Sample Question Paper 01
Class -IX Mathematics
Summative Assessment – II

Time: 3 Hours **Max. Marks: 90**

General Instructions:

(i) All questions are compulsory.

(ii) The question paper consists of **31** question divided into five **section A, B, C, D and E**. Section-A comprises of **4** question of **1 mark** each, **Section-B** comprises of **6** question of **2 marks** each, **Section-C** comprises of **8** question of **3 marks** each and **Section-D** comprises of **10** questions of **4 marks** each. **Section E comprises of two questions of 3 marks each and 1 question of 4 marks from Open Text theme.**

(iii) There is no overall choice.

(iv) Use of calculator is not permitted.

SECTION-A

Question number **1** to **4** carry **one** mark each.

1. Find the volume of the sphere in term of n whose diameter is 6 cm.
2. Find the class mark of the class 100-120.
3. In a throw of a die, find the probability of getting an even number.
4. In a parallelogram ABCD, if $\angle A = 75°$, find $\angle C$.

SECTION-B

Question number **5** to **10** carry **two** marks each.

5. Find the value of k, if x = 2, y = 1 is a solution of the equation $2x + 3y = k$.
6. If the point (3, 4) lies on the graph of the equation $3y = ax + 7$, find the value of a.
7. ABCD is a cyclic quadrilateral whose diagonals intersect at a point E. $\angle DBC = 70°$, $\angle BAC$ is $30°$. Find $\angle BCD$. Further if AB = BC, find $\angle ECD$.
8. In a parallelogram ABCD, AB= 20. The altitude DM to sides AB is 10 cm. Find area of parallelogram.
9. Find whether $(\sqrt{2}, 3\sqrt{2})$ is a solution of x – 3y = 9 or not.
10. The mean of ten numbers is 55. If one number is excluded, their mean becomes 50. Find the excluded number.

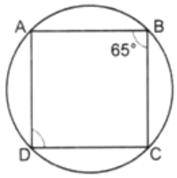
SECTION-C

Question numbers **11** to **18** carry **three** marks each.

11. Draw the graph of the equation 3x + 4y = 12 and find the co- ordinates of the points of intersection of the equation with the co-ordinate axes.

12. Solve for x: $\frac{3}{x-1}+\frac{1}{x+1}=\frac{4}{x}$ where $x \neq 1,\ x \neq -1$

13. In given figure, ABCD is a cyclic quadrilateral in which $AB \parallel CD$. If $\angle B = 65°$, then find other angles.



14. The length, breadth and height of a room are 5 m, 4 m and 3 m respectively. Find the cost of white-washing the walls of the room and the ceiling at the rate of 7.50 per m^2.

15. Shahid has built a cubical water tank with lid for his house, with each edge 2 m. He gets the outer surface of the tank excluding the base, covered with square tiles of side 25 cm. Find how much he would spend for the tiles, if one dozen of tiles costs him Rs 480.

16. A cubical box has each edge 10 cm and another cuboidal box is 12.5 cm long, 10 cm wide and 8 cm high.
(i) Which box has greater lateral surface area and by how much?
(ii) Which box has smaller total surface area and by how much?

17. A study was conducted to find out the concentration of sulphur dioxide in the air in parts per million (ppm) of a certain city. The data obtained for 30 days is as follows:

0.03	0.08	0.08	0.09	0.04	0.17
0.16	0.15	0.02	0.06	0.18	0.20
0.11	0.08	0.12	0.13	0.22	0.07
0.08	0.01	0.10	0.06	0.09	0.18
0.11	0.07	0.05	0.07	0.01	0.04

(i) Make a grouped frequency distribution table for this data with class interval as 0.00 - 0.04, 0.04 - 0.08, and so on.
(ii) For how many days, was the concentration of sulphur dioxide more than 0.11 parts per million?

