Sample Question Paper - 3
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 decimal expansion of $\frac{987}{10500}$ will terminate after: **[1]**

   a) 2 decimal places b) 3 decimal places

   c) 1 decimal place d) None of these

2. A fraction becomes $\frac{9}{11}$, if 2 is added to both the numerator and denominator. If 3 is added to both the numerator and denominator it becomes $\frac{5}{6}$, then the fraction is **[1]**

   a) $\frac{9}{7}$ b) $\frac{-9}{7}$

   c) $\frac{7}{9}$ d) $\frac{-7}{9}$

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. A system of linear equations is said to be inconsistent if it has **[1]**

   a) one solution b) at least one solution

   c) two solutions d) no solution

5. If $\tan \theta = \sqrt{3}$, then $\sec \theta =$ **[1]**

   a) $\sqrt{\frac{3}{2}}$ b) 2

   c) $\frac{2}{\sqrt{3}}$ d) $\frac{1}{\sqrt{3}}$

6. If the LCM of a and 18 is 36 and the HCF of a and 18 is 2, then a = **[1]**

   a) 1 b) 2

   c) 4 d) 3

7. If α and β are the zeros of $2x^2 + 5x - 9$ then the value of $\alpha\beta$ is **[1]**

a) $\frac{-9}{2}$
b) $\frac{9}{2}$
c) $\frac{5}{2}$
d) $\frac{-5}{2}$

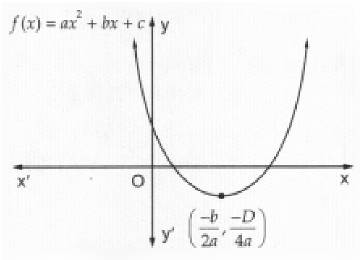
8. ABCD is a rectangle whose three vertices are B (4,0), C (4,3) and D (0,3). The length of one of its diagonals is **[1]**

a) 5
b) 3
c) 4
d) 25

9. The zeroes of the quadratic polynomial $x^2 + kx + k$, $k \neq 0$, **[1]**

a) cannot be both negative
b) cannot be both positive
c) are always equal
d) are always unequal

10. Figure show the graph of the polynomial $f(x) = ax^2 + bx + c$ for which **[1]**



a) a > 0, b < 0 and c > 0
b) a < 0, b < 0 and c < 0
c) a < 0, b > 0 and c > 0
d) a > 0, b > 0 and c < 0

11. A number is selected at random from the numbers 1 to 30. The probability that it is a prime number is **[1]**

a) $\frac{1}{6}$
b) $\frac{11}{30}$
c) $\frac{2}{3}$
d) $\frac{1}{3}$

12. If a = $(2^2 \times 3^3 \times 5^4)$ and b = $(2^3 \times 3^2 \times 5)$ then HCF (a, b) = ? **[1]**

a) 360
b) 90
c) 180
d) 540

13. If R(5, 6) is the midpoint of the line segment AB joining the points A(6, 5) and B(4, y) they y equals **[1]**

a) 7
b) 12
c) 5
d) 6

14. The area of a triangle with vertices A(5, 0), B(8, 0) and C(8, 4) in square units is **[1]**

a) 12
b) 20
c) 6
d) 16

15. The sum and product of the zeroes of the polynomial $x^2 - 6x + 8$ are respectively **[1]**

a) $\frac{-3}{2}$ and 1
b) $\frac{-3}{2}$ and -1
c) $\frac{3}{2}$ and 1
d) 6 and 8

16. If $sin\,\theta - cos\,\theta = 0$, then the value of θ is **[1]**

a) 60° b) 30°

c) 45° d) 90°

17. If a pair of linear equations in two variables is consistent, then the lines represented by two equations are **[1]**

