Solution

POLYNOMIALS WS 3

Class 10 - Mathematics

1. $8x^2 + 3x - 5$
   $= (x + 1)(8x - 5)$
   $\therefore$ x = -1 and x = $\frac{5}{8}$ are the zeroes of the polynomial
   Sum of zeroes = $\frac{-3}{8} = -\frac{\text{coefficient of } x}{\text{coefficient of } x^2}$
   Product of zeroes = $\frac{-5}{8} = \frac{\text{constant term}}{\text{coefficient of } x^2}$
2. The given polynomial $p(x)=ax^2 - 3(a-1)x-1$
   Now 1 is a zero of p(x)
   hence p(1)=0
   $\Rightarrow a(1)^2 - 3(a-1)(1) -1=0$
   $\Rightarrow a - 3(a-1) -1=0$
   $\Rightarrow a - 3a + 3 -1=0$
   $\Rightarrow -2a =-3+1$
   -2a =-2
   Hence a = 1
3. $4x^2 + 17x - 15 = (4x - 3)(x + 5)$
   $\therefore$ 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 = $\frac{-15}{4} = \frac{\text{constant term}}{\text{coefficient of } x^2}$
4. Here $f(x)= x^2 + 5x + 6$
   $=x^2 +3x+2x+6$
   =x(x+3)+2(x+3)
   =(x+3+(x+2)
   f(x)=0 if x+3=0 or x+2=0
   So the zeros of f(x) are -3 and -2
   for $=x^2 +5x+6$
   a=1, b=5, c=6
   Sum of zeros=-3-2=-5=-$\frac{5}{1} = -\frac{b}{a}$
   Product of zeros =(-3)(-2) = 6 = $\frac{6}{1} = \frac{c}{a}$
   Hence the relationship between coefficients and zeros is verified
5. $\alpha + \beta = \frac{7}{5}$ and $\alpha\beta = \frac{1}{5}$
   $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2+\beta^2}{\alpha\beta} = \frac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta}$
   $= \frac{\left(\frac{7}{5}\right)^2-2\times\frac{1}{5}}{\frac{1}{5}}$
   $= \frac{39}{5}$ or 7.8
6. $p(y) = ky^2 + 2y - 3k$
   Compare p(y) with standard form $ax^2 + bx + c$
   a = k, b = 2, c = -3k
   According to question,
   Sum of zeroes = 2(Product of zeroes)
   $\Rightarrow \quad \frac{-b}{a} = 2 \times \frac{c}{a}$
   $\Rightarrow \frac{-2}{k} = 2 \times \frac{-3k}{k}$
   $\Rightarrow \quad \frac{2}{k} = 6$
   $\Rightarrow k = \frac{1}{3}$

7. The standard form of quadratic polynomial be given as: $ax^2 + bx + c$, and its zeroes will be α and β.
   We have
   $\alpha+\beta=-3=\frac{-b}{a}$
   and $\alpha\beta=2=\frac{c}{a}$
   If a = 1, then b = 3 and c = 2. So, one quadratic polynomial which fits the given conditions is $x^2 + 3x + 2$
8. Suppose $p(x) = 4x^2 - 2x + (k - 4)$
   $ax^2+bx+c=0$
   Here, $a=4, b=-2, c=k-4$
   Product of zeroes = $\frac{c}{a}$
   $\Rightarrow \quad \alpha \times \frac{1}{\alpha}=\frac{k-4}{4}$
   $\Rightarrow \quad 1=\frac{k-4}{4}$
   $\Rightarrow \quad k-4=4 \Rightarrow k=8$
9. Sum of zeroes = $\alpha+\beta=\frac{-8}{3}$ and Product of zeroes = $\alpha \cdot \beta=\frac{4}{3}$ [Given]
   Required quadratic polynomial = x^2- (Sum of zeroes)x + Product of zeroes
   ∴ f(x) = $x^2 - (\alpha + \beta)x + \alpha\beta$ [Formula]
   $=x^2-\left(\frac{-8}{3}\right) x+\frac{4}{3}$
   $=x^2+\frac{8}{3} x+\frac{4}{3}$
   So, f(x) = $3x^2 + 8x + 4$ [Multiplying by LCM 3]
   Hence $3x^2 + 8x + 4$ is the required quadratic polynomial.
10. Let α, β be the zeroes of the polynomial. then
    $\alpha+\beta=\sqrt{2}$ and $\alpha\beta=-\frac{3}{2}$
    The quadratic polynomial
    $f(x)=(x-\alpha)(x-\beta)$
    = x^2 - $(\alpha+\beta)$x + $\alpha\beta$
    = $x^2-\sqrt{2} x-\frac{3}{2}$
    Now, f(x) = $x^2-\sqrt{2} x-\frac{3}{2}$
    $\Rightarrow f(x)=\frac{1}{2}\left(2 x^2-2 \sqrt{2} x-3\right)$
    $\Rightarrow f(x)=\frac{1}{2}\left(2 x^2-3 \sqrt{2} x+\sqrt{2} x-3\right)$
    $f(x)=\frac{1}{2}\{\sqrt{2} x(\sqrt{2} x-3)+(\sqrt{2} x-3)\}$
    $\Rightarrow f(x)=\frac{1}{2}(\sqrt{2} x-3)(\sqrt{2} x+1)$
    Now for f(x) = 0, we get
    $x=\frac{3}{\sqrt{2}}$ or, $x=-\frac{1}{\sqrt{2}}$
    Hence, the zeroes of f(x) are $\frac{3}{\sqrt{2}}$ and $-\frac{1}{\sqrt{2}}$.
11. $\frac{1}{3},-1$
    Let the quadratic polynomial be $ax^2 + bx + c$
    and its zeroes be α and β
    Then, $\alpha+\beta=\frac{1}{3}=\frac{-b}{a}$
    and, $\alpha\beta=-1=\frac{C}{a}$
    It a = 3, then b = -1 and c = -3
    So, one quadratic polynomial which fits the given conditions is $3x^2 - x - 3$.
    Aliter
    Here it's given that $\alpha+\beta=\frac{1}{3}$ and $\alpha\beta=-1$
    Let the quadratic polynomial be $ax^2 + bx + c$ and it zeroes are α and β
    $\alpha+\beta=\frac{1}{3}=-\frac{b}{a}$ and $\alpha\beta=-1=\frac{c}{a}$
    Here let b = -k and a = 3k, c = -3 where, k non zero constant.
    now, $3kx^2-kx-3k=k\left(3x^2-x-3\right)$
    So quadratic polynomial which fits the given condition is $3x^2 - x - 3$

