MATHS

BOOKS - NAGEEN MATHS (HINGLISH)

POLYNOMIALS

Solved Examples

1. Find zeroes of the polynormial $x^2 - 3x + 2$ and verify the relation between its zeroes and coefficients.

2. Find zeroes of the polynormial $2x^2 - 5x + 2$ and verify the relation between zeroes and coefficients.

3. Find zeroes of the polynormial $6x^2 - 3 - 7x$ and verify the relation between zeroes and coefficients.

4. Find zeroes of the quadratic $\sqrt{3}x^2 - 8x + 4\sqrt{3}$ and verify the relation between the zeroes and coefficients.

5. Find zeroes of the polynomial $x^2 - 4$ and verify the relation between zeroes and coefficients.

6. Find zeroes of the polynormial $x^2 - 3$ and verify the relation between zeroes and coefficients.

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7. Find zeroes of the polynomial $2t^2 + 3t$ and verify the relation between zeroes and coefficients.

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8. Find a quadratic polynomial, the sum of whose zeroes is 5 and their product is 6. Hence, find zeroes of the polynomial.

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9. Find a quadratic polynomial whose zeroes are -2 and 5. Hence, verify the relation between zeroes and coefficients of the polynomial.

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10. If the product of zeroes of the polynomial $(ax^2 - 6x - 6)$ is 4, find the value of a.

A. 2/3

B. -3/2

C. 1

D. None of these

Answer: B

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11. If $x - \dfrac{2}{3}$ and $x + 3$ are factors of the quadratic polynomial $ax^2 + 7x + b$, then find the values of a and b.

12. If one zero of the polynomial $\left(a^2 + 9\right)x^2 + 13x + 6a$ is reciprocal of the other, find the value of a.

13. Verify that 1,2,3 are the zeroes of the cubic polynomial

$p(x) = x^3 - 6x^2 + 11x - 6$ and verify the

relation between its zeroes and coefficients.

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14. Find a cubic polynomial whose zeroes are

$\dfrac{1}{2}, \ -\dfrac{3}{2}$ and 2.

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15. Divide $2x^2 + x - 5$ by x+2 and verify the division algorithm.

16. Divide $4x^2 - 11x^2 + 7x - 2$ by $1 + x - x^2$ and verify the division algorithm.

Note

Always write the divided and divisor in standard form i.e., decreasing order of the variable.

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

A. $x^2 - x + 3$

B. $x^2 - x + 1$

C. $x^2 - x + 2$

D. $x^2 - x$

Answer: B

18. If the polynomial $\left(x^4 + 2x + 8x^2 + 12x + 18\right)$ is divided by another polynomial $\left(x^2 + 5\right)$, the remainder comes out to be (px+q). Find the values of p and q.

19. What real number should be subtracted from the polynomial $\left(3x^3 + 10x^2 - 14x + 9\right)$

so that $(3x - 2)$ divides it exactly?

A. 5

B. 6

C. 7

D. 8

Answer: A

20. If 2 is a zero of the polynomial $x^3 - 2x^2 - x + 2$, then find its other zeroes.

21. If 1 and -1 are zeroes of the polynomial $x^3 + 5x^2 - x - 5$, then find all zeroes of the given polynomial.

22. Obtian all other zeroes of $\left(x^4 + 4x^3 - 2x^2 - 20x - 15\right)$ if two of its zeroes are $\because \sqrt{5}$ and $-\sqrt{5}$.

23. If sum of zeroes of a polynomial $= \alpha + \beta = -8$ and product of zeroes $= \alpha\beta = 6$, then form a polynomial whose zeroes are $(\alpha - \beta)$ and $(\alpha + \beta)$.

24. If $\alpha, \beta\gamma$ are zeroes of cubic polynomial $x^3 + 5x - 2$, then find the value of $\alpha^3 + \beta^3 + \gamma^3$.

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25. 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.

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26. If $a^2 - 2a - 3$ is a factor of $a^4 + pa^3 + 12a - 9$, find the value of $p^2 - 2q - 3$.

27. If one zero of a quadratic polynomial $p(x) = ax^2 + bx + c$ is square of the other, then give the relation in a, b and c.

28. If α and β are zeroes of the quadratic polynomial $f(x) = 3x^2 - 5x - 2$, then find the value of $\left(\dfrac{\alpha^2}{\beta} + \dfrac{\beta^2}{\alpha} \right) + 6(\alpha + 1)(\beta + 1)$.

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29. Find the maximum and minimum value of the polynomial $f(x) = -x^2 + x + 2$.

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30. If α and β are zeroes of the quadratic polynomial $2x^2 + 2(a + b)x + a^2 + b^2$, form the quadratic polynomial whose zeroes are $(\alpha + \beta)^2$.

