Solution

POLYNOMIALS

Class 10 - Mathematics

1.

(d) $a^2 + 2b$

Explanation:

Given, P(x) = x^2 - ax - b

$\alpha + \beta$ = a, $\alpha\beta$ = -b

$(\alpha + \beta)^2$ = α^2+β^2 + 2$\alpha\beta$

a^2 = α^2+β^2 - 2b

α^2+β^2 = a^2 + 2b

2.

(c) x^2 - 2x - 1

Explanation:

A quadratic polynomial is always in the form of

x^2 - (sum of zeros)x + (product of Zeros)

hence the required polynomial is

x^2 -(2)x + (-1)

= x^2 - 2x - 1

3.

(c) -36

Explanation:

p(-4) = 0(since - 4 is root of p(x))

$(-4)^2$ - 5(-4) + k = 0

$\Rightarrow$ 16 + 20 + k = 0

36 + k = 0

k = -36

4.

(c) $\frac{11}{4}$

Explanation:

Here a = 3,b = 11,c = - 4 Since $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta}$

$\alpha + \beta = \frac{-11}{3}$, $\alpha\beta = \frac{-4}{3}$

So, $\frac{\frac{-11}{3}}{\frac{-4}{3}} = \frac{11}{4}$

5.

(b) $\frac{2}{3}$

Explanation:

Since α, β are the zeros of kx^2 - 2x + 3k, we have

$\alpha + \beta = -\frac{(-2)}{k} = \frac{2}{k}$

$\alpha\beta = \frac{3k}{k} = 3$

Now, $\alpha + \beta = \alpha\beta$

$\Rightarrow \frac{2}{k} = 3$

$\Rightarrow \mathrm{k} = \frac{2}{3}$

6.

(d) 9

Explanation:

Here a = 1, b = -6, c = 8, $\alpha + \beta = 6, \alpha\beta = 8$

Since $\frac{\alpha^2}{\beta}$ + $\frac{\beta^2}{\alpha}$ = $\frac{\alpha^3+\beta^3}{\alpha\beta}$

= $\frac{(\alpha+\beta)[\alpha^2+\beta^2-\alpha\beta]}{\alpha\beta}$ = $\frac{(\alpha+\beta)[\alpha^2+\beta^2+2\alpha\beta-3\alpha\beta]}{\alpha\beta}$

= $\frac{(\alpha+\beta)\left[(\alpha+\beta)^2-3\alpha\beta\right]}{\alpha\beta}$

=$\frac{6[6^2-3\times8]}{8}$

= 9

7.

(c) 0

Explanation:

Sum of zeroes of the quadratic equation

ax^2 + bx + c = 0 is $\frac{-b}{a}$

$\therefore$ Sum of zeroes of x^2 - 1 = x^2 + 0x - 1 = 0 is $\frac{-0}{1}$ = 0

$\therefore \alpha + \beta$ = 0

8.

(b) $3, \frac{-3}{2}$

Explanation:

p(x) = $2x^2$ - 3x - 9

O = $2x^2$ - 6x + 3x - 9

= 2x(x - 3) +3(x - 3)

O = (2x + 3) (x - 3)

$x = \frac{-3}{2}$, x = 3

9.

(c) equal to 0

Explanation:

Given that two of the zeros of the cubic polynomial ax^3 + bx^2+ cx + d are 0,

i.e. $\alpha = 0, \beta = 0$

$\alpha + \beta + \gamma = -\frac{b}{a}$

$\gamma = -\frac{b}{a}$

$\alpha\beta + \beta\gamma + \gamma\alpha = -\frac{c}{a}$

$0 = -\frac{c}{a}$

c = 0

10.

(b) ±3

Explanation:

Let $\alpha,\ \beta$ are the zeroes of the given polynomial.

Given: $\alpha + \beta = \alpha\beta$

$\Rightarrow \frac{-b}{a} = \frac{c}{a}$

$\Rightarrow$ -b = -c

$\Rightarrow$ -(-27) = $3k^2$

$\Rightarrow$ k^2 = 9
$\Rightarrow$ k = ± 3

11.
(d) 2
Explanation:
$\alpha + \beta = \frac{-b}{a}$
$\sqrt{2} = \frac{-(-k\sqrt{2})}{2}$
$\frac{2\sqrt{2}}{\sqrt{2}} = k$
k = 2

12. **(a)** 6 and 8
Explanation:
Sum of the zeroes of the polynomial = $\frac{-b}{a}$ = $\frac{6}{1}$ = 6
And Product of the zeroes of the polynomial = $\frac{c}{a}$= $\frac{8}{1}$ = 8

13.
(b) –m, m + 3
Explanation:
Given: equation $x^2 - 3x - m(m + 3) = 0$, where m is a constant
The given equation is the form of $ax^2 + bx + c = 0$
$\therefore$ a = 1, b = −3, c = −m(m + 3)
We know the roots of the equation can be find out using the formula,
$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$
Substituting the values of a, b, c, we get
$x = \frac{-(-3) \pm \sqrt{(-3)^2-4(1)(-m(m+3)}}{2}$
$\Rightarrow x = \frac{3 \pm \sqrt{9+4m^2+12m}}{2}$
$\Rightarrow x = \frac{3 \pm (2m+3)}{2}$
or $x = \frac{3+(2m+3)}{2}$, $x = \frac{3-(2m+3)}{2}$
$\Rightarrow$ x = m + 3 and x = −m are the required roots of the equation.

14.
(c) 3, 5
Explanation:
Sum of zeroes of polynomial
$5x^2$- (3 + k)x + 7 is $\frac{-[-(3+k)]}{5}$ i.e., $\frac{3+k}{5}$
According to question, $\frac{3+k}{5}$ = 0 $\Rightarrow$ k = -3
Now, $2x^2$ - 2(k+ 11)x + 30 becomes $2x^2$ - 16x + 30.
i.e., $2x^2$ - 16x + 30 = 0 or x^2 - 8x + 15 = 0
$\Rightarrow$x = 3, 5
Hence, zeroes of polynomial $2x^2$ - 16x + 30 are 3, 5.