18. 1500 families with 2 children were selected randomly and the following data were recorded:

Number of girls in a family	2	1	0
Number of families	475	814	211

Compute the probability of family, chosen at random, having
(i) 2 girls, (ii) 1 girl, (iii) No girl.
Also check whether the sum of these probabilities is 1.

SECTION-D

Question numbers **19** to **28** carry **four** marks each.

19. Construct a triangle ABC in which BC= 7 cm, $\angle B = 75°$ and AB + AC= 13 cm.
20. Construct a triangle PQR in which QR = 6 cm, $\angle Q = 60°$ and PR - PQ = 2 cm.
21. If two intersecting chords of a circle make equal angles with the diameter passing through their point of intersection, prove that the chords are equal.
22. Show that EFGH is a ||gram and its area is half of the area of ||gram ABCD. If E, F, G, H are respectively the mid points of the sides AB, BC, CD and DA.
23. The linear equation that convert Fahrenheit (F) to Celsius(C) is given by the relation. $C = \frac{5F - 160}{9}$

    (i) It the temperature is 86°F, what is the temperature in Celsius?

    (ii) If the temperature is 35°C what is the temperature in Fahrenheit?

    (iii) If the temperature is 0°Cwhat is the temperature in Fahrenheit and if the temperature is 0°F, what is the temperature in Celsius?

    (iv) What is the numerical value of the temperature which is same in both the scales?
24. Show that ar (BPC) = ar (DPQ) if BC is produced to a point Q such that AD = CQ and AQ intersect DC at P.
25. A cone of height 24 cm has a curved surface area 550 cm^2. Find its volume.
26. The diameter of a sphere is decreased by 25%. By what per cent does its curved surface area decrease?
27. The length of 40 leaves of a plant are measured correct to one millimetre, and the obtained data is represented in the following table:

Length (in mm)	A	B	C	D	E	F
Number of leaves	75	55	37	29	10	37

(i) Draw a histogram to represent the given data.

(ii) Is there any other suitable graphical representation for the same data?

(iii) Is it correct to conclude that maximum number of leaves are 153 mm long? Why?

28. An Insurance company selected 2000 drivers at random in % particular city to find a relationship between age and accidents The data obtained are given in the following table:

Age of drivers (in years)	Accidents in one year				
	0	1	2	3	Over 3
18 – 29	440	160	110	61	35
30 – 50	505	125	60	22	18
Above 50	360	45	35	15	9

Find the probabilities of the following events for a driver chosen at random from the city:

(i) being 18-29 years of age and having exactly 3 accidents in one year.

(ii) being 30-50 years of age and having one or more accidents in a year.

(iii) having no accident in one year.

SECTION-E (10 Marks)

(Open Text from Chapter-8 Quadrilaterals)

(*Please ensure that open text of the given theme is supplied with this question paper.)

29. OTBA Question
30. OTBA Question
31. OTBA Question

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Solution

SECTION-A

Question number **1** to **4** carry **one** mark each.

1. Volume of sphere $= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times (3)^2 = 36\pi$ cubic cm.
2. Class mark $= \frac{Lower \lim it + Upper \lim it}{2} = \frac{100+120}{2} = 110$
3. Total even number on a die = 3

   P (getting an even numbers) $= \frac{3}{6} = \frac{1}{2}$
4. Opposite angles of a parallelogram are equal.
   $\therefore$ In parallelogram ABCD, $\angle A = \angle C = 75°$

SECTION-B

Question number **5** to **10** carry **two** marks each.

5. We know that, if $x = 2$ and $y = 1$ is a solution of the linear equation $2x + 3y = k$, then on substituting the respective values of x and y in the linear equation $2x + 3y = k$, the LHS and RHS of the given linear equation will not be effected.

   $2(2) + 3(1) = k \quad \Rightarrow \quad k = 4 + 3 \quad \Rightarrow \quad k = 7$

   Therefore, we can conclude that the value of k, for which the linear equation $2x + 3y = k$ has $x = 2$ and $y = 1$ as one of its solutions is 7.
6. We know that if any point lie on the graph of any linear equation, then that point is the solution of that linear equation.

