Sample Question Paper - 3
Class- IX Session- 2021-22
TERM 1
Subject- Mathematics

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 value of $\left(\frac{81}{16}\right)^{\frac{-3}{4}} \times \left\{\left(\frac{25}{9}\right)^{\frac{-3}{2}} \div \left(\frac{5}{2}\right)^{-3}\right\}$ is **[1]**

   a) 4 b) 2

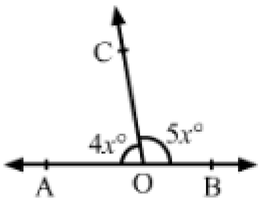
   c) 3 d) 1

2. If (2, 0) is a solution of the linear equation 2x + 3y = k, then the value of k is **[1]**

   a) 2 b) 4

   c) 5 d) 6

3. In the given figure, AOB is a straight line. If $\angle AOC = 4x^\circ$ and $\angle BOC = 5x^\circ$ then $\angle AOC =$? **[1]**



   a) 60° b) 40°

   c) 100° d) 80°

4. The area of one triangular part of a rhombus ABCD is given as 125 cm^2. The area of rhombus ABCD is **[1]**

   a) 1250 cm^2 b) 625 cm^2

   c) 500 cm^2 d) 2500 cm^2

5. The number obtained on rationalising the denominator of $\frac{1}{\sqrt{7}-2}$ is **[1]**

   a) $\frac{\sqrt{7}+2}{45}$ b) $\frac{\sqrt{7}-2}{3}$

c) $\frac{\sqrt{7}+2}{5}$

d) $\frac{\sqrt{7}+2}{3}$

6. How many linear equations in ‘x’ and ‘y’ can be satisfied by x = 1, y = 2? **[1]**

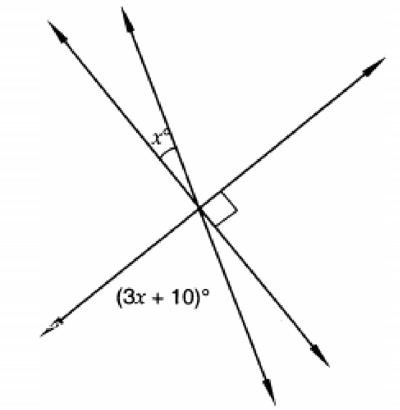
a) Infinitely many

b) Two

c) Only one

d) Three

7. In Fig., the value of x, is **[1]**



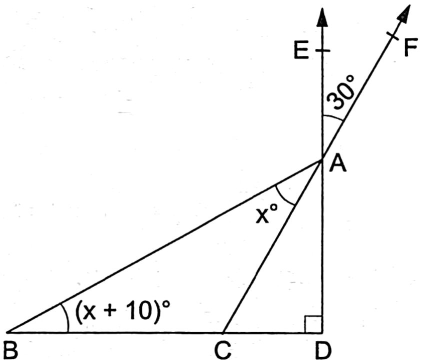
a) 8°

b) 20°

c) 15°

d) 12°

8. In the given figure, EAD$\perp$BCD. Ray FAC cuts ray EAD at a point A such that $\angle EAF = 30^\circ$. Also, in $\triangle BAC$, $\angle BAC = x^\circ$ and $\angle ABC = (x + 10)^\circ$. Then, the value of x is **[1]**



a) 35

b) 30

c) 25

d) 20

9. If $10^{2y} = 25$, then 10^{-y} equals **[1]**

a) $-\frac{1}{5}$

b) $\frac{1}{5}$

c) $\frac{1}{625}$

d) $\frac{1}{50}$

10. Vihaan has marks of 92, 85, and 78 in three mathematics tests. In order to have an average of exactly 87 for the four math tests, he should obtain **[1]**