12. Let the polynomial be $ax^2 + bx + c$,

and its zeroes be α and β.

Then, $\alpha+\beta=0=-\frac{b}{a}$ and $\alpha\beta=\sqrt{5}=\frac{c}{a}$

If a = 1, then b = 0 and $c=\sqrt{5}$.

So, one quadratic polynomial which fits the given conditions is $x^2+\sqrt{5}$.

13. The given polynomial is $p(x)= x^2- 6x + a$

And α, β are zeros of given polynomial

$\alpha+\beta=6$

And $\alpha\beta=a$

Now $3\alpha+2\beta$ = 20 ..... (i)

$\Rightarrow \quad \alpha+2\alpha+2\beta=20$

$\Rightarrow \alpha+2(\alpha+\beta)=20$

$\Rightarrow \quad \alpha+2\times 6=20$

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

Put $\alpha=8$ in (i), we get

$3(8)+2\beta$ = 20

$\therefore \quad \beta=-2$

Now, $\alpha\beta=a$

$\therefore$ 8 $\times$(-2) = a

$\Rightarrow$ a = -16

14. The given polynomial is:

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

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

$=2x(\sqrt{3}x-1)-\sqrt{3}(\sqrt{3}x-1)$

$=(2x-\sqrt{3})(\sqrt{3}x-1)$

Now f(x) = 0,

$2x-\sqrt{3}=0$ or $\sqrt{3}x-1=0$

$x=\frac{1}{\sqrt{3}}$ or $x=\frac{\sqrt{3}}{2}$

so $\alpha=\frac{1}{\sqrt{3}}$ and $\beta=\frac{\sqrt{3}}{2}$

$\alpha+\beta=\frac{1}{\sqrt{3}}+\frac{\sqrt{3}}{2}=\frac{2+3}{2\sqrt{3}}=\frac{5}{2\sqrt{3}}=-\frac{-5}{2\sqrt{3}}=\frac{-b}{a}$

$\alpha\beta=\frac{1}{\sqrt{3}}\times\frac{\sqrt{3}}{2}=\frac{1}{2}=\frac{\sqrt{3}}{2\sqrt{3}}=\frac{c}{a}$

Hence the relationship between the zeros and coefficients of the polynomial is verified.

15. Let the given polynomial is

$p(x) = 25x^2 + 5x$

For zeroes p(x) = 0

$25x^2 + 5x =$

$\Rightarrow$ 5x(x + 1) = 0

$\Rightarrow$ 5x = 0 or 5x + 1 =0

$\Rightarrow$ x = 0 or x = $\frac{-1}{5}$

Therefore, Zeroes of the polynomials are 0, $\frac{-1}{5}$.

Now, a = 25, b = 5, c = 0

$\frac{-b}{a}=\frac{-5}{25}=\frac{-1}{5}$ ..... (i)

Sum of zeroes = 0 + $\left(\frac{-1}{5}\right)=\frac{-1}{5}$ .... (ii)

From (i) and (ii)

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

Also, $\frac{c}{a}=\frac{0}{25}=0$ .... (iii)

And product of the zeroes = $0\times\left(\frac{-1}{5}\right)=0$ .... (iv)

From (iii) and (iv)

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

16. p(x) = $3x^2 + 5x - 28 = 0$
$\Rightarrow (3x - 7)(x + 4) = 0$
$\Rightarrow x = \frac{7}{3}, x = -4$
Now taking $\alpha = \frac{7}{3}, \beta = -4$
$\alpha + \beta = \frac{7}{3} - 4 = -\frac{5}{3} = -\frac{\text{coeff. of } x}{\text{coeff. of } x^2}$
$\alpha\beta = \frac{7}{3}(-4) = -\frac{28}{3} = \frac{\text{const . term}}{\text{coeff. of } x^2}$