   We can conclude that $(3, 4)$ is a solution of the linear equation $3y = ax + 7$.

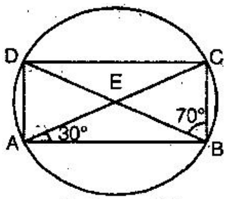
   We need to substitute $x = 3$ and $y = 4$ in the linear equation $3y = ax + 7$, to get

   $3(4) = a(3) + 7 \quad \Rightarrow \quad 12 = 3a + 7$

   $\Rightarrow \quad 3a = 12 - 7 \quad \Rightarrow \quad 3a = 5 \quad \Rightarrow \quad a = \frac{5}{3}$

   Therefore, we can conclude that the value of a will be $\frac{5}{3}$.

7. Here, $\angle DBC = 70°$ and $\angle BAC = 30°$



And $\angle DAC = \angle DBC = 70°$ [Angles in same circle]

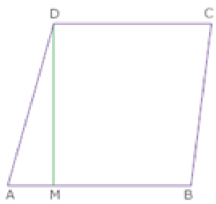
Now ABCD is a cyclic quadrilateral.

$\therefore \angle DAB + \angle BCD = 180°$ [Sum of opposite angles of a cyclic quadrilateral is supplementary]

$\Rightarrow 100° + \angle BCD = 180°$

$\Rightarrow \angle BCD = 80°$

8. Area of parallelogram ABCD



$= AB \times DM$

$= 20 \times 10$

$= 200$ square cm.

9. Assuming $\left(\sqrt{2}, 3\sqrt{2}\right)$ is a solution of the equation.

$\therefore x = \sqrt{2}$, $y = 3\sqrt{2}$

$x - 3y = 9$

$\Rightarrow \sqrt{2} - 3\left(3\sqrt{2}\right) = 9$

$\Rightarrow \sqrt{2} - 9\sqrt{2} = 9$

$\Rightarrow -8\sqrt{2} = 9$

$\Rightarrow$LHS $\neq$ RHS

Hence $\left(\sqrt{2}, 3\sqrt{2}\right)$ is not a solution of the given equation.

10. Mean of 10 numbers= $\dfrac{\sum_{i=1}^{10} x_1}{10}$

$\sum_{i=1}^{10} x_1 = 10 \times 55 = 550$

New mean = $\frac{\sum_{i=1}^{9} x_1}{9}$

$\sum_{i=1}^{9} x_1 = 50 \times 9 = 450$

Excluded number = 550 - 450 = 100

SECTION-C

Question numbers **11** to **18** carry **three** marks each.

11. 3x + 4y = 12

Express y in terms of x.

4y = 12 – 3x

y = $\frac{12-3x}{4}$ ……………. (i)

For graph,

Let x = 2, put in (i)

y = $\frac{12-3(2)}{4} = \frac{12-6}{4} = \frac{6}{4} = \frac{3}{2} = 1.5$

Let x = 4 put in (i)

y = $\frac{12-3(4)}{4} = \frac{12-12}{4} = \frac{0}{4} = 0$

Let x = 0, put in (i)

y = $\frac{12-3(0)}{4} = \frac{12}{4} = 3$

x	2	4	0
y	1.5	0	3
	A	B	C

When line meet x – axis, y = 0

∴ 3x + 4(0) = 12

3x = 12

x = $\frac{12}{3} = 4$

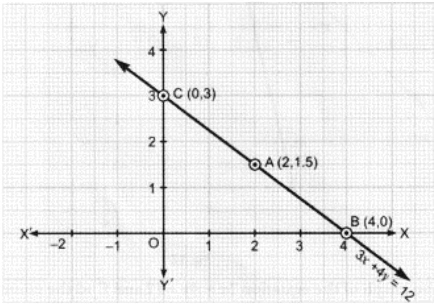
∴ Point of intersection of x – axis is (4, 0).