a) parallel b) always coincident

c) intersecting d) intersecting or coincident

18. A card is selected from a deck of 52 cards. The probability of its being a red face card is **[1]**

a) $\frac{3}{13}$ b) $\frac{1}{2}$

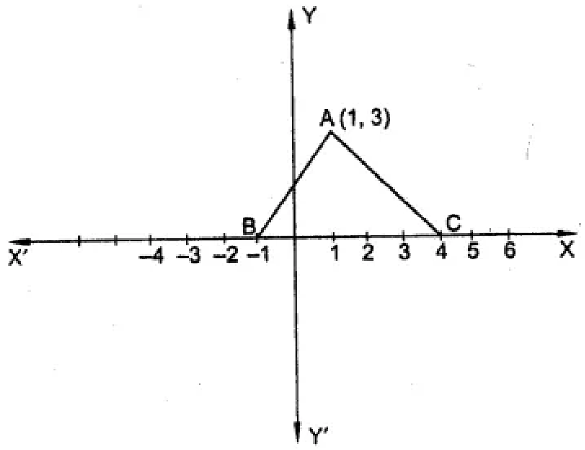
c) $\frac{2}{12}$ d) $\frac{3}{26}$

19. The number $\frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}-\sqrt{2}}$ is **[1]**

a) an irrational number b) an integer

c) not a real number d) a rational number

20. In the figure, the area of $\triangle ABC$ (in square units) is **[1]**



a) 10 b) 2.5

c) 7.5 d) 15

Section B

Attempt any 16 questions

21. The pair of equations 5x – 15y = 8 and 3x – 9y = $\frac{24}{5}$ has **[1]**

a) infinitely many solutions b) no solution

c) two solutions d) one solution

22. If f(x) = ax^2 +bx + c has no real zeros and a + b + c < 0, then **[1]**

a) c > 0 b) c < 0

c) None of these d) c = 0

23. The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is **[1]**

a) 100 b) 10

c) 504 d) 2520

24. If $\sin\theta = \frac{a}{b}$ then $\cos\theta$ = ? [1]

a) $\frac{b}{\sqrt{b^2-a^2}}$

b) $\frac{\sqrt{b^2-a^2}}{b}$

c) $\frac{b}{a}$

d) $\frac{a}{\sqrt{b^2-a^2}}$

25. The difference between two numbers is 26 and one number is three times the other. The numbers are [1]

a) 39 and 13

b) 30 and 10

c) 36 and 12

d) 36 and 10

26. If the zeroes of the quadratic polynomial $x^2 + (a + 1)x + b$ are 2 and –3, then [1]

a) a = 0, b = – 6

b) a = 5, b = –1

c) a = –7, b = –1

d) a = 2, b = – 6

27. A semicircle is drawn on AC. Two chords AB and BC of length 8 cm and 6 cm respectively are drawn in the semicircle. What will be the measure of the diameter of the circle? [1]

a) 12 cm.

b) 10 cm.

c) 14 cm.

d) 11 cm.

28. If the distance between the points (2, -2) and (-1, x) is 5, one of the values of x is [1]

a) -2

b) -1

c) 1

d) 2

29. If 2x = sec A and $\frac{2}{x}$ = tan A then $2\left(x^2 - \frac{1}{x^2}\right)$ = ? [1]

a) $\frac{1}{2}$

b) $\frac{1}{4}$

c) $\frac{1}{16}$

d) $\frac{1}{8}$

30. Half the perimeter of a rectangular garden, whose length is 4m more than its width is 36m. The area of the garden is [1]

a) 320 m^2

b) 300 m^2

c) 400 m^2

d) 360 m^2

31. If two positive integers m and n can be expressed as $m = x^2y^5$ and $n = x^3y^2$, where x and y are prime numbers, then HCF(m, n) = [1]

a) x^2y^2

b) x^2y^3

c) x^3y^2

d) x^3y^3

32. If $\triangle$ABC and $\triangle$DEF are two triangles such that $\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} = \frac{2}{5}$, then Area ($\triangle$ABC): Area ($\triangle$DEF) = [1]

a) 2 : 5

b) 4 : 15

c) 8 : 125

d) 4 : 25

33. If 7 tan θ = 4 then $\frac{(7\sin\theta - 3\cos\theta)}{(7\sin\theta + 3\cos\theta)} = ?$ [1]

a) $\frac{3}{7}$
b) $\frac{1}{7}$
c) $\frac{5}{14}$
d) $\frac{5}{7}$

34. The mid-point of the line segment joining the points A (-2, 8) and B (- 6, - 4) is **[1]**

a) (- 4, -6)
b) (4, 2)
c) (2, 6)
d) (– 4, 2)

