PRACTICE MCQs

CLASS 10 MATHS (TERM - I)

POLYNOMIALS

BY

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learning simplified

Question 1:

If the zeroes of the polynomial $x^3 - 3x^2 + x + 1$ are a - b, a, a + b, then the value of a is

(a) 1

(b)-1

(c)√2

(d)-√2

Answer: (a) 1

We know that, sum of zeroes = -(coefficient of x^2)/(coefficient of x^3)

=> a – b + a + a + b = -(-3)/1

=> 3a = 3

=> a = 1

Question 2:

If 2 and 1/2 are the zeros of $px^2 + 5x + r$, then

(a) p = r = 2

(b) p = r = -2

(c) p = 2, r = -2

(d) p = -2, r = 2

Answer: (b) p = r = -2

Let P(x) = $px^2 + 5x + r$

Since 2 and 1/2 are the zeros of given polynomial,

So, P(2) = 0 and P(1/2) = 0

Now, P(2) = 0

=>p * 2^2 + 5 * 2 + r = 0

=> 4p + 10 + r = 0

=> 4p + r = -10 1

And P(1/2) = 0

=>p * $(1/2)^2$ + 5 * 1/2 + r = 0

=> p/4 + 5/2 + r = 0

=> p + 10 + 4r = 0

=> p + 4r = -10 2

Solving equations 1 and 2, we get

p = r = -2

Question 3:

A quadratic polynomial whose sum and product of its zeroes are 1/4 and -1 respectively, is

(a) $4x^2$ - x + 4

(b) $4x^2$ + x - 4

(c) $4x^2$ - x - 4

(d) $4x^2$ + x + 4

Answer: (c) $4x^2$ - x - 4

Let α and β are the zeroes of the quadratic polynomial ax^2 + bx + c.

Given, α + β = 1/4 = -b/a

And $\alpha * \beta = -1 = -4/4 = c/a$

On comparing, we get

$a = 4, b = -1, c = -4$

Hence, the required quadratic polynomial is $4x^2 - x - 4$.

Question 4:

The zeroes of the polynomial $3x^2 – x – 4$ is

(a) 1, 4/3

(b) -1, 4/3

(c) 1, -4/3

(d) -1, -4/3

Answer: (b) -1, 4/3

Given, polynomial is $3x^2 – x – 4$

$= 3x^2 – 4x + 3x - 4$

$= x(3x - 4) + 1(3x - 4)$

$= (3x - 4)(x + 1)$

The value of $3x^2 – x – 4$ is zero if $3x - 4 = 0$ or $x + 1 = 0$

So, $x = 4/3, -1$

Therefore, zeroes of $3x^2 – x – 4$ are 4/3 and -1.

Question 5:

If α and β are the zeros of $x^2 - 2x + k$ and $\alpha – \beta = 8$, then the value of k is

(a) -5

(b) -10

(c) -15

(d) -20

Answer: (c) -15

Given polynomial is $x^2 - 2x + k$

Again given α and β are the zeroes of this polynomial and α - β = 8

α + β = 2 and α * β = k

Now, $(\alpha + \beta)^2 = (\alpha - \beta)^2 + 4*\alpha * \beta$

=> $2^2 = 8^2 + 4k$

=> 4 = 64 + 4k

=> 4k = 4-64

=> 4k = -60

=> k = -60/4

=> k = -15

Question 6:

If α and β are the zeroes of the polynomial $x^2 + 7x + 3$, then the value of $(\alpha - \beta)^2$ is

(a) √113

(b) √123

(c) √133

(d) √143

Answer: (c) √133

Given polynomial is $x^2 + 7x + 3$

Given α and β are zeroes of this polynomials then

$\alpha + \beta = -7$ and $\alpha * \beta = 3$

Now, $(\alpha - \beta)^2 = (\alpha + \beta)^2 – 4*\alpha * \beta$

$= (-7)^2 – 4*(-7)*3$

= 49 + 84

= 133

=> $\alpha - \beta = \sqrt{133}$

Question 7:

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

(a) 5

(b) -5

(c) 10

(d) -10

Answer: (d) -10

Given quadratic polynomial is: $x^2 + 3x + k$

One zero is 2.

Let another zero is a

Now, a + 2 = -3

=> a = -3 - 2

=> a = -5

and a * 2 = k

=> k = (-5) * 2

=> k = -10

Question 8:

if α and β are zeros of polynomial $x^2 + 6x + 9$,then the polynomial whose zeros are -α and -β is

(a) $x^2 + 6x + 9$

(b) $x^2 - 6x + 9$

(c) $x^2 + 6x - 9$

(d) $x^2 - 6x - 9$

Answer: (b) $x^2 - 6x + 9$

Given, equation is: $x^2 + 6x + 9$

Again, α and β are the zeroes of the equation.

