

**BUDHA DAL PUBLIC SCHOOL PATIALA**  
**FIRST TERM EXAMINATION (21 September 2023)**

Class - X

Paper-Mathematics Standard (Set-A)

M.M. 80

Time: 3hrs.

**General Instructions:**

1. This Question Paper has 5 Sections A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.

**Section-A**

1. The product of two irrational numbers is  
a) always irrational    b) always rational    c) rational or irrational    d) none of these
2. Which one of these is a rational number?  
a)  $3\pi$     b)  $5\sqrt{5}$     c) 0.34666 ....    d) 0.345210651....
3. Which of these numbers can be expressed as a product of two or more prime numbers?  
(i) 15    (ii) 34568    (iii)  $(15 \times 13)$   
a) Only (i)    b) Only (ii)    c) only (i) and (ii)    d) all of them
4. The zeros of the polynomial  $x^2 - 2x - 3$  are  
a) -3, 1    b) -3, -1    c) 3, -1    d) 3, 1
5. If  $\alpha$  and  $\beta$  are the zeros of  $x^2 + 5x + 8$  then  $(\alpha + \beta)$  is  
a) 5    b) -5    c) 8    d) -8
6. If one of the zeros of the quadratic polynomial  $(k - 1)x^2 + kx + 1$  is -3, then the value of  $k$  is  
a)  $\frac{4}{3}$     b)  $\frac{-4}{3}$     c)  $\frac{2}{3}$     d)  $\frac{-2}{3}$
7. If a pair of linear equation is inconsistent then their graph lines will be  
a) parallel    b) always coincident    c) always intersecting    d) intersecting or coincident
8. The pair of linear equation  $y = 0$  and  $y = -5$  has  
a) one solution    b) two solution    c) infinitely many solutions    d) no solution

A-1

9. A pair of linear equations which has a unique solution  $x = 2, y = -3$  is

- a)  $x + y = -1$     b)  $2x + 5y = -11$     c)  $x - 4y = 14$     d) none of these  
     $2x - 3y = -5$      $4x + 10y = -22$      $5x - y = 13$

10. A quadratic equation can have

- a) atleast two zeros    b) atmost two zeros    c) exactly two zeros    d) any number of zeros

11. the value of  $k$  for which the quadratic equation  $2x^2 + kx + 2 = 0$  has equal roots, is

- a) 4    b)  $\pm 4$     c) -4    d) zero

12. If discriminant of a quadratic equation is less than zero then it has

- a) equal and real roots    b) real roots does not exist  
c) real and distinct roots    d) none of these

13. Statement A (Assertion) : If product of two numbers is 5780 and their HCF is 17, then their LCM is 340

Statement R (Reason) : HCF is always a factor of LCM

- a) Both A and R are true and Reason (R) is correct explanation of A  
b) Both A and R are true but Reason (R) is not the correct explanation of A  
c) A is true but R is false  
d) A is false but R is true

14. If  $k, 2k - 1$  and  $2k + 1$  are three consecutive terms of an A.P., the value of  $k$  is

- a) -2    b) 3    c) -3    d) 6

15. The common difference of an A.P. whose  $n^{\text{th}}$  term is  $a_n = (3n - 7)$  is

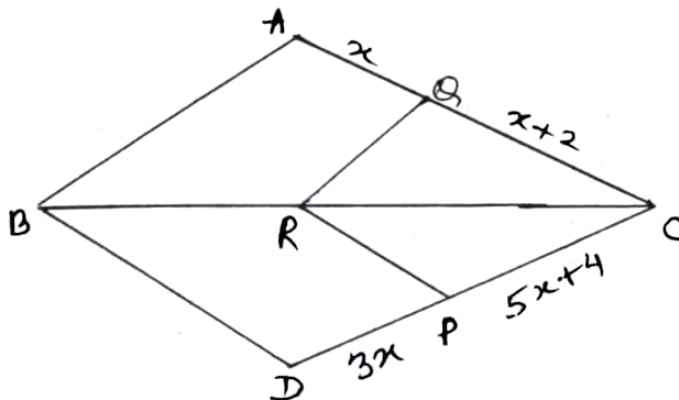
- a) 3    b) 7    c) 10    d) 6

16. The next term of the A.P.  $\sqrt{8}, \sqrt{18}, \sqrt{32}, \dots$  is

- a)  $5\sqrt{2}$     b)  $5\sqrt{3}$     c)  $3\sqrt{3}$     d) none of these

17. In the given figure  $QR \parallel AB$  and  $RP \parallel BD$  find  $x$

- a) 1  
b) 6  
c) 3  
d) 9



18. If the distance between the points A (4, p) and B (1, 0) is 5, then p

- a)  $\pm 4$     b) 4    c) -4    d) 0

19. The mid-point of the line joining the point A (-2, 8) and B (-6, -4) is  
 a) (-4, -6)      b) (2, 6)      c) (-4, 2)      d) (4, 2)
20. Do the points A (4, 5), B (7, 6) and C (6, 3) are collinear  
 a) True      b) False      c) Can't be determined

