This Question Paper contains 4 Printed Pages.]

15E(A)

MATHEMATICS, Paper – I

(English version)

Parts A and B

Time : 2½ Hours] ***[Maximum Marks : 50***

Instructions :

1. *Answer the questions under **Part-A** on a separate answer book.*
2. *Write the answers to the questions under **Part-B** on the Question paper itself and attach it to the answer book of **Part-A**.*

Part - A

Time : 2 Hours **Marks : 35**

SECTION - I *(Marks : 5×2=10)*

Note :

1. Answer **ANY FIVE** questions, choosing atleast **TWO** from each of the following **Groups**, i.e., **A** and **B** .
2. Each question carries **2** marks.

GROUP - A

(Real numbers, Sets, Polynomials, Quadratic Equations)

1. Expand $\log \frac{343}{125}$.

2. Draw the Venn diagrams of the sets (A – B), (B – A).

3. Find a quadratic polynomial, if the zeroes of it are 2 and –1 respectively.

4. Find the roots of the equation $2x^2 + x - 6 = 0$ by factorisation.

GROUP - B

(Pair of Linear equations in two variables, Progressions, Co-ordinate Geometry)

5. 10 students of class X took part in a mathematics quiz. If the number of girls is four more than the number of boys; then find the number of boys and the number of girls, who took part in the quiz.

6. Find the number of terms in the following AP

   7, 13, 19, ..., 205

7. Find the coordinates of the point, which divides the join of (–1, 7) and (4, –3) in the ratio 2 : 3 .

8. Find the area of the triangle, whose vertices are (2, 0), (1, 2), (–1, 6). What do you observe ?

SECTION - II

(Marks : 4×1=4)

Note :

1. Answer **ANY FOUR** of the following **SIX** questions.
2. Each question carries **1** mark.

9. Find the value of $\log_{81} 3$.

10. List all the subsets of the following set $B = \{p, q\}$.

11. Write the following set $\{x : x = 2n + 1 \text{ and } n \in N\}$ in roster form.

12. If $p(x) = x^2 - 5x - 6$; find the value of $p(3)$.

13. Find the common ratio of GP

$2, 2\sqrt{2}, 4, \ldots\ldots$

14. Find the mid point of the line segment joining the points (2, 7) and (12, –7).

SECTION - III

(Marks : 4×4=16)

Note :

1. Answer **ANY FOUR** questions, choosing atleast **TWO** from each of the following **Groups**, i.e., **A** and **B**.
2. Each question carries **4** marks.

GROUP - A

(Real Numbers, Sets, Polynomials, Quadratic Equations)

15. Show that $5-\sqrt{3}$ is irrational.

16. If A = {1, 2, 3, 4}, B = {1, 2, 3, 5, 6}, then find *(i)* $A \cap B$, *(ii)* $B \cap A$, *(iii)* $A - B$, *(iv)* $B - A$, and what do you observe ?

17. Find the zeroes of the polynomial $p(x) = x^2 - 4x + 3$ and verify the relationship between zeroes and coefficients.

18. Solve the quadratic equation $2x^2 + x - 4 = 0$ by completing the square.

GROUP - B

(Pair of Linear equations in two variables, Progressions, Co-ordinate Geometry)

19. Solve the equations.

$$\frac{10}{x+y} + \frac{2}{x-y} = 4, \quad \frac{15}{x+y} - \frac{5}{x-y} = -2$$

20. Solve the pair of equations by Elimination method.

$2x + y - 5 = 0, \quad 3x - 2y - 4 = 0$

21. If the sum of the first 7 terms of an AP is 49 and that of 17 terms is 289; find the sum of the first n terms.

22. Find the area of the triangle formed by joining the mid points of the sides of the triangle, whose vertices are (0, –1); (2, 1) and (0, 3). Find the ratio of this area to the area of the given triangle.

SECTION - IV

(Marks : 1×5=5)

(Polynomials, Pair of Linear equations in two variables)

Note :

1. Answer **ANY ONE** question from the following.
2. This question carries **5** marks.

23. Draw the graph of $p(x) = x^2 + 3x - 4$ and find zeroes.

Verify the zeroes of the polynomials.