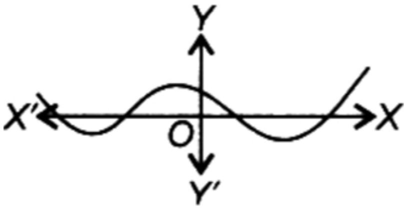
15.
(b) −1
Explanation:
Since α and β are the zeros of the quadratic polynomial $f(x) = x^2 + x + 1$
$\alpha + \beta = -\frac{\text{coefficient of } x}{\text{coefficient of } x^2}$
$= \frac{-1}{1} = -1$

$\alpha \times \beta = \frac{\text{constant term}}{\text{coefficient of } x^2} = \frac{1}{1} = 1$

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

Thus, the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is -1.

16.

(b) 

Explanation:

For more than three distinct real roots the graph must cut x-axis at least four times.

17.

(b) $(x - \sqrt{3})^2$

Explanation:

$\alpha + \beta = 2\sqrt{3}$

$\alpha\beta = 3$

required quad. poly is

$x^2 - (\alpha + \beta)x + \alpha\beta = 0$

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

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

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

18.

(b) $-\frac{9}{2}$

Explanation:

For $ax^2 + bx + c$, we have $\alpha\beta = \frac{c}{a}$

For $2x^2 + 5x - 9$, we have $\alpha\beta = \frac{-9}{2}$

19.

(b) infinite

Explanation:

infinite

20.

(b) $x^2 + 3x + 2$

Explanation:

According to the question:

$\alpha + \beta$ = -3 and $\alpha\beta$ = 2

The quadratic polynomial whose sum and product of the zeroes are given is given by

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

⇒ Then the quadratic polynomial will be:

⇒ $x^2 - (-3)x + 2$

⇒ $x^2 + 3x + 2$

Hence, the quadratic polynomial is $x^2 + 3x + 2$

21.

(d) A is false but R is true.

Explanation:

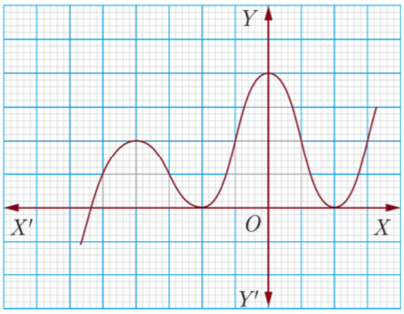
As constant polynomial is only a real number, it has degree as zero, so it has non-zero, so it will never cut x-axis at any point.

22.

(c) A is true but R is false.

Explanation:

As the number of zeroes of polynomial f(x) is the number of points at which f(x) cuts (intersects) then x-axis and number of zero in the given fig. is 3.



So, A is correct but R is not correct.

23. **(a)** Assertion and reason both are correct statements and reason is correct explanation for assertion.

Explanation:

Quadratic polynomial be $x^2 - \left(-\frac{1}{4}\right)x + \frac{1}{4}$

$\Rightarrow x^2 + \frac{1}{4}x + \frac{1}{4} \Rightarrow \frac{1}{4}\left(4x^2 + x + 1\right)$

Quadratic polynomial be $4x^2 + x + 1$.

So, both assertion and reason are correct and reason explains assertion.

24.

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

Explanation:

Reason is true as we know that Sum of zeroes = $-\frac{b}{a}$

Also, we know that Product of zeroes = $\frac{c}{a}$

$\Rightarrow \frac{5k}{1} = -10 \Rightarrow k = -2$

So, the Assertion is true. But Reason is not the correct explanation of assertion.

25.

(d) A is false but R is true.

Explanation:

$x^2 + 7x + 12 = 0$

$\Rightarrow x^2 + 4x + 3x + 12 = 0$

$\Rightarrow x(x + 4) + 3(x + 4) = 0$

$\Rightarrow (x + 4)(x + 3) = 0$

$\Rightarrow (x + 4) = 0$ or $(x + 3) = 0$

$\Rightarrow x = -4$ or $x = -3$

Therefore, $x^2 + 7x + 12$ has two real zeroes.

26. Given: $\alpha + \beta = -6$ and $\alpha\beta = -4$,

The quadratic polynomial with α and β as zeros can be written as:

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

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

$=x^2+6x-4$

27. The number of zeroes is 1 as the graph intersects the x-axis at one point only.

28. Compare $f(x) = 5x^2 - 7x + 1$ with $ax^2 + bx + c$ we get,

a = 5, b = - 7 and c= 1

Since α and β are the zeros of 5x^2 - 7x + 1, we have

$\alpha+\beta=-\frac{(b)}{a}=-\frac{(-7)}{5}=\frac{7}{5}$

$\alpha\beta=\frac{c}{a}=\frac{1}{5}$

$\therefore \frac{1}{\alpha}+\frac{1}{\beta}=\frac{\beta+\alpha}{\alpha\beta}$

$=\frac{\frac{7}{5}}{\frac{1}{5}}$

$=\frac{7}{5}\times\frac{5}{1}$

= 7

29. Let p(t) = t^2 - 15

For zeroes of p(t),

p(t) = 0

$\Rightarrow t^2-15=0 \Rightarrow (t)^2-(\sqrt{15})^2=0$

$\Rightarrow (t-\sqrt{15})|t+\sqrt{15})=0$. Using the identity a^2 - b^2

= (a - b) (a + b)

$\Rightarrow t-\sqrt{15}=0$ or $t+\sqrt{15}=0$

$\Rightarrow t=\sqrt{15}$ or $t=-\sqrt{15} \Rightarrow t=\sqrt{15},-\sqrt{15}$

So, the zeroes of p(t) are $\sqrt{15}$ and $-\sqrt{15}$

We observe that, Sum of its zeroes

$=(\sqrt{15})(-\sqrt{15})=0$

$=\frac{0}{1}=\frac{-(\text{ Coefficient of } t)}{\text{Coefficient of } t^2}$

Product of its zeroes $=(\sqrt{15})\times(-\sqrt{15})$

$=-15=\frac{-15}{1}=\frac{\text{Constant term}}{\text{Coefficient of } t^2}$

Hence relation between zeroes and coefficient is verified.