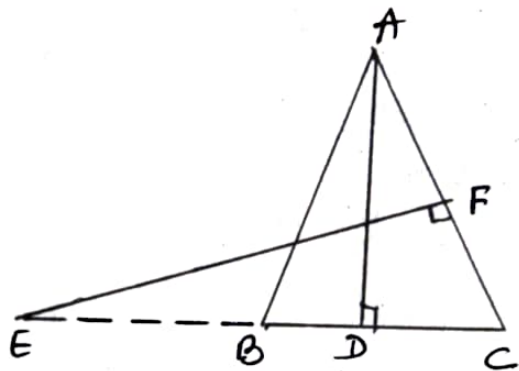
**Section - B**

21. Prove that  $7 - 2\sqrt{5}$  is an irrational number. (Given that  $\sqrt{5}$  is an irrational no)
22. Find the roots of the quadratic equation  $2x^2 - 2\sqrt{2}x + 1 = 0$  if they exist, using quadratic formula.
23. An A.P. consists of 50 terms of which 3<sup>rd</sup> term is 12 and the last term is 106. Find 29<sup>th</sup> term.
24. S and T are points on sides PR and QR of  $\Delta PQR$  such that  $\angle P = \angle RTS$ . Show that

$$\Delta RPQ \sim \Delta RTS$$

OR

E is a point on side CB produced of an isosceles triangle ABC with  $AB = AC$ . If  $AD \perp BC$  and  $EF \perp AC$ , prove that  $\Delta ABD \sim \Delta ECF$



25. If the point P (2, -4) is equidistant from A (3, 8) and B (-10, y). Find the value of y.

**Section - C**

26. Find the largest number which divides 705 and 1053 leaving remainder 9 in each case.
27. Find the zeros of the quadratic polynomial  $3x^2 - x - 4$  and verify the relationship between the zeros and its coefficients.
28. For what value of  $k$ , does the system of linear equations

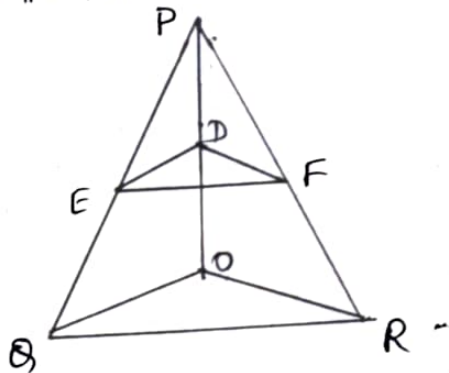
$$2x + 3y = 7$$

$$(k - 1)x + (k + 2)y = 3k$$

have an infinite number of solutions.

29. A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/hr less, than it would have taken 3 hrs more to cover the same distance. Find the speed of the train.

30. In figure  $DE \parallel OQ$  and  $DF \parallel OR$ , show that  $EF \parallel QR$



31. If the points A (1, -2), B (2, 3), C (a, 2) and D (-4, -3) are the vertices of parallelogram, find a.

**Section - D**

32. Five years hence, the age of mother will be three times that of her daughter. Five years ago, mother's age was seven times that of her daughter. What are their present ages?

33. How many terms of the A.P. 24, 21, 18, ..... must be taken so that their sum is 78?

34. Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

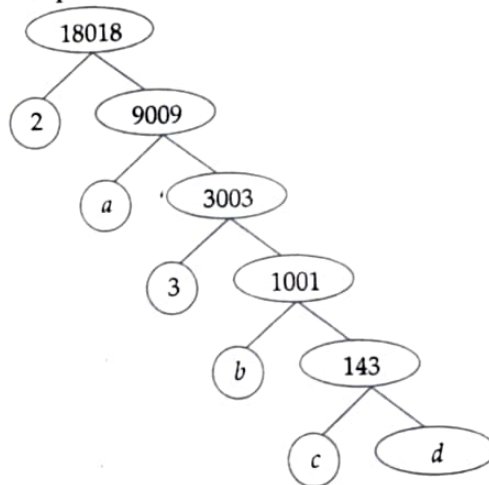
35. In what ratio does the x-axis divide the line segment joining the points (-4, -6) and (-1, 7)? Find the coordinates of the point of intersection also.

**Section - E**

**Case Study : 1**

36. A mathematics exhibition is being conducted in your school and one of your friends is making a model of a factor tree. He has some difficulty and ask for help in completing a quiz for the audience.

The diagram shown below is a prime factor tree.