35. A piggy bank contains 100 fifty paise coins, 50 one rupee coins, 20 two rupee coins and 10 five rupee coins. One coin is drawn at random. The probability that the coin drawn will not be a five rupee coin is **[1]**

a) $\frac{5}{9}$
b) $\frac{7}{18}$
c) $\frac{8}{9}$
d) $\frac{17}{18}$

36. If the lines given by 3x + 2ky = 2 and 2x + 5y + 1 = 0 are parallel, then the value of k is **[1]**

a) $\frac{-5}{4}$
b) $\frac{3}{2}$
c) $\frac{15}{4}$
d) $\frac{2}{5}$

37. Which of the following is an irrational number? **[1]**

a) 3.141141114...
b) $3.\overline{1416}$
c) $\frac{22}{7}$
d) 3.1416

38. If x = a cos θ and y = b sin θ, then $b^2x^2 + a^2y^2 =$ **[1]**

a) $a^2 + b^2$
b) ab
c) a^4b^4
d) a^2b^2

39. A die is thrown once. Find the probability of getting an even number: **[1]**

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

40. The point P which divides the line segment joining the points A(2, -5) and B(5, 2) in the ratio 2 : 3 lies in the quadrant. **[1]**

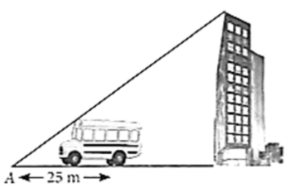
a) III
b) I
c) II
d) IV

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:

Preeti visited to her uncles house. From point A, where Artina was standing, a bus and building come in a straight line as shown in the figure.



41. Which similarity criteria can be seen in this case, if bus and building are considered in a straight line? **[1]**

a) SAS
b) SSS
c) ASA
d) AA

42. If the distance between Preeti and the bus is twice as much as the height of the bus, then the height of the bus is **[1]**

a) 15 m
b) 12.5 m
c) 40 m
d) 25 m

43. If the distance of Preeti from the building is twelve times the height of the bus, then the ratio of the heights of bus and building is **[1]**

a) 1 : 6
b) 3 : 1
c) 1 : 4
d) 2 : 3

44. What is the ratio of the distance between Preeti and top of bus to the distance between the tops of bus and building? **[1]**

a) 2 : 5
b) Can't be determined
c) 1 : 6
d) 1 : 5

45. What is the height of the building? **[1]**

a) 120 m
b) 30 m
c) 75 m
d) 50 m

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

While doing dusting a maid found a button whose upper face is of black colour, as shown in the figure. The diameter of each of the smaller identical circles is $\frac{1}{4}$ of the diameter of the larger circle whose radius is 16 cm.

