Sample Question Paper - 1
Class- X Session- 2021-22 TERM 1
Subject- Mathematics (Basic)

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 40**

General Instructions:

1. The question paper contains three parts A, B and C.
2. Section A consists of 20 questions of 1 mark each. Attempt any 16 questions.
3. Section B consists of 20 questions of 1 mark each. Attempt any 16 questions.
4. Section C consists of 10 questions based on two Case Studies. Attempt any 8 questions.
5. There is no negative marking.

Section A

Attempt any 16 questions

1. The product of a non-zero rational and an irrational number is **[1]**

a) always irrational
b) always rational
c) one
d) rational or irrational

2. The value of k for which the system of equations **[1]**
x + 2y - 3 = 0 and
5x + ky + 7 = 0
has no solution, is

a) 1
b) 10
c) 6
d) 3

3. If α and β are the zeroes of the polynomial $3x^2 + 11x - 4$, then the value of $\frac{1}{\alpha}+\frac{1}{\beta}$ is **[1]**

a) $\frac{13}{4}$
b) $\frac{12}{4}$
c) $\frac{11}{4}$
d) $\frac{15}{4}$

4. If the system 6x – 2y = 3, kx – y = 2 has a unique solution, then **[1]**

a) k = 3
b) $k \neq 4$
c) $k \neq 3$
d) k = 4

5. $5 \cot^2 A - 5 \operatorname{cosec}^2 A =$ **[1]**

a) 0
b) 5
c) 1
d) -5

6. If $9^{x+2} = 240 + 9^x$, then the value of x is **[1]**

a) 0.5
b) 0.1

c) 0.3 d) 0.2

7. Which of the following expressions is not a polynomial? **[1]**

a) $5x^3 - 3x^2 - \sqrt{x} + 2$
b) $5x^3 - 3x^2 - x + \sqrt{2}$
c) $5x^2 - \frac{2}{3}x + 2\sqrt{5}$
d) $\sqrt{5}x^3 - \frac{3}{5}x + \frac{1}{7}$

8. The distance between the points A (0, 6) and B (0, –2) is **[1]**

a) 8
b) 4
c) 6
d) 2

9. A quadratic polynomial whose zeros are $\frac{3}{5}$ and $\frac{-1}{2}$, is **[1]**

a) $10x^2 - x + 3$
b) $10x^2 + x - 3$
c) $10x^2 - x - 3$
d) $10x^2 + x + 3$

10. A polynomial of degree ________ is called a linear polynomial. **[1]**

a) 1
b) 3
c) 2
d) 0

11. A ticket is drawn from a bag containing 100 tickets numbered from 1 to 100. The probability of getting a ticket with a number divisible by 10 is **[1]**

a) $\frac{3}{10}$
b) $\frac{1}{10}$
c) $\frac{4}{10}$
d) $\frac{1}{5}$

12. For every positive integer n, $n^2 - n$ is divisible by **[1]**

a) 6
b) 4
c) 2
d) 8

13. If P(-1, 1) is the midpoint of the line segment joining A(-3, b) and B(1, b + 4) then b = ? **[1]**

a) 0
b) 2
c) 1
d) -1

14. The coordinates of the point P dividing the line segment joining the points A (1, 3) and B(4, 6) in the ratio 2: 1 are **[1]**

a) (2, 4)
b) (3, 5)
c) (4, 2)
d) (5, 3)

15. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of ‘k’ is **[1]**

a) – 10
b) – 5
c) 10
d) 5

16. If $\cos\theta = \frac{4}{5}$ then $\tan\theta$ = ? **[1]**

a) $\frac{3}{4}$
b) $\frac{5}{3}$
c) $\frac{4}{3}$
d) $\frac{3}{5}$

17. If x = α and y = β is the solution of the equations x - y = 2 and x + y = 4, then **[1]**

a) α = 1 and β = 3
b) α = 3 and β = -1
c) α = 3 and β = 1
d) α = -3 and β = 1

18. In a family of 3 children, the probability of having at least one boy is **[1]**

a) $\frac{1}{8}$
b) $\frac{7}{8}$
c) $\frac{3}{4}$
d) $\frac{5}{8}$

19. The HCF of 135 and 225 is: **[1]**

a) 5
b) 15
c) 45
d) 75

20. The points A(9, 0), B(9, 6), C(-9, 6) and D(-9, 0) are the vertices of a **[1]**

a) rhombus
b) trapezium
c) rectangle
d) square

Section B

Attempt any 16 questions

21. Ritu can row downstream 20 km in 2 hours and upstream 4 km in 2 hours. The speed of the current is **[1]**

a) 12 km/hr
b) 6 km/hr
c) 4 km/hr
d) 8 km/hr

22. If the sum of the zeros of the quadratic polynomial for $kx^2 + 2x + 3k$ is equal to the product of its zeros then k = ? **[1]**

a) $\frac{1}{3}$
b) $\frac{2}{3}$
c) $\frac{-2}{3}$
d) $\frac{-1}{3}$

23. The decimal expansion of $\frac{23}{2^5 \times 5^2}$ will terminate after how many places of decimal? **[1]**

a) 1
b) 5
c) 2
d) 4

24. $(\cos 0^o + \sin 30^o + \sin 45^o)(\sin 90^o + \cos 60^o - \cos 45^o)$ = ? **[1]**

a) $\frac{5}{8}$
b) $\frac{7}{4}$
c) $\frac{5}{6}$
d) $\frac{3}{5}$

25. If $\frac{2}{x} + \frac{3}{y} = 6$ and $\frac{1}{x} + \frac{1}{2y} = 2$ then **[1]**

a) $x = \frac{2}{3}, y = 1$
b) $x = \frac{3}{2}, y = 1$
c) $x = 1, y = \frac{2}{3}$
d) $x = 1, y = \frac{3}{2}$

26. The number of zeroes of a cubic polynomial is **[1]**

a) 3
b) 2
c) 4
d) 1

27. $\triangle$ABC $\sim$ $\triangle$PQR. If PQ = 3 cm, QR = 2 cm and RP = 2.5 cm, BC = 4 cm, then perimeter of $\triangle$ABC is **[1]**

a) 20 cm. b) 12 cm.

c) 15 cm. d) 18 cm.

28. The abscissa of any point on the y – axis is **[1]**

a) 0 b) 1

c) y d) – 1

29. If θ is an acute angle such that $\sec^2\theta = 3$, then the value of $\frac{\tan^2\theta - cosec^2\theta}{\tan^2\theta + cosec^2\theta}$ is **[1]**

a) $\frac{1}{7}$ b) $\frac{3}{7}$

c) $\frac{2}{7}$ d) $\frac{4}{7}$

30. The solution of 217x + 131y = 913 and 131x + 217y = 827 is **[1]**

a) x = 2 and y =2 b) x = 2 and y = 3

c) x = 3 and y = 2 d) x = 3 and y = 3

31. The decimal expansion of the number $\frac{14753}{1250}$ will terminate after. **[1]**

a) one decimal place b) three decimal place

c) two decimal place d) four decimal place

32. If the diagonals of a quadrilateral divide each other proportionally then it is a **[1]**

a) square b) rectangle

c) trapezium d) parallelogram

33. $\sin^2A + \sin^2A\tan^2A =$ **[1]**

a) $\tan^2A$ b) $\cos^2A$

c) None of these d) $\sin^2A$

34. If A (-1, 0), B(5, -2) and C(8, 2) are the vertices of a $\triangle$ABC then its centroid is **[1]**

a) (6, 0) b) (0, 6)

c) (4, 0) d) (12, 0)

35. If an event cannot occur then its probability is **[1]**

a) $\frac{3}{4}$ b) $\frac{1}{2}$

c) 0 d) 1

36. The area of the triangle formed by the lines **[1]**
2x + 3y = 12 , x - y = 1 and x = 0 is

a) 6.5 sq. units b) 7 sq. units

c) 7.5 sq. units d) 6 sq. units

37. The sum of the exponents of the prime factors in the prime factorisation of 196, is **[1]**

a) 2 b) 1

c) 4 d) 6

38. If $\sqrt{3}\tan 2\theta - 3 = 0$ then θ = ? **[1]**

a) 30^o

b) 60^o

c) 15^o

d) 45^o

39. The probability that a non leap year selected at random will have 53 Sundays is **[1]**

a) $\frac{1}{7}$

b) $\frac{2}{7}$

c) $\frac{4}{7}$

d) $\frac{3}{7}$

40. If the points (6, 1), (8, 2), (9, 4) and (p, 3), taken in order are the vertices of a parallelogram, then the value of ‘p’ is **[1]**

