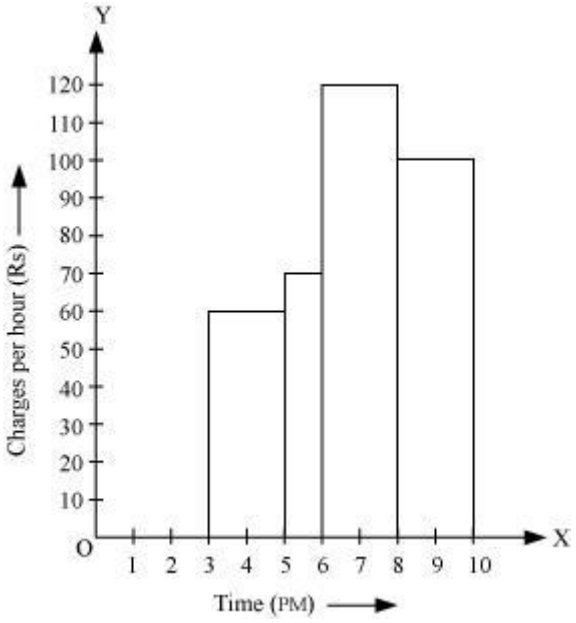
Q1) *Use the following information to answer the next question.*

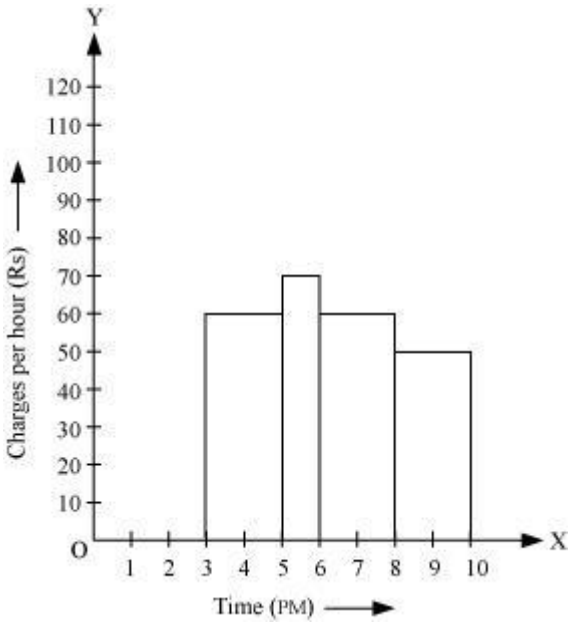
The following table shows the parking charges between the particular times.	
Time duration	**Charge (in Rs)**
3 pm − 5 pm	60
5 pm − 6 pm	70
6 pm − 8 pm	120
8 pm − 10 pm	100

Which histogram correctly represents the given data?

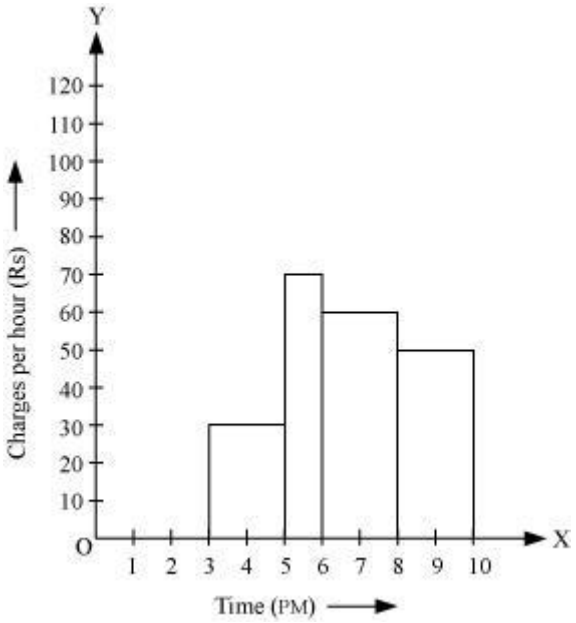
- A)



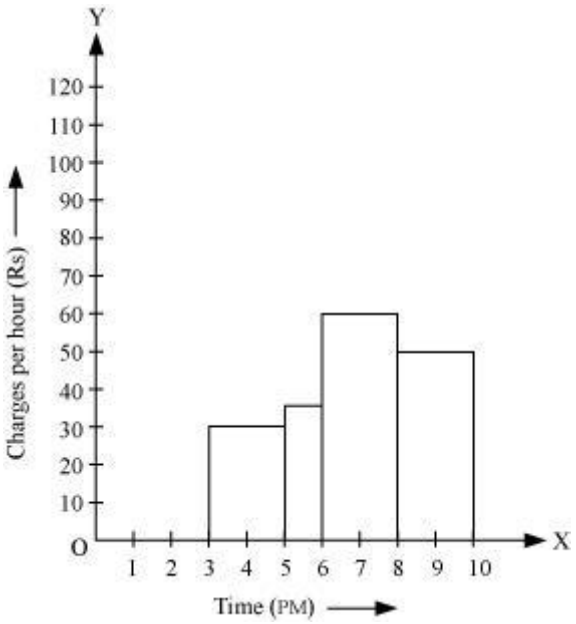
- B)