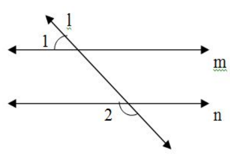
a) 93 marks

b) 91 marks

c) 90 marks

d) 92 marks

11. In the adjoining figure, m || n, if $\angle 1$ = 50°, then $\angle 2$ is equal to - **[1]**



a) 50°

b) 40°

c) 130°

d) 120°

12. If g = $t^{\frac{2}{3}} + 4t^{\frac{-1}{2}}$, what is the value of g when t = 64? **[1]**

a) $\frac{31}{2}$

b) $\frac{257}{16}$

c) $\frac{33}{2}$

d) 16

13. If a = 7 - 4$\sqrt{3}$, then the value of $\sqrt{a} + \frac{1}{\sqrt{a}}$ is **[1]**

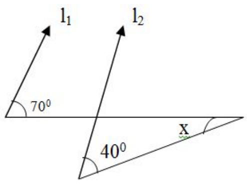
a) 8

b) 4

c) 2

d) 1

14. In figure, lines $l_1 \parallel l_2$. The value of x is : **[1]**



a) 50°

b) 70°

c) 30°

d) 40°

15. The area of the triangle formed by the line 2x + 5y = 10 and the co-ordinate axis is **[1]**

a) 4 sq. units

b) 3 sq. units

c) 5 sq. units

d) 10 sq. units

16. The mean of six numbers is 23. If one of the numbers is excluded, the mean of the remaining numbers becomes 20. The excluded number is **[1]**

a) 37

b) 39

c) 38

d) 36

17. The sides of a triangle are 35 cm, 54 cm and 61 cm, respectively. The length of its longest altitude **[1]**

a) $24\sqrt{5}$cm

b) 28 cm

c) $10\sqrt{5}$cm

d) $16\sqrt{5}$cm

18. If $\bar{x}$ is the mean of $x_1, x_2, \ldots, x_n$ then for a $\neq$0, the mean of $ax_1, ax_2, \ldots, ax_n$, $\frac{x_1}{a}, \frac{x_2}{a}, \ldots, \frac{x_n}{a}$ is **[1]**

a) $\frac{\left(a+\frac{1}{a}\right)\bar{x}}{2n}$

b) $\left(a+\frac{1}{a}\right)\frac{\bar{x}}{2}$

c) $\left(a+\frac{1}{a}\right)\frac{\bar{x}}{n}$

d) $\left(a+\frac{1}{a}\right)\bar{x}$

19. The simplest form of $1.\overline{6}$ is **[1]**

a) $\frac{833}{500}$

b) $\frac{5}{3}$

c) none of these

d) $\frac{8}{5}$

20. An angle is one-fifth of its supplement. The measure of the angle is :- **[1]**

a) 15^0

b) 75^0

c) 150^0 | d) 30^0

Section B

Attempt any 16 questions

21. The distance between the graph of the equations x = - 3 and x = 2 is **[1]**

a) 1 b) 3

c) 2 d) 5

22. Each side of an equilateral triangle measures 8 cm. The area of the triangle is **[1]**

a) $32\sqrt{3}\text{cm}^2$ b) $48\ \text{cm}^2$

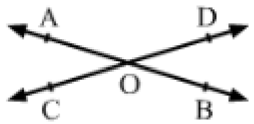
c) $16\sqrt{3}\text{cm}^2$ d) $8\sqrt{3}\text{cm}^2$

23. A linear equation in two variables is of the form ax + by + c = 0, where **[1]**

a) a $\neq$ 0 and b = 0 b) a = 0 and b = 0

c) a $\neq$ 0 and b $\neq$0 d) a = 0 and b $\neq$ 0

24. In the given figure, straight lines AB and CD intersect at O. If $\angle AOC + \angle BOD = 130^\circ$ then $\angle AOD =$? **[1]**



a) 110° b) 65°

c) 115° d) 125°

25. If $\sqrt{7} = 2.646$ then $\frac{1}{\sqrt{7}}$ =? **[1]**

a) None of these b) 0.375

c) 0.378 d) 0.441

26. The area of an isosceles triangle having base 2 cm and the length of one of the equal sides 4 cm, is **[1]**

a) $4\sqrt{15}\ cm^2$ b) $\sqrt{15}\ cm^2$

c) $2\sqrt{15}\ cm^2$ d) $\sqrt{\frac{15}{2}}\ cm^2$

27. The number of times a particular item occurs in a given data is called its. **[1]**

a) class-size b) cumulative frequency

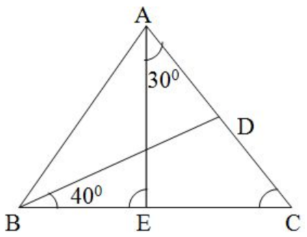
c) frequency d) variation

28. $\frac{5^{n+2}-6\times5^{n+1}}{13\times5^n-2\times5^{n+1}}$ is equal to **[1]**