a) 5

b) – 7

c) 6

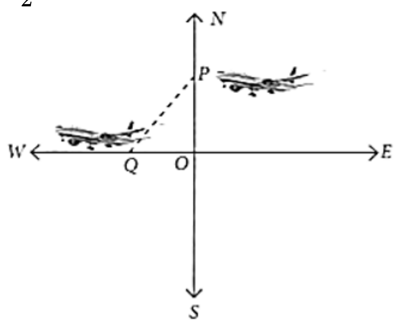
d) 7

Section C

Attempt any 8 questions

Question No. 41 to 45 are based on the given text. Read the text carefully and answer the questions:

An aeroplane leaves an airport and flies due north at a speed of 1200 km /hr. At the same time, another aeroplane leaves the same station and flies due west at the speed of 1500 km/hr as shown below. After $1\frac{1}{2}$ hr both the aeroplanes reaches at point P and Q respectively.



41. Distance travelled by aeroplane towards north after $1\frac{1}{2}$ hr is **[1]**

a) 1350 km

b) 1400 km

c) 1500 km

d) 1800 km

42. Distance travelled by aeroplane towards west after $1\frac{1}{2}$hr is **[1]**

a) 1800 km

b) 1600 km

c) 2400 km

d) 2250 km

43. In the given figure, $\angle$POQ is **[1]**

a) 80^o

b) 70°

c) 90°

d) 100^o

44. Distance between aeroplanes after $1\frac{1}{2}$ hr, is **[1]**

a) $350\sqrt{31}$ km

b) $472\sqrt{41}$ km

c) $125\sqrt{12}$ km

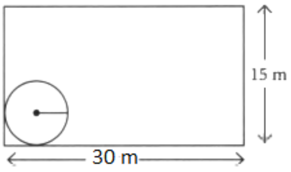
d) $450\sqrt{41}$ km

45. Area of $\triangle$POQ is **[1]**

a) $179000\ km^2$
b) $185000\ km^2$
c) $186000\ km^2$
d) $2025000\ km^2$

Question No. 46 to 50 are based on the given text. Read the text carefully and answer the questions:

A farmer has a rectangular field of length 30 m and breadth 15 m. By the farmer a pit of diameter 7 m is dug 12 m deep for rain water harvesting. The earth taken out is spread in the field.



46. Find the volume of the earth taken out. **[1]**

a) $465\ m^3$
b) $468\ m^3$
c) $462\ m^3$
d) $460\ m^3$

47. The area of the rectangular field is **[1]**

a) $450\ m^2$
b) $440\ m^2$
c) $420\ m^2$
d) $430\ m^2$

48. Find the area of the top of the pit **[1]**

a) $41.5\ m^2$
b) None of these
c) $38.5\ m^2$
d) $40.5\ m^2$

49. The area of the remaining field is **[1]**

a) $405\ m^2$
b) $410\ m^2$
c) $411.5\ m^2$
d) $402.3\ m^2$

50. Find the level rise in the field. **[1]**

a) 0.5 m
b) 2.12 m
c) 1.12 m
d) 3 m

Solution

Section A

1. **(a)** always irrational

   Explanation: The product of a non-zero rational and an irrational number is always irrational. For example, $\sqrt{3} \times 2 = 2\sqrt{3}$

   This is an irrational number.

2. **(b)** 10

   Explanation: The given system of equations are

   x + 2y - 3 = 0

   5x + ky + 7 = 0

   For the equations to have no solutions, we must have

   $\frac{1}{5} = \frac{2}{k} \neq \frac{-3}{7}$

   Taking, $\frac{1}{5} = \frac{2}{k}$

   $\Rightarrow$ k = 10

   Therefore the value of k is10.