Now, α + β = -6

and α * β = 9

Now, equation of polynomial whose zeroes are -α and -β is

$x^2 - \{(-\alpha) + (-\beta)\}x + (-\alpha) * (-\beta)$

$= x^2 - (-\alpha - \beta)x + \alpha * \beta$

$= x^2 + (\alpha + \beta)x + \alpha * \beta$

$= x^2 + (-6)x + 9$

$= x^2 - 6x + 9$

Question 9:

If α and β are the zeroes of a polynomial such that α + β = 6 and α * β = 4, then the polynomial is

(a) $x^2 - 6x + 4$

(b) $x^2 - 6x - 4$

(c) $x^2 + 6x + 4$

(d) $x^2 + 6x - 4$

Answer: (a) $x^2 - 6x + 4$

Given, α and β are the zeroes of a polynomial.

Again, α + β = 6, α * β = 4

Now, the polynomial is

$x^2 - (\alpha + \beta)x + \alpha * \beta$

$= x^2 - (6)x + 4$

$= x^2 - 6x + 4$

This is the required Polynomial.

Question 10:

If α and β are the zeroes of the quadratic polynomial $f(x) = x^2 – px + q$ then the value $\alpha^2 + \beta^2$ is

(a) $p^2 - q$

(b) $p^2 + q$

(c) $p^2 + 2q$

(d) $p^2 - 2q$

Answer: (d) $p^2 - 2q$

Given, quadratic polynomial is $f(x) = x^2 - px + q$

Now, α and β are the zeroes of the polynomial.

So, $\alpha + \beta = -(-p) = p$

=> $\alpha + \beta = p$

and $\alpha * \beta = q$

Now, $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2 * \alpha * \beta$

=> $\alpha^2 + \beta^2 = p^2 - 2 * q$

=> $\alpha^2 + \beta^2 = p^2 - 2q$

Question 11:

If one zero of the polynomial $(a^2 + 9)x^2 + 13x + 6a$ is the reciprocal of the other then the value of a is

(a) 1

(b) 3

(c) 4

(d) 10

Answer: (b) 3

Given, polynomial is $(a^2 + 9)x^2 + 13x + 6a$

Let the zeros of the polynomials are p and 1/p

Now, product of zeros = $6a/(a^2 + 9)$

=> $p * 1/p = 6a/(a^2 + 9)$

=> $6a/(a^2 + 9) = 1$

=> $a^2 + 9 = 6a$

=> $a^2 - 6a + 9 = 0$

=> $(a - 3)^2 = 0$

=> $a - 3 = 0$

=> $a = 3$

So, the value of a is 3

Question 12:

For what value of k, -4 is a zero of the polynomial $x^2 - x - (2k + 2)$?

(a) 2

(b) 3

(c) 6

(d) 12

Answer: (c) 6

Given, -4 is a zero of the polynomial $x^2 - x - (2k + 2)$

So, $(-4)^2 - (-4) - (2k + 2) = 0$

=> $16 + 4 - 3k - 2 = 0$

=> $18 - 3k = 0$

=> $3k = 18$

=> k = 18/3

=> k = 6

Question 13:

If α and 1/α are the zeroes of the polynomial $4x^2 – 2x + (k – 4)$, then the value of k is

(a) 3

(b) 5

(c) 8

(d) 11

Answer: (c) 8

Given, α and 1/α are the zeroes of the polynomial $4x^2 – 2x + (k – 4)$

Now, product of zeroes = (k - 4)/4

=> α * (1/α) = (k - 4)/4

=> 1 = (k - 4)/4

=> k - 4 = 4

=> k = 4 + 4

=> k = 8

Question 14:

If $p(x) = 2x^2 - 3x + 5$, then p(-1) is equal to

(a) 3

(b) 7

(c) 10

(d) -13

Answer: (c) 10

Given, $p(x) = 2x^2 - 3x + 5$

Now, $p(-1) = 2 * (-1)^2 – 3 * (-1) + 5$

$= 2 + 3 + 5$

$= 10$

Question 15:

If $p(x) = 8x^2 - 9x + 9$, then the difference between the sum of its zeroes and the product of its zeroes is

(a) 0

(b) -1

(c) 2

(d) -2

Answer: (a) 0

Given polynomial is: $p(x) = 8x^2 - 9x + 9$

Let a and b are the zeroes of the polynomial.