a) $\frac{3}{5}$ b) -$\frac{3}{5}$

c) -$\frac{5}{3}$ d) $\frac{5}{3}$

29. In $\triangle$ABC, BD $\perp$ AC, $\angle$CAE = 30° and $\angle$CBD = 40°. Then $\angle$AEB =? **[1]**



a) 70°

b) 60°

c) 50°

d) 80°

30. Sheila received x marks in two of her tests and y marks in three other tests. Her average score in all the five tests in terms of x and y is **[1]**

a) $\frac{2x+3y}{2}$

b) $\frac{2x+3y}{5}$

c) $\frac{3x+2y}{3}$

d) $\frac{3x+2y}{5}$

31. The difference of semi-perimeter and the sides of $\triangle ABC$ are 8, 7 and 5 cm respectively. Its semi-perimeter 's' is **[1]**

a) 5 cm

b) 15 cm

c) 10 cm

d) 20 cm

32. $\sqrt{8}+2\sqrt{32}-5\sqrt{2}$ is equal to **[1]**

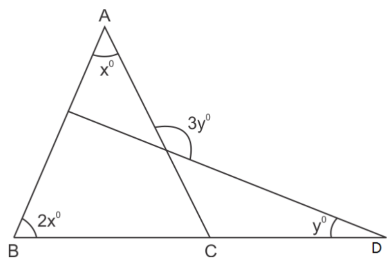
a) none of these

b) $\sqrt{32}$

c) $\sqrt{8}$

d) $5\sqrt{2}$

33. In figure, what is y in terms of x? **[1]**



a) $\frac{3}{2}$x

b) $\frac{3}{4}$x

c) x

d) $\frac{4}{3}$x

34. The mean of n observations is $\overline{X}$. If k is added to each observation, then the new mean is: **[1]**

a) $\overline{X}$ + k

b) k$\overline{X}$

c) $\overline{X}$ - k

d) $\overline{X}$

35. When two straight lines intersect: **[1]**

i. Adjacent angles are complementary
ii. Adjacent angles are supplementary.
iii. Opposite angles are equal.
iv. Opposite angles are supplementary.

Of these statements

a) (ii) and (iv) are correct

b) (i) and (iv) are correct

c) (ii) and (iii) are correct

d) (i) and (iii) are correct

36. The taxi fare in a city is as follows: For the first kilometer, the fare is ₹8 and for the subsequent distance it is ₹5 per kilometer. Taking the distance covered as x km and total fare as ₹y, write a linear equation for this information. **[1]**

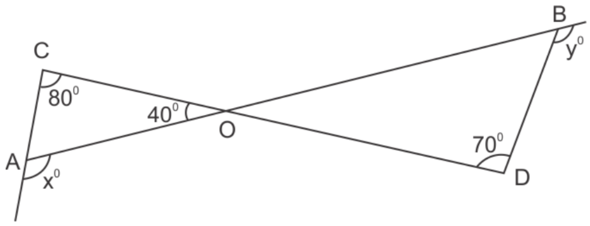
a) y = 5x + 3

b) y = 5x – 3

c) x = 5y – 3

d) x = 5y + 3

37. In figure, x + y = **[1]**



a) 270°

b) 210°

c) 190°

d) 230°

38. The value of $\frac{x^{a(b-c)}}{x^{b(a-c)}} \div \left(\frac{x^b}{x^a}\right)^c$ is **[1]**

a) 1

b) 3

c) 4

d) 2

39. Let $\bar{X}$ be the mean of $x_1, x_2, ..., x_n$ and $\bar{Y}$ the mean of $y_1, y_2, ..., y_n$. If $\bar{Z}$ is the mean of $x_1, x_2, ..., x_n, y_1, y_2, ..., y_n$, then $\bar{Z}$ is equal to: **[1]**

a) $\frac{\bar{x}+\bar{y}}{n}$

b) $\frac{\bar{x}+\bar{y}}{2}$

c) $\bar{x}+\bar{y}$

d) $\frac{\bar{x}+\bar{y}}{2n}$

40. If the mean of x and $\frac{1}{x}$ is M, then the mean of x^2 and $\frac{1}{x^2}$ is **[1]**

a) 2M + 1

b) $2M^2 + 1$

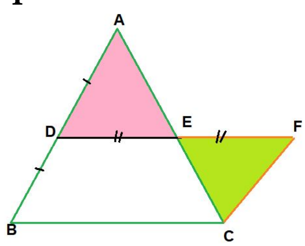
c) 2M – 1

d) $2M^2 - 1$

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:



Hareesh and Deep were trying to prove a theorem. For this they did the following;

i. Draw a triangle ABC
ii. D and E are found as the mid points of AB and AC
iii. DE was joined and DE was extended to F so DE = EF

iv. FC was joined.