17. i. Quadratic polynomial is $x^2 - (sum\ of\ zeros)x + product\ of\ zeros$
$\therefore$ Required polynomial $= x^2 - (0) + \sqrt{2} = x^2 + \sqrt{2}$
ii. Quadratic polynomial is $x^2 - (sum\ of\ zeros)x + product\ of\ zeros$
$\therefore$ Required polynomial $= x^2 - (2 + \sqrt{3})x + (2 - \sqrt{3})$
iii. Quadratic polynomial is $x^2 - (sum\ of\ zeros)x + product\ of\ zeros$
$\therefore$ Required polynomial $= x^2 - 2\sqrt{5}x - \sqrt{5}$
iv. Quadratic polynomial is $x^2 - (sum\ of\ zeros)x + product\ of\ zeros$
$\therefore$ Required polynomial = $2x^2 - 3x - 1$

18. We have given the quadratic equation as: $6x^2 - 3 - 7x$
First of all we will write it into standard form as: $6x^2 - 7x - 3$
(Now we will factorize 7 such that the product of the factors is equal to - 18 and the sum is equal to - 7)
It can be written as
$= 6x^2 + 2x - 9x - 3$
$= 2x(3x + 1) - 3(3x + 1)$
$= (3x + 1)(2x - 3)$
The value of $6x^2 - 3 - 7x$ is zero when $3x + 1 = 0$ or $2x - 3 = 0$,
i.e. $X = \frac{-1}{3}$ or $\frac{3}{2}$
Therefore, the zeroes of $6x^2 - 3 - 7x$ are $\frac{-1}{3}$ and $\frac{3}{2}$
Sum of zeroes = $\frac{-1}{3} + \frac{3}{2} = \frac{7}{6} = \frac{-(-7)}{6} = \frac{-(\text{ coefficient of } x)}{\text{coefficient of } x^2}$
Product of zeroes = $\frac{-1}{3} \times \frac{3}{2} = \frac{-1}{2} = \frac{-3}{6} = \frac{\text{constant term}}{\text{coefficient of } x^2}$
Hence, verified

19. Compare $f(x) = x^2 - 5x + k$ with $f(x) = ax^2 + bx + c$, we get
a = 1 b = -5 and c= k
Let α, β are the zeros of $x^2 - 5x + k$
Then, we have
$\alpha + \beta = -\frac{b}{a} = -\frac{(-5)}{1} = 5$
$\alpha\beta = \frac{c}{a} = \frac{k}{1} = k$
Given, $\alpha - \beta = 1$
Now, $(\alpha + \beta)^2 = (\alpha - \beta)^2 + 4\alpha\beta$
$\Rightarrow (5)^2 = (1)^2 + 4(k)$
$\Rightarrow 25 = 1 + 4k$
$\Rightarrow 4k = 24$
$\Rightarrow k = \frac{24}{4}$
$\Rightarrow k = 6$

20. Here $p(x) = 4x^2 - 2x + k - 4$
Here a = 4, b = -2, c = k - 4
Given α and β are zeros of the given polynomial
$\alpha = \frac{1}{\beta}$
$\Rightarrow \beta = \frac{1}{\alpha}$
$\alpha\beta = 1$
also $\alpha\beta = \frac{c}{a} = \frac{k-4}{4}$
So $\frac{k-4}{4} = 1$

k - 4 = 4

k = 4 + 4 = 8

21. α and β are zero of the polynomial:

 p(x)=4x^2-5x-1

 a=4,b=-5,c=-1

 So, Sum of the zeroes = α + β=-$\frac{b}{a} = \frac{5}{4}$

 Product of the zeroes = αβ=$\frac{c}{a} = \frac{-1}{4}$

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

 $= \frac{5}{4}\left(\frac{-1}{4}\right)$

 $= \frac{-5}{16}$.

22. The polynomial with α and β as zeros is:

 f(x) = x^2 - (α + β)x + αβ

 Given that α + β = 10 and αβ = 6

 so f(x) = x^2 - 10x + 6

23. Given, ax^2 + 7x + b = 0

 it's roots are $\frac{2}{3}$ and -3

 Let A and B are coefficients of x^2, and x and C be the constant term.

 So A = a, B = 7 and C = b

 Now, Sum or roots $= \frac{2}{3} + (-3) = \frac{2-9}{3} = \frac{-7}{3}$

 Hence $-\frac{7}{3} = -\frac{\mathrm{B}}{\mathrm{A}} = -\frac{7}{\mathrm{a}}$

 ⇒ a = 3

 Product of roots $= \frac{2}{3} \times (-3) = -2$

 So $\frac{\mathrm{C}}{\mathrm{A}} = \frac{\mathrm{b}}{\mathrm{a}} = -2$

 ⇒ $\frac{b}{3} = -2$

 ⇒ b = -6

 Hence, a = 3 and b = -6

24. 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

 ⇒ 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.

25. Let S and P denotes respectively the sum and product of the zeros of a polynomial are $2\sqrt{3}$ and 2.

 The required polynomial g(x) is given by

 $g(x) = k\left(x^2 - Sx + P\right)$

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

 Hence, the quadratic polynomial is $g(x) = k\left(x^2 - 2\sqrt{3}x + 2\right)$ where k is any non-zero real number.

26. Let α=5

 Given α+β=0

 5+β=0,β=-5

 So the polynomial f(x)=(x-5)[x-(-5)]

 =(x-5)(x+5)

 =x^2-25

27. We have,

 x^2 + 7x + 10 = (x + 2)(x + 5)

So, the value of $x^2 + 7x + 10$ is zero when x + 2 = 0 or x + 5 = 0, i.e., when x = – 2 or x = –5. Therefore, the zeroes of $x^2 + 7x + 10$ are -2 and -5.