Then, a + b = -Coefficient of x/Coefficient of x^2

=> a + b = -(-9)/8

=> a + b = 9/8 1

Again, a * b = Constant term/Coefficient of x^2

=> a * b = 9/8

Now, (a + b) - a * b = 9/8 - 9/8

=> (a + b) - a * b = 0

Question 16:

A quadratic polynomial whose zeroes are 5 + √2 and 5 − √2, is

(a) x^2 - 10x + 23

(b) x^2 + 10x - 23

(c) x^2 + 10x + 23

(d) x^2 - 10x - 23

Answer: (a) x^2 - 10x + 23

Given, zeroes of the polynomials are 5 + √2 and 5 - √2

The quadratic polynomial is defined as

x^2 - (Sum of zeroes)x + Product of zeroes

Now, sum of zeroes = 5 + √2 + 5 - √2 = 10

Product of zeroes = (5 + √2)(5 - √2) = 5^2 - $(\sqrt{2})^2$ = 25 - 2 = 23

So, the required polynomial = x^2 - 10x + 23

Question 17:

The polynomial $2x^2$ + 3√5x + 5 can be written as

(a) (2x + √5)(2x + √5)

(b) (x + 2√5)(2x + √5)

(c) (x + 2√5)(2x + 2√5)

(d) (x + √5)(2x + √5)

Answer: (d) (x + √5)(2x + √5)

Given, $2x^2 + 3\sqrt{5}x + 5$

$= 2x^2 + (2\sqrt{5} + \sqrt{5})x + \sqrt{5} * \sqrt{5}$

$= 2x^2 + 2\sqrt{5}x + \sqrt{5}x + \sqrt{5} * \sqrt{5}$

$= 2x(x + \sqrt{5}) + \sqrt{5}(x + \sqrt{5})$

$= (x + \sqrt{5})(2x + \sqrt{5})$

So, $2x^2 + 3\sqrt{5}x + 5 = (x + \sqrt{5})(2x + \sqrt{5})$

Question 18:

If one of the zeroes of the cubic polynomial $x^3 + ax^2 + bx + c$ is –1, then the product of the other two zeroes is

(a) b – a + 1

(b) b – a – 1

(c) a – b + 1

(d) a – b –1

Answer: (a) b – a + 1

Let $p(x) = x^3 + ax^2 + bx + c$

Given, -1 is one of the zero of cubic polynomial

So, p(-1) = 0

=> $(-1)^3 + a * (-1)^2 + b * (-1) + c = 0$

=> -1 + a – b + c = 0

=> c = 1 – a + b

Now, product of all zeroes = -constant term/coefficient of x^3

=> αβγ = -c/1 [α, β, γ are the zeroes of coefficient]

=> (-1) * βγ = -c

=> βγ = c

=> βγ = 1 – a + b

Question 19:

If sum of the squares of zeroes of the quadratic polynomial $6x^2 + x + k$ is 25/36, the value of k is

(a) 4

(b) -4

(c) 2

(d) -2

Answer: (d) -2

Let α and β be the roots of the equation.

Given, quadratic polynomial is $6x^2 + x + k$

Now, α and β = -1/6

And α * β = k/6

Given, $\alpha^2 + \beta^2 = 25/36$

=> $(\alpha + \beta)^2 - 2 * \alpha * \beta = 25/36$

=> $(-1/6)^2 - 2(k/6) = 25/36$

=> 1/36 – 2k/6 = 25/36

=> (1 – 12k)/36 = 25/36

=> 1 – 12k = 25

=> -12k = 24

=> k = -2

Question 20:

The relationship between the zeros and coefficient of the quadratic polynomial $ax^2 + bx + c$ is

(a) α + β = c/a

(b) α + β = -b/a

(c) α + β = -c/a

(d) α + β = b/a

Answer: (b) α + β = -b/a

Given, quadratic polynomial is $ax^2 + bx + c$.

Now, sum of zeros = -coefficient of x /coefficient of x^2

=>α + β = -b/a

Question 21:

If the zeroes of the quadratic polynomial $ax^2 + bx + c$, c ≠ 0 are equal, then

(a) c and b have opposite signs

(b) c and a have opposite signs

(c) c and b have same signs

(d) c and a have same signs

Answer: (d) c and a have same signs

For equal roots, discriminant will be equal to zero.