41. △ADE and △EFC are congruent by which criteria? **[1]**

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

42. ∠EFC is equal to which angle? **[1]**

a) ∠B
b) ∠DAE
c) ∠AED
d) ∠ADE

43. ∠ECF is equal to which angle? **[1]**

a) ∠AED
b) ∠ADE
c) ∠DAE
d) ∠B

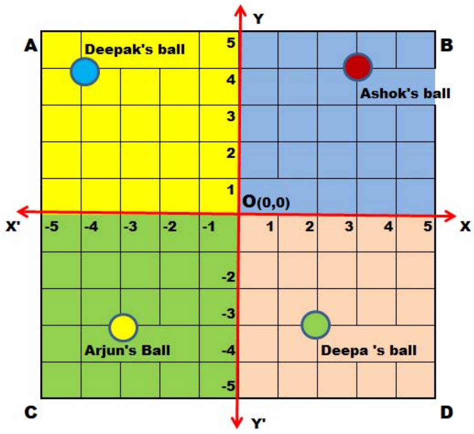
44. CF is equal to which of the following? **[1]**

a) BD
b) AE
c) EF
d) CE

45. CF is parallel to which of the following? **[1]**

a) AE
b) BD
c) CE
d) EF

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



There is a square park ABCD in the middle of Saket colony in Delhi. Four children Deepak, Ashok, Arjun and Deepa went to play with their balls. The colour of the ball of Ashok, Deepak, Arjun and Deepa are red, blue, yellow and green respectively.
All four children roll their ball from centre point O in the direction of **XOY, X'OY, X'OY' and XOY'**. Their balls stopped as shown in the above image.

46. What are the coordinates of the ball of Deepa? **[1]**

a) (2, 2)
b) (2, 3)
c) (3, 2)
d) (2, -3)

47. What the line XOX' is called? **[1]**

a) x-axis
b) ordinate
c) y-axis
d) origin

48. What the point **O (0,0)** is called? **[1]**

a) x-axis
b) y-axis
c) ordinate
d) origin

49. What is the ordinate of the ball of Arjun? **[1]**

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

50. What are the coordinates of the ball of Ashok? **[1]**

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

Solution

Section A

1. **(d)** 1

Explanation:
$$\left(\frac{81}{16}\right)^{\frac{-3}{4}} \times \left\{\left(\frac{25}{9}\right)^{\frac{-3}{2}} \div \left(\frac{5}{2}\right)^{-3}\right\}$$
$$\Rightarrow \left(\frac{3}{2}\right)^{4\times\frac{-3}{4}} \times \left\{\left(\frac{5}{3}\right)^{2\times\frac{-3}{2}} \div \left(\frac{5}{2}\right)^{-3}\right\}$$
$$\Rightarrow \left(\frac{3}{2}\right)^{-3} \times \left\{\left(\frac{5}{3}\right)^{-3} \div \left(\frac{5}{2}\right)^{-3}\right\}$$
$$\Rightarrow \left(\frac{3}{2}\right)^{-3} \times \left(\frac{5}{3}\times\frac{2}{5}\right)^{-3}$$
$$\Rightarrow \left(\frac{3}{2}\right)^{-3} \times \left(\frac{2}{3}\right)^{-3}$$
$$\Rightarrow \left(\frac{3}{2}\times\frac{2}{3}\right)^{-3}$$
$$\Rightarrow (1)^{-3} = 1$$

2. **(b)** 4

Explanation: (2, 0) is a solution of the linear equation 2x + 3y = k

$\Rightarrow 4 = k$

3. **(d)** 80°

Explanation: We have :

$\angle AOC + \angle BOC = 180^\circ$ [Since AOB is a straight line]

$\Rightarrow$ 4x + 5x = 180°

$\Rightarrow$ 9x = 180°

$\Rightarrow$ x = 20°

$\therefore \angle AOC = 4 \times 20^\circ = 80^\circ$

4. **(c)** 500 cm^2

Explanation: Since diagonals of a rhombus divide it into 4 triangles of equal area. Therefore,