24. Solve the following equations graphically.

$3x - y = 7$,

$2x + 3y = 1$

15E(B)

MATHEMATICS, Paper – I

(English version)

Parts A and B

Time : 2½ Hours] ***[Maximum Marks : 50***

Instructions :

*Write the answers to the questions under **Part-B** on the Question paper itself and attach it to the answer book of **Part-A**.*

Part - B

Time : 30 minutes ***Marks : 15***

Note :

1. Each question carries ½ mark.
2. Answers are to be written in the Question paper only.
3. Answer **all** the questions.
4. Marks will **not** be awarded in case of any over-written, re-written or erased answers.

I. *Write the CAPITAL LETTER showing the correct answer for the following questions in the brackets provided against them.* $10 \times \frac{1}{2} = 5$

1. If p is prime, then $\sqrt{p}$ is ..... [ ]

(A) Composite number (B) Rational number

(C) Positive integer (D) Irrational number

2. Exponential form of $\log_4 8 = x$ is ..... [ ]

(A) $x^8 = 4$ (B) $x^4 = 8$

(C) $4^x = 8$ (D) $8^x = 4$

3. If $\log 625 = k \log 5$, then the value of k is ..... [ ]

(A) 5 (B) 4

(C) 3 (D) 2

4. $\frac{p}{q}$ form of 0.0875 is ..... [ ]

(A) $\frac{7}{2^4 \times 5}$ (B) $\frac{7}{2 \times 5^4}$

(C) $\frac{7}{2^4 \times 5^4}$ (D) $\frac{5^3 \times 7}{2^3 \times 5^4}$

5. If $A \subset B$, $n(A) = 5$ and $n(B) = 7$, then $n(A \cup B) =$ ..... [ ]

(A) 5 (B) 7

(C) 2 (D) 12

6. If 2 and 3 are two zeroes of $x^3 - 5x^2 + 6x$, then find the third zero .... [ ]

(A) 1 (B) 4

(C) 5 (D) 0

7. Which is not a linear equation of the following ? [ ]

(A) $5 + 4x = y + 3$

(B) $x + 2y = y - x$

(C) $3 - x = y^2 + 4$

(D) $x + y = 0$

8. Two angles are complementary. If the larger angle is twice the measure of a smaller angle, then smaller is ..... [ ]

(A) 30° (B) 45°

(C) 60° (D) 15°

9. The common difference of AP 1, –1, – 3, ... is ..... [ ]

(A) – 1 (B) +2

(C) –2 (D) +1

10. Distance between (0, 7) and (–7, 0) is ..... [ ]

(A) $2\sqrt{7}$ (B) $7\sqrt{2}$

(C) $\sqrt{14}$ (D) +1

II. *Fill in the blanks with suitable answers.* $10 \times \frac{1}{2} = 5$

11. Decimal form of $\frac{36}{2^3 \times 5^3}$ value is .....

12. If L.C.M. and H.C.F. of two numbers are 108 and 9 respectively and one of them is 54; then other number is .....

13. If $\log_2 x = 3$, then $x =$ .....

14. If $\frac{52}{160} = \frac{13}{2^n \times 5^m}$, then $m + n =$ .....

15. If the polynomial $p(x) = x^2 - 8x + k$ is divided by $(x - 1)$, the remainder comes out to be '6', then k is .....

16. The discriminant of the Quadratic equation $px^2 + qx + r = 0$ is .....

17. The first negative number of AP; 14, 11, 8, ... is ..... term.

18. Intersecting point of $x + y = 6$, $x - y = 4$ is .....

19. $(-2, 8)$ point lies on ..... quadrant.

20. Slope of Y - axis is .....

III. *Find the correct answer for the questions given under* ***Group-A*** *selecting them from* ***Group-B*** *and write the indicating letter in the brackets provided against each question.* $10 \times \frac{1}{2} = 5$

(i)

Group - A		**Group - B**
21. The zero of linear polynomial $ax - b =$	[ ]	(A) 0
22. If the product of zeroes is '0' of the polynomial $ax^2 + bx + c$, then the value of c is	[ ]	(B) -2
23. Product of the zeroes of the polynomial $2x^2 - 3x + 6$ is	[ ]	(C) $\frac{b}{a}$
24. Sum of the zeroes of the polynomial $bx^2 + ax + c$ = ...	[ ]	(D) $\frac{a}{b}$
		(E) 2
		(F) $-\frac{a}{b}$
25. α, β, γ are the zeroes of the polynomial $x^3 + 3x^2 - x + 2$, then $\alpha\beta\gamma$ is	[ ]	(G) $-\frac{b}{a}$
		(H) 3