30. Let the two zeroes of x^2-8x+k be $\alpha,\alpha+2$

$\therefore 2\alpha+2=8$

$\Rightarrow \alpha=3,$ other zero is 5

$\therefore \mathrm{k}=15$

31. Here, h(t) = t^2 - 15 = t^2 - $(\sqrt{15})^2$

= (t + $\sqrt{1}$5)(t - $\sqrt{1}$5)

h(t) = 0, if t + $\sqrt{1}$5 = 0 or t- $\sqrt{1}$5 = 0

Hence, the zeroes of h(t) are $-\sqrt{15}$ and $\sqrt{15}$

Now in polynomial t^2 - 15

Sum of the zeroes = $-\sqrt{15}+\sqrt{15}=0$ = $-\frac{b}{a}$

Product of zeroes =$-\sqrt{15}\times\sqrt{15}=-15$ = $\frac{c}{a}$

Hence, the relationship between zeros and coefficients is verified.

32. Let α= $\frac{3-\sqrt{3}}{5}$and β=$\frac{3+\sqrt{3}}{5}$

Given α+β=$\frac{3-\sqrt{3}}{5}$+$\frac{3+\sqrt{3}}{5}$=$\frac{6}{5}$

Product of zeroes,

αβ = $\left(\frac{3-\sqrt{3}}{5}\right)\times\left(\frac{3+\sqrt{3}}{5}\right)$= $\frac{3^2-(\sqrt{3})^2}{5\times5}=\frac{6}{25}$

Polynomial

p(x) = x^2 - (α+β)x)+αβ

= x^2 - $\frac{6}{5}x+\frac{6}{25}$

p(x)= 25x^2 - 30x + 6

33. Since, α and β are the zeroes of the quadratic polynomial f(x) = 6x^2 + x - 2.

a=6, b=1, c=-2

sum of zeros =α+β=$-\frac{b}{a}=\frac{-1}{6}$

Product of the zeroes = αβ=$\frac{c}{a}=\frac{-1}{3}$

Now,

$\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{\alpha^2+\beta^2}{\alpha\beta}=\frac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta}$

$=\frac{\left(-\frac{1}{6}\right)^2-2(-\frac{1}{3})}{-\frac{1}{3}}=\frac{\frac{1}{36}+\frac{2}{3}}{-\frac{1}{3}}=-\frac{\frac{75}{108}}{\frac{1}{3}}=-\frac{75}{108}\times\frac{3}{1}=-\frac{225}{108}=-\frac{25}{12}$

34. Let p(x) $=x^2-5x+6$.Then,

$\alpha+\beta=-\frac{-5}{1}=5$

$\alpha\beta=\frac{6}{1}=6$

Now,$\frac{1}{\alpha}+\frac{1}{\beta}-2\alpha\beta$

$=\frac{\alpha+\beta}{\alpha\beta}-2\alpha\beta$

$=\frac{5}{6}-2\times 6$

$=\frac{5}{6}-12=-\frac{67}{6}$

35. $4x^2$ + 17x - 15 = (4x - 3) (x + 5)

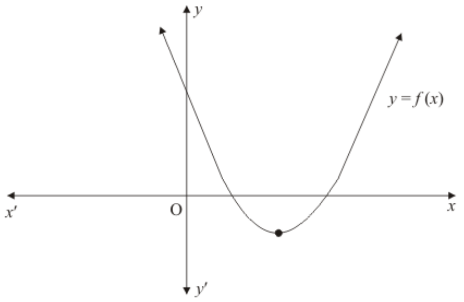
$\therefore$ x = $\frac{3}{4}$ & x = -5 are the zeroes of the polynomial.

a = 4, b = 17, c = -15

Sum of zeroes = $\frac{-17}{4}$ = $\frac{-\text{ coefficient of } x}{\text{coefficient of } x^2}$

Product of zeroes = $\frac{-15}{4}$ = $\frac{\text{constant term}}{\text{coefficient of } x^2}$

36. Clearly, $f(x)=ax^2+bx+c$ represent a parabola opening upwards. Therefore, a>0



Since the parabola cuts the x-axis at two points, this means that the polynomial will have two real solutions.

Hence $b^2-4ac>0$

Hence a>0 and $b^2-4ac>0$

37. Given that,

Quadratic polynomial is x^2 + 6x + 8

$\Rightarrow$ x^2 + 6x + 8

$\Rightarrow$ x2 + 4x + 2x + 8

$\Rightarrow$ x(x + 4) + 2(x + 4)

$\Rightarrow$ (x + 2)(x + 4)

Zeroes are -2, -4

Now, Sum of zeroes = -2 + (-4) = -6

Product of zeroes = (-2) $\times$ (-4) = 8

Also, Sum of zeroes = $\frac{-b}{a}=\frac{-6}{1}$ = -6

Product of zeroes = $\frac{c}{a}=\frac{8}{1}$ = 8

Hence, relationship between zeroes and coefficients verified.

38. Here it is given that

f(x) = x^2 - 2

$=(\mathrm{x}+\sqrt{2})(\mathrm{x}-\sqrt{2})$

f(x)=0 if

x + $\sqrt{2}$ = 0 or x - $\sqrt{2}$ = 0

$\Rightarrow$ x = -$\sqrt{2}$ or x = $\sqrt{2}$

So, the zeros of f(x) are -$\sqrt{2}$ and $\sqrt{2}$.

Now in $\mathrm{x}^2-2=\mathrm{x}^2-0\times\mathrm{x}-2$

Sum of zeros = $-\sqrt{2}+\sqrt{2}=0=\frac{0}{2}=-\frac{\mathrm{b}}{\mathrm{a}}$
Product of zeros = $-\sqrt{2}\times\sqrt{2}=-2=\frac{-2}{1}=\frac{\mathrm{c}}{\mathrm{a}}$
Hence the relationship between zeros and coefficients is verified.

39. The given polynomial is
p(x) = $2x^2$ + px + 4
So, a = 2 , b = p and c = 4
One zero = 2
Let the other zero = m
Now, sum of zeroes = $-\frac{p}{2}$ ....(i)
and product of the zeroes = $\frac{4}{2}$ = 2
$\Rightarrow \quad 2\times m=2$
$\therefore$ Other zero = 1
$\therefore$ Sum of zeroes = 2 + 1 = 3 ....(ii)
From (i) and (ii),
$-\frac{p}{2}=3$
$\Rightarrow p=-6$
Hence the value of p is -6.