Area of rhombus = 4 $\times$ Area of triangle

= 4 $\times$ 125 = 500 sq. cm

5. **(d)** $\frac{\sqrt{7}+2}{3}$

Explanation: After rationalising:

$\frac{1}{\sqrt{7}-2} = \frac{1}{\sqrt{7}-2} \times \frac{\sqrt{7}+2}{\sqrt{7}+2}$

$= \frac{\sqrt{7}+2}{(\sqrt{7})^2-(2)^2}$

$= \frac{\sqrt{7}+2}{7-4}$

$= \frac{\sqrt{7}+2}{3}$

6. **(a)** Infinitely many

Explanation: There are many linear equations in ‘x’ and ‘y’ can be satisfied by x = 1, y = 2

for example

x + y = 3 x - y =-1

2x + y =4

and so on there are infinte number of examples

7. **(b)** 20°

Explanation: Let,

AB, CD and EF intersect at O

$\angle$COB = $\angle$AOD (Vertically opposite angle)
$\angle$AOD = 3x + 10 ....(i)

$\angle$AOE + $\angle$AOD + $\angle$DOF = 180^o (Linear pair)

x + 3x + 10^o + 90^o = 180^o

4x + 100^o = 180^o

4x = 80^o

x = 20^o

8. **(c)** 25
Explanation: In the given figure $\angle \mathrm{CAD} = \angle \mathrm{EAF}$ (Vertically opposite angels)
$\therefore \angle CAD = 30^\circ$
In $\triangle ABD$,
$\angle \mathrm{ABD} + \angle \mathrm{BAD} + \angle \mathrm{ADB} = 180^\circ$ (Angle sum property)
$\Rightarrow (x+10)^\circ + (x^\circ + 30^\circ) + 90^\circ = 180^\circ$
$\Rightarrow 2x + 130^\circ = 180^\circ$
$\Rightarrow 2x = 180^\circ - 130^\circ = 50^\circ$
$\Rightarrow$ x = 25
Thus, the value of x is 25.
Hence, the correct answer is 25.

9. **(b)** $\frac{1}{5}$
Explanation: 10^{2y} = 25

10^{2y} = 5^2

$(10^y)^2$ = $(5)^2$

$\Rightarrow$ 10^y = 5

Now 10^{-y}
= $\frac{1}{10^y}$
= $\frac{1}{5}$

10. **(a)** 93 marks
Explanation: Let, Vihaan obtains x marks in the fourth test.
So,
$\frac{92+85+78+x}{4}$ = 87
$\frac{255+x}{4}$ = 87
255 + x = 348
x = 348 - 255
x = 93 marks

11. **(c)** 130°
Explanation: $\angle$2 = 180° - $\angle$1
$\angle$2 = 180° - 50° = 130°

12. **(c)** $\frac{33}{2}$
Explanation: g = $t^{\frac{2}{3}} + 4t^{\frac{-1}{2}}$
= $t^{\frac{2}{3}}$ + $4 \times \frac{1}{t^{\frac{1}{2}}}$
= $(64)^{\frac{2}{3}}$ + $4 \times \frac{1}{64^{\frac{1}{2}}}$
= $\left(4^3\right)^{\frac{2}{3}}$ + $4 \times \frac{1}{(8^2)^{\frac{1}{2}}}$
= $4^{\frac{2}{3}\times 3}$ + $4 \times \frac{1}{8^{2\times\frac{1}{2}}}$
= 4^2 + $\frac{4}{8}$

$= 16 + \frac{1}{2}$
$= \frac{33}{2}$

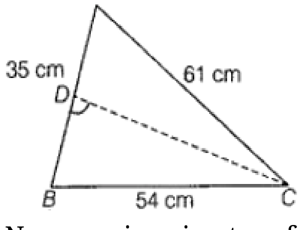
13. **(b)** 4
Explanation: Let $\sqrt{a} + \frac{1}{\sqrt{a}}$ = x
Then, squaring both side, we get
$a + \frac{1}{a} + 2 = x^2$
$\Rightarrow \frac{a^2+1}{a} + 2 = x^2$
Now, put the value of a,
$\frac{(7-4\sqrt{3})^2+1}{7-4\sqrt{3}} + 2 = x^2$
$\Rightarrow \frac{49+48-56\sqrt{3}+1}{7-4\sqrt{3}} + 2 = x^2$
$\Rightarrow \frac{98-56\sqrt{3}}{7-4\sqrt{3}} + 2 = x^2$
$\Rightarrow 14\left(\frac{7-4\sqrt{3}}{7-4\sqrt{3}}\right) + 2 = x^2$
$\Rightarrow 16 = x^2$
$\Rightarrow x = 4$
So, x = $\sqrt{a} + \frac{1}{\sqrt{a}}$ = 4