(ii)

Group - A		Group - B
26. Distance between X-axis and $(-4, 3)$ is	[ ]	(I) $\sqrt{5}$
27. Distance between origin and $(2, 3)$ is	[ ]	(J) (1, 1)
28. Distance between Y-axis and $(4, 0)$ is	[ ]	(K) 3
		(L) 2
		(M) 4
29. Mid point of line joining the points $(2, 3)$ and $(-2, 3)$ = ...	[ ]	(N) $\sqrt{13}$
30. Centroid of a triangle, whose vertices are $(0, 3)$; $(3, 0)$; $(0, 0)$ is	[ ]	(O) (0, 0)
		(P) (0, 3)

Andhra Pradesh SSC Class 10th Maths Question Paper 1 With Solution 2016

QUESTION PAPER CODE 15E(A)

SECTION - I
GROUP - A

(5 * 2 = 10)

Answer ANY 5 Questions choosing two from each of the following groups.

Question 1: Expand log 343 / 125

Solution:

Logarithmic rules:

i) $\log (x / y) = \log x - \log y$

ii) $\log a^n = n \log a$

$\log (343 / 125)$

$= \log (7^3/5^3)$

$= \log (7 / 5)^3$

$= 3 \log (7 / 5)$

$= 3 [\log 7 - \log 5]$

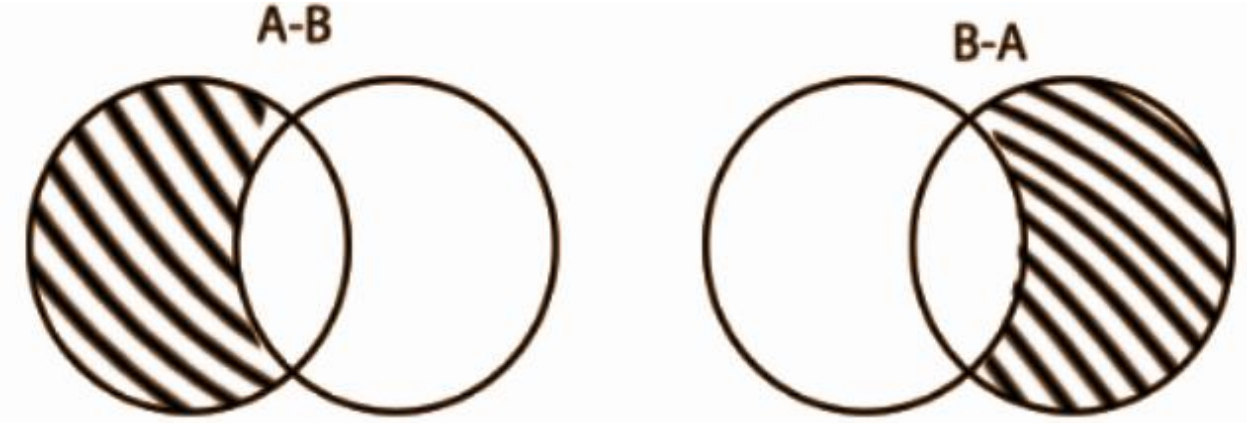
$= 3 \log 7 - 3 \log 5$

$= 3 \log 7 / 3 \log 5$

$= \log 7 / \log 5$

Question 2: Draw the Venn diagrams of the sets (A – B), (B – A).

Solution:



Question 3: Find a quadratic polynomial, if the zeroes of it are 2 and -1 respectively.

Solution:

Quadratic = x^2 - (sum)x + product = 0

Sum = 2 + (-1) = 1

Product = 2 * - 1 = -2

x^2 - x – 2 = 0 is the quadratic polynomial.

Question 4: Find the roots of equation $2x^2 + x - 6 = 0$ by factorisation.

Solution:

Given the quadratic equation: $2x^2 + x - 6 = 0$

Splitting the middle term,

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

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

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

Therefore ,

x + 2 = 0 or 2x - 3 = 0

x = -2 or x = 3/2

GROUP - B

Question 5: 10 students of class X took part in a mathematics quiz. If the number of girls is four more than the number of boys; then find the number of boys and the number of girls, who took part in the quiz.