Y
120
110
100
90
80
70
60
50
40
30
20
10
O
X
1 2 3 4 5 6 7 8 9 10
Charges per hour (Rs)
Time (PM)

- C)


Y
120
110
100
90
80
70
60
50
40
30
20
10
O
X
1 2 3 4 5 6 7 8 9 10
Charges per hour (Rs)
Time (PM)

- D)



Answer:

C

Solution:

It can be seen that in the given data, intervals are not equally spaced.

It is known that areas of rectangles in a histogram are proportional to their frequencies.

Here, since the intervals are not equally spaced, the widths of rectangles will be varying and the graph will not be correct.

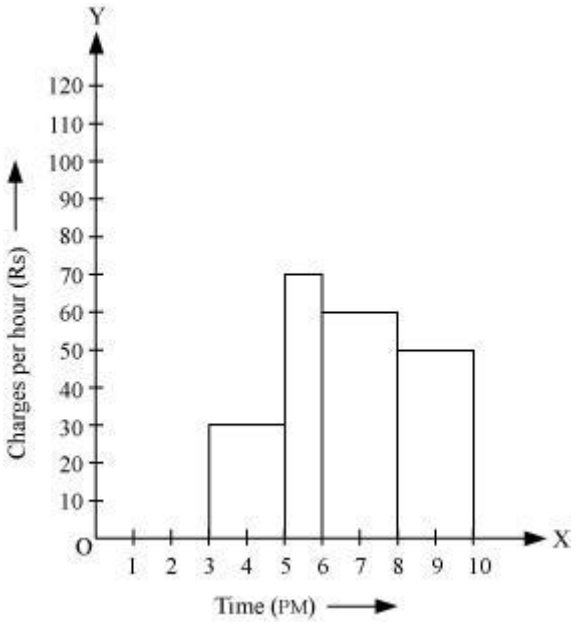
To draw the correct graph, the new length of the rectangle proportional to the minimum class size, which is 1, has to be joined.

The following table shows the proportion of number of charges per hour.

Time duration	Frequency	Width of class	Length of rectangle
3 pm − 5 pm	60	2	$\frac{60}{2} = 30$
5 pm − 6 pm	70	1	$\frac{70}{1} = 70$

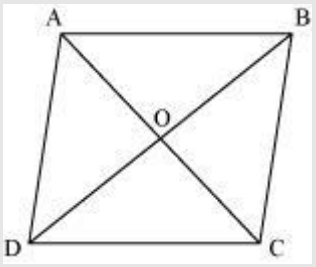
6 pm − 8 pm	120	2	$\frac{120}{2} = 60$
8 pm − 10 pm	100	2	$\frac{100}{2} = 50$

Now, the correct histogram can be drawn as:



The correct answer is C.

Q2) *Use the following information to answer the next question.*

In the given figure, ABCD is a rhombus in which ∠DCB = 116°.	

What is the measure of ∠OBA?

A) 26°

B) 32°

C) 58°

D) 64°

Answer:

B

Solution:

We know that the diagonals of a rhombus bisect the angles.

∴ ∠OBA = ∠OBC

∠DCB = 116°

$$\therefore \angle OCB = \frac{1}{2}\ \angle DCB = \left(\frac{1}{2} \times 116^\circ\right) = 58^\circ$$

The diagonals of a rhombus are perpendicular to each other.

∴ ∠BOC = 90°

In ΔOBC, by angle sum property of triangles, we obtain

∠OBC + ∠OCB + ∠BOC = 180°

⇒ ∠OBC + 58° + 90° = 180°

⇒ ∠OBC + 148° = 180°

⇒ ∠OBC = 32°

∴ ∠OBA = 32°

Thus, the measure of ∠OBA is 32°.

The correct answer is B.

Q3)

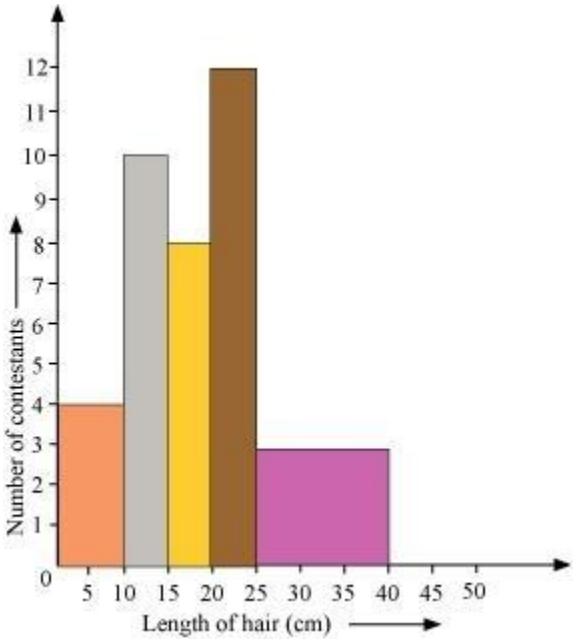
Use the following information to answer the next question.