3. **(c)** $\frac{11}{4}$

   Explanation: Here a = 3,b = 11,c = - 4 Since $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta}$

   $\alpha + \beta = \frac{-11}{3}, \alpha\beta = \frac{-4}{3}$

   So, $\frac{\frac{-11}{3}}{\frac{-4}{3}} = \frac{11}{4}$

4. **(c)** $k \neq 3$

   Explanation: If the system has a unique solution, then $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

   Here $a_1 = 6, a_2 = k, b_1 = -2$

   and $b_2 = -1$

   $\therefore \frac{6}{k} \neq \frac{-2}{-1} \Rightarrow 3k \neq 6 \Rightarrow k \neq 3$

   2k ≠ 6

   k ≠ 3

5. **(d)** -5

   Explanation: Given: $5\cot^2A - 5\ \text{cosec}^2A$

   $= 5(\cot^2A - \text{cosec}^2A)$

   $= 5 \times -1 = -5$

   $[\because \text{cosec}^2\theta - \cot^2\theta = 1]$

6. **(a)** 0.5

   Explanation: $9^{x+2} = 240 + 9^x$

   $\Rightarrow 9^x \times 9^2 = 240 + 9^x$

   $\Rightarrow 9^x (81 - 1) = 240$

   $\Rightarrow 9^x = 3$

   $\Rightarrow 9^x = 9^{1/2}$

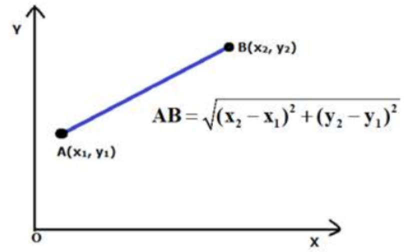
   $\Rightarrow x = \frac{1}{2} = 0.5$

7. **(a)** $5x^3 - 3x^2 - \sqrt{x} + 2$

   Explanation: $5x^3 - 3x^2 - \sqrt{x} + 2$ is not a polynomial because each term of a polynomial should be a product of a constant and one or more variable raised to a positive, zero or integral power. Here $\sqrt{x}$ does not satisfy the condition of being a polynomial.

8. **(a)** 8

Explanation: By using the distance formula:



$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

Lets calculate the distance between the points (x_1, y_1) and (x_2, y_2)

We have;

$x_1 = 0, x_2 = 0$

$y_1 = 6, y_2 = -2$

$d^2 = (0 - 0)^2 + (-2 - 6)^2$

d = $\sqrt{(0)^2 + (-8)^2}$

d = $\sqrt{64}$

d = 8 units

So, the distance between A (0, 6) and B (0, - 2) = 8

9. **(c)** $10x^2 - x - 3$

Explanation: $\alpha + \beta = \left(\frac{3}{5} - \frac{1}{2}\right) = \frac{1}{10}, \alpha\beta = \frac{3}{5} \times \left(\frac{-1}{2}\right) = \frac{-3}{10}$

Required olynomial is $x^2 - \frac{1}{10}x - \frac{3}{10}$, i.e., $10x^2 - x - 3$

10. **(a)** 1

Explanation: A polynomial of degree 1 is called a linear polynomial. Example 4x + 3, 65y are linear polynomials.

11. **(b)** $\frac{1}{10}$

Explanation: Number of possible outcomes = {10, 20, 30, 40, 50, 60, 70, 80, 90, 100} = 10

Number of Total outcomes = 100

∴ Required Probability = $\frac{10}{100} = \frac{1}{10}$

12. **(c)** 2

Explanation: $n^2 - n = n(n - 1)$. Since n and (n - 1) are consecutive integers. Therefore, one of them must be divisible by 2.

13. **(d)** -1

Explanation: we have $\frac{b+(b+4)}{2} = 1 \Rightarrow 2b + 4 = 2 \Rightarrow 2b = -2 \Rightarrow b = -1$

14. **(b)** (3, 5)

Explanation: Point P divides the line segment joining the points A(1, 3) and B(4, 6) in the ratio 2: 1

Let coordinates of P be (x, y), then

$x = \frac{m_1x_2+m_2x_1}{m_1+m_2} = \frac{2\times4+1\times1}{2+1} = \frac{8+1}{3} = \frac{9}{3} = 3$

$y = \frac{m_1y_2+m_2y_1}{m_1+m_2} = \frac{2\times6+1\times3}{2+1} = \frac{12+3}{3} = \frac{15}{3} = 5$