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31. If α, β are zeroes of polynomial $f(x) = x^2 - p(x + 1) - c$, then find the value of $(\alpha + 1)(\beta + 1)$.

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32. If α, β gamma are the zeroes of polynomial $f(x) = (x - 1)(x^2 + x + 3)$, then find the value of $\alpha^3 + \beta^3 + \gamma^3$.

33. Amitabh own a garden.In the garden, the number of mango trees is equal to number of mangoes per tree and the cost price per mango is the same as the number of mango trees in the garden. The maintenance cost is ₹

860 per tree. If Amitabh sells one mango at ₹ 61, the overall loss in the business is ₹ 800. Find the number of mangoes in the garden, if no mangoes were wasted and the number of trees were more than 30.

34. Find zeroes of the polynomial p(x) $x^3 - 9x^2 + 26x - 24$, if it is given that the product of its two zeroes is 8.

35. Find the common zeroes of the polynomials $x^3 + x^2 - 2x - 2$ and $x^3 - x^2 - 2x + 2$.

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Problems From Ncert Exemplar

1. Find zeroes of the polynomial $5t^2 + 12x + 7$ by factorisation mothod and verify the

relation between zeroes and coefficients of the polynomial.

2. Given that zeroes of cubic polynomial $x^3 - 6x^2 + 10$ are of the form a,a+b,a+2b for some real numbers a and b, find the values of a and b as well as zeroes of the given polynomial.

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

4. Find k so that $x^2 + 2x + k$ is a factor of $2x^4 + x^3 - 14x^2 + 5x6$. Also find all zeroes of two polynomials.

5. For which values of a and b are zeroes of $q(X) = x^3 + 2x + a$ also zeroes of the polynomial $p(x)$ $= x^5 - x^4 - 4x^3 + 3x^2 + 3x + b?$ Which zeroes of p(x) are not zeroes of p(x)?

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

(i) degp(x)=deg q(x)

(ii) deg q(x)=deg r(x)

(iii) deg r(x)=0

7. If one of the zeroes of the cubic polynomial $ax^3 + bx^2 + cx + d$ is zero, the product of the other two zeroes is :

A. $-\dfrac{c}{a}$

B. $\dfrac{c}{a}$

C. 0

D. $\dfrac{-b}{a}$

Answer: B

8. 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

9. If the zeroes of the quadratic $ax^2 + bx + c$

where $c \neq 0$, are equal then:

A. c and a have opposite signs

B. c and b have opposite signs

C. c and a have same signs

D. c and b have same signs

Answer: C

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10. If the zeroes of the cubic polynomial $x^3 - 6x^2 + 3x + 10$ are of the form $a, a + b$ and $a + 2b$ for some real numbers a and b, find the values of a and b as well as the zeroes of the given polynomial.

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11. For which values of a and b , the zeroes of $q(x) = x^3 + 2x^2 + a$ are also the zeroes of the polynomial $p(x) = x^5 - x^4 - 4x^3 + 3x^2 + 3x + b$? Which zeroes of p(x) are not the zeroes of q(x)?

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Exercise 2 A

1. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

$$x^2 + 9x + 20$$

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2. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

$$x^2 + 4x - 5$$

3. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

$$x^2 - 6x - 16$$

4. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the

relation between zeroes and coefficients :

$$4x^2 - 4x - 3$$

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5. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

$$2x^2 - 15 - 11x$$

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6. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

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

7. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

$$6x^2 - x - 2$$

8. Find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

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

9. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the

relation between zeroes and coefficients :

$$\sqrt{3}x^2 + 8x + 5\sqrt{3}$$

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10. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

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

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11. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

$x^2 - 9$

12. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

$x^2 - 2$

13. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

$$u^2 + 2u$$

14. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify

the relation between zeroes and coefficients :

$$3t^2 + 5t$$

15. Find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

$$6x^2 + 5ax - 6a^2 = 0$$

16. From question number 1 to 16, find zeroes of the given quadratic polynomials and verify the relation between zeroes and coefficients :

$$a^2x^2 - 11a^2x + 30a^2 - a - 1, \ a \neq 0$$

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17. Find the quadratic polynomial, the sum of whose zeroes is 17 and the product is 60. Hence, find zeroes of the polynomial.

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18. Find a quadratic polynomial, the sum of whose zeroes is 7 and the product is -60. Hence, verify the relation between zeroes and coefficients of the polynomial.

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19. If the product of zeroes of the polynomial $3x^2 + 5x + k$ is 6, find the value of k.

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20. If the sum of zeroes of the polynomial $x^2 + 2kx - 12$ is 1, find the value of k.

21. If $x = \dfrac{5}{3}$ and $x = -\dfrac{1}{2}$ are the zeroes of the polynomial $ax^2 - 7x + b$, then find the values of a and b.