14. **(c)** 30°
Explanation: 40° + x = 70°(exterior angle)
$\angle x = 70° - 40°$
$\angle x = 30°$

15. **(c)** 5 sq. units
Explanation: To find the area of the triangle formed by the line 2x + 5y = 10 and co-ordinate axis
We put x = 0 in given equation at x = 0, we get y = 2
at y = 0 we get x = 5
So the line cut y-axis at 2 and x-axis at 5
So the height of the triangle is 2 unit and the base is 5 unit
Area of triangle = $\frac{1}{2}$ base $\times$ height
$= \frac{1}{2} \times 2 \times 5$
= 5 sq. units

16. **(c)** 38
Explanation: The mean of the six numbers is 23.
So the sum of six numbers is 23 $\times$ 6 = 138
After excluding one number, the mean of the remaining numbers is 20.
So the sum of five numbers is 20 $\times$ 5 = 100
The difference between them is
138 - 100 = 38

17. **(a)** $24\sqrt{5}$cm
Explanation: Let ABC be a triangle in which sides AB = 35cm, BC = 54 cm and CA = 61 cm



Now, semi-perimeter of a triangle,
$s = \frac{a+b+c}{2} = \frac{35+54+61}{2} = \frac{150}{2} = 75\text{cm}$
[∵ semiperimeter, s = $\frac{a+b+c}{2}$]
∵ Area of $\triangle ABC = \sqrt{s(s-a)(s-b)(s-c)}$ [by Heron's formula]

$= \sqrt{75(75-35)(75-54)(75-61)}$
$= \sqrt{75 \times 40 \times 21 \times 14}$
$= \sqrt{25 \times 3 \times 4 \times 2 \times 5 \times 7 \times 3 \times 7 \times 2}$
$= 5 \times 2 \times 2 \times 3 \times 7\sqrt{5}$
$= 420\sqrt{5}\text{cm}^2$
Also, Area of $\triangle ABC = \frac{1}{2} \times AB \times \text{ Altitude}$
$\Rightarrow \frac{1}{2} \times 35 \times CD$
$\Rightarrow CD = \frac{420 \times 2\sqrt{5}}{35}$
$\therefore$ CD $= 24\sqrt{5}$
Hence, the length of altitude is $24\sqrt{5}$cm.

18. **(b)** $\left(a+\frac{1}{a}\right)\frac{\bar{x}}{2}$
Explanation: mean of $ax_1, ax_2, \ldots, ax_n$, is $a\overline{x}$
mean of $\frac{x_1}{a}, \frac{x_2}{a}, \ldots, \frac{x_n}{a}$ is $\frac{1}{a}\overline{x}$
so the their mean is $\left(a+\frac{1}{a}\right)\frac{\bar{x}}{2}$

19. **(b)** $\frac{5}{3}$
Explanation: Let x=1.666...---(i)
multiply eq. (i) by 10, we get
10 x = 16.666...---(i)
subtract eq(i) from (ii) we get
9 x = 15
x = $\frac{5}{3}$

20. **(d)** 30^0
Explanation: Let one angle be x^o
Its supplementary angle will be 180^o - x^o
According to question
x = $\frac{1}{5}$(180^o - x)
5x + x = 180^o
6x = 180^o
x = $\frac{180}{6}$
x = 30^0

Section B

21. **(d)** 5
Explanation: Distance between the graph of the equations *x* = -3 and *x* = 2 is = 2 – (-3) = 5 units

22. **(c)** $16\sqrt{3}\text{cm}^2$
Explanation: Area of equilateral triangle $= \frac{\sqrt{3}}{4} \times (\text{ Side })^2$
$= \frac{\sqrt{3}}{4} \times (8)^2$
$= \frac{\sqrt{3}}{4} \times 64$
$= 16\sqrt{3}\text{cm}^2$