The given table shows the lengths of hair of contestants of a particular Miss beauty contest.	
Length of hair (cm)	**Number of contestants**

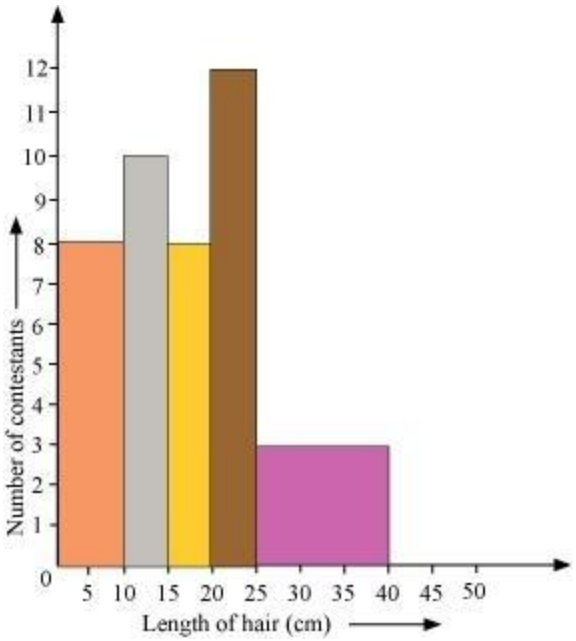
0 − 10	8
10 − 15	10
15 − 20	8
20 − 25	12
25 − 40	6

Which histogram correctly represents the given data?

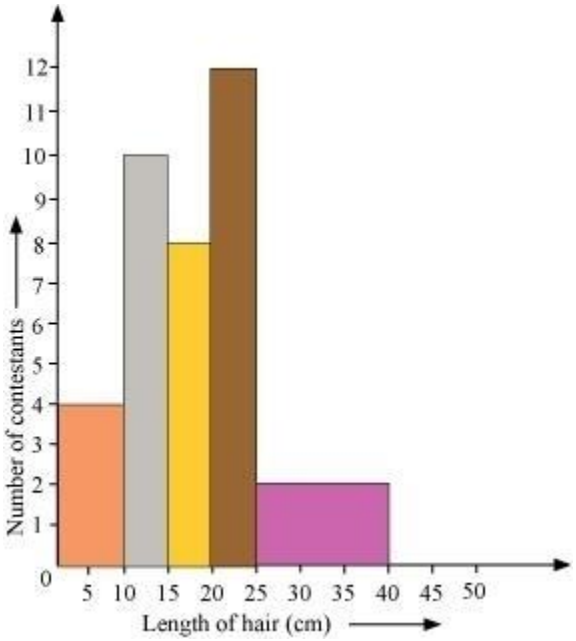
- A)



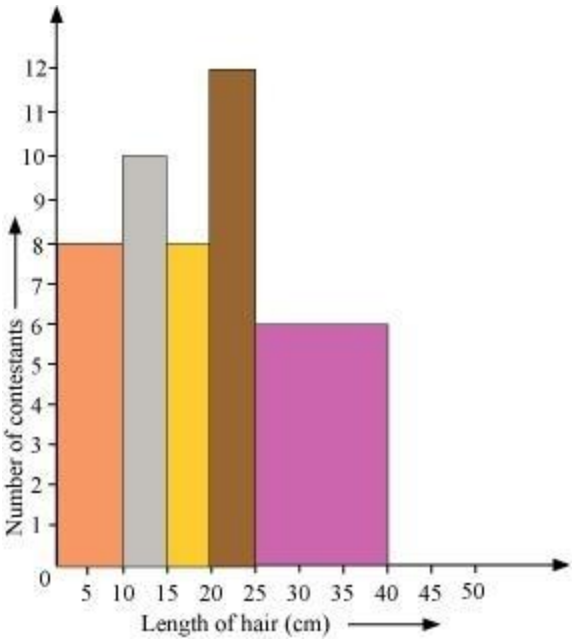
- B)


12
11
10
9
8
7
6
5
4
3
2
1
0
Number of contestants
5 10 15 20 25 30 35 40 45 50
Length of hair (cm)

- C)


12
11
10
9
8
7
6
5
4
3
2
1
0
Number of contestants
5 10 15 20 25 30 35 40 45 50
Length of hair (cm)

- D)



Answer:

C

Solution:

It can be seen that in the given data, the intervals are not equally spaced. It is known that the areas of rectangles in a histogram are proportional to their frequencies. Here, since the intervals are not equally spaced, the widths of rectangles will be varying and the histogram will not be correct.