40. By splitting the middle term
$5t^2$ + 12t + 7 = 0
$5t^2$ + (5t + 7t) + 7 = 0
$5t^2$ + 5t + 7t + 7 = 0
5t (t + 1) + 7(t + 1) = 0
(t + 1)(5t + 7) = 0
(t + 1)(5t + 7) = 0
$\Rightarrow$ t = - 1, - 7/5
<u>Verification:</u>
Sum of the zeroes = - (coefficient of x) / coefficient of x^2
$\alpha+\beta$ = - b/a
(- 1) + (- 7/5) = - (12)/5
= - 12/5 = - 12/5
Product of the zeroes = constant term / coefficient of x^2
$\alpha\beta$ = c/a
(- 1)(- 7/5) = 7/5
7/5 = 7/5

41. Here, p(x) = $3x^2$ - 2.
Now p(x) = 0
$\Rightarrow \quad 3x^2-2=0$
$\Rightarrow 3x^2=2$
$\Rightarrow \quad x^2=\frac{2}{3}$
$\Rightarrow x=\pm\sqrt{\frac{2}{3}}$
Therefore, zeroes are $\sqrt{\frac{2}{3}}$ and $-\sqrt{\frac{2}{3}}$.
If p(x) = $3x^2$ - 2 , then a = 3, b = 0 and c = -2
Now, sum of zeroes = $\sqrt{\frac{2}{3}}+\left(-\sqrt{\frac{2}{3}}\right)$= 0 .... (i)
Also, $\frac{-b}{a}=\frac{-0}{3}=0$ .... (ii)
From (i) and (ii)
Sum of zeroes= $\frac{-b}{a}$
and product of zeroes = $\sqrt{\frac{2}{3}}\times-\sqrt{\frac{2}{3}}=\frac{-2}{3}$ .... (iii)
Also, $\frac{c}{a}=\frac{-2}{3}$ .... (iv)

From (iii) and (iv)
Product of zeroes = $\frac{c}{a}$

42. p(x) = $x^2 + 3x + 2$
α, β are its zeroes
$\therefore \alpha + \beta = -3, \alpha\beta = 2$
Now,
$(\alpha + 1) + (\beta + 1) = \alpha + \beta + 2 = -3 + 2 = -1$
$(\alpha + 1)(\beta + 1) = \alpha\beta + (\alpha + \beta) + 1 = + 2 - 3 + 1 = 0$
$\therefore$ Required Polynomial is $k(x^2 + x)$ or $x^2 + x$

43. Consider general quadratic polynomial $p(x) = ax^2 + bx + c,\ a \neq 0$
b = 0 (given)
Let α, β be the zeroes of p(x)
$\therefore$ Sum of zeroes = $\alpha + \beta = -\frac{b}{a} = \frac{0}{a} = 0$
$\Rightarrow \alpha + \beta = 0$
$\Rightarrow \alpha = -\beta$
In other words $\beta = -\alpha$
$\therefore$ The zeroes are $\alpha, -\alpha$.
Hence, the zeroes are equal in magnitude but opposite in sign.

44. Let the given polynomial is p(x) =$x^2 + 7x + 7$
Here,a = 1, b = 7, c = 7
$\therefore \alpha, \beta$ are both zeroes of p(x)
$\therefore \quad \alpha + \beta = \frac{-b}{a}$ = -7.........(i)
$\alpha\beta = \frac{c}{a} = 7$ ....(ii)
Now,
$\frac{1}{\alpha} + \frac{1}{\beta} - 2\alpha\beta = \frac{\beta+\alpha}{\alpha\beta} - 2\alpha\beta$
$= \frac{-7}{7} - 2 \times 7$
= -1 - 14
= -15
Hence the value of $\frac{1}{\alpha} + \frac{1}{\beta} - 2\alpha\beta$ is - 15.

45. Let p(x) = $x^2 - 2x - 8$
By the method of splitting the middle term,
$x^2 - 2x - 8 = x^2 - 4x + 2x - 8$
$= x(x-4) + 2(x-4) = (x-4)(x+2)$
For zeroes of p(x),
p(x) = 0
$\Rightarrow (x-4)(x+2) = 0$
$\Rightarrow x - 4 = 0$ or $x + 2 = 0$
$\Rightarrow x = 4$ or $x = -2$
$\Rightarrow x = 4, -2$
So, the zeroes of p(x) are 4 and -2.
We observe that, Sum of its zeroes
= 4 + (-2) = 2
$= \frac{-(-2)}{1} = \frac{-\text{ (Coefficient of } x)}{\text{Coefficient of } x^2}$
Product of its zeroes
$= 4x(-2) = -8 = \frac{-8}{1} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$
Hence, relation between zeroes and coefficients is verified.

46. The given polynomial p(x) = $x^2 + 2\sqrt{2}x - 6$
$= x^2 + 3\sqrt{2}x - \sqrt{2}x - 6$
$= x(x + 3\sqrt{2}) - \sqrt{2}(x + 3\sqrt{2})$
$= (x + 3\sqrt{2})(x - \sqrt{2})$

p(x) = 0 if x+3$\sqrt{2}$ = 0 or x = $\sqrt{2}$

Zeroes of the polynomials are $\sqrt{2}$ and -3$\sqrt{2}$

For p(x) = x^2 + 2$\sqrt{2}$ x - 6

a = 1, b = 2$\sqrt{2}$, c = -6

Sum of the zeroes $\sqrt{2} - 3\sqrt{2} = -2\sqrt{2} = -\frac{2\sqrt{2}}{1} = -\frac{b}{a}$

Product of the zeroes =$\sqrt{2} \times -3\sqrt{2} = \frac{-6}{1}$ = $\frac{c}{a}$

Hence, the relationship is verified.