Based on the above factor tree, answer the following questions:

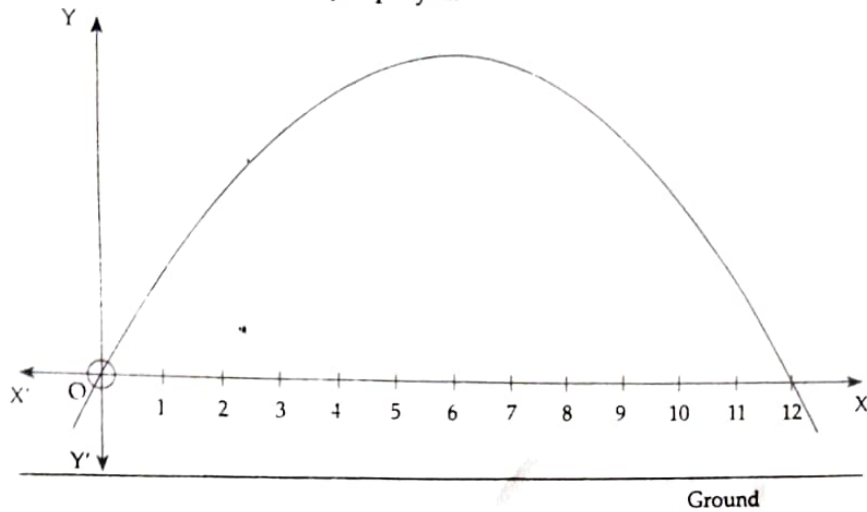
- (i) Find the value of 'a'.
- (ii) Find the value of 'b'.
- (iii) Find the value of (c + d)

OR

- (iii) Find HCF (a, b, c).

### CASE-STUDY 2

During an inter school competition, a shot put event was organised. The objective of this game is to throw a heavy spherical ball (known as a shot) as far as possible. The graph given below depicts the path covered a shot put by a player.



Based on the above information, answer the following questions:

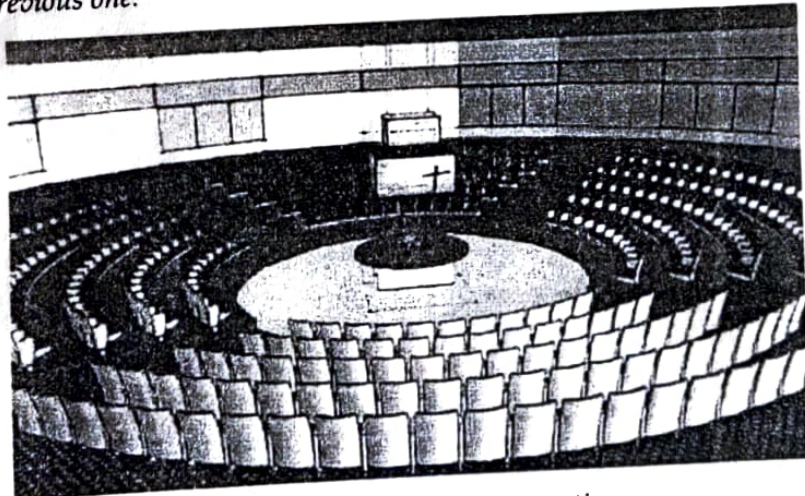
- (i) Name the shape of the path covered by the shot.
- (ii) What is the number of zeroes of the polynomial representing the above graph?

OR

- (ii) What are the zeroes of the polynomial representing the above graph?
- (iii) Find the polynomial representing the above graph.

### 38. CASE-STUDY 3

The school auditorium was to be constructed to accommodate at least 1500 people. The chairs are to be placed in concentric circular arrangement in such a way that each succeeding circular row has 10 seats more than the previous one.



Based on the information given above, answer the following questions:

- (i) If the first circular row has 30 seats, how many seats will be there in the 10th row?
- (ii) For 1500 seats in the auditorium, how many rows need to be there?

OR

- If 1500 seats are arranged in the auditorium, how many seats are still left to be put after 10th row?
- (iii) If there were 17 rows in the auditorium, how many seats will be there in the middle row?

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Class - X

Paper-Mathematics Standard (Set-B)

M.M. 80

Time: 3hrs.

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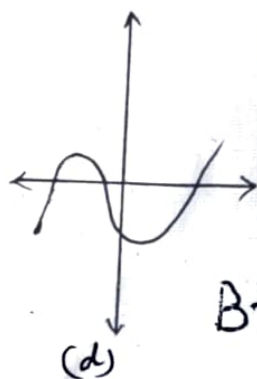
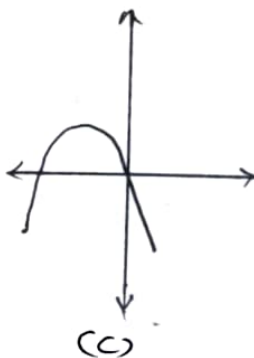
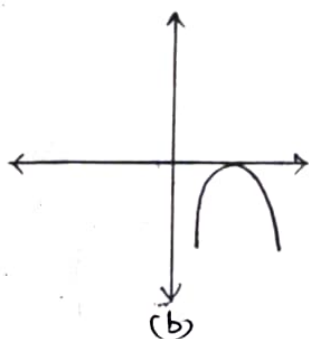
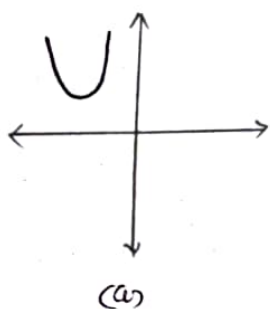
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**Section-A**

1. Let  $a$  and  $b$  be two positive integers such that  $a = p^3q^4$  and  $b = p^2q^3$ , where  $p, q$  are prime numbers.