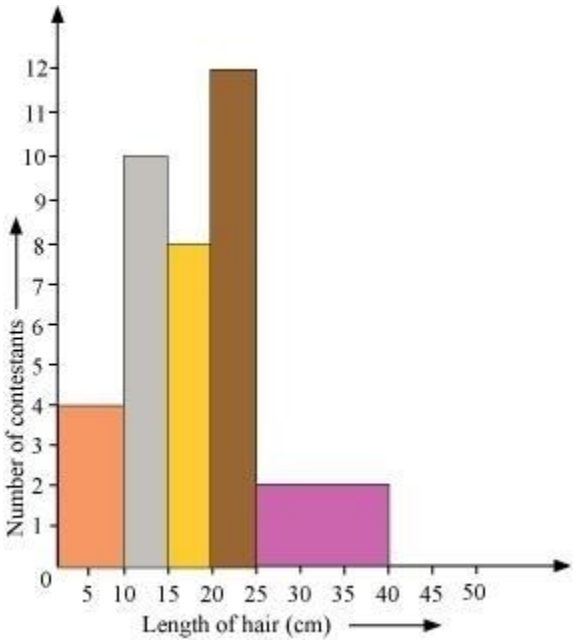
To draw the correct graph, the new length of rectangle proportional to the minimum class size, which is 5, has to be found.

The proportion of the number of contestants per 5 cm interval can be shown by the following table:

Length of hair (cm)	Frequency	Width of class	Proportional Length of rectangle
0 − 10	8	10	$\frac{8\times5}{10}=4$
10 − 15	10	5	$\frac{10\times5}{5}=10$
15 − 20	8	5	$\frac{8\times5}{5}=8$

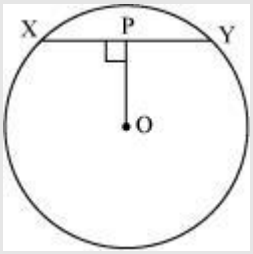
20 − 25	12	5	$\frac{12\times5}{5}=12$
25 − 40	6	15	$\frac{6\times5}{15}=2$

Thus, the correct histogram can be drawn as:



The correct answer is C.

Q4) *Use the following information to answer the next question.*

The radius of the given circle with centre O is 5 cm.	

If OP = 3 cm, then what is the length of chord XY?

A) 4 cm

B) 6 cm

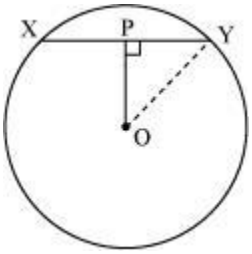
C) 8 cm

D) 12 cm

Answer:

C

Solution:



We start by joining OY.

We know that the perpendicular from the centre of a circle to a chord bisects the chord.

∴ XP = PY

Let the length of PY be *x*.

On applying Pythagoras theorem to ΔOPY, we obtain

$OY^2 = OP^2 + PY^2$

$\Rightarrow (5\text{ cm})^2 = (3\text{ cm})^2 + PY^2$

$\Rightarrow 25\text{ cm}^2 = 9\text{ cm}^2 + PY^2$

$\Rightarrow PY^2 = (25 - 9)\text{ cm}^2 = 16\text{ cm}^2$

⇒ PY = 4 cm

∴ XY = XP + PY = 2 PY = 2 (4 cm) = 8 cm

Thus, the length of chord XY is 8 cm.

The correct answer is C.

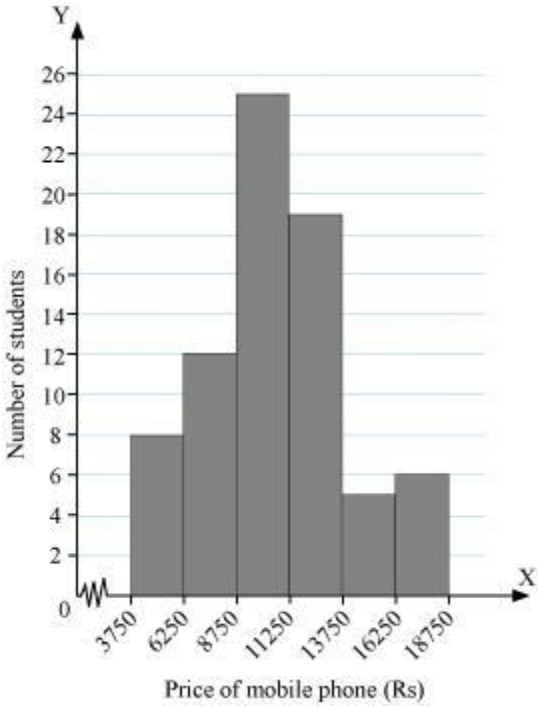
Q5) *Use the following information to answer the next question.*