Solution:
Let the number of boys be x.
The number of girls is 10 – x.
The number of girls = 4 + number of boys
10 – x = 4 + x
6 = 2x
x = 3
Number of boys = 3
Number of girls = 7

Question 6: Find the number of terms in the following AP. 7, 13, 19, ……., 205

Solution:
A.P. 7, 13, 19, ..., 205
a = 7
d = 13 – 7 = 6
A_n = 205
A_n = a + (n – 1) d
205 = 7 + (n – 1) 6
=> 205 – 7 = (n – 1) 6
=> 198 = (n – 1) 6
=> n – 1 = 198 / 6
=> n – 1 = 33
=> n = 33 + 1
=> n = 34
Thus, the total number of terms is 34.

Question 7: Find the coordinates of the point, which divides the join of (-1, 7) and (4, -3) in the ratio 2 : 3.

Solution:
m : n = 2 : 3
(x, y) = $(mx_2 + nx_1) / (m + n), (my_2 + ny_1) / (m + n)$
= (2 * 4 + 3 * [-1]) / [2 + 3], (2 * [-3] + 7 * 3) / [2 + 3]

= (5 / 5), (-6 + 21 / 5)
= 1, 3

Question 8: Find the area of the triangle, whose vertices are (2, 0), (1, 2), (-1, 6). What do you observe?

Solution:

$\text{Area of the triangle} = |2(2-6) - 0(1+1) + 1(6+2)|$

$= |(-8) + 0 + 8|$

= 0

If the area of triangle = 0, then the three points are collinear.

SECTION - II

(4 * 1 = 4)

Answer ANY 4 questions of the following six questions.

Question 9: Find the value of $\log_{81} 3$.

Solution:

$\log_{81} 3 = x$

Rewrite as an exponential. In this case, x is the exponent, and 81 is the base.

$81^x = 3$

Find a common base for both sides, which is 3.

$81 = 3^4$

$(3^4)\ x = 3$

Use the exponent rule $(x^a)^b = x^{ab}$

$3^{4x} = 3^1$

$4x = 1$

$x = 1 / 4$

Question 10: List all the subsets of the following set B = {p, q}.

Solution:

All subsets of B are {}, {p}, {q}, {p, q}.

Question 11: Write the following set {x : x = 2n + 1 and n ∈ N} in roster form.

Solution:
{3, 5, 7, 9, 11, 13, ……}

Question 12: If $p(x) = x^2 - 5x - 6$, then find the value of p(3).

Solution:
$p(x) = x^2 - 5x - 6$
$p(3) = 3^2\ 3 * 5 - 6$
$= 9 - 15 - 6$
$= -12$

Question 13: Find the common ratio of GP 2, 2√2, 4, ……

Solution:
$r = 2\sqrt{2} / 2$
$= \sqrt{2}$
So, the common ratio is √2.

Question 14: Find the midpoint of the line segment joining the points (2, 7) and (12, - 7).

Solution:
Given points are
$(2, 7) = (x_1, y_1)$
$(12, -7) = (x_2, y_2)$
mid point = $(x_1 + x_2 /2 , y_1 + y_2 / 2)$
$\Rightarrow (2 + 12 / 2 , 7 + (-7) / 2)$
$\Rightarrow (14 / 2 , 0 / 2)$
$\Rightarrow (7, 0)$ is the midpoint.

SECTION - III

(4 * 4 = 16)

Answer ANY 4 questions, choosing at least TWO from each of the following groups.

GROUP - A

Question 15: Show that 5 − √3 is irrational.

Solution:

Assume that 5 − √3 is a rational number such that a, b exists, where a and b are two co−prime numbers.

= 5 − √3 = a / b

= √3 = 5 − a / b

=> a and b are integers.

So, (5 - a / b) is rational.

There arises a contradiction with our assumption that 5 − √3 is a rational number.

Hence, 5 −√3 is an irrational number.

Question 16: If A = { 1, 2, 3, 4}, B = {1, 2, 3, 5, 6}, then find

(i) A ∩ B ,

(ii) B ∩ A

(iii) A – B,

(iv) B – A, and what do you observe?

Solution:

(i) A ∩ B → {1, 2, 3}

(ii) B ∩ A → {1, 2, 3}

(iii) A - B → {4}

(iv) B - A → {5, 6}

Question 17: Find the zeroes of the polynomial $p(x) = x^2 - 4x + 3$ and verify the relationship between zeroes and coefficients.

