



# MATHS

# **BOOKS - KUMAR PRAKASHAN**

# POLYNOMIALS

**Textual Examples** 

**1.** Look at the graphs in the figures given below. Each is the graph of y = p(x), where p(x) is a polynomial. For each of the graphs, find the

#### number of zeroes of p(x).



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2. Look at the graphs in the figures given below. Each is the graph of y = p(x), where p(x) is a polynomial. For each of the graphs, find the

#### number of zeroes of p(x).



**3.** Look at the graphs in the figures given below. Each is the graph of y = p(x), where p(x) is a

number of zeroes of p(x).



**4.** Look at the graphs in the figures given below. Each is the graph of y = p(x), where p(x) is a

number of zeroes of p(x).



5. Look at the graphs in the figures given below. Each is the graph of y = p(x), where p(x) is a

number of zeroes of p(x).



**6.** Look at the graphs in the figures given below. Each is the graph of y = p(x), where p(x) is a

number of zeroes of p(x).





7. Find the zeroes of the quadratic polynomial  $x^2 + 7x + 10$ , and verify the relationship between the zeroes and the coefficients.



**8.** Find the zeroes of the polynomial  $x^2 - 3$  and verify the relationship between the zeroes and the coefficients.

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**9.** Find the quadratic polynomial the sum and product of whose zeroes are -3 and 2, respectively.



10. Verify that  $3, -1, -\frac{1}{3}$  are the zeroes of the cubic polynomial  $p(x) = 3x^3 - 5x^2 - 11x - 3$ , and then verify the relationship between the zeroes and the coefficients.

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**11.** Divide  $2x^2 + 3x + 1$  by x + 2.







15. The graphs of y = p(x) are given in the figures

below, for some polynomials p(x) :



Find the number of zeroes of p(x) in each case .

**1.** The graphs of y = p(x) are given in the figures

below, for some polynomials p(x) :



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**3.** The graphs of y=p(x) are given in the figures

below, for some polynomials p(x) :



Find the number of zeroes of p(x) in each case .



4. When the polynomial  $p(x) = x^4 + 5x^3 + 10x^2 + 16x + 7$  is divided by divisor  $g(x) = x^2 + 2x + 3$ , the remainder is ax + b. Find the values of a and b.

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5. Find the value of a for which the polynomial

 $3x^3 + 14x^2 + 9x + a$  is divisible by 3x + 5.





















# Exercise 2 2

 Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients :

 $x^2-2x-8$ 

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2. Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients :

 $4s^2 - 4s + 1$ 

**3.** Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients :

$$6x^2 - 3 - 7x$$

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**4.** Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients :

 $4u^2 + 8u$ 

**5.** Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients :

 $t^2 - 15$ 

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**6.** Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients :

 $3x^2 - x - 4$ 



**7.** Find the quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively :

 $rac{1}{4},\;-1$ 



**8.** Find the quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively :

$$\sqrt{2}, \frac{1}{3}$$



**9.** Find the quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively :

 $0,\sqrt{5}$ 

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**10.** Find the quadratic polynomial each with the given numbers as the sum and product of its

```
zeroes respectively :
```

1, 1



**11.** Find the quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively :

$$-rac{1}{4},rac{1}{4}$$



**12.** Find the quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively :

4, 1





**1.** Divide the polynomial p(x) by the polynomial g(x) and find the quotient and remainder in each

of the following :

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

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**2.** Divide the polynomial p(x) by the polynomial g(x) and find the quotient and remainder in each of the following :

$$p(x)=x^4-3x^2+4x+5, g(x)=x^2+1-x$$



**3.** Divide the polynomial p(x) by the polynomial g(x) and find the quotient and remainder in each of the following :

$$p(x)=x^4-5x+6, g(x)=2-x^2.$$

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**4.** Check whether the first polynomial is a factor of the second polynomial by dividing the second polynomial by the first polynomial :

$$t^2-3, 2t^4+3t^3-2t^2-9t-12$$

**5.** Check whether the first polynomial is a factor of the second polynomial by dividing the second polynomial by the first polynomial :