The given data shows the price of the mobile phones used by a group of students of a certain college.	
Price of mobile phone (in Rs)	**Number of students**

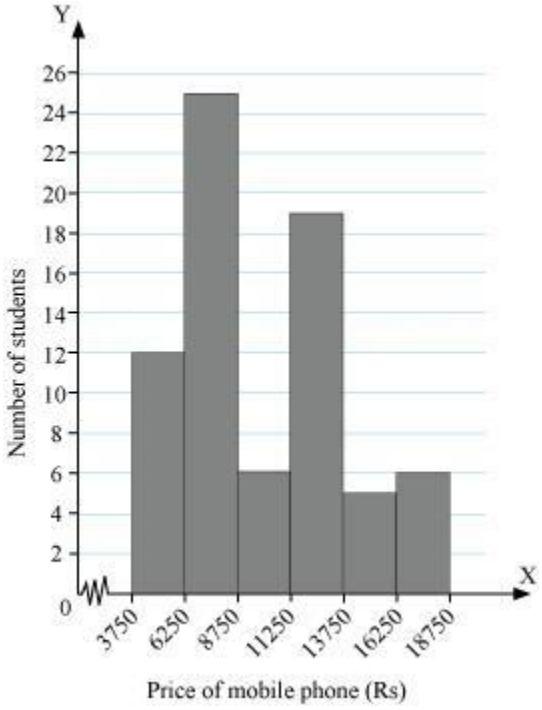
4000 − 6000	8
6500 − 8500	12
9000 − 11000	25
11500 − 13500	19
14000 − 16000	5
16500 − 18500	6

Which histogram correctly represents the given data?

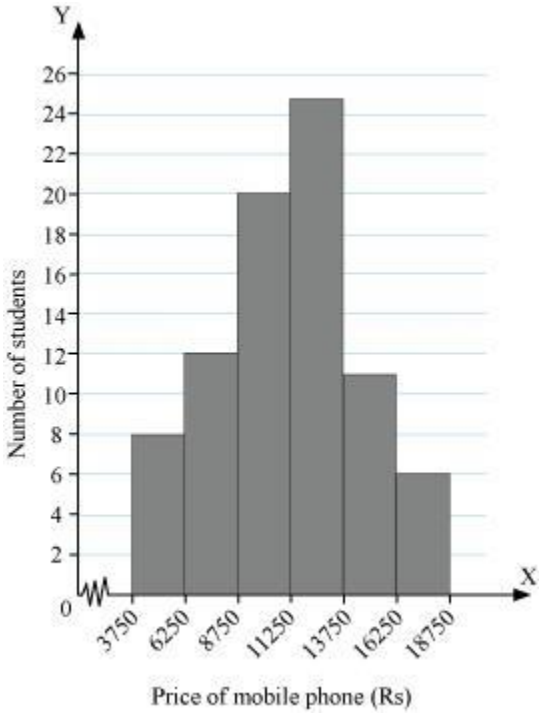
- A)



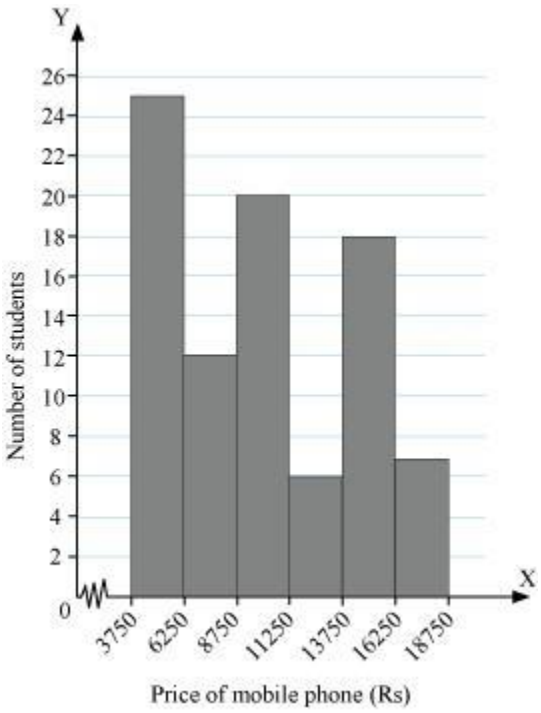
- B)


Y
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Number of students
X
3750
6250
8750
11250
13750
16250
18750
Price of mobile phone (Rs)

- C)


Y
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Number of students
X
3750
6250
8750
11250
13750
16250
18750
Price of mobile phone (Rs)

- D)



Answer:

A

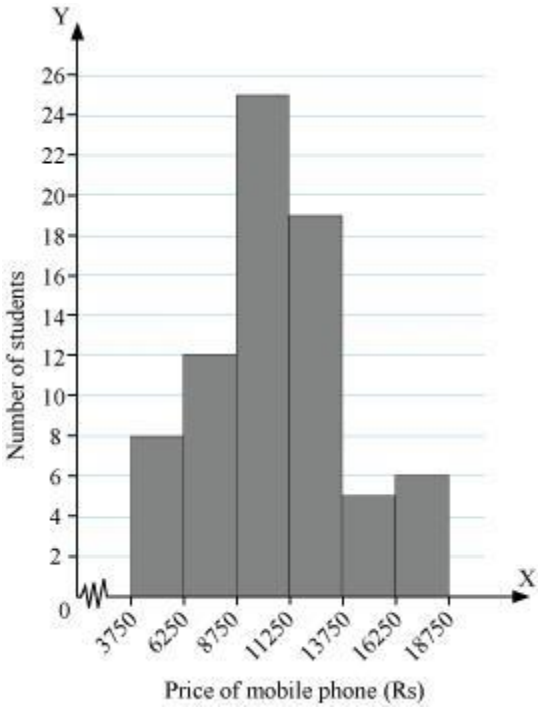
Solution:

It can be observed that class intervals are not continuous in the given data. Hence, they have to be made continuous by adding $\frac{6500-6000}{2}=250$ to the upper class limit and subtracting it from the lower class limit.

Accordingly, the given frequency distribution table can be made into continuous as:

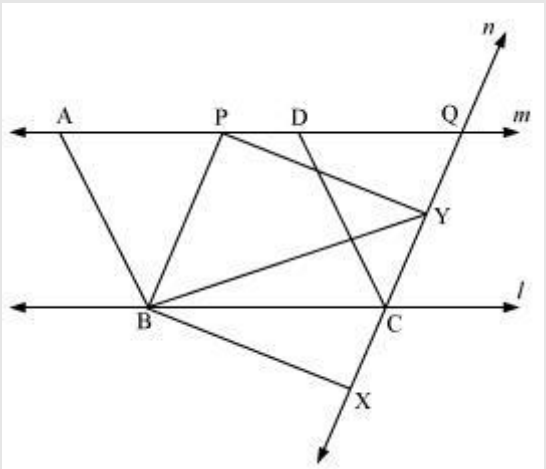
Price of mobile phone (in Rs)	Number of students
3750 − 6250	8
6250 − 8750	12
8750 − 11250	25
11250 − 13750	19
13750 − 16250	5
16250 − 18750	6

Taking the price of mobile phones along the *x*-axis and the number of students along the *y*-axis, the histogram can be drawn as:



The correct answer is A.

Q6) *Use the following information to answer the next question.*

In the given figure, *l*||*m*, *n*||PB, AB||CD, and BX||PY.	

If the area of ΔPBY is 15 cm^2, then what is the area of quadrilateral ABCD?

A) 15 cm^2

B) 22.5 cm^2

C) 30 cm^2

D) 37.5 cm^2

Answer:

C

Solution:

In quadrilateral ABCD,

AB||CD [Given]

AD||BC [$l||m$]

∴ ABCD is a parallelogram.

Similarly, we can show that quadrilaterals PBCQ and PBXY are parallelograms.

BY is a diagonal of parallelogram PBXY.

It is known that the diagonal of a parallelogram divides it into two triangles of equal areas.

∴ Area (PBXY) = 2area (ΔPBY)

= (2 × 15) cm^2 [Area (ΔPBY) = 15 cm^2]

= 30 cm^2 (i)

It is seen that parallelograms PBXY and PBCQ are lying on the same base PB and between the same parallels PB and n.

∴ Area (PBCQ) = Area (PBXY) (ii)

It is also seen that parallelograms PBCQ and ABCD are lying on the same base BC and between same parallels BC and m.

∴ Area (ABCD) = Area (PBCQ) (iii)

From (i), (ii), and (iii), we obtain

Area (ABCD) = 30 cm^2

Thus, the area of quadrilateral ABCD is 30 cm^2.

The correct answer is C.

Q7) The equation $3y = 2x + 3$ has

A) two solutions

B) three solutions

C) a unique solution

D) infinitely many solutions

Answer:

D

Solution:

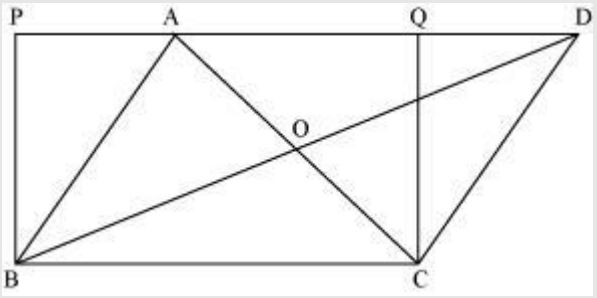
The equation $3y = 2x + 3$ is a linear equation in two variables i.e., x and y.

We know that a linear equation in two variables has infinitely many solutions.

Thus, the equation $3y = 2x + 3$ has infinitely many solutions.

The correct answer is D.