23. **(c)** a $\neq$ 0 and b $\neq$0
Explanation: A linear equation in two variables is of the form ax + by + c = 0 as a and b are cofficient of x and y
so if a = 0 and b = 0 or either of one is zero in that case the equation will be one variable or their will be no equation respectively.
therefore when a $\neq$ 0 and b $\neq$ 0 then only the equation will be in two variable

24. **(c)** 115°
Explanation: We have:
$\angle AOC = \angle BOD$ [Vertically-Opposite Angles]

$\therefore \angle AOC + \angle BOD = 130^\circ$
$\Rightarrow \angle AOC + \angle AOC = 130^\circ$ $[\because \angle AOC = \angle BOD]$
$\Rightarrow 2\angle AOC = 130^\circ$
$\Rightarrow \angle AOC = 65^\circ$
Now,
$\angle AOC + \angle AOD = 180^\circ$ [∵ COD is a straight line]
$\Rightarrow 65^\circ + \angle AOD = 180^\circ$
$\Rightarrow \angle AOC = 115^\circ$

25. **(c)** 0.378
Explanation: $\frac{1}{\sqrt{7}} = \frac{1}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}}$
$= \frac{\sqrt{7}}{7}$
$= \frac{1}{7} \times \sqrt{7}$
$= \frac{1}{7} \times 2.646$
= 0.378

26. **(b)** $\sqrt{15}\ cm^2$
Explanation: s = $\frac{4+4+2}{2}$ = 5 cm
Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$
= $\sqrt{5(5-4)(5-4)(5-2)}$
= $\sqrt{5 \times 1 \times 1 \times 3}$
= $\sqrt{15}$ sq. cm

27. **(c)** frequency
Explanation: The number of times a particular item occurs in a given data is called its Frequency.

28. **(c)** -$\frac{5}{3}$
Explanation: $\frac{5^{n+2}-6\times5^{n+1}}{13\times5^{n}-2\times5^{n+1}}$
= $\frac{5^{n}(5^{2}-6\times5^{1})}{5^{n}(13-2\times5^{1})}$
= $\frac{5^{2}-6\times5}{13-2\times5}$
= $\frac{25-30}{13-10}$
= $\frac{-5}{3}$

29. **(d)** 80°
Explanation: In BDC
∠BDC + ∠BCD + ∠DBC = 180°
BD ⊥ AC
∠BCD = 90°, ∠DBC = 40°
90° + ∠BCD + 40° = 180°
∠BCD + 130° = 180°
∠BCD = 180° - 130°
∠BCD = 50°
∠AEB = ∠CAE + ∠C ...(exterior angle)
∠CAE = 30°
∠C = 50°
∠AEB = 30° + 50°
∠AEB = 80°

30. **(b)** $\frac{2x+3y}{5}$
Explanation: Average is equal to the sum of all the values in the data set divided by the number of values in the data set.
Average = $\frac{x+x+y+y+y}{5}$
Average = $\frac{2x+3y}{5}$

31. **(d)** 20 cm
Explanation: Given: s - a = 8 cm, s - b = 7 cm and s - c = 5 cm
Adding all equations,
s - a + s - b + s - c = 8 + 7 + 5
$\Rightarrow$ 3s - (a + b + c) = 20 [s = $\frac{a+b+c}{2}$]
$\Rightarrow$ 3s - 2s = 20
$\Rightarrow$ s = 20 cm

32. **(d)** $5\sqrt{2}$
Explanation: $\sqrt{8}+2\sqrt{32}-5\sqrt{2}$
$\Rightarrow 2\sqrt{2}+2\times4\sqrt{2}-5\sqrt{2}$
$\Rightarrow 10\sqrt{2}-5\sqrt{2}$
$\Rightarrow 5\sqrt{2}$

33. **(a)** $\frac{3}{2}$x
Explanation: From Figure, $\angle$DOC = 180° - $\angle$AOD (Both are Supplementary)
$\Rightarrow$ $\angle$DOC = $180^\circ - 3y^\circ$
Also, $\angle$ACB = 180° - $\angle$A - $\angle$B
$\Rightarrow$ $\angle$ ACB = 180° - $x^\circ - 2x^\circ$ = 180° - $3x^\circ$
And $\angle$ ACD = 180° - $\angle$ACB
= 180° - (180° - $3x^\circ$)
$\Rightarrow \angle ACD = 3x^\circ$
Now, in $\triangle OCD$
$\angle$DOC + $\angle$OCD + $\angle$D = 180°
$180^\circ - 3y^\circ + 3x^\circ + y^\circ = 180^\circ$ [$\angle$OCD = $\angle$ACD]
$\Rightarrow 2y^\circ = 3x^\circ$
$\Rightarrow$ y = $\frac{3}{2}$x