22. Find a quadratic polynomial, the sum of whose zeroes is $\dfrac{5}{3}$ and product is 2.

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23. Find a quadratic polynomial, the sum of whose zeroes is $-\dfrac{3}{4}$ and product is 5.

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24. If α, β be the zeros of the polynomial $2x^2 + 5x + k$ such that $\alpha^2 + \beta^2 + \alpha\beta = \dfrac{21}{4}$ then k= ?

25. If α and β are zeroes of a polynomial f(x0 $= 3x^2 - 4x + 1$, finda quadratic polynomial whose zeroes are $\dfrac{\alpha^2}{\beta}$ and $\dfrac{\beta^2}{\alpha}$.

26. If α, β are zeroes of the polynomial $x^2 - 2x - 15,$ then form a quadratic polynomial whose zeroes are $(2\alpha) and (2\beta).$

27. If α and β are zeroes of a quadratic polynomial $ax^2 + bx + c.$ Find the value of:

(i) $\alpha^2 - \beta^2$

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

(iii) $\alpha^4\beta + \beta^4\alpha$

(iv) $\sqrt{\dfrac{\alpha}{\beta}} + \sqrt{\dfrac{\beta}{\alpha}}$
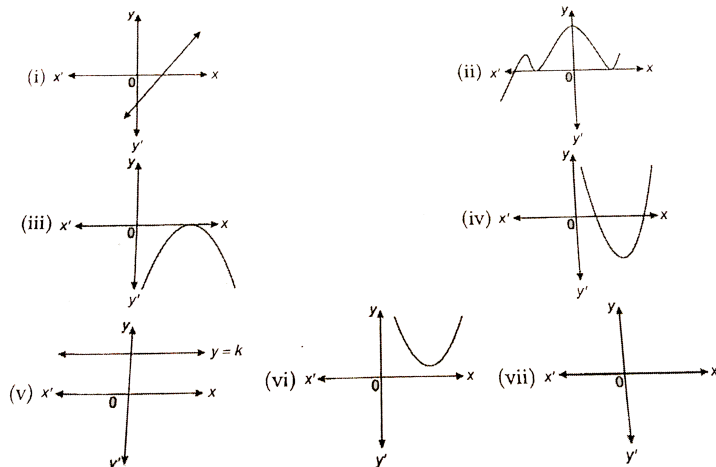
(v) $\dfrac{\alpha^2}{\beta} + \dfrac{\beta^2}{\alpha}$

$\left(\alpha^{-1} + \dfrac{1}{\alpha^{-1}} \right) \left(\beta^{-1} + \dfrac{1}{\beta^{-1}} \right)$

28. Which of the graphs given below corresponds to linear polynomial or a quadratic polynomial ? Also, find the number

of zeroes of the polynomial in each case.

(i) (ii) (iii) (iv) (v) (vi) (vii)

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Exercise 2 B

1. Verify that 1,-2,4 are zeroes of the cubic

polynomial $x^3 - 3x^2 - 6x + 8$. Also verify the

relation between zeroes and coefficient of the polynomial.

2. Verify that 1,-2, and 1/2 are zeroes of $2x^3 + x^2 - 5x + 2$. Also verify the relationship between the zeroes and the coefficients

3. Find a cubic polynomial whose zeroes are 5,6 and -4.

4. Find a cubic polynomial whose zeroes are $\dfrac{1}{2}$,1 and -1.

5. Find the cubic polynomial with the sum, sum of the products of its zeroes taken two at a time and the product of its zeroes are 5, -6, 12 respectively.

6. Find the quotient and remainder in each of the following and verify the division algorithm :

(i) $p(x) = x^3 - 4x^2 + 2x - 1$ is divided by

g(x)=x+2.

(ii) $p(x) = x^4 + 2x^2 - x + 1$ is divided by g(x)

$= x^2 + 1.$

(iii) $p(x) = 2x^4 - 3x^3 + x^2 + 5x - 3$ is

divided by $g(x) = x^2 + x - 1.$

(iv) $p(x) = x^4 - 5x^2 + 6$ is divided by g(x)=x+2.

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7. By actual division show that x+2 is a factor

of $x^3 + 4x^2 + 3x^2 - 20.$

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8. On dividing $3x^3 + x^2 + 2x + 6$ by a polynomial g(x), the quotient and remainder are (3x-5) and (3x+21) respectively. Find g(x).