Now,

sum of zeroes = $-2+(-5)=-(7)=\frac{-(7)}{1}=\frac{-(\text{ Coefficient of } x)}{\text{Coefficient of } x^2}$

product of zeroes = $(-2)\times(-5)=10=\frac{10}{1}=\frac{\text{Constant term}}{\text{coefficient of } x^2}$

28. Here the given polynomial f(x) = $x^2 - (\sqrt{3} + 1)x + \sqrt{3}$

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

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

$= (x - \sqrt{3})(x - 1)$

f(x) = 0 if x = $\sqrt{3}$ or x = 1

Hence zeros of the polynomials are 1 and $\sqrt{3}$

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

a = 1, b = - $(\sqrt{3} + 1)$, c = $\sqrt{3}$

Sum of zeros $= \sqrt{3}+1 = -\frac{-(\sqrt{3}+1)}{1}=-\frac{\mathrm{b}}{\mathrm{a}}$

Product of zeros = $\sqrt{3}\times 1=\sqrt{3}=\frac{\sqrt{3}}{1}=\frac{\mathrm{c}}{\mathrm{a}}$

Hence, the relationship is verified.

29. Let f(x) = $x^2 + \frac{1}{6}x - 2$.

Then, f(x) = $\frac{1}{6}(6x^2 + x - 12) = \frac{1}{6}(6x^2 + 9x - 8x - 12)$

$\Rightarrow$ f(x) = $\frac{1}{6}\{(6x^2 + 9x) - (8x + 12)\}$

= $\frac{1}{6}\{3x(2x + 3) - 4(2x + 3)\}$

= $\frac{1}{6}(2x + 3)(3x - 4)$

Now for f(x)=0, we get

$x=-\frac{3}{2}\ or\ x=\frac{4}{3}$

Hence, $\alpha=\frac{-3}{2}$ and $\beta=\frac{4}{3}$ are the zeros of the given polynomial.

$Now\ \alpha+\beta=\frac{-3}{2}+\frac{4}{3}=\frac{-9+8}{6}=-\frac{1}{6}$

and $\alpha\beta=\frac{-3}{2}\times\frac{4}{3}=-2$

The given polynomial is f(x) =$x^2 + \frac{1}{6}x - 2$.

so a=1 b=$\frac{1}{6}$ c=-2

$\alpha+\beta=-\frac{b}{a}=\frac{-\frac{1}{6}}{1}=-\frac{1}{6}$

and $\alpha\beta=\frac{c}{a}=\frac{-2}{1}=-2$

Hence, the relation between the coefficients and zeros is verified.

30. Let p(x) = $6x^2 - 18x + 12$

For zeroes of p(x), we put p(x) = 0

$6x^2 - 18x + 12 = 0$

$6x^2 - 6x - 12x + 12 = 0$

6x(x - 1) - 12(x - 1) = 0

(6x - 12)(x - 1) = 0

Either 6x - 12 = 0 or x - 1 = 0

Either x = 2 or x = 1

Thus, the zeroes of p(x) are 1, 2.

Now, sum of zeros = 1 + 2 = 3 $=-\frac{(-18)}{6}=-\frac{coeff.\,of\,x}{coeff.\,of\,x^2}$

and product of zeros = 1$\times$ 2 = 2 $=\frac{12}{6}=\frac{constant\ term}{coeff.\,of\,x^2}$

31. Compare f(x) = $x^2 + x - 2$ with f(x) = $ax^2 + bx + c$

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

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

$\alpha+\beta=-\frac{b}{a}=-\frac{1}{1}$ = -1

$\alpha\beta = \frac{c}{a} = \frac{-2}{1}$ = -2

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

$= \frac{\sqrt{(\beta+\alpha)^2-4\alpha\beta}}{\alpha\beta}$

$= \frac{\sqrt{(-1)^2-4(-2)}}{-2}$

$= -\frac{\sqrt{1+8}}{2}$

$= -\frac{\sqrt{9}}{2}$

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

32. The given polynomial

 p(x) = x^2 + 6x + 9

 So, a = 1 , b = 6 and c = 9

 $\because \alpha, \beta$ are zeroes of p(x)

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

 $\Rightarrow \alpha + \beta = -6$

 Also, $\alpha\beta = \frac{c}{a} = 9$

 Now quadratic polynomial whose zeroes are $-\alpha$ and — β is

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

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

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

 = x^2 - 6x + 9

33. Comparing polynomial x^2 - 2x - 8 with general form of quadratic polynomial ax^2 + bx + c ,

 We get a = 1, b = -2 and c = -8

 We have, x^2 - 2x - 8

 = x^2 - 4x + 2x - 8

 = x(x - 4) + 2(x - 4)

 = (x - 4)(x + 2)

 Now, for zeroes of polynomial, we have;

 (x - 4) (x + 2) = 0

 x - 4= 0 or x + 2 = 0

 x = 4 or x = -2

 ⇒ x = 4, −2 are two zeroes.

 a = 1, b = -2 and c = -8

 Sum of zeroes = 4 + (– 2) = 2

 Sum of zeroes $= \frac{-(-2)}{1} = \frac{-b}{a} = \frac{-\text{ Coefficient of } x}{\text{Coefficient of } x^2}$

 Product of zeroes = 4 × (−2) = −8

 Product of zeroes $= \frac{-8}{1} = \frac{c}{a} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$