 $x^2 + 3x + 1, 3x^4 + 5x^3 - 7x^2 + 2x + 2$ 

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**6.** Check whether the first polynomial is a factor of the second polynomial by dividing the second polynomial by the first polynomial :

$$x^3 - 3x + 1, x^5 - 4x^3 + x^2 + 3x + 1$$



8. On dividing  $x^3 - 3x^2 + x + 2$  by a polynomial g(x), the quotient and remainder are x - 2 and -2x + 4 respectively. Find g(x).



Give examples of polynomials 9. p(x), q(x), q(x) and r(x), which satisfy the division algorithm and deq p(x) = deq q(x)Watch Video Solution

10. Give examples of polynomials p(x), g(x), q(x) and r(x), which satisfy the division algorithm and

degq(x) = degr(x)

**11.** Give examples of polynomials p(x), g(x), q(x) and r(x), which satisfy the division algorithm and

degr(x) = 0.

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Exercise 2 4

**1.** Verify that the numbers given alongside of the cubic polynomials below are their zeroes. Also verify the relationship between the zeroes and the

coefficients in each case :

$$2x^3+x^2-5x+2,rac{1}{2},1,\ -2$$



**2.** Verify that the numbers given alongside of the cubic polynomials below are their zeroes. Also verify the relationship between the zeroes and the coefficients in each case :

$$x^3 - 4x^2 + 5x - 2, 2, 1, 1$$

**3.** Find a cubic polynomial with the sum of its zeroes, sum of the product of its zeroes taken two at a time, and the product of its zeroes as 2, -7, -14 respectively.

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4. If the zeroes of the polynomial  $x^3 - 3x^2 + x + 1$  are a - b, a, a + b, find a and b.
5. It two zeroes of the polynomial  $x^4-6x^3-26x^2+138x-35$  are  $2\pm\sqrt{3}$ , find other zeroes.

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6. If the polynomial  $x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by another polynomial  $x^2 - 2x + k$ , the remainder comes out to be x + a, find k and a.

**1.** The graphs of y=p(x) are given in the figures below, for some polynomials p(x) find the number

of zeroes of p(x) :





**2.** The graphs of y = p(x) are given in the figures below, for some polynomials p(x) find the number of zeroes of p(x) : X  $\odot$ Watch Video Solution

**3.** The graphs of y = p(x) are given in the figures below, for some polynomials p(x) :



**4.** The graphs of y = p(x) are given in the figures

below, for some polynomials p(x) :



5. Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients of the polynomial :  $y^2 - 8y - 20$ 

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**6.** Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients of the polynomial :  $2x^2 + 11x + 15$ 

7. Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients of the polynomial :

 $6x^2 - 17x + 12$ 

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8. Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients of the polynomial :  $x^2 - 4x - 77$ 

**9.** Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients of the polynomial :  $x^2 + 2\sqrt{5}x - 15$ 

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10. Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients of the polynomial :  $12x^2 + 17x - 5$ 

11. Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients of the polynomial :  $2s^2 - (1 + 2\sqrt{2})s + \sqrt{2}$ 



12. Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients of the polynomial :  $v^2 + 4\sqrt{3}v - 15$ 



**14.** Find a quadratic polynomial each with given numbers as the sum and product of its zeroes respectively :

$$\frac{1}{2}, \frac{-5}{2}$$

**15.** Find a quadratic polynomial each with given numbers as the sum and product of its zeroes respectively :

$$\sqrt{3}, \frac{1}{5}$$

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**16.** Find a quadratic polynomial each with given numbers as the sum and product of its zeroes respectively :

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$$rac{\sqrt{3}}{2}, -4$$

**17.** Find a quadratic polynomial each with given numbers as the sum and product of its zeroes respectively :

$$0, -\sqrt{10}$$

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**18.** Verify that 1, 2 and  $\frac{3}{2}$  are the zeroes of the cubic polynomial  $p(x) = 2x^3 - 9x^2 + 13x - 6$ . Then, verify the relationship between the zeroes and the coefficient of the polynomial.



and the product of zeroes is 15.