Q8) *Use the following information to answer the next question.*

In the given figure, ABCD is a rhombus and PQCB is a rectangle.	

If AC = 12 cm and BD = 16 cm, then what is the measure of PB?

A) 8 cm

B) 9.6 cm

C) 10 cm

D) 12.8 cm

Answer:

B

Solution:

In a rhombus, diagonals bisect each other at right angle.

∴ΔOBC is right-angled at point O, where OB $= \frac{1}{2}BD = \frac{1}{2} \times 16 \text{ cm} = 8 \text{ cm}$ and OC $= \frac{1}{2}AC = \frac{1}{2} \times 12 \text{ cm} = 6 \text{ cm}$

On applying Pythagoras theorem to ΔOBC, we obtain

$BC^2 = OB^2 + OC^2$

$\Rightarrow BC^2 = (8 \text{ cm})^2 + (6 \text{ cm})^2$

$\Rightarrow BC^2 = 64 \text{ cm}^2 + 36 \text{ cm}^2$

$\Rightarrow BC^2 = 100 \text{ cm}^2$

$\Rightarrow BC = 10 \text{ cm}$

ABCD and PQCB are parallelograms lying on the same base BC and between the same parallels PD and BC.

∴ Area (PQCB) = Area (ABCD)

Area of rhombus ABCD = $\frac{1}{2} \times \text{product of diagonals}$

$= \frac{1}{2} \times AC \times BD = \left(\frac{1}{2} \times 12 \times 16 \right) \text{ cm}^2 = 96 \text{ cm}^2$

Since ABCD is a rectangle, Area (ABCD) = Length × Breadth = BC × PB

∴ $BC \times PB = 96 \text{ cm}^2$

$\Rightarrow 10 \text{ cm} \times PB = 96 \text{ cm}^2$

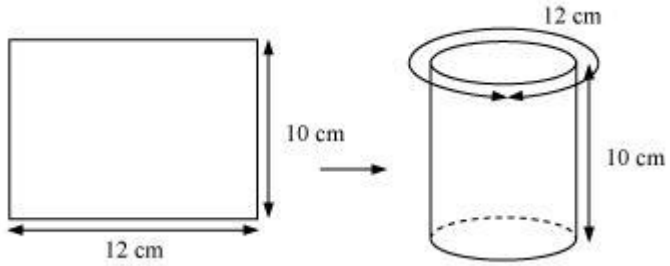
$\Rightarrow PB = \frac{96}{10} \text{ cm} = 9.6 \text{ cm}$

Thus, the measure of PB is 9.6 cm.

The correct answer is B.

Q9) A rectangular sheet of dimensions 10 cm × 12 cm is folded to form a cylinder of height 10 cm. What is the radius of the cylinder? $\left(\text{Use } \pi = \frac{22}{7}\right)$

Solution:



Height of cylinder = 10 cm

∴ Circumference of the base of cylinder = 12 cm

Let *r* be the radius of the circular base of cylinder.

∴ 2π*r* = 12 cm

$$2 \times \frac{22}{7} \times r = 12 \text{ cm}$$

$$r = \frac{12 \times 7}{2 \times 22} \text{ cm}$$

$$r = \frac{21}{11} \text{ cm}$$

Therefore, the radius of the cylinder so formed is $\frac{21}{11}$ cm.

Q10) If the numerator of a fraction is decreased by 1 and its denominator is increased by 2, then the fraction becomes $\frac{3}{2}$. Graphically find the fraction when the denominator is 4.

Solution:

Let the numerator of the fraction be *x* and the denominator be *y*.

∴ Fraction = $\frac{x}{y}$

According to the given information,

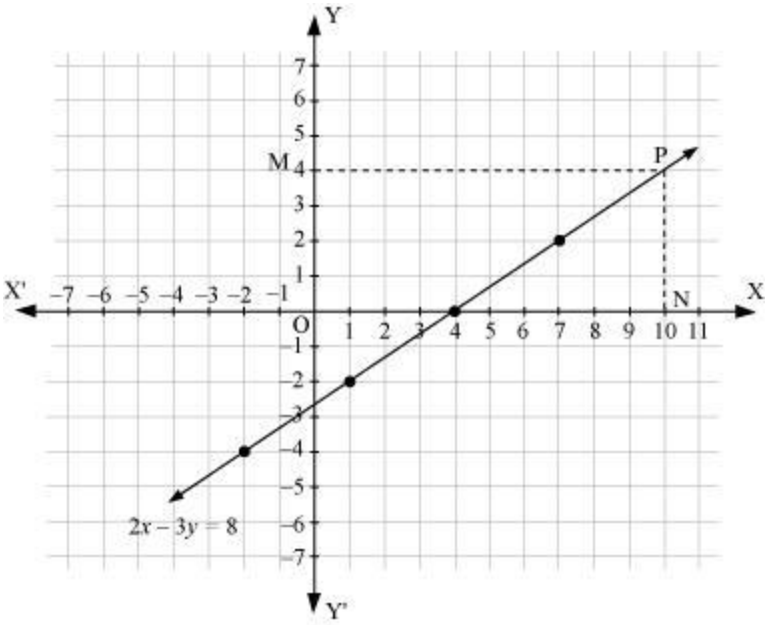
$$\frac{x-1}{y+2}=\frac{3}{2}$$
$$\Rightarrow 2x-2=3y+6$$
$$\Rightarrow 2x-3y=8 \qquad ...(1)$$