34. Here, g(s) = $4s^2$ - 4s + 1

 Now $4s^2$ - 4s + 1 = $4s^2$ - 2s - 2s + 1

 = 2s (2s − 1) − 1 (2s − 1)

 = (2s − 1) (2s − 1)

 g(s)=0 if 2s-1=0

 Hence S $= \frac{1}{2}, \frac{1}{2}$

 Sum of zeroes $= \frac{1}{2} + \frac{1}{2} = 1 =$ - $\frac{-4}{4} = -\frac{\mathrm{b}}{\mathrm{a}} = -\frac{\text{coefficient of s}}{\text{coefficient of s}^2}$

 Product of Zeroes = $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4} = \frac{\mathrm{c}}{\mathrm{a}} = \frac{\text{constant term}}{\text{coefficient of s}^2}$

35. we know that

 Sum of zeros = $-\left(\frac{b}{a}\right)$

 $\alpha + \beta = -\left(\frac{-5}{1}\right)$ = 5 ...(i)

 and Product of Zeros = $\frac{c}{a}$

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

Now for the new Polynomial roots are given $\frac{1}{\alpha}$ and $\frac{1}{\beta}$

so the sum of zeros $= \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta}$

$= \frac{5}{6}$

now Product of Zeros = $\frac{1}{\alpha\beta} = \frac{1}{6}$

the Required polynomial is

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

$= x^2 - (\frac{5}{6})x + (\frac{1}{6})$

= $6x^2 - 5x + 1$

36. Given, $x^2 - (k + 6)x + 2(2k - 1)$

Here, a = 1 , b = -(k + 6) and c = 2(2k - 1)

Now,

Sum of zeroes = $-\frac{b}{a} = -\frac{-(k+6)}{1} =$ k + 6

Product of zeroes = $\frac{c}{a} = \frac{2(2k-1)}{1} =$ 2(2k – 1)

According to question, k + 6 = $\frac{1}{2} \times$ 2(2k−1)

⇒ k = 7

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

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

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

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

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

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

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

38. $ax^2 + 7x + b$

Sum of zeroes = $\frac{-7}{a} = \frac{-7}{3}$

∴ a = 3

Product of zeroes = $\frac{b}{a}$ = -2

∴ b = -6

39. The given quadratic equation is $4s^2 - 4s + 1$

= $(2s)^2 - 2(2s)1 + 1^2$

As, we know $(a - b)^2 = a^2 - 2ab + b^2$, the above equation can be written as

= $(2s - 1)^2$

The value of $4s^2 - 4s + 1$ is zero when $2s - 1 = 0$, and when, s = $\frac{1}{2}$, $\frac{1}{2}$

Therefore, the zeroes of $4s^2 - 4s + 1$ are $\frac{1}{2}$ and $\frac{1}{2}$

Sum of zeroes = $\frac{1}{2} + \frac{1}{2} = 1 = \frac{-(-4)}{4} = \frac{-(\text{coefficient of } s)}{\text{coefficient of } s^2}$

Product of zeroes = $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4} = \frac{\text{constant term}}{\text{coefficient of } s^2}$

Hence Verified.

40. Let

Let α=7

Given α+β=-18

7+β=-18,β=-18-7=-25

∴ Product of zeroes αβ = 7 × (-25) = -175

Quadratic polynomial

p(x) = x^2 - (α+β)x+ αβ

= x^2 - (-18)x - 175

= x^2 + 18x - 175

41. p(x) = $2x^2 - 7x - 15 = 0$

⇒ (2x + 3)(x - 5) = 0

$\Rightarrow \alpha$ = x = $-\frac{3}{2}$, β = x = 5.

$\therefore \alpha\beta = -\frac{3}{2}$ + 5 = $\frac{7}{2}$ = $-\frac{(-7)}{2} = \frac{-\text{coefficient of } x}{\text{coefficient of } x^2}$

$\alpha\beta = -\frac{3}{2} \times 5 = -\frac{15}{2} = \frac{\text{constant term}}{\text{coefficient of } x^2}$

42. One zero = 5,

Product of zeroes = 30

$\therefore$ Other zero = $\frac{30}{5}$= 6

The polynomial

p(x)=(x-5)(x-6)

= x^2 - 6x-5x+30

= x^2 - 11x + 30

43. Let One zero(α)=$\sqrt{5}$

Product of zeroes (αβ)=-2$\sqrt{5}$

So β==$-\frac{2\sqrt{5}}{\sqrt{5}} = -2$

Quadratic polynomial

p(x) = x^2 - (α+β)x + αβ

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

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

44. Here the given polynomial f(x)= 2x^2+ 5x -12

= 2x^2 + 8x - 3x -12

= 2x(x + 4) - 3(x + 4)

= (x + 4)(2x-3)

f(x) = 0,

$\Rightarrow$ x+4 =0 or 2x-3=0

then, x = - 4 or x = $\frac{3}{2}$

So, the zeros of f(x) are -4 and $\frac{3}{2}$

Now,

Sum of the zeros = $\left(-4+\frac{3}{2}\right) = \frac{-5}{2} = \frac{-\mathrm{b}}{\mathrm{a}}$,

product of the zeros = (-4)$\times\frac{3}{2} = \frac{-12}{2} = \frac{\mathrm{c}}{\mathrm{a}}$

Hence the relation of zeros and coefficients of the polynomial is verified.