21. For what value of a, -3 is a zero of the polynomial  $p(x) = x^3 + 12x^2 + ax + 60?$ 

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22. If the product of the zeroes of the polynomial

 $p(x) = ax^2 + 11x + 12$  is 6, find the value of a.

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23. If  $lpha \,$  and  $\,$   $eta \,$  are the zeroes of the polynomial  $p(x) = 3x^2 - 14x + 15$ , find the value of  $lpha^2 + eta^2$ .



24. For what value of k, 7 is a zero of the polynomial  $p(x) = x^2 - (5k - 18)x - 35?$  Also find the other zero.

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25. If  $\alpha$  and  $\beta$  are the zeroes of the polynomial  $p(x) = 3x^2 + 11x + a$ , form a quadratic polynomial whose zeroes are  $3\alpha$  and  $3\beta$ .

**26.** Without finding the zeroes  $\alpha$  and  $\beta$  of the polynomial  $p(x) = x^2 - 5x + 6$ , find the values of the following :

$$\frac{1}{lpha} + \frac{1}{eta}$$

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27. Without finding the zeroes  $\alpha$  and  $\beta$  of the polynomial  $p(x) = x^2 - 5x + 6$ , find the values of the following :

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

28. Without finding the zeroes  $lpha \ ext{ and } eta$  of the polynomial  $p(x) = x^2 - 5x + 6$ , find the values of the following :

 $\alpha^3 + \beta^3$ .

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29. When the polynomial  $p(x) = x^3 + 2x^2 + kx + 3$  is divided by x - 3, the remainder is 21. Find the value of k and the

quotient. Hence, find the zeroes of the polynomial

 $x^3 + 2x^2 + kx - 18.$ 

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**30.** Given that  $\sqrt{2}$  is a zero of the polynomial  $6x^3 + \sqrt{2}x^2 - 10x - 4\sqrt{2}$ , find the other two zeroes of the polynomial.

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**31.** Find all the other zeroes of the polynomial  $p(x) = 2x^4 - 9x^3 + 5x^2 + 3x - 1$ , if two of its



**33.** What must be added to polynomial  $2x^3 + 9x^2 - 5x - 15$  so that the resulting polynomial is exactly divisible by 2x + 3?

## **Practice Thoroughly**

**1.** Find the zeroes of the following quadratic polynomials by factorisation method and verify the relationship between the zeroes and the coefficients of the polynomial :

 $x^2 - 7x + 12$ 

2. Find the zeroes of the following quadratic polynomials by factorisation method and verify the relationship between the zeroes and the coefficients of the polynomial :

$$x^2+2\sqrt{2}x-6$$

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**3.** Find the zeroes of the following quadratic polynomials by factorisation method and verify the relationship between the zeroes and the

coefficients of the polynomial :

$$x^2 - rac{2}{15}x - rac{1}{15}$$

**4.** Find the zeroes of the following quadratic polynomials by factorisation method and verify the relationship between the zeroes and the coefficients of the polynomial :

 $6x^2 + x - 12$ 

**5.** Find the zeroes of the following quadratic polynomials by factorisation method and verify the relationship between the zeroes and the coefficients of the polynomial :

$$t^2-rac{3\sqrt{5}}{2}t-5$$

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**6.** Find the zeroes of the following quadratic polynomials by factorisation method and verify the relationship between the zeroes and the

coefficients of the polynomial :

$$2x^2-ig(1+2\sqrt{2}ig)x+\sqrt{2}$$



**7.** Find a quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively :

-4, 3



**8.** Find a quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively :

-10, 21



**9.** Find a quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively :

$$-4\sqrt{2}, -10$$

**10.** Find a quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively :

$$-2\sqrt{7}, -21$$

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**11.** Find a quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively :

$$1, -20$$

**12.** Find a quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively :

 $-6\sqrt{3}, 15$ 

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13. If lpha and eta are the zeroes of the polynomial  $p(x)=9x^2+9x+2$ , find the value of  $lpha^2+eta^2.$ 

14. Form a quadratic polynomial whose zeroes are

 $7 + \sqrt{5}$  and  $7 - \sqrt{5}$ .