46. The area of each of the smaller circle is **[1]**

a) 52.3 cm^2
b) 50.28 cm^2
c) 46.39 cm^2
d) 40.28 cm^2

47. The area of the larger circle is **[1]**

a) 855.57 cm^2
b) 804.57 cm^2
c) 704.57 cm^2
d) 990.57 cm^2

48. The area of the black colour region is **[1]**

a) 623.45 cm^2

b) 603.45 cm^2

c) 610.45 cm^2

d) 600.45 cm^2

49. The area of quadrant of a smaller circle is **[1]**

a) 12 cm^2

b) 12.57 cm^2

c) 11.57 cm^2

d) 13.68 cm^2

50. If two concentric circles are of radii 2 cm and 5 cm, then the area between them is **[1]**

a) 66 cm^2

b) 60 cm^2

c) 68 cm^2

d) 63 cm^2

Solution

Section A

1. **(b)** 3 decimal places
Explanation: $\frac{987}{10500}$ = $\frac{47}{500}$ = $\frac{47}{2^2 \times 5^3}$ Here, in the denominator of the given fraction the highest power of prime factor 5 is 3, therefore, the decimal expansion of the rational number $\frac{47}{2^2 \times 5^3}$ will terminate after 3 decimal places.
2. **(c)** $\frac{7}{9}$
Explanation: Let the fraction be $\frac{x}{y}$.
According to question
$\frac{x+2}{y+2} = \frac{9}{11}$
$\Rightarrow$ 11x + 22 = 9y + 18
$\Rightarrow$ 11x - 9y = -4 ... (i)
And $\frac{x+3}{y+3} = \frac{5}{6}$
$\Rightarrow$ 6x + 18 = 5y + 15
$\Rightarrow$ 6x - 5y = -3 ... (ii)
On solving eq. (i) and eq. (ii), we get
x = 7, y = 9
Therefore, the fraction is $\frac{7}{9}$
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. **(d)** no solution
Explanation: A system of linear equations is said to be inconsistent if it has no solution means two lines are running parallel and not cutting each other at any point.
5. **(b)** 2
Explanation: Since $\sec\theta = \sqrt{1+\tan^2\theta}$
$\therefore \sec\theta = \sqrt{1+\left(\sqrt{3}\right)^2}$
= $\sqrt{1+3} = \sqrt{4}$ = 2
6. **(c)** 4
Explanation: LCM (a, 18) = 36
HCF (a, 18) = 2
We know that the product of numbers is equal to the product of their HCF and LCM.
Therefore,
18a = 2(36)
$a = \frac{2(36)}{18}$
a = 4
7. **(a)** $\frac{-9}{2}$
Explanation: For ax^2 + bx + c, we have $\alpha\beta = \frac{c}{a}$
For $2x^2$ + 5x - 9, we have $\alpha\beta = \frac{-9}{2}$

8. **(a)** 5

Explanation: Three vertices of a rectangle ABCD are B (4,0), C (4, 3) and D (0, 3) length of one of its diagonals

$\text{BD} = \sqrt{(4-0)^2 + (0-3)^2} = \sqrt{4^2 + 3^2}$

$= \sqrt{16 + 9} = \sqrt{25}$ = 5

9. **(b)** cannot be both positive

Explanation:

Let p(x) = x^2 + kx + k, k≠0

On comparing p(x) with ax^2 + bx + c, we get

$a = 1, b = k \text{ and } c = k$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ [by quadratic formula]

$= \frac{-k \pm \sqrt{k^2 - 4k}}{2 \times 1}$

$= \frac{-k \pm \sqrt{k(k-4)}}{2}, k \neq 0$

Here, we see that k(k − 4)> 0

$\Rightarrow k \in (-\infty, 0) \cup (4, \infty)$

In quadratic polynomial ax^2 + bx + c

If a > 0, b> 0, c> 0 or a< 0, b< 0,c< 0, then the polynomial has always all negative zeroes.

and if a > 0, c < 0 or a < 0, c > 0, then the polynomial has always zeroes of opposite sign.

Case I: If $\text{k} \in (-\infty, 0)$ i.e., $\text{k} < 0$

$\Rightarrow a = 1 > 0, \quad b, c = k < 0$

So, both zeroes are of opposite sign.

Case II: If $\text{k} \in (4, \infty)$ i.e., $\text{k} \geq 4$

$\Rightarrow a = 1 > 0, b, c > 4$

So, both zeroes are negative.

Hence, in any case zeroes of the given quadratic polynomial cannot both be positive.

10. **(a)** a > 0, b < 0 and c > 0

Explanation: Clearly, $f(x) = ax^2 + bx + c$ represent a parabola opening upwards.

Therefore, $a > 0$

The vertex of the parabola is in the fourth quadrant, therefore b < 0

$y = ax^2 + bx + c$ cuts Y axis at P which lies on OY.

Putting x = 0 in $y = ax^2 + bx + c$, we get y = c.

So the coordinates of P is (0, c).

Clearly, P lies on OY. ⇒ c>0

Hence, a>0, b<0 and c>0

11. **(d)** $\frac{1}{3}$

Explanation: Total outcomes of selecting a number from 30 numbers = 30

Favourable numbers (prime numbers) = 10,

i.e., (2, 3, 5, 7, 11, 13, 17, 19, 23, 29)

∴ Probability of selecting a prime number $= \frac{10}{30} = \frac{1}{3}$

12. **(c)** 180

Explanation: It is given that: a = $(2^2 \times 3^3 \times 5^4)$ and b = $(2^3 \times 3^2 \times 5)$

∴ HCF (a, b) = Product of smallest power of each common prime factor in the numbers = $2^2 \times 3^2 \times 5$ = 180

13. **(a)** 7

Explanation: Given that R is the mid- point of the line segment AB.