Solution:

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

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

$x (x - 3) - 1 (x - 3) = 0$

$(x - 3) (x - 1) = 0$

$x = 3, 1$

Sum of the roots = (alpha + beta) = 3 + 1 = 4 = - (-4) / 1 = -4 = (-b / a)

Product of the roots = (alpha * beta) = 3 * 1 = 3 = (3 / 1) = (c / a)

Question 18: Solve the quadratic equation $2x^2 + x - 4 = 0$ by completing the square.

Solution:

$(a + b)^2 = a^2 + 2ab + b^2$

To find the value of x, use the above formula,

To bring the given equation to that form $a^2 + 2ab + b^2$ for some value a & b.,.

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

$=> x^2 + (x / 2) - 2 = 0$ [Dividing both the sides by 1 / 2]

$=> x^2 + 2 * (1 / 4) x - 2 = 0$

Multiplying & dividing the middle term by 2 to get the term 2ab (here a = x, b = 1 / 2)

$a^2 + 2ab + c$ (for some value c, here it is - 4), we need b^2 to bring this equation to that form,

By adding $(1 / 4)^2$ both the sides,

$=> x^2 + 2 * (1 / 4) x + (1 / 4)^2 - 2 = (1 / 4)^2$

It can be, reduced to the form $(a + b)^2$

$=> (x + [1 / 4])^2 - 2 = 1 / 16$

$=> x + (1 / 4)^2 = [1 / 16] + 2$

$=> (x + [1 / 4])^2 = 33 / 16$

By moving the square from LHS to RHS, we get,

$=> x + [1 / 4] = \sqrt{33} / 16$

$=> x = [\sqrt{33} - 1 / 4]$ or $[\sqrt{-33} - 1 / 4]$

GROUP - B

Question 19: Solve the equations: 10 / [x + y] + 2 / [x - y] = 4, 15 / [x + y] - 5 / [x - y] = -2.

Solution:

Let 1 / [x + y] = k
1 / [x - y] = m
10k + 2m = 4 * 5
15k – 5m = -2 * 2
50k + 10m = 20
30k - 10m = -4
_____
80k = 16
k = 16 / 80 = 1 / 5
1 / [x + y] = 1 / 5
x + y = 5 ----- (1)
m = [4 - 10k] / 2 = [4 - 2] / 2 = 1
1 / [x + y] = 1
x - y = 1
x + y = 5
_____
2x = 6
x = 3
y = 5 - x
y = 2

Question 20: Solve the pair of equations by elimination method: 2x + y – 5 = 0, 3x – 2y - 4 = 0.

Solution:

2x + y = 5 * 2
3x - 2y = 4
4x + 2y = 10
3x - 2y = 4 (on adding)
_____

$7x = 14$
$x = 14 / 7 = 2$
$y = 5 - 2x$
$= 5 - 2 * 2$
$= 1$

Question 21: If the sum of the first 7 terms of an AP is 49 and that of 17 terms is 289; find the sum of the first n terms.

Solution:
Sum = $[n / 2] * [2a_0 + [n - 1] d]$
$49 = (7 / 2) [2a_0 + 6d]$
$14 = 2a_0 + 6d$
$7 = a_0 + 3d$ ---- (1)
$289 = 17 / 2 * [2a_0 + 16d]$
$34 = 2a_0 + 16d$
$17 = a_0 + 8d$ ---- (2)
$7 = a_0 + 3d$
$17 = a_0 + 8d$

$10 = 5d$
$d = 10 / 5 = 2$
$a_0 = 7 - 3d = 7 - 3 * 2 = 1$
Sum of first n terms = $[n / 2] * [2a_0 + [n - 1] d]$
$= (n / 2) (2 + 2n - 2)$
$= (n / 2) * (2n)$
$= n^2$

Question 22: Find the area of the triangle formed by joining the midpoints of the sides of the triangle, whose vertices are (0, -1); (2, 1) and (0, 3). Find the ratio of this area to the area of the given triangle.