47. Let $P(x) = 2x^2 + 3x + \lambda$

Its one zero is $\frac{1}{2}$ so $P(\frac{1}{2}) = 0$

$P(\frac{1}{2}) = 2 \times (\frac{1}{2})^2 + 3(\frac{1}{2}) + \lambda = 0$

$\Rightarrow 2 \times \frac{1}{4} + 3/2 + \lambda = 0$

$\Rightarrow \frac{1}{2} + \frac{3}{2} + \lambda = 0$

$\Rightarrow \frac{4}{2} + \lambda = 0$

$\Rightarrow 2 + \lambda = 0$

$\Rightarrow \lambda$= -2

Let the other zero be α

Then $\alpha + \frac{1}{2} = -\frac{3}{2}$

$\Rightarrow \alpha = -\frac{3}{2} - \frac{1}{2} = -\frac{4}{2} = -2$

48. The given polynomial is

p(x) = $6x^2$ -7x -3

Factorize the above quadratic polynomial, we have

$6x^2$ -7x -3 = $6x^2$ -9x + 2x - 3

= 3x(2x - 3) + 1(2x - 3)

= (3x + 1)(2x - 3)

For p(x) = 0, either 3x + 1 = 0 or 2x - 3 = 0

$\Rightarrow \quad x = \frac{-1}{3}$ or $x = \frac{3}{2}$

Verification:we have a = 6, b = -7, c = -3

Sum of zeroes = $\frac{-1}{3} + \frac{3}{2} = \frac{7}{6}$

Also, $\frac{-b}{a} = \frac{-(-7)}{6} = \frac{7}{6}$

Now, product of zeroes= $\left(-\frac{1}{3}\right) \times \frac{3}{2} = \frac{-1}{2}$

Also, $\frac{c}{a} = \frac{-3}{6} = \frac{-1}{2}$

49. The given quadratic polynomial is p(x) = $2x^2$ - 3x + p

Since, 3 is a root (zero) of p(x)

$\Rightarrow$ $2(3)^2$ - 3 $\times$ 3 + p = 0

$\Rightarrow$18 - 9 + p = 0

$\Rightarrow$9 + p = 0

$\Rightarrow$ p = - 9

Now p(x) = $2x^2$ - 3x - 9

= $2x^2$- 6x + 3x - 9

= 2x (x - 3) + 3 (x - 3)

= (x - 3) (2x + 3)

For roots of polynomial, p(x) = 0

$\Rightarrow$(x - 3) (2x + 3) = 0

$\Rightarrow$ x = 3 or x = -$\frac{3}{2}$

Hence the other root is -$\frac{3}{2}$.

50. Here, $\alpha + \beta = \frac{-3}{2\sqrt{5}}$ and $\alpha \cdot \beta = -\frac{1}{2}$ [Given]

f(x) = x^2 - $(\alpha + \beta)$x + $\alpha\beta$ [Formula]

$= x^2 - \left(\frac{-3}{2\sqrt{5}}\right)x + \left(-\frac{1}{2}\right)$

$\Rightarrow f(x) = x^2 + \frac{3}{2\sqrt{5}}x - \frac{1}{2}$

$\Rightarrow f(x) = 2\sqrt{5}x^2 + 3x - \sqrt{5}$

For zeroes of polynomial f(x), f(x) = 0

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

$\Rightarrow 2\sqrt{5}x^2 + 5x - 2x - \sqrt{5} = 0$

$\Rightarrow \sqrt{5}x(2x + \sqrt{5}) - 1(2x + \sqrt{5}) = 0$

$\Rightarrow (2x + \sqrt{5})(\sqrt{5}x - 1) = 0$

$\Rightarrow (2x + \sqrt{5}) = 0$ or $\sqrt{5}x - 1 = 0$

$\Rightarrow x = \frac{-\sqrt{5}}{2}$ or $x = \frac{1}{\sqrt{5}}$

$\therefore\ \alpha = \frac{-\sqrt{5}}{2}$ and $\beta = \frac{1}{\sqrt{5}}$.

51. $7y^2 - \frac{11}{3}y - \frac{2}{3}$

$= \frac{1}{3}(21y^2 - 11y - 2)$

$= \frac{1}{3}(21y^2 - 14y + 3y - 2)$

$= \frac{1}{3}[7y(3y - 2) + 1(3y - 2)]$

$= \frac{1}{3}(3y - 2)(7y + 1)$

$\Rightarrow y = \frac{2}{3}, \frac{-1}{7}$ are zeroes of the polynomial.

If Given polynimoal is $7y^2 - \frac{11}{3}y - \frac{2}{3}$

Then a = 7 , b = $-\frac{11}{3}$ and c = $-\frac{2}{3}$

Sum of zeroes = $\frac{2}{3} + \frac{-1}{7} = \frac{14-3}{21} = \frac{11}{21}$ .... (i)

Also, $\frac{-b}{a} = \frac{-\left(\frac{-11}{3}\right)}{7} = \frac{11}{21}$ .... (ii)

From (i) and (ii)

Sum of zeroes = $\frac{-b}{a}$

Now, product of zeroes = $\frac{2}{3} \times \frac{-1}{7} = \frac{-2}{21}$ .... (iii)

Also, $\frac{c}{a} = \frac{\frac{-2}{3}}{7} = \frac{-2}{21}$ .... (iv)

From (iii) and (iv)

Product of zeroes = $\frac{c}{a}$

52. Here, $\alpha + \beta = -2\sqrt{3}$ and $\alpha\beta = -9$

f(x) = $x^2 - (\alpha + \beta)x + \alpha\beta$ [Formula]

$= x^2 - (-2\sqrt{3})x + (-9)$

$\Rightarrow f(x) = x^2 + 2\sqrt{3}x - 9$

For zeroes of polynomial f(x), f(x) = 0

$\Rightarrow x^2 + 2\sqrt{3}x - 9 = 0$

$\Rightarrow x^2 + 3\sqrt{3}x - 1\sqrt{3}x - 9 = 0$

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

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

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

$\Rightarrow x = -3\sqrt{3}$ or $x = \sqrt{3}$

$\therefore\ \alpha = -3\sqrt{3}$ and $\beta = \sqrt{3}$

Hence the polynomial is $x^2 + 2\sqrt{3}x - 9$ and its zeros are $-3\sqrt{3}$ and $\sqrt{3}$.