Th y-coordinate of R = $\frac{5+y}{2}$

⇒ y = 7

14. **(c)** 6

Explanation: The given points are A(5,0), B(8, 0) and C(8, 4)

∴(x_1 = 5, y_1 = 0), (x_2 = 8, y_2 = 0) and (x_3 = 8, y_3 = 4)

The area of the triangle

$= \frac{1}{2}|x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)|$
$= \frac{1}{2}\lceil(0-4)+8(4-0)+8(0)$
$= \frac{1}{2}|-20+32+9|$
$= \frac{1}{2}\times 12$
= 6 sq. units

15. **(d)** 6 and 8
Explanation: Sum of the zeroes of the polynomial = $\frac{-b}{a}$ = $\frac{6}{1}$ = 6
And Product of the zeroes of the polynomial = $\frac{c}{a}$ = $\frac{8}{1}$ = 8

16. **(c)** 45°
Explanation: Given: $\sin\theta-\cos\theta=0$
$\Rightarrow\sin\theta=\cos\theta$
$\Rightarrow\sin\theta=\sin(90^\circ-\theta)$
$\Rightarrow\theta=90^\circ-\theta$
$\Rightarrow 2\theta=90^\circ$
$\Rightarrow\theta=45^\circ$

17. **(d)** intersecting or coincident
Explanation: If a pair of linear equations in two variables is consistent, then its solution exists.
$\therefore$ The lines represented by the equations are either intersecting or coincident.

18. **(d)** $\frac{3}{26}$
Explanation: In a deck of 52 cards, there are 12 face cards i.e. 6 red (3 hearts and 3 diamonds) and 6 black cards (3 spade and 3 clubs)
So, probability of getting a red face card = 6/52 = 3/26

19. **(a)** an irrational number
Explanation: $\frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}-\sqrt{2}}$
= $\frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}-\sqrt{2}}\times\frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}+\sqrt{2}}$
= $\frac{(\sqrt{5}+\sqrt{2})^2}{(\sqrt{5})^2-(\sqrt{2})^2}$
= $\frac{(\sqrt{5})^2+(\sqrt{2})^2+2\times\sqrt{5}\times\sqrt{2}}{5-2}$
= $\frac{5+2+2\sqrt{10}}{3}$
= $\frac{7+2\sqrt{10}}{3}$
Here $\sqrt{10}=\sqrt{2}\times\sqrt{5}$
Since $\sqrt{2}$ and $\sqrt{5}$ both are an irrational number
Therefore, $\frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}-\sqrt{2}}$ is an irrational number.

20. **(c)** 7.5
Explanation: Vertices of $\triangle ABC$ are
A(1, 3), B(-1, 0), C(4, 0)
$\therefore$ Area $= \frac{1}{2}[(x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)]$
$= \frac{1}{2}[1(0-0)+(-1)(0-3)+4(3-0)]$
$= \frac{1}{2}[0+3+12]=\frac{15}{2}=7.5$

Section B

21. **(a)** infinitely many solutions
Explanation: Given: $a_1=5, a_2=3, b_1=-15, b_2=-9, c_1=8$ and $c_2=\frac{24}{5}$ Here
$\frac{a_1}{a_2}=\frac{5}{3}, \frac{b_1}{b_2}=\frac{-15}{-9}=\frac{5}{3}, \frac{c_1}{c_2}=\frac{8}{\frac{24}{5}}=\frac{5}{3} \because \frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$
Since all have the same answer $\frac{5}{3}$.
Therefore, the pair of given linear equations has infinitely many solutions.

22. **(b)** c < 0
Explanation: We are given a+b+c < 0
$\Rightarrow \quad f(1) < 0$
So, f(x) must be negative for all x.