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15. If the sum of zeroes of the polynomial $p(x)=(a-1)x^2+(2a-6)x+(3a-18) ext{ is } -1$ 

, find the product of its zeroes.



16. If the zeroes of the polynomial  $x^2 + px + q$  are double in the value of the zeroes of  $2x^2 - 9x + 4$ , find the values of p and q.

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17. Obtain all the zeroes of  $6x^3 - 17x^2 + 15x - 4$  given that one of its zeroes is  $\frac{1}{2}$ .

18. Check whether  $x^2 + 2x + 2$  is a factor of  $x^4 - x^3 - 3x^2 - 4x + 2$  or not. Watch Video Solution

19. What must be subtracted from the polynomial  $p(x) = x^3 + 13x^2 + 35x + 50$ , so that the resulting polynomial is exactly divisible by  $g(x) = x^2 + 11x + 10$ ?

**20.** Find all the zeroes of the polynomial 
$$3x^4 - 15x^3 + 17x^2 + 5x - 6$$
 if two of its zeroes are  $-\frac{1}{\sqrt{3}}$  and  $\frac{1}{\sqrt{3}}$ . **Vatch Video Solution**

## **Objective Questions**

**1.** Fill in the blanks so as to make each of the following statements true :

The zero of linear polynomial p(x)=3x+2

is.....

**2.** Fill in the blanks so as to make each of the following statements true :

The product of the zeroes of quadratic polynomial

 $p(x)=x^2-7x+12$  is.....



**3.** Fill in the blanks so as to make each of the following statements true :

The sum of zeroes of cubic polynomial $p(x)=2x^3-17x+38x-15\,{
m is.....}$ 



4. Fill in the blanks so as to make each of the following statements true :

If 3 one of the zeroes of polynomial  $p(x)=x^3+3x^2+kx-24$ , then k=.....

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5. Fill in the blanks so as to make each of the following statements true :

If the sum of zeroes and the product of zeroes of

the polynomial  $p(x) = x^2 + (k-7)x + (k+1)$ 

are equal, then k=.....



**6.** Answer each question by selecting the proper alternative from those given below each question so as to make the statement true :

The number of zeroes lying between -1 and 1 of

the polynomial p(x), whose graph is given, is.....



 $\mathsf{A.}\,4$ 

B. 3

 $\mathsf{C.}\,2$ 

**D**. 1

#### Answer: C

7. Answer each question by selecting the proper alternative from those given below each question so as to make the statement true :
The quadratic polynomial for which the sum and

product of zeroes are 4 and 4 respectively is......

A. 
$$x^2 - 4x - 4$$

$$\mathsf{B.}\,x^2+4x+4$$

C.  $x^2 + 4x - 4$ 

D. 
$$x^2 - 4x + 4$$
### Answer: D



**8.** Answer each question by selecting the proper alternative from those given below each question so as to make the statement true :

The quadratic polynomial whose sum and product

of zeroes are -3 and 2 respectively is.....

A. 
$$x^2 + 3x + 2$$

B. 
$$x^2-3x-2$$

C. 
$$x^2 + 2x + 3$$

D. 
$$x^2 - 2x - 3$$

Answer: A



**9.** Answer each question by selecting the proper alternative from those given below each question so as to make the statement true :

The quadratic polynomial with zeroes 5 and 3 is.....