∴ Coordinates of P are (3, 5)

15. **(a)** – 10

Explanation: Given Polynomial is $p(x) = x^2 + 3x + k$

According to question, $p(x) = 0$ (Put x = 2)

p(2) = 0

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

$\Rightarrow 4 + 6 + k = 0$

$\Rightarrow k = -10$

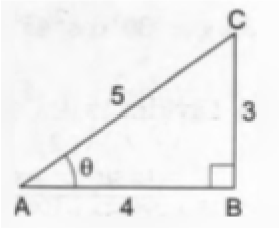
16. **(a)** $\frac{3}{4}$

Explanation: $\cos\theta = \frac{4}{5} = \frac{AB}{AC}$

$\therefore \quad BC^2 = AC^2 - AB^2 = 25 - 16 = 9$

$\Rightarrow$ BC = 3

$\therefore \tan\theta = \frac{BC}{AB} = \frac{3}{4}$



17. **(c)** α = 3 and β = 1

Explanation: Given: x - y = 2 ... (i) ... (i)

And x + y = 4 ... (ii)

Adding eq. (i) and (ii) for the elimination of y, we get

2x = 6

$\Rightarrow$ x = 3

Putting the value of x in eq. (i), we get

3 - y = 2

$\Rightarrow$ y = 1

$\therefore$ x = α = 3 and y = β = 1

18. **(b)** $\frac{7}{8}$

Explanation: All possible outcomes are BBB, BBG, BGB, GBB, BGG, GBG, GGB, GGG.

Number of all possible outcomes = 8.

Let E be the event of having at least one boy.

Then, E contains GGB, GBG, BGG, BBG, BGB, GBB, BBB.

Number of cases favourable to E = 7.

Therefore,required probability = P(E) = $\frac{7}{8}$

19. **(c)** 45

Explanation: We have,

135 = 3 $\times$ 45

= 3 $\times$ 3 $\times$ 15

= 3 $\times$ 3 $\times$ 3 $\times$ 5

= $3^3 \times 5$

Now, for 225 will be

225 = 3 $\times$ 75

= 3 $\times$ 3 $\times$ 5$\times$5

= $3^2 \times 5^2$

The HCF will be $3^2 \times 5$ = 45

20. **(c)** rectangle

Explanation: A (9, 0), B(9, 6), C(- 9, 6) and D(- 9, 0) are the given vertices.

Then,

$AB^2 = (9 - 9)^2 + (6 - 0)^2$

$= (0)^2 + (6)^2 = 0 + 36 = 36$ units

$BC^2 = (-9 - 9)^2 + (6 - 6)^2$

$= (-18)^2 + (0)^2 = 324 + 0 = 324$ units

$CD^2 = (-9 + 9)^2 + (0 - 6)^2 = (0)^2 + (-6)^2 = 0 + 3 = 36$ units

$DA^2 = (-9 - 9)^2 + (0 - 0)^2 = (-18)^2 + (0)^2 = 324 + 0 = 324$ units

Therefore, we have:

$AB^2 = CD^2$ and $BC^2 = DA^2$

Now, the diagonals are:

$AC^2 = (-9-9)^2 + (6-0)^2 = (-18)^2 + (6)^2 = 324 + 36 = 360$ units

$BD^2 = (-9-9)^2 + (0-6)^2 = (-18)^2 + (-6)^2 = 324 + 36 = 360$ units

Therefore,

$AC^2 = BD^2$

Hence, *ABCD* is a rectangle.

Section B

21. **(c)** 4 km/hr

Explanation: Let speed of boat = x km/h

speed of current = y km/h

$\therefore$ Downstream speed = (x + y) km/h

and Upstream speed = (x - y) km/h

$\because$ Speed = $\frac{\text{Distance}}{\text{Time}}$

$\therefore$ Time = $\frac{\text{Distance}}{\text{Speed}}$

According to question,

In downstream, $\frac{20}{x+y} = 2$

$\Rightarrow$ x + y =10 ... (i)

And In upstream, $\frac{4}{x-y} = 2$

$\Rightarrow$ x - y = 2 ... (ii)

Subtracting eq. (ii) from (i),

we get 2y = 8

$\Rightarrow$ y = 4

Therefore, the speed of the current is 4 km/h.