45. The given polynomial is

p(x) = 100x^2- 81

For zeroes, p(x) = 0

$\Rightarrow$ 100x^2- 81 = 0

$\Rightarrow$ $(10x)^2$ - $(9)^2$= 0

$\Rightarrow$ (10x - 9) (10x + 9) = 0

$\Rightarrow$ 10x - 9 = 0 or 10x + 9 = 0

$\Rightarrow x = \frac{9}{10}$ or $x = \frac{-9}{10}$

Compare 100x^2- 81 with ax^2 + bx + c

Now a = 100, b = 0, c = -81

$\frac{-b}{a} = \frac{0}{100} = 0$ ..... (i)

Sum of zeroes =$\frac{9}{10} + \left(\frac{-9}{10}\right)$= 0 .... (ii)

From (i) and (ii), we get

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

Also, $\frac{c}{a} = \frac{-81}{100}$ ...... (iii)

Product of zeroes = $\frac{9}{10} \times \left(\frac{-9}{10}\right) = \frac{-81}{100}$ .... (iv)

From (iii) and (iv), we get

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

46. $x^2 + \frac{1}{6}x - 2 = \frac{1}{6}$ ($6x^2$ + x - 12) $= \frac{1}{6}$ [$6x^2$ + 9x - 8x - 12]

$=\frac{1}{6}$[3x(2x + 3) - 4(2x + 3)] $= \frac{1}{6}(3x - 4)(2x + 3)$

Hence, $\frac{4}{3}$ and $-\frac{3}{2}$ are the zeroes of the given polynomial.

The given polynomial is $x^2 + \frac{1}{6}x - 2$

The sum of zeroes $= \frac{4}{3} + -\frac{3}{2} = \frac{-1}{6} = -\frac{\text{Coefficient of } x}{\text{Coefficient of } x^2}$ and

the product of zeroes $= \frac{4}{3} \times \frac{-3}{2} = -2 = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$

47. The given polynomial is $3x^2$ + 4x - 4

By splitting the middle term we have

$3x^2$ + 4x - 4 = 0

$3x^2$ + (6x - 2x) - 4 = 0

$3x^2$ + 6x - 2x - 4 = 0

3x(x + 2) - 2(x + 2) = 0

(x + 2)(3x - 2) = 0

⇒ x = - 2, 2/3

<u>Verification:</u>

Sum of the zeroes = - (coefficient of x) ÷ coefficient of x^2

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

- 2 + (2/3) = - (4)/3

= - 4/3 = - 4/3

Product of the zeroes = constant term ÷ coefficient of x^2

$\alpha\beta$ = c/a

Product of the zeroes = (- 2) (2/3) = - 4/3

48. 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

⇒ $2 \times m = 2$

∴ Other zero = 1

∴ Sum of zeroes = 2 + 1 = 3 ....(ii)

From (i) and (ii),

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

⇒ $p = -6$

Hence the value of p is -6.

49. Polynomial K(x^2 + 3x + 2)

Put K = 1 ⇒ required polynomial x^2 + 3x + 2

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

∴ Zeroes are -2, -1

50. 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

⇒ 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

51. Since, α and β are the zeroes of the quadratic polynomial

    $f(x) = x^2 - p(x+1) - c = x^2 - px - (p+c)$

    So A=1 B=-p,C=-(p+c)

    Sum of the zeroes $\alpha + \beta = -\frac{B}{A}$=P

    Product of the zeroes $\alpha\beta = \frac{C}{A}$=- (p + c)

    (α + 1)(β + 1)

    = αβ + α + β + 1

    = αβ + (α + β) + 1

    =-(p+c)+p+1

    =-p-c-p+1

    =1-c

    Hence proved

52. α,β are zeros of ax^2+bx+c

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

    $\alpha^2\beta + \alpha\beta^2$

    = αβ (α + β)

    $= \frac{c}{a}\left(\frac{-b}{a}\right)$

    $= \frac{-bc}{a^2}$.

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

    $= (t + \sqrt{15})(t - \sqrt{15})$

    h(t) = 0, if $t + \sqrt{15} = 0$ or $t - \sqrt{15} = 0$

    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.

54. $f(x) = x^4 + 4x^2 + 6$

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

    Let $x^2 = n$,

    Then, $f(x) = n^2 + 4n + 6$,

    Here a = 1, b = 4, c = 6

    Discriminant (D) = $b^2 - 4ac = (4)^2 - 4 \times 1 \times 6 = 16 - 24 = -8$

    Since the discriminant is negative so this polynomial has no real zeros

    Hence, $f(x) = x^4 + 4x^2 + 6$ has no real zero.