34. **(a)** $\overline{X}$ + k
Explanation: Let us take n observations X_1, ... X_n
If $\overline{X}$ be the mean of the n observations, then we have
$\overline{X}$ = $\frac{1}{n}\sum_{i=1}^{n} X_i$
$\Rightarrow \sum_{i=1}^{n} X_i$ = n$\overline{X}$
Add a constant k to each of the observations. Then the observations becomes X_i + k, ..., X_n + k
If $\overline{Y}$ be the mean of the new observations, then we have
$\overline{Y}$ = $\frac{1}{n}\sum_{i=1}^{n}$ (X_i + k)
= $\frac{1}{n}\sum_{i=1}^{n} X_i + \frac{1}{n}\sum_{i=1}^{n} k$
= $\overline{X} + \frac{1}{n}\cdot nk$
= $\overline{X}$ + k

35. **(c)** (ii) and (iii) are correct
Explanation: When two straight lines intersect them, Adjacent angles are supplementary and opposite angles are equal.

36. **(a)** y = 5x + 3
Explanation: Taxi fare for first kilometer = ₹8
Taxi fare for subsequent distance = ₹5
Total distance covered = x
Total fare = y
Since the fare for first kilometer = ₹8
According to problem, Fare for (x - 1) kilometer = 5(x - 1)

So, the total fare y = 5(x - 1) + 8
⇒ y = 5(x - 1) + 8
⇒ y = 5x – 5 + 8
⇒ y = 5x + 3
Hence, y = 5x + 3 is the required linear equation.

37. **(d)** 230°
Explanation: In △ACO
∠ACO + ∠COA + ∠OAC = 180°
Now, ∠OAC = 180°
⇒ 80° + 40° + 180° - x°= 180°
⇒ x° = 120°
∠BOD = ∠COA = 40° (Opposite angles)
∠BDO = 70°
In △OBD
∠OBD = 180° - 40° - 70° = 70°
Also, y° = 180° - ∠OBD = 180° - 700° = 110°
⇒ x° + y° = 120° + 110° = 230°

38. **(a)** 1
Explanation: $\frac{x^{a(b-c)}}{x^{b(a-c)}} \div \left(\frac{x^b}{x^a}\right)^c$
⇒ $\frac{x^{ab-ac}}{x^{ba-be}} \div \left(\frac{x^{bc}}{x^{ac}}\right)$
⇒ $x^{ab-ac-ab+bc} \div x^{bc-ac}$
⇒ $x^{bc-ac} \div x^{bc-ac}$
⇒ 1

39. **(b)** $\frac{\overline{x}+\overline{y}}{2}$
Explanation: Since $\bar{x}$ and $\bar{y}$ are two numbers, though being means, their arithmetic mean is given by:
$\bar{z} = \frac{\bar{x} \text{ and } \bar{y}}{2}$

40. **(d)** $2M^2 - 1$
Explanation: Given, $\frac{x+\frac{1}{x}}{2}$ = M
Taking square on both sides
$\left(\frac{x+\frac{1}{x}}{2}\right)^2 = (M)^2$
$\left(x+\frac{1}{x}\right)^2 = (2M)^2$
$\left(x^2+2+\frac{1}{x^2}\right) = (2M)^2$
$\left(x^2+\frac{1}{x^2}\right) = 4M^2 - 2$
Divide by 2 on both sides to get mean
$\frac{\left(x^2+\frac{1}{x^2}\right)}{2} = 2M^2 - 1$

Section C

41. **(a)** SAS
Explanation: SAS

42. **(d)** ∠ADE
Explanation: ∠ADE

43. **(c)** ∠DAE
Explanation: ∠DAE

44. **(a)** BD
Explanation: BD

45. **(b)** BD
Explanation: BD

46. **(d)** (2, -3)
Explanation: (2, -3)

47. **(a)** x-axis
Explanation: x-axis

48. **(d)** origin
Explanation: origin

49. **(d)** -3
Explanation: -3

50. **(c)** (3, 4)
Explanation: (3, 4)