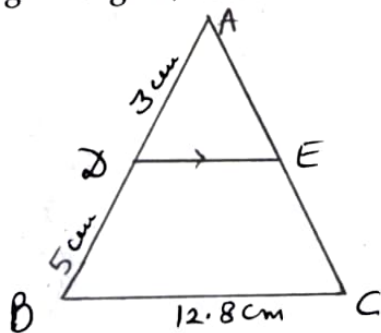
If  $HCF(a, b) = p^m q^n$  and  $LCM(a, b) = p^r q^s$ , then  $(m+n)(r+s) =$

- a) 15    b) 30    c) 35    d) 72
2. If  $a^2 = \frac{23}{25}$ , then  $a$  is
- a) rational    b) irrational    c) whole number    d) integer
3. The sum of the exponents of the prime factors in the prime factorization of 196 is
- a) 1    b) 2    c) 4    d) 6
4. If  $\alpha$  and  $\beta$  are the zeros of  $2x^2 + 5x - 9$  then the value of  $2\alpha\beta$
- a) -5    b) .5    c) -9    d) 9
5. If one zero of  $3x^2 + 8x + k$  be the reciprocal of the other then  $k$  is
- a) 3    b) -3    c)  $\frac{1}{3}$     d)  $-\frac{1}{3}$
6. Which of the following is not the graph of a quadratic polynomial?



B-1

7. If a pair of linear equation is consistent then their graph lines will be  
 a) parallel    b) always coincident    c) always intersecting    d) intersecting or coincident
8. The pair of linear equations  $x = 2$  and  $y = 3$  has  
 a) many solutions    b) no solution    c) one solution    d) none of these
9. The value of  $k$  for which the system of linear equations  $x + 2y = 3$ ;  $5x + ky + 7 = 0$  have no solution, is  
 a)  $\frac{-14}{3}$     b)  $\frac{2}{5}$     c) 5    d) 10
10. If the equation  $x^2 + 4x + k = 0$  has real and distinct roots, then  
 a)  $k < 4$     b)  $k > 4$     c)  $k \geq 4$     d)  $k \leq 4$
11. The discriminant of  $(x + 2)^2 = 0$  is  
 a) -2    b) 2    c) 4    d) 0
12. If one root of the equation  $2x^2 + kx + 4 = 0$  is 2, then the other root is  
 a) 6    b) -6    c) -1    d) 1
13. The value of  $x$  for which  $2x, x + 10$  and  $3x + 2$  are three consecutive terms of an A.P., is  
 a) -6    b) 18    c) 6    d) -18
14. The sum of first four terms of an A.P., whose first term is -2 and the common difference is -2 are  
 a)  $5n$     b) 20    c) -20    d)  $-5n$
15. The 14<sup>th</sup> term of an A.P. -11, -8, -5, ..... is  
 a) -50    b) -28    c) 28    d) 50
16. If  $DE \parallel BC$  in the given figure, find DE



- a) 4.8    b) 7.6    c) 19.2    d) 2.5
17. If the distance between the points A (4, p) and B (1, 0) is  $\sqrt{5}$ , then p  
 a)  $\pm 4$     b) 4    c) -4    d) 0
18. If the point P(x, y) is equidistant from A (5, 1) and B (-1, 5) then  
 a)  $5x = y$     b)  $x = 5y$     c)  $3x = 2y$     d)  $2x = 3y$

19. The mid point of the line segment joining the points  $A(-2, 8)$  and  $B(-6, -4)$  is  
 a)  $(-4, -6)$     b)  $(2, 6)$     c)  $(-4, 2)$     d)  $(4, 2)$
20. Statement A (Assertion) : If product of two numbers is 5780 and their HCF is 17, then their LCM is 340  
 Statement R (Reason) : HCF is always a factor of LCM  
 a) Both A and R are true and Reason (R) is correct explanation of A  
 b) Both A and R are true but Reason (R) is not the correct explanation of A  
 c) A is true but R is false  
 d) A is false but R is true

**Section - B**

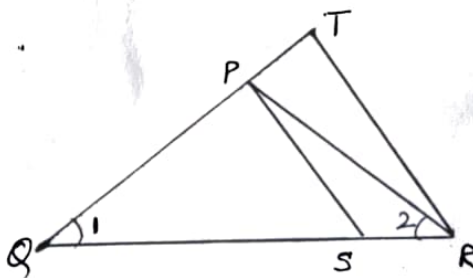
21. Prove that  $5 - 2\sqrt{2}$  is an irrational number. (Given that  $\sqrt{2}$  is an irrational no)
22. Find the roots of the quadratic equation  $3x^2 - 4\sqrt{3}x + 4 = 0$  if they exist, using quadratic formula.
23. Check whether 301 is a term of the list of numbers 5, 11, 17, 23, .....
24. S and T are points on sides PR and QR of  $\Delta PQR$  such that  $\angle P = \angle RTS$ . Show that

$$\Delta RPQ \sim \Delta RTS$$

OR

In figure  $\frac{QR}{QS} = \frac{QT}{PR}$  and  $\angle 1 = \angle 2$

Show that  $\Delta PQS \sim \Delta TQR$



25. If A and B are  $(-2, -2)$  and  $(2, -4)$  respectively. Find the coordinates of P such that  $AP = \frac{3}{7}AB$  and P lies on the line segment AB.

