 3$ and verify the relationship between the zeroes and the coefficients.

Ans. : Polynomial $x^2 - 3 = x^2 - 0x - 3$

$$= (x - \sqrt{3})(x + \sqrt{3})$$

The value of $x^2 - 3$ is zero when $x-\sqrt{3}=0$ or $x+\sqrt{3}=0$ i.e. when $x=\sqrt{3}$ or $x=-\sqrt{3}$

Therefore, the zeroes of x^2-3 are $\sqrt{3}$ and $-\sqrt{3}$, sum of zeroes

$$=\sqrt{3}-\sqrt{3}=0=\frac{-0}{1}=\frac{-(\text{coeff. of } x)}{\text{coeff. of } x^2}$$

Product of zeroes =

$$=\sqrt{3}\times-\sqrt{3}=-3=\frac{-3}{1}=\frac{\text{constant term}}{\text{coeff. of } x^2}$$

Q.13 : If α and β are zeroes of the quadratic polynomial $f(x) = x^2 - x - 4$ find the value of $\frac{1}{\alpha}+\frac{1}{\beta}-\alpha\beta$

Ans. : α and β are zeroes of the quadratic polynomial $f(x) = x^2 - x - 4$

$$\therefore \quad \alpha+\beta=-\frac{(-1)}{1}=1 \qquad ---(i)$$

$$\alpha\beta=\frac{-4}{1}=-4 \qquad ---(ii)$$

Now $\frac{1}{\alpha}+\frac{1}{\beta}-\alpha\beta=\frac{\alpha+\beta}{\alpha\beta}-\alpha\beta$

$$=\frac{1}{-4}-(-4)$$

$$=-\frac{1}{4}+4=\frac{15}{4}$$

OR

If the sum of the zeroes of the quadratic polynomial $kx^2 + 3x + 5k$ is equal to their product find the value of k.

Ans. : $p(x) = kx^2 + 3x + 5k$

Here, a = k, b = 3, and c = 5k

Let α,β be the zeroes of the polynomial

$\alpha+\beta=\alpha\beta$ ---(given)

$$\therefore \quad \frac{-b}{a}=\frac{c}{a}$$

$$\therefore \quad -b=c$$

$$\therefore \quad -3=5k$$

$$\therefore \quad k=\frac{-3}{5}$$

Section : C (Each 3 Marks)

Q.14 : Compute the zeroes of the polynomial $4x^2 - 4x - 8$. Also, establish a relationship between the zeroes and coefficients.

Ans. : Let the given polynomial be

$$p(x) = 4x^2 - 4x - 8$$

To find the zeroes, take $p(x) = 0$

Now, factorise the equation

$4x^2 - 4x - 8 = 0$

$4x^2 - 4x - 8 = 0$

$4(x^2 - x - 2) = 0$

$x^2 - x - 2 = 0$

$x^2 - 2x + x - 2 = 0$

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

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

$x = 2, x = -1$

So, the roots of $4x^2 - 4x - 8$ are -1 and 2.

Relation between the sum of zeroes and coefficients:

$-1 + 2 = 1 = -(-4)/4$ i.e.

($-$coefficient of x/ coefficient of x^2)

Relation between the product of zeroes and coefficients:

$(-1) \times 2 = -2 = -8/4$ i.e (constant/ coefficient of x^2).

Q.15 : **α and β are zeroes of the quadratic polynomial $x^2 - 6x + y$. Find the value of 'y' if $3\alpha + 2\beta = 20$.**

Ans. : Let, $f(x) = x^2 - 6x + y$

From the given,

$3\alpha + 2\beta = 20$ ———— (i)

From f(x),

$\alpha + \beta = 6$ ———— (ii)

And,

$\alpha\beta = y$ ———— (iii)

Multiply equation (ii) by 2. Then, subtract the whole equation from equation (i),

$\Rightarrow \alpha = 20 - 12 = 8$

Now, substitute this value in equation (ii),

$\Rightarrow \beta = 6 - 8 = -2$

Substitute the values of α and β in equation (iii) to get the value of y, such as;

$y = \alpha\beta = (8)(-2) = -16$.

OR

Find a quadratic polynomial, the sum and product of whose zeroes are 0 and $\frac{-3}{5}$ respectively. Hence find the zeroes.

Ans. : Quadratic polynomial = x^2 – (Sum)x + Product

$$= x^2 - (0)x + \left(\frac{-3}{5}\right) = x^2 - \frac{3}{5}$$

$$= (x)^2 - \left(\sqrt{\frac{3}{5}}\right)^2 = \left(x - \sqrt{\frac{3}{5}}\right)\left(x + \sqrt{\frac{3}{5}}\right)$$

Zeroes are, $x - \sqrt{\frac{3}{5}} = 0$ or $x + \sqrt{\frac{3}{5}}$

$$\Rightarrow \quad x = \sqrt{\frac{3}{5}} \quad \text{or} \quad x = -\sqrt{\frac{3}{5}}$$

$$\Rightarrow \quad x = \sqrt{\frac{3}{5} \times \frac{5}{5}} \quad \text{or} \quad x = -\sqrt{\frac{3}{5} \times \frac{5}{5}}$$

$$\Rightarrow \quad x = \frac{\sqrt{15}}{5} \quad \text{or} \quad x = \frac{-\sqrt{15}}{5}$$

The zeroes are $= \frac{\sqrt{15}}{5}$ and $\frac{-\sqrt{15}}{5}$.