53. Given polynomial is

f(x) = $x^2 - 2x + 3$

Compare with $ax^2 + bx + c$, we get

a = 1 , b = -2 and c = 3

Sum of the zeroes $= \alpha + \beta = -\frac{b}{a} = -\frac{-2}{1} = 2$

Product of the zeroes $= \alpha\beta = \frac{c}{a} = \frac{3}{1} = 3$

i. Sum of the zeroes of new polynomial = $(\alpha + 2) + (\beta + 2)$

   $= \alpha + \beta + 4$

   = 2 + 4 = 6

   Product of the zeroes of new polynomial = $(\alpha + 2)(\beta + 2)$

= $\alpha\beta + 2\alpha + 2\beta + 4$
= $\alpha\beta + 2(\alpha + \beta) + 4$
= 3 + 2(2) + 4
= 11

So, quadratic polynomial is: x^2 - (sum of the zeroes)x + (product of the zeroes)

= x^2 - 6x + 11

Hence, the required quadratic polynomial is f(x) = (x^2 - 6x + 11)

ii. Sum of the zeroes of new polynomial = $\frac{\alpha-1}{\alpha+1} + \frac{\beta-1}{\beta+1}$
$= \frac{(\alpha-1)(\beta+1)+(\beta-1)(\alpha+1)}{(\alpha+1)(\beta+1)}$
$= \frac{\alpha\beta+\alpha-\beta-1+\alpha\beta+\beta-\alpha-1}{(\alpha+1)(\beta+1)}$
$= \frac{\alpha\beta-1+\alpha\beta-1}{\alpha\beta+\alpha+\ \beta+1}$
$= \frac{3-1+3-1}{3+1+2}$
$= \frac{4}{6}$
$= \frac{2}{3}$
Product of the zeroes of new polynomial $= \frac{\alpha-1}{\alpha+1} \times \frac{\beta-1}{\beta+1}$
$= \frac{(\alpha-1)(\beta-1)}{(\alpha+1)(\beta+1)}$
$= \frac{\alpha\beta\ \ -\ \alpha-\beta+1}{\alpha\beta\ \ +\ \alpha+\beta+1}$
$= \frac{\alpha\beta\ \ -(\alpha+\beta)+1}{\alpha\beta\ \ +(\ \alpha+\beta)\ +1}$
$= \frac{3\ -\ 2+1}{3+\ 2\ \ +1}$
$= \frac{2}{6} = \frac{1}{3}$
So, the quadratic polynomial is, x^2 - (sum of the zeroes)x + (product of the zeroes)
$= x^2 - \frac{2}{3}x + \frac{1}{3}$
Thus, the required quadratic polynomial is $f(x) = k\left(x^2 - \frac{2}{3}x + \frac{1}{3}\right)$.

54. Sum of the zeroes: (2 + β) = (-1)
Product of the zeroes : 2β = -20
So, required Quadratic polynomial
= $\left[x^2 + (\alpha + \beta)x + 2\beta\right]$
= $\left[x^2 + (-1)x + (-20\right]$
= $x^2 - x - 20$
$\Rightarrow x^2 - x - 20$ = 0 is the polynomial

55. x^2 - 6

Let p(x) = x^2 - 6
For zeroes of p(x), p(x) = 0
$\Rightarrow x^2 - 6 = 0 \Rightarrow (x)^2 - (\sqrt{6})^2 = 0$
$\Rightarrow (x - \sqrt{6})(x + \sqrt{6}) = 0$
Using the identity a^2 - b^2 = (a - b) (a + b)
$\Rightarrow x - \sqrt{6} = 0$ or $x + \sqrt{6} = 0$
$\Rightarrow x = \sqrt{6}$ or $x = -\sqrt{6} \Rightarrow x = \sqrt{6}, -\sqrt{6}$
So, the zeroes of x^2 - 6 are $\sqrt{6}$ and $-\sqrt{6}$
Sum of zeroes
$= (\sqrt{6}) + (-\sqrt{6}) = 0 = \frac{-0}{1} = \frac{-\text{ Coefficient of } x}{\text{Coefficient of } x^2}$
Product of zeroes
$= (\sqrt{6}) \times (-\sqrt{6}) = -6 = \frac{-6}{1} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$
Hence the relation between zeroes and coefficient is verified.

56. Given quadratic polynomial is
f(y) = $7y^2 - \frac{11}{3}y - \frac{2}{3}$

For zeroes of f(y), put f(y) = 0

$\Rightarrow 7y^2 - \frac{11}{3}y - \frac{2}{3} = 0$

$\Rightarrow$ 21y^2 - 11y - 2 = 0

$\Rightarrow$ 21y^2 - 14y + 3y - 2 = 0 (by splitting the middle term method)

$\Rightarrow$ 7y(3y - 2) + 1(3y - 2) = 0

$\Rightarrow$ (3y - 2)(7y + 1) = 0

Therefore, either 3y - 2 = 0 or 7y + 1 = 0

$\Rightarrow y = \frac{2}{3}$ or $y = \frac{-1}{7}$

Now Verification of the relations between α, β ,a, b, and c:

We have $\alpha = \frac{2}{3},\ \beta = \frac{-1}{7},$ a = 7, $b = -\frac{11}{3},\ c = \frac{-2}{3}$

$\Rightarrow \alpha + \beta = \frac{-b}{a}$

$\Rightarrow \left(\frac{2}{3}\right) - \frac{1}{7} = \frac{+\frac{11}{3}}{7}$

$\Rightarrow \frac{14-3}{21} = \frac{11}{3} \times \frac{1}{7}$

$\Rightarrow \frac{11}{21} = \frac{11}{21}$

$\Rightarrow$ LHS = RHS

Hence verified.

Also, we know that $\alpha \cdot \beta = \frac{c}{a}$

$\Rightarrow \left(\frac{2}{3}\right) \times \left(\frac{-1}{7}\right) = \frac{\frac{-2}{3}}{7}$

$\Rightarrow \frac{-2}{21} = \frac{-2}{3} \times \frac{1}{7}$

$\Rightarrow \frac{-2}{21} = \frac{-2}{21}$

$\Rightarrow$ LHS = RHS

Hence verified.