Solution:
D = [0 + 2] / [2], [-1 + 1] / [2]
= (1, 0)

E = [2 + 0] / [2], [1 + 3] / [2]
= (1, 2)
F = [0 + 0] / [2], [3 - 1] / [2]
= (0, 1)
Area of triangle = (1 / 2) (0 [1 - 3] + 2 [3 + 1] + 0 [-1 -1])
= (1 / 2) * 8
= 4
Area of midpoint triangle = (1 / 2) (1 [2 - 1] + 1 [1 - 0] + 0 [0 - 2])
= (1 / 2)

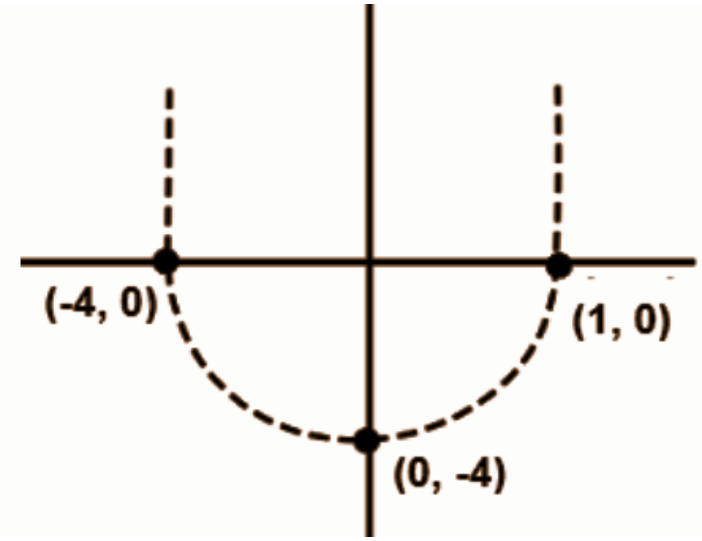
SECTION - IV

(1 * 5 = 5)

Answer any ONE question.

Question 23: Draw the graph of $p(x) = x^2 + 3x - 4$ and find zeroes. Verify the zeroes of the polynomials.

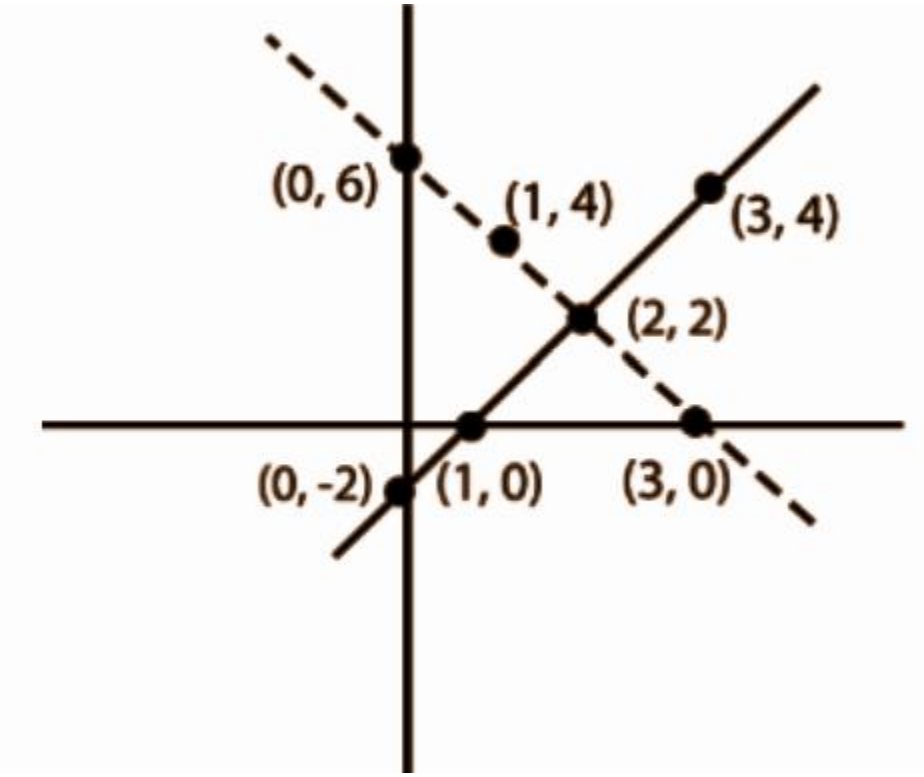
Solution:



The graph is an upward parabola as it is a quadratic equation.
The curve passes through (-4,0) and (1,0).
The zero of the polynomial is where the curve cut the x-axis. i.e. the zero of the polynomial is -4 and 1.