9. If 1 is a zero of the polynomial $x^3 - 4x^2 - 7x + 10$, find its other two zeroes.

10. If two zeroes of the polynomial

$$x^4 + 3x^3 - 20x^2 - 6x + 36$$ are

$\sqrt{2}$ and $-\sqrt{2}$. find the other zeroes of

polynomial

11. Find all the zeros of the polynomial

x^4+x^3-34^2-4x+120,

12. 13. find all zeroes of

$2x^4 - 3x^3 - 3x^2 + 6x - 2$, if you know that

two of its zeroes are $\sqrt{2}$ and $-(\sqrt{2})$

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13. Find all zeroes of the polynomial

$2x^4 - 9x^3 + 5x^2 + 3x - 1$ if two of its zeroes

are $2 + \sqrt{3}$ and $2 - \sqrt{3}$

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14. Obtain all zeros of $(3x^4 - 15x^3 + 13x^2 + 25x - 30)$, if two of its zeros are $\sqrt{\dfrac{5}{3}}$ and $-\sqrt{\dfrac{5}{3}}$.

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15. 012 if -5 and 7 are zeroes of $x^4 - 6x^3 - 26x^2 + 138x - 35$ find the other zeroes

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16. If the zeroes of the polynomial

$$x^3 - 3x^2 + x + 1$$ are

$a \backslash \backslash b, \backslash a, \backslash a \backslash + \backslash b$, find a and b.

17. Find zeroes of the polynomial $f(x)$

$$= x^3 - 13x^2 + 32x - 60,$$ if it is given that

the product of its two zeroes is 10.

18. What must be added to p(x0 $= 4x^4 - 5x^3 - 39x^2 - 46x - 2$, so that the resulting polynomial is divisible by g(x) $= 4x^2 + 7x + 3t^2$?

19. What must be added to $11t^3 + 5t^4 + 6t^5 - 3t^2 + t + 5$, so that the resulting polynomial is exactly divisible by $4 - 2t + 3t^2$?

20. If α, β, γ are zeroes of polynomial $6x^3 + 3x^2 - 5x + 1$, then find the value of $\alpha^{-1} + \beta^{-1} + \gamma^{-1}$.

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Revision Exercise Very Short Answer Questions

1. Find zeroes of the polynomial $x^2 - x - 2$.

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2. Find zeroes of the polynomial $x^2 + x - a(a+1)$.

3. If one zero of the polynomial $x^2 + 5x + k$ is 2, find the value of k.

4. If one zero of the polynomial $kx^2 - 3x + k$ is 1, find the value of k.

5. If 3 is a zero of the polynomial $2x^2 + x + k$, find the value of k.

6. If 1 is a zero of the polynomial $ax^2 - 3(a-1)x - 1$, then find the value of a.

7. If -4 is a zero of the polynomial $x^2 - x - (2k+2)$, then find the value of k.

8. If the sum of zeroes of the polynomial $3x^2 - 2kx + 5$ is 4, then find the value of k.

9. If the product of zeroes of the polynomial $x^2 + 5x - k$ is 10, then find the value of k.

10. If x+a is a factor of $2x^2 + 2ax + 5x + 10$,

find the value of a.

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11. State division algorithm for polynomials.

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Revision Exercise Short Answer Questions

1. $2\sqrt{3}x^2 - 5x + \sqrt{3}$

2. Find zeroes of the polynomial $5x^2 - 4 - 8x$.

3. If α and β are zeroes of $x^2 - 5x + 6$, then find the value of $\alpha^2 + \beta^2$.

4. If α and β are zeroes of $5x^2 - 7x + 1$, then find the value of $\dfrac{1}{\alpha} + \dfrac{1}{\alpha}$.

5. If α and β are zeroes of $8x^2 - 6x + 1$, then find the value of $\dfrac{1}{\alpha} + \dfrac{1}{\beta}$.

A. 6

B. 8

C. -6

D. -8

Answer: A

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6. If (a-b), a and (a+b) are zeroes of $2x^3 - 12x^2 + 5x - 1$, then find the value of a.

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7. If α and β are zeroes of the polynomial $3x^2 + 6x + 1$, then find the value of $\alpha + \beta + \alpha\beta$.

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8. Find zeroes of the polynomial $x^2 - \sqrt{2}x - 12$.

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Revision Exercise Long Answer Questions

1. Divide $x^4 + 5x^3 - x^2 + 4x - 3$ by x-2 and verify the division algorithm.

2. Find the quadratic polynomial whose zeroes are $-\dfrac{1}{3}$ and $\dfrac{2}{5}$. Verify the relation between coefficients and zeroes of the polynomial.

3. obtain all the zeroes of $3x^4 + 6x^3 - 2x^2 - 10x - 5$ if two of its zeroes are $\sqrt{\dfrac{5}{3}}$ and $-\sqrt{\dfrac{5}{3}}$

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4. Find all zeroes of the polynomial $2x^4 - 9x^3 + 5x^2 + 3x - 1$ if two of its zeroes are $2 + \sqrt{3}$ and $2 - \sqrt{3}$

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