57. Sum of zeroes of a quadratic polynomial is $\frac{-b}{a}$ and the product is $\frac{c}{a}$

So a + b = $\frac{-2}{5}$ and ab = $\frac{-3}{5}$

According to question

Sum of zeroes of the polynomial is $\frac{1}{a}$ + $\frac{1}{b}$

= $\frac{a+b}{ab}$

= $\frac{\frac{-2}{5}}{\frac{-3}{5}}$

= $\frac{2}{3}$

Product of zeroes of the polynomial is $\frac{1}{ab}$

= $\frac{1}{\frac{-3}{5}}$

= $\frac{-5}{3}$

We know that a quadratic equation is of the form ax^2 + bx + c

= x^2 – $\frac{2}{3}$x – $\frac{5}{3}$

58. Here, $f(v) = v^2 + 4\sqrt{3}v - 15$

For zeroes of f(v), put f(v) = 0

$\Rightarrow v^2 + 4\sqrt{3}v - 15 = 0$

$\Rightarrow v^2 + 5\sqrt{3}v - 1\sqrt{3}v - 15 = 0$ (By splitting the middle term)

$\Rightarrow v(v + 5\sqrt{3}) - \sqrt{3}(v + 5\sqrt{3}) = 0$

$\Rightarrow (v + 5\sqrt{3})(v - \sqrt{3}) = 0$

$\Rightarrow (v + 5\sqrt{3}) = 0$ or $(v - \sqrt{3}) = 0$

Therefore, either $v = -5\sqrt{3}$ or $v = \sqrt{3}$

Verification of relations between α, β, a, b, c:

we have, $\alpha = -5\sqrt{3},\ \beta = \sqrt{3},$ a = 1, $b = 4\sqrt{3},$ and c = -15

$\alpha + \beta = \frac{-b}{a}$

$\Rightarrow -5\sqrt{3} + \sqrt{3} = \frac{-4\sqrt{3}}{1}$

$\Rightarrow -4\sqrt{3} = -4\sqrt{3}$

$\Rightarrow$ LHS = RHS

Hence, verified.

Also we know that

$\alpha \cdot \beta = \frac{c}{a}$

$\Rightarrow (-5\sqrt{3})(\sqrt{3}) = \frac{-15}{1}$

$\Rightarrow$ -5 × 3 = -15

$\Rightarrow$ -15 = -15

$\Rightarrow$ LHS = RHS

Hence, verified.

59. Given, β and $\frac{1}{\beta}$ are zeroes of the polynomial (α^2 + α)x^2 + 61x + 6α.

$\therefore \quad \beta + \frac{1}{\beta} = -\frac{61}{\alpha^2+\alpha}$

or, $\frac{\beta^2+1}{\beta} = \frac{-61}{\alpha^2+\alpha}$ ....(i)

and $\beta \cdot \frac{1}{\beta} = \frac{6\alpha}{\alpha^2+\alpha}$

or, $1 = \frac{6}{\alpha+1}$

α + 1 = 6

α = 5

Substituting this value of α in (i), we get

$\frac{\beta^2+1}{\beta} = \frac{-61}{5^2+5} = -\frac{61}{30}$

$30\beta^2 + 30 = -61\beta$

$30\beta^2 + 61\beta + 30 = 0$

or, $\frac{-61 \pm \sqrt{(-61)^2 \times 4 \times 30 \times 30}}{2 \times 30}$

$= \frac{-61 \pm \sqrt{3721-3600}}{60}$ = $\frac{-61 \pm 11}{60}$

$\beta = \frac{-5}{6}$ or $\frac{-6}{5}$

Hence, $\alpha = 5, \beta = \frac{-5}{6}, \frac{-6}{5}$

60. Zeroes are -2, -3

factors are (x + 2), (x + 3)

g(x) = (x + 2) (x + 3) = x^2 + 5x + 6

$\frac{x^4+2x^3-7x^2-8x+12}{x^2+5x+6}$ = x^2 - 3x + 2

x^2 - 3x + 2 = (x - 2)(x - 1)

Other zeroes are 2, 1

61. $2x^2$ + 3x - 14 = $2x^2$ + 7x - 4x - 14

= (x - 2)(2x + 7)

x = 2, $-\frac{7}{2}$

Sum of zeroes = $2 + \left(-\frac{7}{2}\right)$ = $-\frac{3}{2}$

Product of zeroes = $2 \times -\frac{7}{2}$ = -7

$-\frac{b}{a}$ = $-\frac{3}{2}$

$\frac{c}{a}$ = $-\frac{14}{2}$ = -7

$\Rightarrow$ \Hence, sum of zeroes = $-\frac{b}{a}$

Product of zeroes = $\frac{c}{a}$

62. According to the question, $\alpha$and $\beta$are zeroes of p(x) = $6x^2$ - 5x + k

So, Sum of zeroes =$\alpha + \beta = -\left(\frac{-5}{6}\right) = \frac{5}{6}$ ....(i)

$\alpha - \beta = \frac{1}{6}$ (Given).......(ii)

Adding equations (i) and (ii), we get

2α= 1

or, $\alpha = \frac{1}{2}$

On putting the value of α in equation (ii), we get

$\frac{1}{2} - \beta = \frac{1}{6}$

$\beta=\frac{1}{2}-\frac{1}{6}$
$\beta=\frac{2}{6}=\frac{1}{3}$
$\therefore \quad \alpha\beta=\frac{k}{6}=\frac{1}{2}\times\frac{1}{3}$
Hence, k = 1

63. Since α and β are the zeroes of the quadratic polynomial x^2+4x+3
So, $\alpha+\beta=-4$
and $\alpha\beta=3$
Sum of zeroes of new polynomial $=1+\frac{\beta}{\alpha}+1+\frac{\alpha}{\beta}$
$=\frac{\alpha\beta+\beta^2+\alpha\beta+\alpha^2}{\alpha\beta}$
$=\frac{\alpha^2+\beta^2+2\alpha\beta}{\alpha\beta}$
$=\frac{(\alpha+\beta)^2}{\alpha\beta}=\frac{(-4)^2}{3}=\frac{16}{3}$
Product of zeroes = $\left(1+\frac{\beta}{\alpha}\right)\left(1+\frac{\alpha}{\beta}\right)$
$=\left(\frac{\alpha+\beta}{\alpha}\right)\left(\frac{\beta+\alpha}{\beta}\right)$
$=\frac{(\alpha+\beta)^2}{\alpha\beta}$
$=\frac{(-4)^2}{3}=\frac{16}{3}$
So required polynomial = x^2 - (Sum of the zeroes)x + Product of the zeroes
$=x^2-\left(\frac{16}{3}\right)x+\frac{16}{3}$
$=\left(x^2-\frac{16}{3}x+\frac{16}{3}\right)$
$=\frac{1}{3}\left(3x^2-16x+16\right)$