Question 24: Solve the following equations graphically. 3x – y = 7, 2x + 3y = 1.

Solution:



PART - B

(10 * 0.5 = 5)

Question 1: If p is prime, then √p is

(A) Composite number
(B) Rational number
(C) Positive integer
(D) Irrational number

Answer: D

Question 2: Exponential form of $\log_4 8$ is

(A) $x^8 = 4$ (B) $x^4 = 8$ (C) $4^x = 8$ (D) $8^x = 4$

Answer: C

Question 3: If log 625 = k log 5, then the value of k is

(A) 5 **(B) 4** **(C) 3** **(D) 2**

Answer: B

Question 4: p / q form of 0.0875 is
(A) $7 / 2^4 * 5$ **(B) $7 / 2 * 5^4$** **(C) $7 / 2^4 * 5^4$** **(D) $5^3 * 7 / 2^3 * 5^4$**

Answer: A

Question 5: If $A \subset B$, $n(A) = 5$ and $n(B) = 7$, then $n(A \cup B) =$
(A) 5 **(B) 7** **(C) 2** **(D) 12**

Answer: D

Question 6: If 2 and 3 are two zeroes $x^3 - 5x^2 + 6x$, then find the third zero.
(A) 1 **(B) 4** **(C) 5** **(D) 0**

Answer: D

Question 7: Which is not a linear equation of the following
(A) $5 + 4x = y + 3$
(B) $x + 2y = y - x$
(C) $3 - x = y^2 + 4$
(D) $x + y = 0$

Answer: C

Question 8: Two angles are complementary. If the larger angle is twice the measure of the smaller angle, then smaller is
(A) 30 **(B) 45** **(C) 60** **(D) 15**

Answer: A

Question 9: The common difference of AP 1, -1, -3, …… is
(A) -1 (B) 2 (C) -2 (D) 1

Answer: C

Question 10: Distance between (0, 7) and (-7, 0) is
(A) $2\sqrt{7}$ (B) $7\sqrt{2}$ (C) $\sqrt{14}$ (D) 1

Answer: B

Fill in the blanks.

Question 11: The decimal form of $36 / 2^3 * 5^3$ is _____ (0.036)

Question 12: If LCM and HCF of two numbers are 108 and 9 respectively and one of them is 54, then the other number is _____ (18)

Question 13: If $\log_2 x = 3$, then x = _____ (8)

Question 14: If $52 / 160 = 13 / 2^n * 5^m$, then m + n is _____ (4)

Question 15: If the polynomial $p(x) = x^2 - 8x + k$ is divided by (x - 1), the remainder comes out to be '6', then k is _____ (13)

Question 16: The discriminant of the quadratic equation $px^2 + qx + r = 0$ is _____ ($D = \sqrt{q^2} - 4pr$