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

$\Rightarrow b^2 = 4ac$

$\Rightarrow ac = b^2/4$

$\Rightarrow ac > 0$ (as square of any number cannot be negative)

Now, $ac > 0$ when both a and c have same sign.

Question 22:

The zeroes of the quadratic polynomial $x^2 + 99x + 127$ are

(a) both positive

(b) both negative

(c) one positive and one negative

(d) both equal

Answer: (b) both negative

Roots of a quadratic polynomial$ax^2 + bx + c$ can be calculated as,

$x = \{-b \pm \sqrt{(b^2 - 4ac)}\}/2a$

$x = \{-99 \pm \sqrt{(99^2 - 4 * 1 * 127)}\}/(2 * 1)$

$x = \{-99 \pm \sqrt{(9801 - 508)}\}/2$

$x = \{-99 \pm \sqrt{(9293)}\}/2$

$x = (-99 \pm 96.4)/2$

Since $99 > 96.4$

So, both zeroes are negative.

Question 23:

The number of polynomials having zeroes as –2 and 5 is

(a) 1

(b) 2

(c) 3

(d) more than 3

Answer: (d) more than 3

The polynomial with zeroes -2 and 5 is

$f(x) = x^2 – (-2 + 5)x + (-2) * 5$

$f(x) = x^2 – 3x - 10$

But as we can multiply this polynomial with any number, we get different polynomials.

So, the number of polynomials having zeroes as –2 and 5 is infinite.

Case Study Based Questions

Question 24:

The figure given alongside shows the path of a diver, when she takes a jump from the diving board. Clearly it is a parabola.

Annie was standing on a diving board, 48 feet above the water level. She took a dive into the pool. Her height (in feet) above the water level at any time 't' in seconds is given by the polynomial h(t) such that $h(t) = -16t^2 + 8t + k$.

(i). What is the value of k?

(a) 0

(b) -48

(c) 48

(d) 48/(-16)

(ii). At what time will she touch the water in the pool?

(a) 30 seconds

(b) 2 seconds

(c) 1.5 seconds

(d) 0.5 seconds

(iii). Rita's height (in feet) above the water level is given by another polynomial p(t) with zeroes -1 and 2. Then p(t) is given by-

(a) $t^2 + t - 2$

(b) $t^2 + 2t - 1$

(c) $24t^2 - 24t + 48$

(d) $-24t^2 + 24t + 48$

(iv). A polynomial q(t) with sum of zeroes as 1 and the product as -6 is modelling Anu's height in feet above the water at any time t(in seconds). Then q(t) is given by

(a) $t^2 + t + 6$

(b) $t^2 + t - 6$

(c) $-8t^2 + 8t + 48$

(d) $8t^2 - 8t + 48$

(v). The zeroes of the polynomial $r(t) = -12t^2 + (k - 3)t + 48$ are negative of each other. Then k is

(a) 3

(b) 0

(c) -1.5

(d) -3

Answer:

(i). (c) 48

Given, polynomial is $h(t) = -16t^2 + 8t + k$

At t = 0, height = 48 feet

i.e. h(0) = 48

=> -16 * 0 + 8 * 0 + k = 48

=> k = 48

(ii). (b) 2

She will touch the water in pool i.e. h = 0

=> h(t) = 0

=> $-16t^2 + 8t + 48 = 0$ [Since k = 48]

=> $2t^2 - t - 6 = 0$

=> $2t^2 - 4t + 3t - 6 = 0$

=> $2t(t - 2) + 3(t - 2) = 0$

=> $(t - 2)(2t + 3) = 0$

=> $t = 2, -3/2$

Since, time cannot be negative,

So, t = 2 seconds

(iii). (d) $-24t^2 + 24t + 48$

Given, zeroes of the polynomial is -1, 2

So, required polynomial $p(t) = \{t - (-1)\}(t - 2)$

=> $p(t) = (t + 1)(t - 2)$

=> $p(t) = t^2 - t - 2$

But, we can multiply any constant to this polynomial and that polynomial has the same zeroes.

Now, we multiply by -24, we get the polynomial

$p(t) = -24(t^2 - t - 2)$

$p(t) = -24t^2 + 24t + 48$

(iv). (c) $-8t^2 + 8t + 48$

Given, sum of zeroes = 1

And product of zeroes = -6

Now, the polynomial $p(t) = t^2 - (\text{sum of zeroes})t + \text{product of zeroes}$

=> $p(t) = t^2 - t - 6$

But, we can multiply any constant to this polynomial and that polynomial has the same zeroes.