64. Since α and β are the zeros of the quadratic polynomial $f(x) = ax^2 + bx + c$
$\alpha+\beta=\frac{-\text{ Coefficient of } x}{\text{Coefficient of } x^2}=\frac{-b}{a}$
$\alpha\beta=\frac{\text{Constant term}}{\text{Coefficient of } x^2}=\frac{c}{a}$
We have,
$a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)=a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)$
$a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)=a\left(\frac{\alpha^3+\beta^3}{\alpha\beta}\right)+b\left(\frac{\alpha^2+\beta^2}{\alpha\beta}\right)$
$a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)=a\left(\frac{(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)}{\alpha\beta}\right)+\left(\frac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta}\right)$
By substituting $\alpha+\beta=\frac{-b}{a}$ and $\alpha\beta=\frac{c}{a}$ we get,
$a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)=a\left(\frac{\left(\frac{-b}{a}\right)^3-3\times\frac{c}{a}\left(\frac{-b}{a}\right)}{\frac{c}{a}}\right)+b\left(\frac{\left(\frac{-b}{a}\right)^2-2\times\frac{c}{a}}{\frac{c}{a}}\right)$
$a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)=a\left(\frac{\frac{-b^3}{a^3}+\frac{3bc}{a^2}}{\frac{c}{a}}\right)+b\left(\frac{\frac{b^2}{a^2}-\frac{2c}{a}}{\frac{c}{a}}\right)$
$a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)=a\left(\frac{-b^3+3bca}{a^3}\times\frac{a}{c}\right)+b\left(\frac{b^2-2ca}{a^2}\times\frac{a}{c}\right)$
$a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)=a\left(\frac{-b^3+3abc}{a^2c}\right)+b\left(\frac{b^2-2ca}{ac}\right)$
$a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)=\frac{-b^3+3abc}{ac}+\frac{b^3-2abc}{ac}$
$a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)=\frac{-b^3+3abc+b^3-2abc}{ac}$
$a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)=\frac{3abc-2abc}{ac}$
$a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)=\frac{abc}{ac}$
$a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)=b$
Hence, the value of $a\left(\frac{\alpha^2}{\beta}+\frac{\beta^2}{\alpha}\right)+b\left(\frac{\alpha}{\beta}+\frac{\beta}{\alpha}\right)$ is b.

65. Here the given polynomial is
$f(s) = 2s^2-(1+2\sqrt{2})s+\sqrt{2}$

$= s(2s-1) - \sqrt{2}(2s-1)$
$= (2s-1)(s-\sqrt{2})$
Hence f(s) = 0 if 2s - 1 = 0 or $s - \sqrt{2} = 0$
$s = \frac{1}{2}$ or $s = \sqrt{2}$
Verification of the relation between α, β, a, b and c
$\alpha = \frac{1}{2}, \beta = \sqrt{2}$,, a = 2, $b = -(1+2\sqrt{2})$, $c = \sqrt{2}$
$\alpha + \beta = \frac{-b}{a}$
$\Rightarrow \frac{1}{2} + \sqrt{2} = \frac{+(1+2\sqrt{2})}{2}$
$\Rightarrow \frac{1}{2} + \sqrt{2} = \frac{1}{2} + \frac{2\sqrt{2}}{2}$
$\Rightarrow \frac{1}{2} + \sqrt{2} = \frac{1}{2} + \sqrt{2}$
⇒ LHS = RHS
Now, $\alpha \times \beta = \frac{c}{a}$
$\Rightarrow \left(\frac{1}{2}\right)\left(\sqrt{2}\right) = \frac{\sqrt{2}}{2}$
$\Rightarrow \frac{\sqrt{2}}{2} = \frac{\sqrt{2}}{2}$
⇒ LHS = RHS
Hence verified.

66. i. 2
ii. 81.2 m
iii. quadratic polynomial
OR
(x - 3) and (x - 2)

67. i. Zeroes of the polynomial are 0 and 5
ii. Maximum height achieved by ball
$= 25 \times \frac{5}{2} - 5 \times \left(\frac{5}{2}\right)^2$
$= \frac{125}{4}$ or 31.25 m
iii. a. $-5t^2 + 25t = 30$
$\Rightarrow t^2 - 5t + 6 = 0$
$\Rightarrow$ (t - 2)(t - 3) = 0
$t \neq 3, t = 2$
OR
b. $-5t^2 + 25t = 20$
$\Rightarrow t^2 - 5t + 4 = 0$
$\Rightarrow$ (t - 4)(t - 1) = 0
$\Rightarrow$ t = 4, 1

68. i. Parabola
ii. a > 0
iii. ∵ The graph cut the x-axis thrice
∴ No of zeroes = 3
OR
a < 0

69. i. Graph of y = f(x) intersects X-axis at two distinct points. So we can say that no of zeros of y = f(x) is 2.
ii. There will not be any zero if graph of f(x) does not intersect x- axis.
iii. x^2 + (a + 1) x + b is the quadratic polynomial.
2 and -3 are the zeros of the quadratic polynomial.
Thus, 2 + (-3) = $\frac{-(a+1)}{1}$
$\Rightarrow \frac{(a+1)}{1}$ = 1
$\Rightarrow$ a + 1 = 1
$\Rightarrow$ a = 0
Also, 2 $\times$ (-3) = b
$\Rightarrow$ b = -6

OR

If -4 is zero of given polynomial then,

$(-4)^2 - 2(-4) - (7p + 3) = 0$

$\Rightarrow$ 16 + 8 - 7p - 3 = 0

$\Rightarrow$ 7p = 21

$\Rightarrow$ p = 3

70. i. Point of intersection of graph of polynomial, gives the zeroes of the polynomial.

$\therefore$ zeroes = -4 and 7

ii. Since, zero's are α = -4, β = 7

$\alpha + \beta$ = -4 + 7 = 3

$\alpha\beta$ = -4 $\times$ 7 = -28

P(x) = x^2 - (Sum of zeroes)x + product of zeroes

P(x) = x^2 - 3x + (-28)

P(x) = x^2 - 3x - 28

iii. Product of zeroes = -4 $\times$ 7

= -28

OR

a is a non-zero real number, b and c are any real numbers c.