22. **(c)** $\frac{-2}{3}$

Explanation: $\alpha + \beta = \alpha\beta \Rightarrow \frac{-2}{k} = \frac{3k}{k} \Rightarrow \frac{-2}{k} = 3 \Rightarrow k = \frac{-2}{3}$

23. **(b)** 5

Explanation: We have,

$\frac{23}{2^5 \times 5^2} = \frac{23 \times 5^3}{2^5 \times 5^2 \times 5^3}$

$= \frac{2875}{10000}$

= 0.02875

$\therefore$ the given number will be terminate after 5 digits.

24. **(b)** $\frac{7}{4}$

Explanation: $(\cos 0^o + \sin 30^o + \sin 45^o)(\sin 90^o + \cos 60^o - \cos 45^o) = ?$

$= \left(1 + \frac{1}{2} + \frac{1}{\sqrt{2}}\right)\left(1 + \frac{1}{2} - \frac{1}{\sqrt{2}}\right) = \left(\frac{3}{2} + \frac{1}{\sqrt{2}}\right)\left(\frac{3}{2} - \frac{1}{\sqrt{2}}\right) = \left(\frac{9}{4} - \frac{1}{2}\right) = \frac{7}{4}$

25. **(a)** $x = \frac{2}{3}, y = 1$

Explanation: Put $\frac{1}{x} = u$ and $\frac{1}{y} = v$. Then, 2u + 3v = 6 .....(i)

and u + $\frac{1}{2}$v = 2 $\Rightarrow$ 2u + v = 4 .....(ii)

Solve (i) an (ii) we get

$x = \frac{2}{3}, y = 1$

26. **(a)** 3

Explanation: The number of zeroes of a cubic polynomial is at most 3 because the highest power of the variable in cubic polynomial is 3, i.e. $ax^3 + bx^2 + cx + d$

27. **(c)** 15 cm.

Explanation: Given: $\Delta ABC \sim \Delta PQR$

$\therefore \frac{\text{Perimeter of } \Delta\text{ABC}}{\text{Perimeter of } \Delta\text{PQR}} = \frac{\text{BC}}{\text{QR}}$

$\Rightarrow \frac{\text{Perimeter of }\Delta ABC}{3+2+2.5} = \frac{4}{2}$

$\Rightarrow$ Perimeter of $\triangle$ABC = 15 cm

28. **(a)** 0

Explanation: Since coordinates of any point on $y-$axis is $(0, y)$.
Therefore, abscissa is 0.

29. **(a)** $\frac{1}{7}$

Explanation: Given, $\sec^2\theta = 3 \Rightarrow \sec\theta = \frac{\sqrt{3}}{1} = \frac{\text{Hypotenuse}}{\text{Base}}$

By Pythagoras Theorem,

(Hypotenuse)^2 = (Base)^2 + (Perpendicular)^2

$(\sqrt{3})^2$ = (1)^2 + (Perp.)^2

$\Rightarrow$ 3 = 1 + (Perp.)^2 $\Rightarrow$ (Perp.)^2 = 3 - 1 = 2

$\therefore$ Perpendicular = $\sqrt{2}$

$\therefore \tan\theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{\sqrt{2}}{1} = \sqrt{2}$

$\operatorname{cosec}\theta = \frac{\text{Hypotenuse}}{\text{Perpendicular}} = \frac{\sqrt{3}}{\sqrt{2}} = \sqrt{\frac{3}{2}}$

Now, $\frac{\tan^2\theta - \csc^2\theta}{\tan^2\theta + \csc^2\theta}$

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

$= \frac{\frac{1}{2}}{\frac{7}{2}} = \frac{1}{2} \times \frac{2}{7} = \frac{1}{7}$

30. **(c)** x = 3 and y = 2

Explanation: Firstly add up both eq.