When line meets y – axis, x = 0

∴ 3(0) + 4y = 12

y = $\frac{12}{4} = 3$

∴ Point of intersection with y – axis is (0, 3).



12. $\frac{3}{x-1}+\frac{1}{x+1}=\frac{4}{x}$

$\frac{3(x+1)+1(x-1)}{(x-1)(x+1)}=\frac{4}{x}$

$\frac{3x+3+x-1}{x^2-1}=\frac{4}{x}$

$\frac{4x+2}{x^2-1}=\frac{4}{x}$

$x(4x+2)=4(x^2-1)$

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

2x = -4

x = -2

13. $\angle A+\angle D=180^\circ$ (Opp. angles of cyclic quadrilateral)

$65^\circ+\angle D=180^\circ$

$\angle D=180^\circ-65^\circ$ = 115°

Since $AB \parallel CD$ and BC is the transversel

$\angle B+\angle C=180^\circ$

$65^\circ+\angle C=180^\circ$

$\angle C=180^\circ-65^\circ$

$\angle C=115^\circ$

Now, $\angle A+115^\circ=180^\circ$ (Opposite angles of cyclic quadrilateral)

$\angle A=180^\circ-115^\circ$

$\angle A=65^\circ$

14. Area of four walls **=** 2h (l + b)

Here, l = 5 m, b = 4 m and h= 3 m

Area of four walls = $2\times3(5+4)$ = 54 m^2

Area of ceiling = $l\times b=5\times4$ = 20 m^2

Total area to be white-washed = 54 + 20 = 74 m^2

Cost of white-washing of 1 square meter = Rs. 7.50

∴ Cost of white-washing = Rs. 75×7.50 = Rs. 555.

15. Edge of tank = 2 m = $2 \times 100cm$ = 200 cm

Area of five faces of the tank = $5a^2$

= $5(200cm)^2$ = 2, 00,000 cm^2

Area of a square tile = $25cm \times 25cm$

= 625 cm^2

Number of tiles required = $\frac{\text{Area of five walls}}{\text{Area of a tile}} = \frac{200000}{625}$

=320

=$\frac{320}{12}$ dozen

Cost of one dozen of tiles = Rs. 480

∴ Cost of $\frac{320}{12}$ dozen tiles = $480 \times \frac{320}{12}$

= Rs. 12,800

16. (i) Lateral surface area of cubical box = $4a^2$

$4 \times 10^2 = 400 \ cm^2$

Lateral surface area of cuboidal box = 2h(l + b)

= $2 \times 8(12.5 + 10)$

= $16 \times 22.5 = 360 \ cm^2$

Thus, lateral surface area of cubical box is greater by

($400 \, cm^2$ - $360 \, cm^2$) = $40 \, cm^2$

(ii) Total surface area of cubical box = $6a^2$

= $6 \times 10^2 cm^2$ = 600 cm^2

Total surface area of cuboidal box = 2(lb + bh + hl)

= $2(12.5 \times 10 + 10 \times 8 + 8 \times 12.5)$

= 2(125 + 80 +100)

= $2 \times 305cm^2$

= 610 cm^2

Thus, total surface area of cuboidal box is greater by (610 - 600) cm^2

=$10cm^2$

17. (i) Frequency distribution of above data in tabular form is given as:

Concentration of sulphur dioxide (in ppm)	**Tally marks**	**Frequency**
0.00 - 0.04	||||	4
0.04-0.08	~~||||~~ |||	8

<table>
<tr><td>0.08-0.12</td><td>卌 ||||</td><td>9</td></tr>
<tr><td>0.12-0.16</td><td>|||</td><td>3</td></tr>
<tr><td>0.16-0.20</td><td>||||</td><td>4</td></tr>
<tr><td>0.20-0.24</td><td>||</td><td>2</td></tr>
<tr><td>Total</td><td></td><td>30</td></tr>
</table>

(ii) The concentration of sulphur dioxide was more than 0.11 ppm for 9 days.