**Section - C**

26. The HCF of two numbers is 54 and their LCM is 3024. If one number is 336. Find the other number.
27. Find  $k$  if one of the zero of the polynomial  $(k - 1)x^2 + kx + 1$  is  $-4$ .



28. For what value of  $k$ , does the system of linear equations

$$2x + 3y = 7$$

$$(k - 1)x + (k + 2)y = 3k$$

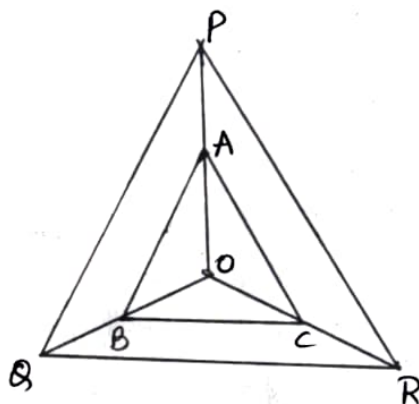
have an infinite number of solution

29. A train travels a distance of 360 km at a uniform speed. Had the speed had been 5km/hr more, than it would have taken 1 hour less for the journey. Find the original speed of the train.

30. In figure A, B and C are points on

OP, OQ and OR respectively. Such that

$AB \parallel PQ$  and  $AC \parallel PR$ , show that  $BC \parallel QR$



31. In what ratio does the point P  $(-4, y)$  divide the line segment joining the points A  $(-6, 10)$  and B  $(3, -8)$ ? Hence find the value of  $y$

### Section - D

32. The father's age is six times his son's age. Four years hence, the age of the father will be four times his son. What are their present age.
33. How many terms of the A.P. 3, 7, 11, 15, ..... are needed to get the sum 1275?
34. If the coordinates of two adjacent sites of a parallelogram are  $(3, 2)$ ,  $(1, 0)$  and diagonals meet at  $(2, -5)$ , find the coordinates of the other two vertices.
35. Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

Section - E

36 . CASE-STUDY 1

Have you ever watched how beautifully the Diwali lighting glow one after another, few very fast and other slower. On Diwali, Shreya decorates her house with three types of lights. The three lights glow after an interval of 12, 18 and 20 seconds respectively. The lights start glowing together at the same time.

Based on the above information, answer the following questions:

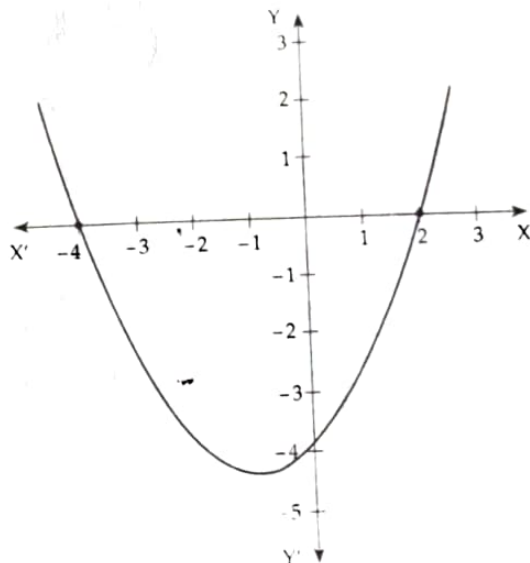
- (i) To find the time after which the lights will glow together again, we need to find LCM of numbers or HCF of numbers?
- (ii) After how many seconds the lights will glow together again?
- (iii) Find the HCF of 12, 18 and 20.

OR

- (iii) Find HCF (12, 20). Hence, find LCM (12, 20).

37 CASE-STUDY 2

The graphs of quadratic polynomial are parabolic vaguely 'U' shaped and have a highest or lowest point called the vertex. They may open up or down. They are symmetrical curves. The graph of a quadratic polynomial is given below:



Based on the above information, answer the following questions:

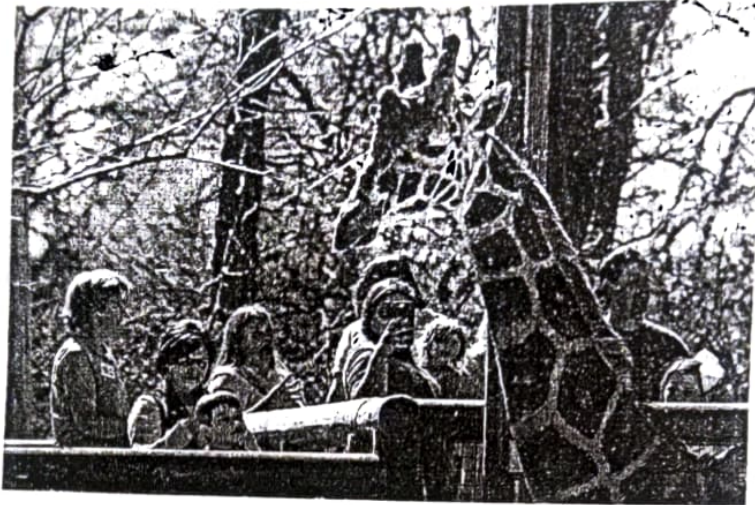
- (i) Fill in the blank:  
The graph shown above is that of a .....
- (ii) What are the zeroes of the polynomial for the given graph?
- (iii) Find the polynomial representing the above graph.

OR

- (iii) If 2 and 3 are zeroes of the polynomial  $3x^2 - 2px + 2q$ , then find the values of  $p$  and  $q$ .

**CASE-STUDY 3**

In November 2020, some new animals were added to a zoo. As a result the number of visitors to the zoo, increased daily by 10. A total of 6150 people visited zoo during that month.



Based on the above information, answer the following questions:

- (i) How many visitors visited the zoo on 1st November?
- (ii) On which day of the month did 250 visitors visit the zoo?
- (iii) How many persons visited the zoo in the last 5 days of the month of November?

OR

- (iii) How much collection (in rupees) from sale of tickets was done in the zoo on 15th Nov., if each entry ticket costs ₹ 50?

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**Section-A**

1. If two positive integers  $p$  and  $q$  can be expressed as  $p = ab^2$  and  $q = a^3b$  where  $a, b$  being prime numbers, then  $LCM(p, q)$  is equal to  
a)  $ab$       b)  $a^2b^2$       c)  $a^3b^2$       d)  $a^3b^3$
2. The product of a non - zero rational and an irrational number is  
a) always irrational      b) always rational      c) one      d) none of these
3. If one of the zero of the quadratic polynomial  $(k - 1)x^2 + kx + 1$  is  $-3$ , then the value of  $k$  is  
a)  $\frac{4}{3}$       b)  $-\frac{4}{3}$       c)  $\frac{2}{3}$       d)  $-\frac{2}{3}$
4.  $\sqrt{7}$  is  
a) an integer      b) an irrational number      c) rational number      d) none of these
5. A quadratic polynomial with sum and product of its zeroes as  $8$  and  $-9$  is  
a)  $x^2 - 8x + 9$       b)  $x^2 - 8x - 9$       c)  $x^2 + 8x - 9$       d)  $x^2 + 8x + 9$
6. If a pair of linear equations has infinitely many solutions then the lines representing them will be  
a) parallel      b) intersecting      c) always coincident      d) none of these
7. If the lines given by  $3x + 2ky = 2$  and  $2x + 5y = 1$  are parallel then the value of  $k$  is  
a)  $-\frac{5}{4}$       b)  $\frac{2}{5}$       c)  $\frac{15}{4}$       d)  $\frac{3}{2}$
8. The pair of equations  $x + 2y + 5 = 0$  and  $-3x - 6y + 1 = 0$  has  
a) a unique solution      b) exactly two solutions      c) infinitely many solutions      d) no solution

9. Which of the following equations has the sum of its roots as 3?

- a)  $2x^2 - 3x + 6 = 0$    b)  $-x^2 + 3x - 3 = 0$    c)  $\sqrt{2}x^2 - \frac{3}{\sqrt{2}}x + 1 = 0$    d)  $3x^2 - 3x + 3 = 0$

10. The first term and common difference of for the AP  $\frac{4}{3}, \frac{1}{3}, \frac{-2}{3}, \frac{-5}{3} \dots$  are

- a)  $(\frac{4}{3}, 1)$    b)  $(\frac{4}{3}, -1)$    c)  $(1, \frac{4}{3})$    d)  $(-1, \frac{4}{3})$