217x + 131y = 913,

131x + 217y = 827,

348x + 348y = 1740

Dividing both side by 348

We get x + y = 5 ... (i)

Similarly Subtract given eqn 217x + 131y = 913 - (131x + 217y = 827)

86x - 86y = 86

Dividing both side by 86

We get x - y = 1 ... (ii)equation

Now, solve equation (i) and (ii)

x + y = 5

x - y = 1

2x = 6

$\Rightarrow$ x = 3

Put x = 3 in equation (i)

x + y = 5

3 + y = 5

y = 5 - 3

$\Rightarrow$ y = 2

Hence, x = 3 y = 2

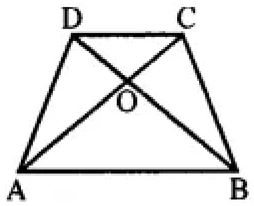
31. **(d)** four decimal place

Explanation: $\frac{14753}{1250} = \frac{14753}{5^4 \times 2} = \frac{14753 \times 2^3}{5^4 \times 2^4} = \frac{118024}{10000} = 11.8024$

So, the decimal expansion of the number will terminate after four decimal places.

32. **(c)** trapezium

Explanation: Diagonals of a quadrilateral divide each other proportionally, then it is



In quadrilateral ABCD, diagonals AC and BD intersect each-other at O and $\frac{AO}{OC} = \frac{BO}{OD}$
Then, quadrilateral ABCD is a trapezium.

33. **(a)** $\tan^2 A$

Explanation: Given: $\sin^2 A + \sin^2 A \tan^2 A$

$= \sin^2 A(1 + \tan^2 A)$

$= \sin^2 A(\sec^2 A)$

$= \sin^2 A \times \frac{1}{\cos^2 A}$

$= \frac{\sin^2 A}{\cos^2 A}$

$= \tan^2 A$

34. **(c)** (4, 0)

Explanation: Centroid is G $\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right) = G\left(\frac{-1+5+8}{3}, \frac{0-2+2}{3}\right) = (4,0)$

35. **(c)** 0

Explanation: The event which cannot occur is said to be impossible event and probability of impossible event is zero.

36. **(c)** 7.5 sq. units

Explanation:

Graph of the equation 2x + 3y - 12 = 0

We have

2x + 3y = 12

2x = 12 - 3y

$x = \frac{12-3y}{2}$

Putting y = 4

We get $x = \frac{12-3\times4}{2} = 0$

Putting y = 2,

We get $x = \frac{12-3\times2}{2} = 3$

Thus, we have the following table for the points:

x	0	3
y	4	2

Plotting point A(0, 4), B(3, 2) on the graph paper and drawing a line passing through them we obtain a graph of the equation.

Graph of the equation x - y - 1

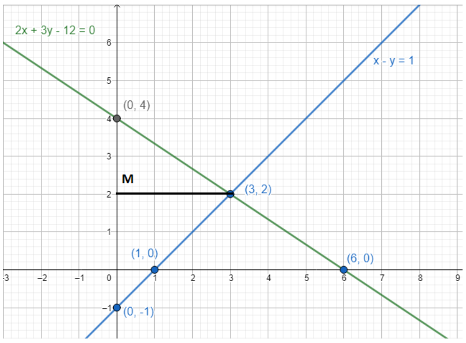
We have x - y = 1

x = 1 + y

Thus, we have the following table for the points for the line x - y = 1

x	1	0
y	0	-1

Plotting point C(1, 0) and D(0, -1) on the same graph paper drawing a line passing through them, we obtain the graph of the line represented by the equation x - y = 1



Clearly two lines intersect at A(3, 2).

The graph of line 2x + 3y = 12 intersect with y-axis at B(0, 4) and the graph of the line x - y = 1 intersect with y-axis at C(0, -1)

So, the vertices of the triangle formed by the two straight lines and y-axis are A(3, 2) and B(0, 4) and C(0, -1)

Now,

Area of $\Delta ABC = \frac{1}{2}$[Base $\times$ Height]

$= \frac{1}{2}(BC \times AB)$

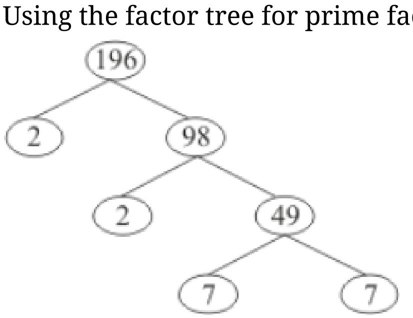
$= \frac{1}{2}(5 \times 3)$

$= \frac{15}{2} sq.units = 7.5 sq.units$

37. **(c)** 4

Explanation:

Using the factor tree for prime factorisation, we have:



Therefore,

$196 = 2 \times 2 \times 7 \times 7$

$196 = 2^2 \times 7^2$

The exponents of 2 and 7 are 2 and 2 respectively.