18. (i) P (a family having 2 girls)

$$= \frac{\text{Number of families having 2 girls}}{\text{Total number of families}}$$

$$= \frac{475}{1500} = \frac{19}{60}$$

(ii) P (a family having 1 girl)

$$= \frac{\text{Number of families having 1 girls}}{\text{Total number of families}}$$

$$= \frac{814}{1500} = \frac{407}{750}$$

(iii) P (a family having no girl)

$$= \frac{\text{Number of families having no girls}}{\text{Total number of families}}$$

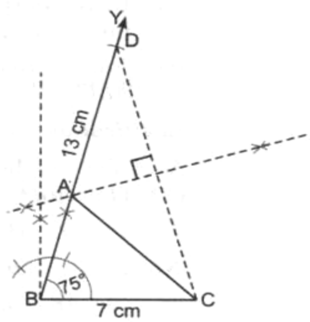
$$= \frac{211}{1500}$$

$$\text{Sum of probabilities} = \frac{475}{1500} + \frac{814}{1500} + \frac{211}{1500} = \frac{1500}{1500} = 1$$

SECTION-D

Question numbers **19** to 28 carry **four** marks each.

19.



Steps of Construction:

(i) Draw BC = 7 cm.

(ii) Construct $\angle$YBC = 75°.

(iii) From ray BY, cut-offline segment

BD =AB +AC = 13 cm.

(iv) Join CD.

(v) Draw the perpendicular bisector of CD meeting BY at A.

(vi) Join AC to obtain the required triangle ABC.

Justification

Since A lies on the perpendicular bisector of CD.

∴ AC = AD

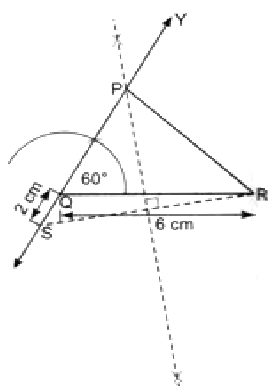
Now BD = 13 cm

⇒ BA+AD = 13 cm

⇒ BA + AC = 13 cm

Hence, ΔABC is the required triangle.

20.



Steps of Construction

(i) Draw QR = 6 cm.

(ii) Construct $\angle YQR = 60°$

(iii) Produce YQ to Y' to form line YQY'.

(iv) From ray QY', cut-offline segment QS = 2 cm.

(v) Join SR.

(vi) Draw perpendicular bisector of RS which intersect QY at P.

(vii) Join PR to obtain required ΔPQR.

Justification

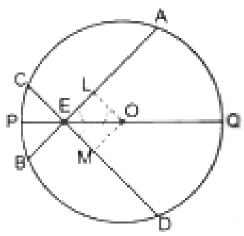
As P lies on the perpendicular bisector of RS.

Therefore, PR = PS = PQ + QS = PQ + 2 cm

PR – PQ = 2 cm

Hence, ΔPQR is the required triangle.

21. **Given:** AB and CD are two chords of a circle with centre O, intersecting at point E. PQ is a diameter through E, such that $\angle AEQ = \angle DEQ$



To prove: AB = CD

Construction: Draw $OL \perp AB$ and $OM \perp CD$

Proof: $\angle LOE + \angle LEO + \angle OLE = 180°$ (Angle sum property of a triangle)

$\angle LOE + \angle LEO + 90° = 180°$

$\angle LOE + \angle LEO = 90°$ ………………… (i)

Similarly $\angle MOE + \angle MEO + \angle OME = 180°$

$\angle MOE + \angle MEO + 90° = 180°$

$\angle MOE + \angle MEO = 90°$ ………………. (ii)