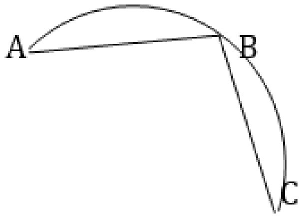
23. **(d)** 2520
Explanation: Factors of 1 to 10 numbers
1 = 1
2 = 1 $\times$ 2
3 = 1 $\times$ 3
4 = 1 $\times$ 2 $\times$ 2
5 = 1 $\times$ 5
6 = 1 $\times$ 2 $\times$ 3
7 = 1 $\times$ 7
8 = 2 $\times$ 2 $\times$ 2
9 = 1 $\times$ 3 $\times$ 3
$\Rightarrow$ LCM of number 1 to 10 = LCM (1, 2, 3, 4, 5, 6, 7, 8, 9, 10)
= 1 $\times$ 2 $\times$ 2 $\times$ 2 $\times$ 3 $\times$ 3 $\times$ 5 $\times$ 7 = 2520

24. **(b)** $\frac{\sqrt{b^2-a^2}}{b}$
Explanation: $\cos^2\theta = \left(1-\sin^2\theta\right) = \left(1-\frac{a^2}{b^2}\right) = \frac{b^2-a^2}{b^2} \Rightarrow \cos\theta = \frac{\sqrt{b^2-a^2}}{b}$

25. **(a)** 39 and 13
Explanation: Let the two numbers be x and y
According to question, x - y = 26 and x = 3y
Putting the value of x in x - y = 26, we get,
3y - y = 26
$\Rightarrow$ y = 13 And x = 3 $\times$ 13 = 39
Therefore, the two numbers are 13 and 39.

26. **(a)** a = 0, b = – 6
Explanation: Zeroes of a polynomial are the values of x at which the polynomial is equal to zero.
2 and - 3 are the zeroes of the polynomial p(x) = x^2 + (a + 1)x + b
i.e. p(2) = 0 and p(- 3) = 0
p(2) = $(2)^2$ + (a + 1)(2) + b = 0
$\Rightarrow$ 4 + 2a + 2 + b = 0
$\Rightarrow$ 6 + 2a + b = 0 .... (1)
P(-3) = $(-3)^2$ + (a + 1)(- 3) + b = 0
$\Rightarrow$ 9 - 3a - 3 + b = 0
$\Rightarrow$ 6 - 3a + b = 0 ....(2)
Equating (1) & (2), as both the equations are equal to zero.
$\therefore$ 6 + 2a + b = 6 - 3a + b
$\Rightarrow$ 5a = 0
$\Rightarrow$ a = 0
Putting the value of ‘a’ in (1)
6 + 2(0) + b = 0
$\Rightarrow$ b = - 6

27. **(b)** 10 cm.
Explanation: The diameter of circle is AC. Here $\angle$ABC is angle of semicircle.



$\therefore \angle \mathrm{ABC} = 90^\circ \therefore \Delta \mathrm{ABC}$ is a right angled triangle.

$\therefore$ By using Pythagoras theorem,

$\therefore$ AC = $\sqrt{\mathrm{AB}^2 + \mathrm{BC}^2}$ = $\sqrt{(8)^2 + (6)^2}$ C $\Rightarrow$ AC = $\sqrt{100}$ = 10 cm

28. **(d)** 2

Explanation: 2

29. **(a)** $\frac{1}{2}$

Explanation: We know that $\sec^2 A - \tan^2 A = 1$.

$\therefore (2x)^2 - \left(\frac{2}{x}\right)^2 = 1 \Rightarrow 4x^2 - \frac{4}{x^2} = 1 \Rightarrow 4\left(x^2 - \frac{1}{x^2}\right) = 1$

$\Rightarrow \left(x^2 - \frac{1}{x^2}\right) = \frac{1}{4} \Rightarrow 2\left(x^2 - \frac{1}{x^2}\right) = 2 \times \frac{1}{4} = \frac{1}{2}$

30. **(a)** 320 m^2

Explanation: Let the width be x

then length be x + 4

According to the question,

l + b = 36

x + (x + 4) = 36

2x + 4 = 36

2x = 36-4

2x = 32

x = 16.

Hence, The length of the garden will be 20 m and width will be 16 m.