11. The 11<sup>th</sup> and 13<sup>th</sup> terms of an AP are 35 and 41 respectively its common difference is

- a) 38   b) 32   c) 6   d) 3

12. In an AP if  $d = -4, n = 7$  and  $a = 28$  then  $a_n$  is equal to

- a) 6   b) 4   c) 20   d) 28

13. If  $-10, -6, -2, 2 \dots$  is an A.P. then common difference is

- a) -16   b) -4   c) 4   d) none of these

14. If the common difference of an AP is 5 then what is  $a_{18} - a_{13}$ ?

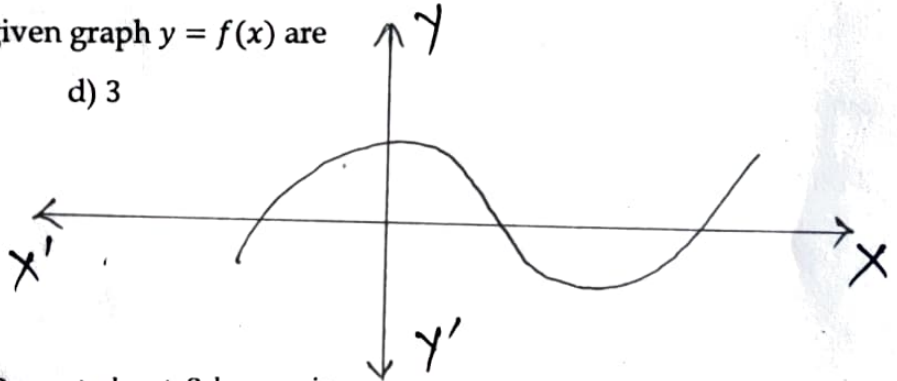
- a) 5   b) 20   c) 25   d) 30

15. A quadratic equation  $2x^2 + bx + c = 0$  has two distinct roots if

- a)  $b^2 - 4ac = 0$    b)  $b^2 - 4ac < 0$    c)  $b^2 - 4ac > 0$    d) none of these

16. The number of zeroes of given graph  $y = f(x)$  are

- a) 0   b) 1   c) 2   d) 3



17. The general form of an AP  $a, a + d, a + 2d, \dots$  is

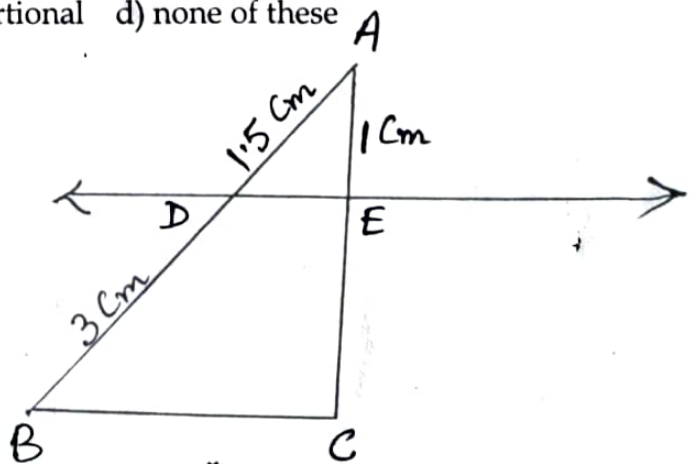
- a)  $\frac{n}{2}(a + l)$    b)  $a + (n - 1)d$    c)  $\frac{n}{2}[2a + (n - 1)d]$    d) none of these

18. All circles are

- a) Congruent   b) similar   c) proportional   d) none of these

19. In the given figure  $DE \parallel BC$ , then EC is

- a) 1 cm  
b) 2 cm  
c) 3 cm  
d) 3.5 cm



20. If  $P(x) = ax^2 + bx + c$  then  $\frac{c}{a}$  is equal to  
 a) 0      b) sum of zeroes      c) product of zeroes      d) 1

**Section - B**

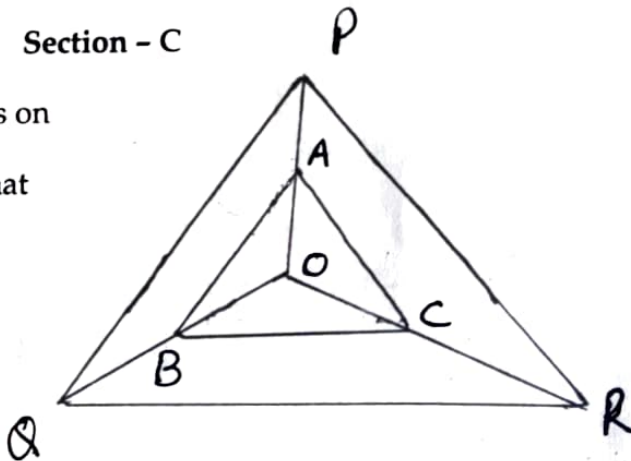
21. Prove that  $\sqrt{3}$  is an irrational number.
22. Find the zeroes of the quadratic polynomial  $6x^2 - 3 - 7x$  and verify the relationship between the zeroes and the coefficient.
23. On comparing the ratios  $\frac{a_1}{a_2}$ ,  $\frac{b_1}{b_2}$  and  $\frac{c_1}{c_2}$ , find out whether the lines representing following pairs of linear equations intersect at a point, parallel or coincident.
- $5x - 4y + 8 = 0$   
 $7x + 6y - 9 = 0$
24. Find two number whose sum is 27 and product is 182.
25. Which term of the A.P. : 21, 18, 15 ..... is  $-81$  ?

**OR**

Determine the AP whose 3<sup>rd</sup> term is 5 and the 7<sup>th</sup> term is 9.