From (i) and (ii) we get

$\angle LOE + \angle LEO = \angle MOE + \angle MEO$ ……… (iii)

Also, $\angle LEO = \angle MEO$ (Given) …….. (iv)

From (iii) and (iv) we get

$\angle LOE = \angle MOE$

Now in triangles OLE and OME

$\angle LEO = \angle MEO$

$\angle LOE = \angle MOE$

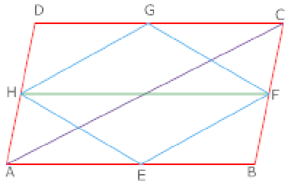
EO = EO (Common)

$\Delta OLE = \Delta OME$ (ASA congruence criterion)

OL = OM (CPCT)

Thus, chords AB and CD are equidistant from the centre 0 of the circle. Since, chords of a circle which are equidistant from the centre are equal AB = CD

22. Join AC and HF



E and F are the mid-points of AB and BC

$\therefore$ EF=$\frac{1}{2}$AC and EF||AC .... (i)

Similarly ,GH = $\frac{1}{2}$AC and GH||AC .... (ii)

From (i) and (ii)

GH = EF and GH||EF

$\therefore$ EFGH is a ||gram

$ar(\Delta HGF) = \frac{1}{2} ar(\| \ gram \ HDFC) ....(iii)$

$ar(\Delta HEF) = \frac{1}{2} ar(\| \ gram \ HABF) ....(iv)$

Adding (iii) and (iv),

$ar(\Delta HGF) + ar(\Delta HEF) = \frac{1}{2} ar(\| \ gram \ HDCF) + ar(\| \ gram \ HABF)$

$\Rightarrow ar(\| \ gram \ EFGH) \frac{1}{2}$ are$(\| \ gram \ ABCD)$

23. (i) $C = \frac{5F - 160}{9}$, putting F = 86°, we get

$C = \frac{5 \times 86 - 160}{9} = \frac{430 - 16}{9} = \frac{270}{9}$

$C = 30°C$

(ii) $C = \frac{5F - 160}{9}$, putting $C = 35°C$, we get,

$35 = \frac{5F - 160}{9}$

315=5F – 160

5F = 315 + 160 = 476

(iii) $C = \frac{5F - 160}{9}$, putting C = $0°C$, we get

$0 = \frac{5F - 160}{9}$

5F – 160 = 0

5F = 160

$F = \frac{160}{5} = 32$

$F = 32°F$

Putting $F = 0°F$ we get,

$C = \frac{5 \times 0 - 160}{9}$

$C = \frac{-160}{9}$

$C = \left(\frac{-160}{9}\right)°C$

(iv) $C = \frac{5F - 160}{9}$, putting F = C, we get

$C = \frac{5C - 160}{9}$

9C = 5C – 160

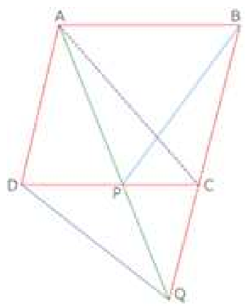
9C – 5C= -160

4C = -160

$C = \frac{-160}{4}$

C = -40

24. Join AC



$ar(\Delta BCP) = ar(\Delta APC)\ldots\ldots\ldots(i)$

$AD = CQ$

$AD \parallel BC$

$AD \parallel CQ$

Hence, a pair of opposite side AD and CQ of the quadrilateral ADQC is equal and parallel.

In ΔAPC and ΔQPD,

AP = QP

CP = DP

$\angle APC = \angle QPD$

$\Delta APC \cong \Delta QPD$

$ar(\Delta APC) = ar(\Delta QPD)$.........$(ii)$

From (i) and (ii)

$ar(\Delta BCP) = ar(\Delta QPD)$

$ar(BPC) = ar(DPQ)$

25. Height of the cone (h) = 24 cm

Let r cm be the radius of the base and l cm be the slant height of the cone.