Area = length $\times$ breath = 20 $\times$ 16 = 320 m^2

31. **(a)** x^2y^2

Explanation: $x^2y^5 = y^3(x^2y^2)$

$x^3y^3 = x(x^2y^2)$

Therefore HCF (m, n) is x^2y^2

32. **(d)** 4 : 25

Explanation: In $\Delta \mathrm{ABC}\ and\ \Delta \mathrm{DEF}$

$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} = \frac{2}{5}$

$\because$ The sides are proportional

$\therefore \triangle \mathrm{ABC} \sim \Delta \mathrm{DEF}$

$\therefore \frac{\text{area of } \Delta \mathrm{ABC}}{\text{area of } \Delta \mathrm{DEF}} = \frac{\mathrm{AB}^2}{\mathrm{DE}^2}$

$= \left(\frac{2}{5}\right)^2 = \frac{4}{25}$

$\therefore$ Ratio = 4: 25

33. **(b)** $\frac{1}{7}$

Explanation: Given, tan $\theta = \frac{4}{7}$

$\therefore \frac{(7 \sin \theta - 3 \cos \theta)}{(7 \sin \theta + 3 \cos \theta)} = \frac{(7 \tan \theta - 3)}{(7 \tan \theta + 3)}$ [Dividing numerator and denom. by cosθ]

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

34. **(d)** (– 4, 2)

Explanation: (x, y) = $\{\frac{(-6+(-2))}{2}, \frac{(8+(-4))}{2}\}$

= $(\frac{-8}{2}, \frac{4}{2})$

= (-4,2)

35. **(d)** $\frac{17}{18}$

Explanation: Number of total coins = 100 + 50 + 20 + 10 = 180

Number of coins except five rupee coins = 180 - 10 = 170

∴ Required Probability = $\frac{170}{180} = \frac{17}{18}$

36. **(c)** $\frac{15}{4}$

Explanation: Condition for parallel lines is

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \ldots (i)$

Given lines,

3x + 2ky - 2 = 0 and

2x + 5y - 1 = 0;

Comparing with standard form,

Here, a_1 = 3, b_1 = 2k, c_1 = - 2

and a_2 = 2, b_2 = 5, c_2 = - 1

From Eq. (i),

$\frac{3}{2} = \frac{2k}{5}$

$k = \frac{15}{4}$

37. **(a)** 3.141141114...

Explanation: 3.141141114 is an irrational number because it is a non-repeating and non-terminating decimal.

38. **(d)** a^2b^2

Explanation: x = a cos θ, y = b sin θ

bx = ab cos θ ...(i)

ay = ab sin θ ...(ii)

Squaring and adding (i) and (ii) we get,

$b^2x^2 + a^2y^2 = a^2b^2 \cos^2\theta + a^2b^2 \sin^2\theta$

= $a^2b^2 (\cos^2\theta + \sin^2\theta)$

= $a^2b^2 \times 1$

= a^2b^2

39. **(a)** $\frac{1}{2}$

Explanation: Total number of outcomes = {1, 2, 3, 4, 5, 6}

So, total outcomes = 6

Favourable outcomes in this case = {2, 4, 6}

So, number of favourable outcomes = 3

∴ P(an even number) = $\frac{Favourable\ outcomes}{Total\ outcomes}$ = $\frac{3}{6}$ = $\frac{1}{2}$

40. **(d)** IV

Explanation: The point p is given by P $\left(\frac{2\times5+3\times2}{2+3}, \frac{2\times2-3\times5}{2+3}\right) = P\left(3, \frac{-11}{5}\right)$

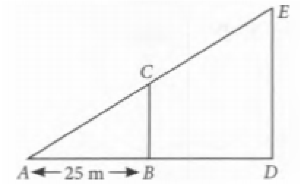
so, p lies in IV quadrant.

$(-,+)$	$(+\infty)$ if
	if $(+,-)$
$(-,-)$	

Section C

41. **(d)** AA

Explanation: Let BC represents the height of bus and DE represents the height of building.



In $\triangle$ABC and $\triangle$ADE,

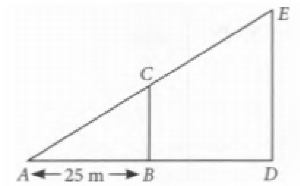
$\angle A = \angle A$ (Common)

$\angle B = \angle D$ (Corresponding angles)

$\therefore \triangle ABC \sim \triangle ADE$ (By AA similarity criteria)

42. **(b)** 12.5 m

Explanation: Let BC represents the height of bus and DE represents the height of building.



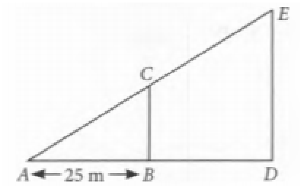
We have, AB = 2BC

$\Rightarrow$ BC = $\frac{25}{2}$ = 12.5 m

So, height of bus = 12.5 m

43. **(a)** 1 : 6

Explanation: Let BC represents the height of bus and DE represents the height of building.