Now, we multiply by -8, we get the polynomial

$p(t) = -8(t^2 - t - 6)$

$p(t) = -8t^2 + 8t + 48$

(v). (a) 3

Given, $r(t) = -12t^2 + (k - 3)t + 48$

Also, zeroes are negative of each other

Let zeroes of r(t) are α and $-\alpha$.

Now, sum of zeroes = $-(k - 3)/12$

=> $\alpha + (-\alpha) = -(k - 3)/12$

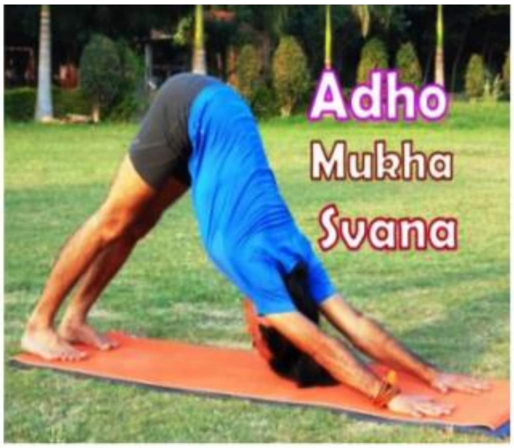
=> $-(k - 3)/12 = 0$

=> $k - 3 = 0$

=> $k = 3$

Question 25:

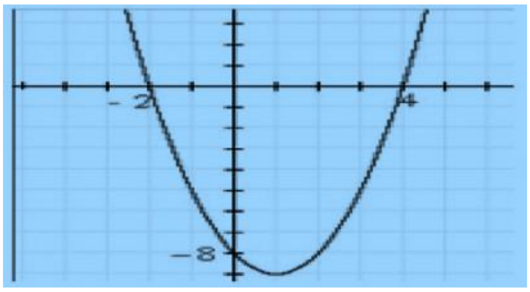
An asana is a body posture, originally and still a general term for a sitting meditation pose, and later extended in hatha yoga and modern yoga as exercise, to any type of pose or position, adding reclining, standing, inverted, twisting, and balancing poses. In the figure, one can observe that poses can be related to representation of quadratic polynomial.



(i). The shape of the poses shown is
(a) Spiral
(b) Ellipse
(c) Linear
(d) Parabola

(ii). The graph of parabola opens downwards, if _______
(a) $a \geq 0$
(b) $a = 0$
(c) $a < 0$
(d) $a > 0$

(iii). In the graph, how many zeroes are there for the polynomial?



a) 0
b) 1
c) 2
d) 3

(iv). The two zeroes in the above shown graph are
(a) 2, 4
(b) -2, 4
(c) -8, 4
(d) 2,-8

(v). The zeroes of the quadratic polynomial $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$ are
(a) 2/√3, √3/4
(b) -2/√3, √3/4
(c) 2/√3, -√3/4
(d) -2/√3, -√3/4

Answer:

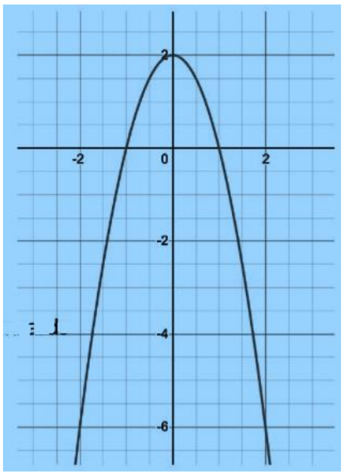
(i). (d) parabola

The shapes of poses are in the form of parabola.

(ii). (c) a < 0

For a quadratic polynomial $ax^2 + bx + c$, a can never be 0.

Again if $a < 0$, then the graph opens downwards as shown in the given figure.



(iii). (c) 2

Number of zeroes is equal to the number of times parabola intersects the x-axis.

In the given figure, parabola intersects x-axis two times.

So, number of zeroes = 2

(iv). (b) -2, 4

Zeroes are the values of x where the graph intersects the x-axis.

In the graph, the parabola intersects x-axis at -2 and 4.

So, zeroes are -2 and 4.

(v). (b) -2/√3, √3/4

To find the zeroes of polynomial, we have

=> $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$

=> $4\sqrt{3}x^2 + 8x - 3x - 2\sqrt{3} = 0$

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

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

$\Rightarrow x = -2/\sqrt{3}, \sqrt{3}/4$

Hence, zeroes are $-2/\sqrt{3}$ and $\sqrt{3}/4$.

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