Then,

Now, Curved surface area = πrl

Squaring both the sides we get

$r^2(r^2 + 576) = 30625$

$(r^2)^2 + 576r^2 - 30625 = 0$

Let $r^2 = x$

$\therefore x^2 + 576x - 30625 = 0$

$x^2 + 625x - 49x - 30625 = 0$

x (x + 625) - 49(x + 625) = 0

(x+ 625)(x - 49) = 0

x + 625 = 0,   x - 49 = 0

x = - 625,   x = 49

x ≠- 625,   x = 49

$\therefore r^2 = 49$

r = $\sqrt{49}$

r= 7 cm

Volume of the cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 7^2 \times 24 = 1232\, cm^3$

26. Let the original diameter of the sphere be 2x.

Then, original radius of the sphere = x

Original curved surface area = $4\pi r^2$

Decreased diameter of the sphere =2x – 25% of 2x

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

Decreased radius of the sphere $= \frac{3}{4}x$

$\therefore$ Decreased curved surface area $= 4\pi\left(\frac{3}{4}x\right)^2 = \frac{9}{4}\pi x^2$

Decrease in area $= 4\pi x^2 - \frac{9}{4}\pi x^2 = \frac{7}{4}\pi x^2$

Hence, percentage decrease in area $= \frac{\frac{7}{4}\pi x^2}{4\pi x^2} \times 100\%$

$= \frac{7}{16} \times 100\% = \frac{175}{4}\% = 43.75\%$

27. (i) Consider the class 118 – 126 and 127 – 135

The lower limit of 127 - 135 = 127

The upper limit of 118 – 126 = 126

Half of the difference $= \frac{127 - 126}{2} = 0.5$

So, the new class interval formed from 118 – 126 is

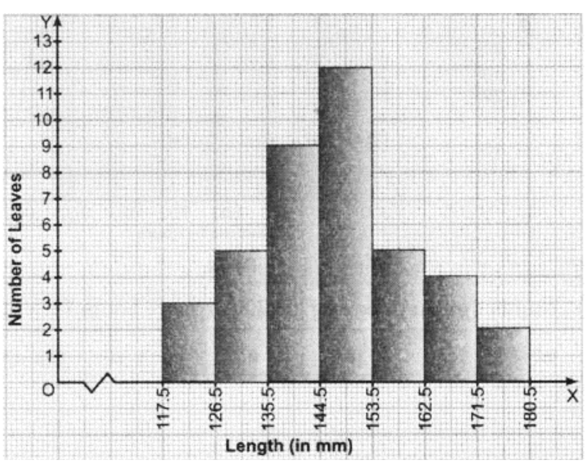
(118 – 0.5) – (126 + 0.5), i.e., 117.5 – 126.5

Continuing in the same manner, the continuous classes formed are:

Length (in mm)	Number of leaves
117.5-126.5	3
126.5-135.5	5
135.5-144.5	9
144.5-153.5	12
153.5-162.5	5
162.5-171.5	4
171.5-180.5	2

(ii) Yes, frequency polygon.

(iii) No, this frequency includes all leaves whose length are from 144.5 mm to 153.5 mm.



28. Total number of drivers = 2000

(i) Number of drivers who are 18–29 years old and have exactly 3 accidentsin one year is 61

So, P (driver is 18–29 years old with exactly 3 accidents) $= \frac{61}{2000} = 0.0305 \approx 0.031$

(ii) Number of drivers having 30–50 years of age and having one or more accidents in one year

= 125 + 60 + 22 + 18 = 225

So, P (driver is 30–35 years of age and having one or more accidents)

$\frac{225}{2000} = 0.1125 = 0.113$

(iii) Number of drivers having no accident in one year = 440 + 505 + 360= 1305

So, P (drivers with no accident) $= \frac{1305}{2000} = 0.6525 = 0.653$