A. 
$$x^2 - 8x + 15$$

B. 
$$x^2+8x+15$$

C. 
$$x^2 + 8x - 15$$

D. 
$$x^2-8x-15$$

#### Answer: A



**10.** Answer each question by selecting the proper alternative from those given below each question so as to make the statement true :

If  $\alpha, \beta$  and  $\gamma$  are the zeroes of the cubic



**Answer: B** 



**11.** Answer each question by selecting the proper alternative from those given below each question so as to make the statement true :

If  $\alpha$ ,  $\beta$  and  $\gamma$  are the zeroes of the cubic polynomial  $ax^3 + bx^2 + cx + d$ , then  $\frac{1}{\alpha\beta} + \frac{1}{\beta\gamma} + \frac{1}{\gamma\alpha} = \dots$ A.  $\frac{b}{d}$ 

$$B. - \frac{b}{d}$$
$$C. \frac{c}{d}$$
$$D. - \frac{c}{d}$$

Answer: A



12. Answer each question by selecting the proper alternative from those given below each question so as to make the statement true : The zeroes of the polynomial  $x^2 + 2x - 15$ are......

A. 3 and 5

- B.-3 and -5
- C.3 and -5
- D.-3 and 5

### Answer: C



**13.** Answer each question by selecting the proper alternative from those given below each question so as to make the statement true :

If  $\alpha$  and  $\beta$  are the zeroes of polynomial  $p(x) = 6x^2 - 7x - 3$ , then  $\frac{1}{\alpha} + \frac{1}{\beta} = \dots$ A.  $\frac{7}{6}$ B.  $\frac{7}{3}$ C.  $-\frac{7}{3}$ 

#### Answer: C

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**14.** Answer each question by selecting the proper alternative from those given below each question so as to make the statement true :

For the cubic polynomial  $p(x) = x^3 - x^2 - 17x - 15$ , the sum of the products of zeroes taken two at a time is......

$$A. - 15$$

B. - 17

 $C.\,17$ 

D. 15

Answer: B

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**15.** Answer each question by selecting the proper alternative from those given below each question so as to make the statement true :

If the zeroes of quadratic polynomial

$$p(x)=6x^2-13x+3m-9$$
 are reciprocal of

each other, then m=.....

A. 6

 $B.\,15$ 

 $\mathsf{C.}\,5$ 

 $\mathsf{D.}\,2$ 

### Answer: C



**16.** Answer each question by selecting the proper alternative from those given below each question so as to make the statement true :

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

A. both positive

B. both negative

C. equal

D. having opposite signs

Answer: B

**17.** Answer the following by a number or a word or a sentence :

What is the sum of the zeroes of the polynomial

$$x^2 - 12x + 20?$$

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18. Answer the following by a number or a word or a sentence : Given that one of the zeroes of the cubic polynomial  $ax^3 + bx^2 + cx + d$  is zero, what is the product of other two zeroes?

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**19.** Answer the following by a number or a word or

a sentence :

What is the product of zeroes of the cubic

polynomial  $p(x)=x^3+5x^2-2x-24?$ 

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**20.** Answer the following by a number or a word or a sentence :

Can  $x^2-1$  be the quotient on division of

 $x^6+2x^3+x-1$  by a polynomial in x of degree



**21.** Answer the following by a number or a word or a sentence :

If on division of a polynomial p(x) by a polynomial

g(x), the quotient is zero, what is the relation

between the degrees of p(x) and g(x)?

**22.** State whether each of the following statements is true or false :

If the graph of a polynomial intersects the x-axis at

only one point, it cannot be a quadratic polynomial.

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**23.** State whether each of the following statements is true or false :

If two of the zeroes of a cubic polynomial are zero,

then it does not have the term with x and the

constant term.

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24. State whether each of the following  
statements is true or false :  
2 is one of the zeroes of the polynomial  

$$p(x) = x^2 - 6x + 8$$

25. State whether each of the following statements is true or false : 5 is one of the zerores of the polynomial  $p(x) = 2x^3 - 5x - 13x + 30$ 

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**26.** State whether each of the following statements is true or false :

If 3 is one of the zeroes of the polynomial  $p(x) = x^2 - 11x + k$ , then k= 24.