**Section - C**

26. In given figure A, B and C are points on OP, OQ and OR respectively such that  $AB \parallel PR$ . Show that  $BC \parallel QR$



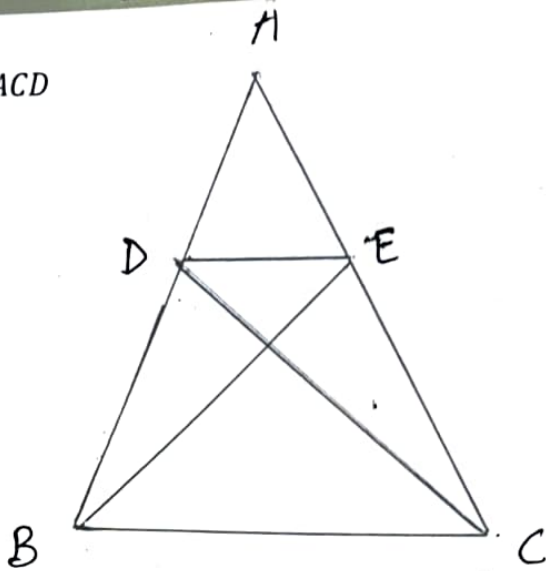
27. How many terms of the AP 24, 21, 18 ..... Must be taken so that their sum is 78?
28. Show that the points  $(1, 7)$ ,  $(4, 2)$ ,  $(-1, -1)$  and  $(-4, 4)$  are the vertices of a square.

**OR**

Find the value of  $y$  for which the distance between the points  $P(2, -3)$  and  $Q(10, y)$  is 10 units.

29. In given figure if  $\triangle ABE \cong \triangle ACD$

show that  $\triangle ADE \sim \triangle ABC$



30. A sum of Rs. 700 is to be used to give seven cash prizes to students of a school for their overall academic performance. If each prize is Rs. 20 less than its preceding prize. Find the value of each of the prizes.

31. Find the coordinates of the points of trisection of the line segment joining  $(4, -1)$  and  $(-2, -3)$ .

#### Section - D

32. a) If  $\alpha$  and  $\beta$  are zeroes of  $P(x) = x^2 + x - 1$  then find  $\frac{1}{\alpha} + \frac{1}{\beta}$

b) If  $HCF(306, 657) = 9$ , find  $LCM(306, 657)$

33. Draw the graphs of the equations  $x - y + 1 = 0$  and  $3x + 2y - 12 = 0$ . Determine the coordinates of the vertices of the triangle formed by these lines and the  $x$ -axis and shade the triangular region.

34. Find the nature of the roots of quadratic equation  $3x^2 - 4\sqrt{3}x + 4 = 0$ , if real roots exist, find them.

35. a) Find the sum of the odd numbers between 0 and 50.

b) Which term of the AP : 3, 15, 27, 39 ..... will be 132 more than its 54<sup>th</sup> term?

## Case Study-based Questions

Q36 Read the following and answer any four questions from (i) to (v).

In order to conduct Sports Day activities in your School, lines have been drawn with chalk powder at a distance of 1 m each, in a rectangular shaped ground  $ABCD$ , 100 flowerpots have been placed at a distance of 1 m from each other along  $AD$ , as shown in given figure below. Niharika runs  $\frac{1}{4}$  th the distance  $AD$  on the 2nd line and posts a green flag. Preet runs  $\frac{1}{5}$ th distance  $AD$  on the eighth line and posts a red flag.

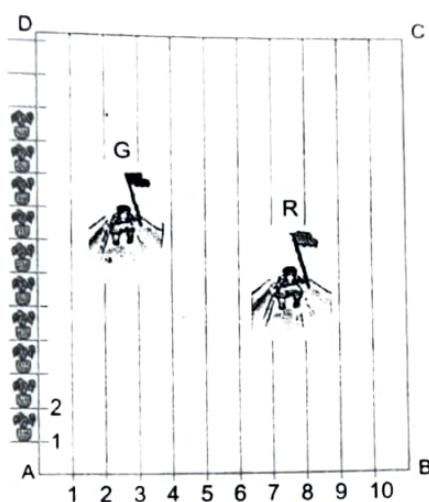


Fig. 6.22

(i) Find position of green flag

(ii) find position of red flag is

(1,1,2)

(iii) What is the distance between both the flags?

Q37

Read the following and answer given questions

A seminar is being conducted by an Educational Organisation, where the participants will be educators of different subjects. The number of participants in Hindi, English and Mathematics are 60, 84 and 108 respectively.



(i) In each room the same number of participants are to be seated and all of them being in the same subject, find maximum number of participants that can accommodated in each room



(ii) Find the LCM of 60, 84 and 108.

(1, 1, 2)

(iii) Express 108 as a product of its prime numbers.

Q 38 Read the following and answer the questions

Your friend Veer wants to participate in a 200 m race. He can currently run that distance in 51 seconds and with each day of practice it takes him 2 seconds less. He wants to complete it in 31 seconds.



(i) Find first four terms of the AP.

(ii) If  $a_n = 2n + 3$  then find the common difference of an A.P.

(iii) Find  $x$  if  $2x, x + 10, 3x + 2$  are three consecutive terms of an AP.

(1, 1, 2)