Thus the sum of the exponents is 4.

38. **(a)** 30^o

Explanation: $\sqrt{3}\tan 2\theta - 3 = 0$

$\Rightarrow \sqrt{3}\tan 2\theta = 3$

$\Rightarrow \tan 2\theta = \frac{3}{\sqrt{3}}$

$\Rightarrow \tan 2\theta = \sqrt{3}$

$\Rightarrow \tan 2\theta = \tan 60^\circ$

$\Rightarrow 2\theta = 60^\circ$

$\Rightarrow \theta = 30^\circ$

39. **(a)** $\frac{1}{7}$

Explanation: Non-leap year contains 365 days = 364 days + 1 day= (364/7) weeks + 1 day = 52 weeks + 1 remaining day = 52 Sundays + 1 remaining day

We will have 53 Sundays if 1 remaining day is a Sunday.

Possible outcomes = {(Monday) , (Tuesday) , (Wednesday) , (Thursday) , (Friday) , (Saturday) , (Sunday)**}**

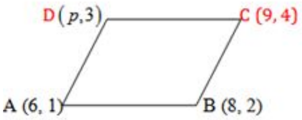
Number of Total outcomes = 7

Number of possible outcomes = 1

$\therefore$ Required Probability = $\frac{Possible\ outcomes}{Total\ outcomes} = \frac{1}{7}$

40. **(d)** 7

Explanation: In parallelogram, AB = CD, squaring both sides



$\Rightarrow AB^2 = CD^2$
$\Rightarrow (8-6)^2 + (2-1)^2 = (p-9)^2 + (3-4)^2$
$\Rightarrow 4 + 1 = p^2 + 81 - 18p + 1$
$\Rightarrow p^2 - 18p + 77 = 0$
$\Rightarrow (p-7)(p-11) = 0$
$\Rightarrow p = 7$ and $p = 11$

Section C

41. **(d)** 1800 km

Explanation: Speed = 1200 km/hr

Time = $1\frac{1}{2}\text{hr} = \frac{3}{2}\text{hr}$

$\therefore$ Required distance = Speed $\times$ Time

= $1200 \times \frac{3}{2}$ = 1800 km

42. **(d)** 2250 km

Explanation: Speed = 1500 km/hr

Time = $\frac{3}{2}$ hr

$\therefore$ Required distance = Speed $\times$ Time

= $1500 \times \frac{3}{2}$ = 2250 km

43. **(c)** 90°

Explanation: Clearly, directions are always perpendicular to each other.

$\therefore \angle POQ = 90^o$

44. **(d)** $450\sqrt{41}$ km

Explanation: Distance between aeroplanes after $1\frac{1}{2}$ hour

= $\sqrt{(1800)^2 + (2250)^2} = \sqrt{3240000 + 5062500}$

= $\sqrt{8302500} = 450\sqrt{41}$ km

45. **(d)** 2025000 km^2

Explanation: Area of $\triangle POQ = \frac{1}{2} \times$ base $\times$ height

= $\frac{1}{2} \times 2250 \times 1800$ = 2250×900 = 2025000 km^2

46. **(c)** 462 m^3

Explanation: Volume of the earth taken out

= $\pi\left(\frac{7}{2}\right)^2 \times 12$ = $\frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12$ = 462 m^3

47. **(a)** 450 m^2

Explanation: Area of the rectangular field

= 30×15 = 450 m^2

48. **(c)** 38.5 m^2

Explanation: Area of top of the pit = $\pi\left(\frac{7}{2}\right)^2 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$

= $\frac{77}{2}$ = 38.5 m^2

49. **(c)** 411.5 m^2

Explanation: Area of the remaining field = Area of rectangular field - area of top of pit

= 450 - 38.5 = 411.5 m^2

50. **(c)** 1.12 m

Explanation: The rise in the level of field = $\frac{462}{411.5}$ = 1.12 m