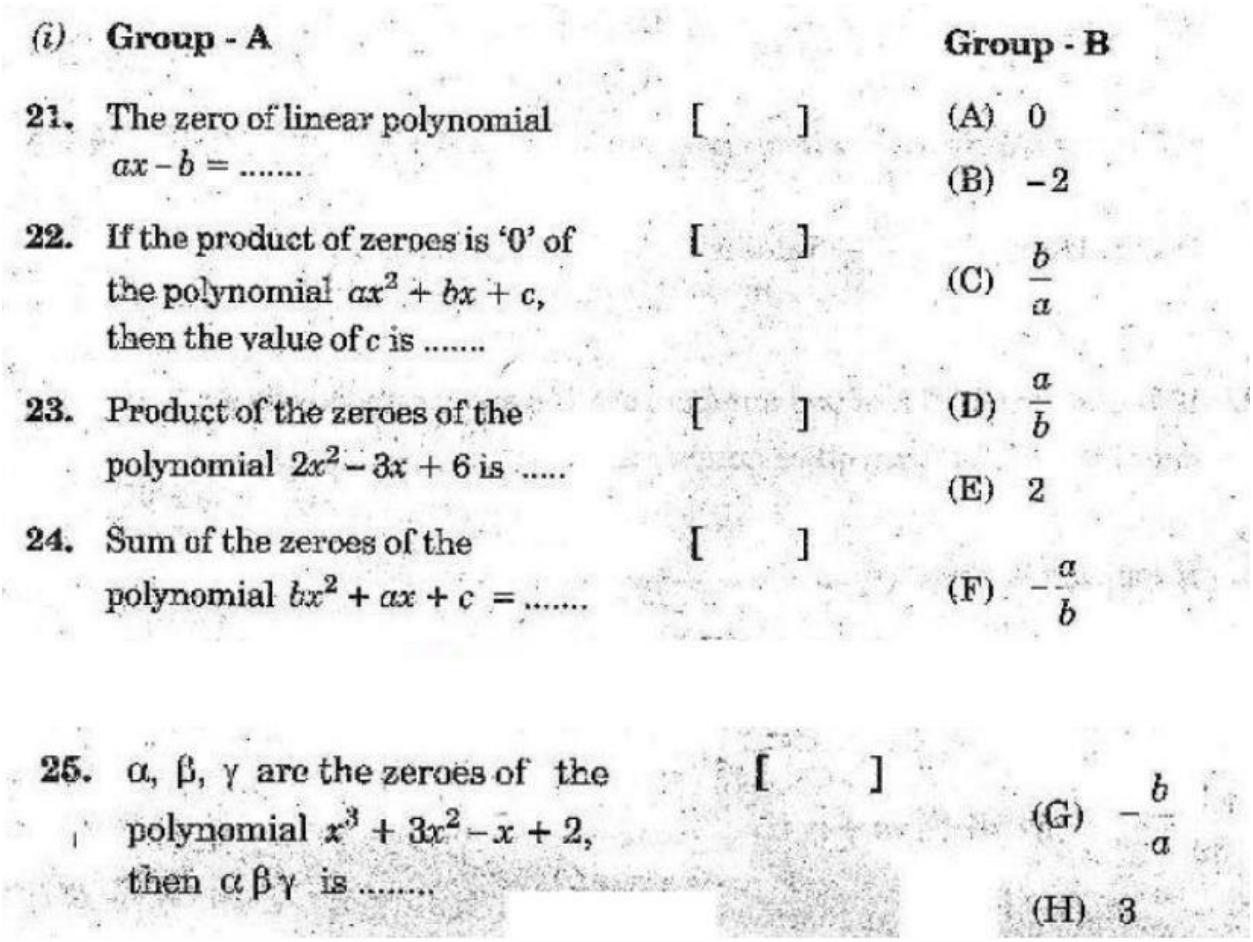
Question 17: The first negative number of AP 14, 11, 8, …… is _____ term (6^{th})

Question 18: The intersecting point of x + y = 6, x - y = 4 is _____. (5, 1)

Question 19: (-2, 8) lies in ____ quadrant (second)

Question 20: Slope of the y-axis is _____ (undefined)

Question: [i] Find the correct answer for the given question sunder group - A selecting from group - B. (10 * 0.5 = 5)



(i) **Group - A**

Group - B

21. The zero of linear polynomial $ax - b$ = ... [ ]

22. If the product of zeroes is '0' of the polynomial $ax^2 + bx + c$, then the value of c is ..... [ ]

23. Product of the zeroes of the polynomial $2x^2 - 3x + 6$ is ..... [ ]

24. Sum of the zeroes of the polynomial $bx^2 + ax + c$ = ... [ ]

25. α, β, γ are the zeroes of the polynomial $x^3 + 3x^2 - x + 2$, then $\alpha\beta\gamma$ is ..... [ ]

(A) 0

(B) -2

(C) $\frac{b}{a}$

(D) $\frac{a}{b}$

(E) 2

(F) $-\frac{a}{b}$

(G) $-\frac{b}{a}$

(H) 3

Answer:

21 - (C)

22 - (A)

23 - (H)

24 - (F)

25 - (B)

[ii]

(ii)	Group - A		Group - B
26.	Distance between X-axis and (– 4, 3) is	[ ]	(I) $\sqrt{5}$
			(J) (1, 1)
27.	Distance between origin and (2, 3) is	[ ]	(K) 3
28.	Distance between Y-axis and (4, 0) is	[ ]	(L) 2
			(M) 4
29.	Mid point of line joining the points (2, 3) and (–2, 3) = ...	[ ]	(N) $\sqrt{13}$
30.	Centroid of a triangle, whose vertices are (0, 3); (3, 0); (0, 0) is	[ ]	(O) (0, 0)
			(P) (0, 3)

26 - (K)
27 - (N)
28 - (M)
29 - (P)
30 - (J)