We have, AD = 12 BC

$\Rightarrow$ AD = 12 $\times$ 12.5 = 150 m

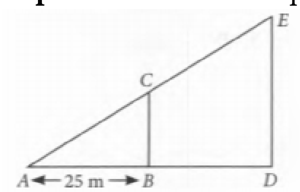
$\because \triangle ABC \sim \triangle ADE$

$\because \frac{AB}{AD} = \frac{BC}{DE} \Rightarrow \frac{BC}{DE} = \frac{25}{150} = \frac{1}{6}$

So, ratio of heights of bus and building is 1 : 6.

44. **(d)** 1 : 5

Explanation: Let BC represents the height of bus and DE represents the height of building.

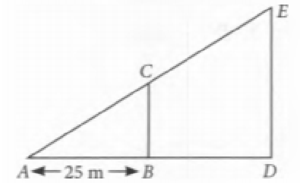


Since $\triangle ABC \sim \triangle ADE$

$\Rightarrow \frac{AB}{AD} = \frac{AC}{AE} \Rightarrow \frac{AC}{AE} = \frac{1}{6}$

$\Rightarrow \quad \frac{AC}{AE-AC} = \frac{1}{6-1} \Rightarrow \frac{AC}{EC} = \frac{1}{5}$

$\therefore$ Required ratio = 1 : 5

45. **(c)** 75 m
Explanation: Let BC represents the height of bus and DE represents the height of building.


Height of the building = DE
Now, $\frac{BC}{DE} = \frac{1}{6}$
$\Rightarrow$ DE = 6BC = 6×12.5 = 75 m

46. **(b)** 50.28 cm^2
Explanation: Let r and R be the radii of each smaller circle and larger circle respectively.
We have, d = $\frac{1}{4}$D
$\Rightarrow$ r = $\frac{1}{4}$R $\Rightarrow$ r = $\frac{1}{4} \times 16 \Rightarrow$ r = 4cm
Area of smaller circle = πr^2
= $\frac{22}{7} \times 4 \times 4$ = 50.28 cm^2

47. **(b)** 804.57 cm^2
Explanation: Let r and R be the radii of each smaller circle and larger circle respectively.
We have, d = $\frac{1}{4}$D
$\Rightarrow$ r = $\frac{1}{4}$R $\Rightarrow$ r = $\frac{1}{4} \times 16 \Rightarrow$ r = 4cm
Area of lrger circle = πR^2
= $\frac{22}{7} \times 16 \times 16 = \frac{5632}{7}$ = 804.57 cm^2

48. **(b)** 603.45 cm^2
Explanation: Let r and R be the radii of each smaller circle and larger circle respectively.
We have, d = $\frac{1}{4}$D
$\Rightarrow$ r = $\frac{1}{4}$R $\Rightarrow$ r = $\frac{1}{4} \times 16 \Rightarrow$ r = 4 cm
Area of the black colour region = Area of larger circle - Area of 4 smaller circles
= 804.57 - 4 $\times$ 50.28 = 603.45 cm^2

49. **(b)** 12.57 cm^2
Explanation: Let r and R be the radii of each smaller circle and larger circle respectively.
We have, d = $\frac{1}{4}$D
$\Rightarrow$ r = $\frac{1}{4}$R $\Rightarrow$ r = $\frac{1}{4} \times 16 \Rightarrow$ r = 4 cm
Area of quadrant of a smaller circle
= $\frac{1}{4} \times$ 50.28 = 12.57 cm^2

50. **(a)** 66 cm^2
Explanation: Let r and R be the radii of each smaller circle and larger circle respectively.
We have, d = $\frac{1}{4}$D
$\Rightarrow$ r = $\frac{1}{4}$R $\Rightarrow$ r = $\frac{1}{4} \times 16 \Rightarrow$ r = 4 cm
Area between two concentric circles
= $\pi(R^2 - r^2) = \frac{22}{7}(5^2 - 2^2)$
= $\frac{22}{7}(25 - 4) = \frac{22}{7} \times 21$ = 66 cm^2