Section - D(Each 5 Marks)

Q.16 : **If α and β are zeroes of the polynomial $p(x) = 2x^2 - 7x + k$ satisfying the condition $\alpha^2 + \beta^2 + \alpha\beta = \frac{67}{4}$, then find value of k for this to be possible.**

Ans. : $p(x) = 2x^2 - 7x + k$

Here, a = 2, b = –7 and c = k

$$\alpha^2 + \beta^2 + \alpha\beta = \frac{67}{4}$$

$$\therefore \left[(\alpha+\beta)^2 - 2\alpha\beta\right] + \alpha\beta = \frac{67}{4}$$

$$\therefore \quad (\alpha+\beta)^2 - \alpha\beta = \frac{67}{4}$$

$$\therefore \quad \left(\frac{-b}{a}\right)^2 - \frac{c}{a} = \frac{67}{4}$$

$$\therefore \quad \frac{b^2}{a^2} - \frac{c}{a} = \frac{67}{4}$$

$$\therefore \quad \frac{(-7)^2}{2^2} - \frac{k}{2} = \frac{67}{4}$$

$$\therefore \quad \frac{49}{4} - \frac{k}{2} = \frac{67}{4}$$

$$\therefore \quad \frac{49}{4} - \frac{67}{4} = \frac{k}{2}$$

$$\therefore \quad \frac{-18}{4} = \frac{k}{2}$$

$$\therefore \quad -36 = 4k$$

$$\therefore \quad k = -9$$

OR

If α and β are the zeroes of $p(x) = kx^2 - 4x + 4$ such that $\alpha^2 + \beta^2 = 24$, find k.

Ans. : $p(x) = kx^2 - 4x + 4$

Here, $a = k$, $b = -4$ and $c = 4$

$\alpha^2 + \beta^2 = 24$ ---(given)

$\therefore\ (\alpha + \beta)^2 - 2\alpha\beta = 24$

$\therefore\ \left(\frac{-b}{a}\right)^2 - 2\left(\frac{c}{a}\right) = 24$

$\therefore\ \frac{b^2}{a^2} - \frac{2c}{a} = 24$

$\therefore\ \frac{(-4)^2}{k^2} - 2\left(\frac{4}{k}\right) = 24$

$\therefore\ \frac{16}{k^2} - \frac{8}{k} = 24$

$\therefore\ 16 - 8k = 24k^2$

$\therefore\ 24k^2 + 8k - 16 = 0$

$\therefore\ 8(3k^2 + k - 2) = 0$

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

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

$\therefore\ 3k(k+1) - 2(k+1) = 0$

$\therefore\ (3k-2)(k+1) = 0$

$\therefore\ 3k - 2 = 0$ or $k + 1 = 0$

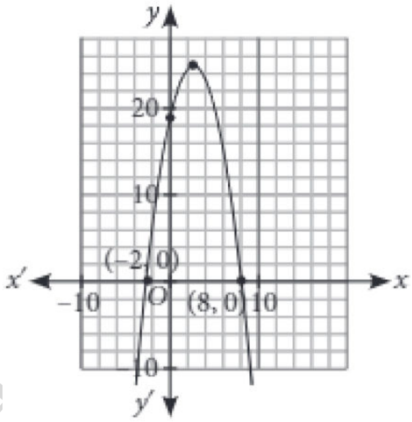
$\therefore\ 3k = 2$ or $k = -1$

$\therefore\ k = \frac{2}{3}$.

Section : E

Q.17 : Case Study :

Priya and her ------- shown in the graph.



Based on the above information, answer the following questions.

i) What is the zeroes of the polynomial whose graph is given?

Ans. : The zeroes of the polynomial whose graph is given are – 2 and 8

ii) What will be the expression of the polynomial given in diagram?

Ans. : Sum of zeroes = – 2 + 8 = 6

Product of zeroes = – 2 × 8 = – 16

Therefore, The expression of the polynomial given in diagram

$= -[x^2 - (\text{sum of zeroes})\,x + (\text{product of zeroes})]$

$= -[x^2 - (6)x + (-16)]$

$= -x^2 + 6x + 16$.

iii) What is the value of the polynomial. represented by the graph, when x = 4?

Ans. : The given polynomial is

$p(x) = -x^2 + 6x + 16$

putting x = 4, in p(x)

$\therefore\ p(4) = -(4)^2 + 6(4) + 16$

$= -16 + 24 + 16$

$= 24.$

OR

If one of the zero is 4 and sum of zeroes is –3, then find the representation of tunnel as a polynomial.

Ans. : One of the zeroes = 4

sum of zeroes = – 3

So, other zero = – 3 – 4 = – 7

Thus product of zeroes = $4 \times -7 = -28$

Therefore, the required polynomial

$= -[x^2 - (-3)x - 28]$

$= -x^2 - 3x + 28.$

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