55. Here $P(x) = 3x^2 - 2kx + 2m$

    Since, 2 is a zero of p(x), then

    $P(2) = 3(2)^2 - 4k + 2m = 12 - 4k + 2m=0$

    12 - 4k + 2m = 0

    4k - 2m = 12-----(1)

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

    $P(3) = 3(3)^2 - 2\times3k + 2m = 0$

$\Rightarrow$ 27 - 6k + 2m = 0

$\Rightarrow$ 6k - 2m = 27.........(2)

On subraction of (1) from(2) we get

2k=15,k=$\frac{15}{2}$

From (1)

2(2k)-2m=12

$2\times$15-2m=12

2m=30-12=18

Hence m=9,k=$\frac{15}{2}$

56. If α,β are zeros of ax^2+bx+c then

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

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

$\frac{1}{\alpha}-\frac{1}{\beta}$

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

we know that,

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

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

$\alpha-\beta=-\frac{\sqrt{b^2-4c^2}}{a}$

Putting the values in (1) we get

$$\frac{1}{\alpha}-\frac{1}{\beta}=\frac{\frac{\sqrt{b^2-4ac}}{a}}{\frac{c}{a}}=\frac{\sqrt{b^2-4ac}}{c}.$$

57. Here α and β are the zeros of polynomial $f(x) = x^2 - px + q$

So a=1,b=-p,c=q

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

Product of the zeroes αβ=q

$\frac{\alpha^2}{\beta^2}+\frac{\beta^2}{\alpha^2}$

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

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

$=\frac{(p^2-2q)^2-2q^2}{q^2}=\frac{p^4+4q^2-4p^2q-2q^2}{q^2}=\frac{p^4+2q^2-4p^2q}{q^2}$

$=\frac{p4}{q^2}-\frac{4p^2q}{q^2}+\frac{2q^2}{q^2}=\frac{p4}{q^2}-\frac{4p^2}{q}+2=RHS$

Hence, proved.

58. $x^2 - 11x + 18 = (x - 9)(x - 2)$

$\Rightarrow$ x = 9 & x = 2 are the zeroes of the given polynomial

Sum of zeroes = 9 + 2 = $\frac{11}{1}$ - $\frac{\text{coefficient of } x}{\text{coefficient of } x^2}$

Product of zeroes = 9 $\times$ 2 = $\frac{18}{1}$ = $\frac{\text{constant term}}{\text{coefficient of } x^2}$

59. we have $x^2 - 4\sqrt{3}x + 3 = 0$

If α and β are the zeroes of $x^2-4\sqrt{3}x+3$

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

$\Rightarrow\ \alpha+\beta=-\frac{(-4\sqrt{3})}{1}$

$\alpha+\beta=4\sqrt{3}$

Now, $\alpha\beta=\frac{c}{a}$

$\Rightarrow\ \alpha\beta=\frac{3}{1}$

$\Rightarrow \quad \alpha\beta = 3$

$\therefore \alpha + \beta - \alpha\beta = 4\sqrt{3} - 3$

60. 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.

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

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

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

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

$=x^2+6x-4$

62. The given polynomial $f(x) = 6x^2-7x-3$

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

f(x)=0 if 3x+1 = 0 or 2x-3 = 0

So zeros of the polynomials are $\frac{3}{2}$ and $\frac{-1}{3}$

Now in the given polynomial, we have

Sum of the zero = $\frac{3}{2} - \frac{1}{3} = \frac{7}{6} = -\frac{\mathrm{b}}{\mathrm{a}}$

Product of zeros = $\frac{3}{2} \times -\frac{1}{3} = -\frac{1}{2} = \frac{\mathrm{c}}{\mathrm{a}}$

Hence, the relationship is verified.

63. Given quadratic equation: $x^2 - 3$

Recall the identity $a^2 – b^2 = (a – b)(a + b)$. Using it,

we can write:

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

So, the value of $x^2 – 3$ is zero when x = $\sqrt{3}$ or x = $-\sqrt{3}$

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

Now, the sum of zeroes = $\sqrt{3} - \sqrt{3} = 0 = \frac{-(\text{ Coefficient of } x)}{\text{Coefficient of } x^2}$

and the product of zeroes = $(\sqrt{3})(-\sqrt{3}) = -3 = \frac{-3}{1} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$

64. i. Quadratic polynomial is $x^2 - (sum\ of\ zeros)x + product\ of\ zeros$
    $\therefore$ Required polynomial $= x^2 - (2)x + \sqrt{2} = x^2 - 2x + \sqrt{2}$
  ii. Quadratic polynomial is $x^2 - (sum\ of\ zeros)x + product\ of\ zeros$
    $\therefore$ Required polynomial $= x^2 - (2 - \sqrt{2})x + (2 - \sqrt{7})$
  iii. Quadratic polynomial is $x^2 - (sum\ of\ zeros)x + product\ of\ zeros$
    $\therefore$ Required polynomial $= x^2 - \sqrt{3}x - \sqrt{5}$
  iv. Quadratic polynomial is $x^2 - (sum\ of\ zeros)x + product\ of\ zeros$
    $\therefore$ Required polynomial = $x^2 - \frac{2}{3}x - \frac{1}{2}$

65. Let $f(x)=3x^2 + 4x +2k$

If -2 is zero of f(x) then f(-2)=0

$\Rightarrow 3 \times (-2)^2 + 4 \times -2 + 2k = 0$

$\Rightarrow$ 12 - 8 + 2k = 0

$\Rightarrow$ 4 + 2k = 0

$\Rightarrow$ 2k = -4

$\Rightarrow$ k = $\frac{-4}{2}$

$\Rightarrow$ k = -2

66. If α and β are zeroes of the polynomial f(x) = x^2 - 4x - 5, where a = 1, b = - 4, c = - 5

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

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

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

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

As we know that

$\alpha^2 + \beta^2 = (a + \beta)^2 - 2\alpha\beta$

= $(4)^2$ - 2(-5)

= 16 + 10

= 26

67. By splitting the middle term

$4x^2 - 3x - 1 = 0$

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

$4x^2 - 4x + x - 1 = 0$

4x(x - 1) + 1(x - 1) = 0

(x - 1)(4x + 1) = 0

⇒ x = 1, - 1/4

Verification:

Sum of the zeroes = - (coefficient of x) / coefficient of x^2

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

1 - 1/4 = - (- 3)/4

= 3/4 = 3/4

Product of the zeroes = constant term / coefficient of x^2

$\alpha\beta$ = c/a

1(- 1/4) = - 1/4

- 1/4 = - 1/4

68. p(x) = $4x^2$+ 24x + 36

For zeroes, p(x) = 0

$\Rightarrow$ $4x^2$ + 24x + 36 = 0

$\Rightarrow$ 4(x^2+ 6x + 9) = 0

$\Rightarrow$ (x^2+ 3x + 3x + 9) = 0

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

$\Rightarrow$ x + 3 = 0 or x + 3 = 0

$\Rightarrow$ x = -3, x = -3

$\therefore$ Zeroes are -3, -3.

After comparing $4x^2$+ 24x + 36 with ax^2 + bx + c, we get

Now, a = 4, b = 24, c = 36

$\frac{-b}{a} = \frac{-24}{4}$ = -6 ...... (i)

Sum of zeroes = -3 + (-3) = -6 ...... (ii)

From (i) and (ii)

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

Also, $\frac{c}{a} = \frac{36}{4} = 9$ .... (iii)

and, Product of zeroes = (-3) $\times$(-3) = 9 .... (iv)

From (iii) and (iv)

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

69. The given polynomial is p(y) = $2y^2$ + 7y + 5

Here a = 2 , b = 7 , c = 5

α, β are two zeroes

So sum of the zeroes = $\alpha + \beta$ = $\frac{-b}{a}$=$\frac{-7}{2}$

Product of zeroes = $\alpha\beta$ = $\frac{c}{a}$ = $\frac{5}{2}$.

Now just put the values

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

= $\frac{-7}{2}$ + $\frac{5}{2}$

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

So the value of $\alpha + \beta + \alpha\beta$ is -1.

70. Given polynomial is

p(x) = $5x^2$ + 5x + 1

Here, a = 5, b = 5, c = 1

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

$\Rightarrow \quad \alpha^2 + \beta^2 = \left(\frac{-b}{a}\right)^2 - 2\frac{c}{a}$

$\Rightarrow \quad \alpha^2 + \beta^2 = \left[\frac{-5}{5}\right]^2 - 2 \times \frac{1}{5} = 1 - \frac{2}{5} = \frac{3}{5}$

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

$= \frac{-(-6)}{1}$ = 6

and $\alpha\beta = \frac{c}{a} = \frac{k}{1} = k$

$\therefore \alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = 40$

$\Rightarrow$ $(6)^2$ - 2k = 40

$\Rightarrow$ 36 - 2k = 40

$\Rightarrow$ -2k = 4

$\Rightarrow$ k = -2

72. Polynomial is x^2 - (k + 6)x + 2(2k - 1).

$\alpha + \beta = -\frac{\mathrm{b}}{\mathrm{a}} = \frac{\mathrm{k}+6}{1} = \mathrm{k} + 6$

and $\alpha\beta = \frac{\mathrm{c}}{\mathrm{a}} = \frac{2(2\mathrm{k}-1)}{1} = 4\mathrm{k} - 2$

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

k + 6 = $\frac{1}{2}$(4k - 2)

k+6 = 2k -1

k = 7

73. The given quadratic polynomial is $2x^2$ + 5x + k.

If α, β are zeroes of quadratic polynomial

$\alpha + \beta = \frac{-b}{a} = \frac{-5}{2}$

$\alpha\beta = \frac{c}{a} = \frac{k}{2}$

Putting these values in $(\alpha + \beta)^2 - \alpha\beta$ = 24,

we get $\left(\frac{-5}{2}\right)^2 - \frac{k}{2} = 24$

$\Rightarrow \frac{25}{4} - \frac{k}{2} = 24$

$\Rightarrow \frac{-k}{2} = 24 - \frac{25}{4}$

$\Rightarrow \frac{-k}{2} = \frac{96-25}{4}$

$\Rightarrow k = \frac{-71}{4} \times 2 = \frac{-71}{2}$

74. Let the zeros of polynomial are α and β

Sum of zeroes α+β= $-9 + \left(-\frac{1}{9}\right) = \frac{-81-1}{9} = \frac{-82}{9}$

Product of zeroes αβ= $(-9) \times \left(-\frac{1}{9}\right)$= 1

The polynomial with α and β as zeros is:

f(x)=x^2-(α+β)x+αβ

$= x^2 - \left(\frac{-82}{9}\right)x + 1$

= $9x^2$ + 82x + 9

75. Since, α and β are the zeroes of the quadratic polynomial f(t) = t^2 - 4t + 3

Compare with F(x) = ax^2 + bx + c

a = 1 , b =-4 and c = 3

So, Sum of the zeroes = $\alpha + \beta$= $-\frac{b}{a} = -\frac{-4}{1}$ = 4

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

Now,

$\alpha^4\beta^3 + \alpha^3\beta^4$=$\alpha^3\beta^3(\alpha + \beta)$

= $(\alpha\beta)^3(\alpha + \beta)$

= $(3)^3(4)$

= 108

Therefore $\alpha^4\beta^3 + \alpha^3\beta^4$ = 108