$$\Rightarrow y=\frac{2x-8}{3}$$

Four different solutions of equation (1) have been shown in the table as:

x	−2	1	4	7
$y=\frac{2x-8}{3}$	−4	−2	0	2

On plotting and joining the points (−2, −4), (1, −2), (4, 0) and (7, 2), a straight line representing equation (1) is obtained. This can be done as:



Now, the value of x for $y = 4$ can be found by first drawing a perpendicular from $y = 4$ to the line, and then, from that point, by drawing a perpendicular to the x-axis. The point where the perpendicular intersects the x-axis is the value of x corresponding to $y = 4$.

It can be seen that, $x = 10$ for $y = 4$.

Thus, the required fraction is $\frac{10}{4}$.

Q11) The duration of some musical tracks in an audio compact disc is 4 minutes each, while each of the remaining tracks in the same disc is 6 minutes long. The total runtime of the disc is 68 minutes.If the numbers of tracks of durations 4 minutes and 6 minutes are $x$and $y$respectively, then write a linear equation to represent this situation.

Solution:

Number of tracks which are 4 minutes long = x

Number of tracks which are 6 minutes long = y

Therefore, $x$tracks will run for $4 \times x = 4x$minutes and $y$tracks will run for $6 \times y = 6y$minutes.

Thus, the total runtime of the audio compact disc can be represented as $4x + 6y$.

But, the runtime of the disc is also given as 68 minutes.

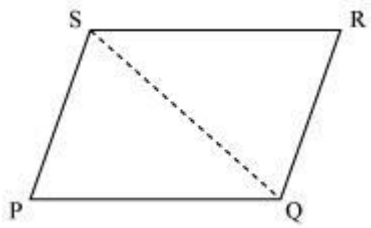
$\therefore 4x + 6y = 68$

$\Rightarrow 4x + 6y - 68 = 0$

Thus, the given situation can be represented as $4x + 6y - 68 = 0$.

Q12) Show that the opposite angles of a parallelogram are equal.

Solution:



Let PQRS be a parallelogram.

We know that the diagonal of a parallelogram divides it into two congruent triangles.

$\therefore \Delta PQS \cong \Delta RSQ$

$\Rightarrow \angle P = \angle R$ (By C.P.C.T.)

Similarly, it can be proved that

$\angle Q = \angle S$

Thus, the opposite angles of a parallelogram are equal.

Q13) Three times the number of chocolates with Anil is 8 more than five times the number of chocolates that Aarti has. If the number of chocolates that Anil and Aarti have are x and y respectively, then find an equation satisfying the given information.

Solution:

Number of chocolates with Anil = x

Number of chocolates with Aarti = y

Therefore, 8 more than five times the number of chocolates Aarti has = $8 + 5y$

It is given that three times the number of chocolates with Anil is 8 more than five times the number of chocolates Aarti has.

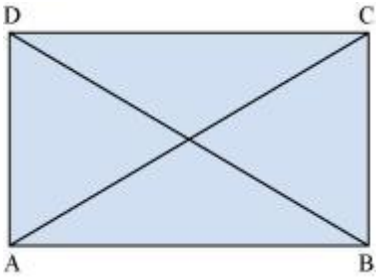
$\therefore 3x = 8 + 5y$

$\Rightarrow 3x - 5y - 8 = 0$

Thus, the required equation is $3x - 5y - 8 = 0$

Q14) Prove that if the diagonals of a parallelogram are equal, then the parallelogram is a rectangle.

Solution:



ABCD is a parallelogram with AC = BD

ABCD is a parallelogram. Therefore,

AB = CD and AD = BC

To prove ABCD is a rectangle, we just have to show that its one angle is a right angle.

Now, in ΔABC and ΔBAD,

AC = BD (Given)

BC = AD (Since opposite sides of a parallelogram are equal)

AB = AB (Common)

∴ ΔABC ≅ΔBAD (By SSS congruency criterion)

∴ ∠ABC = ∠BAD (By CPCT) … (1)

We also know that opposite sides of a parallelogram are parallel.

∴ AD || BC

∴ ∠ABC + ∠BAD = 180°(Angles on the same side of transversal are supplementary)

Using equation (1), we have

∠BAD + ∠BAD = 180°

⇒ 2∠BAD = 180°

⇒ ∠BAD = 90°

This proves that ABCD is a rectangle.