

SUBJECT: MATHEMATICS

MAX. MARKS : 40

CLASS : IX

DURATION : 1½ hrs

General Instructions:

- (i). All questions are compulsory.
- (ii). This question paper contains 20 questions divided into five Sections A, B, C, D and E.
- (iii). **Section A** comprises of 10 MCQs of 1 mark each. **Section B** comprises of 4 questions of 2 marks each. **Section C** comprises of 3 questions of 3 marks each. **Section D** comprises of 1 question of 5 marks each and **Section E** comprises of 2 Case Study Based Questions of 4 marks each.
- (iv). There is no overall choice.
- (v). Use of Calculators is not permitted

SECTION – A**Questions 1 to 10 carry 1 mark each.**

1. The class marks of a frequency distribution are given as follows:

15, 20, 25, ...

The class corresponding to the class mark 20 is

- (a) 12.5–17.5 (b) 17.5–22.5 (c) 18.5–21.5 (d) 19.5–20.5

Ans. (b) 17.5–22.5

Class size = Second class mark – First class mark = $20 - 15 = 5$ Lower limit of class mark 20 = $20 - 5/2 = 20 - 2.5 = 17.5$ Upper limit of class mark 20 = $20 + 5/2 = 20 + 2.5 = 22.5$

Therefore, class interval for class mark 20 = 17.5 – 22.5

2. In the class intervals 10–20 and 20–30, the number 20 is included in

- (a) 10–20 (b) 20–30 (c) both the intervals. (d) none of these intervals.

Ans. (b) 20–30.

Since we know that we have to take the frequency 20 in class 20–30 as it starts with 20.

3. The class mark of the class 90–120 is

- (a) 90 (b) 105 (c) 115 (d) 120

Ans. (b) 105

Here, class mark = $(90 + 120)/2 = 105$.

4. In a frequency distribution, the mid value of a class is 10 and the width of the class is 6. The lower limit of the class is

- (a) 6 (b) 7 (c) 8 (d) 12

Ans. (b) 7

Mid value of class = 10, Class size = 6

Then lower limit = Mid value - (Class size/2)

 $= 10 - (6/2) = 10 - 3 = 7$.

5. To draw a histogram to represent the following frequency distribution:

Class Interval	5 – 10	10 – 15	15 – 25	25 – 45	45 – 75
Frequency	6	12	10	8	15

The adjusted frequency for the class 25–45 is

- (a) 6 (b) 5 (c) 3 (d) 2

Ans. (d) 2

Class size of CI = 25–45 = 20

Adjusted frequency for class interval for 25 – 45 = $(5/20) \times 8 = 2$.

6. For drawing a frequency polygon of a continuous frequency distribution, we plot the points whose ordinates are the frequencies of the respective classes and abscissa are respectively:

(a) upper limits of the classes (b) lower limits of the classes
(c) class marks of the classes (d) upper limits of preceding classes

Ans. (c) class marks of the classes

For drawing a frequency polygon of a continuous frequency distribution, we plot the frequencies of the classes on the ordinates and the class marks of the classes on the abscissae.

Class mark is the mid value or the central value of a class

It is calculated as follows: $(\text{Upper limit} + \text{Lower limit})/2$

7. In a frequency distribution, the mid value of a class is 10 and the width of the class is 6. The upper limit of the class is:

(a) 10 (b) 7 (c) 8 (d) 13

Ans. (d) 13

Mid value = 10, Class width = 6

Lower limit = mid value – (Class width/2) = $10 - (6/2) = 10 - 3$

\Rightarrow lower limit = 7

\Rightarrow Class width = upper limit – lower limit

$\Rightarrow 6 = \text{upper limit} - 7$

$\Rightarrow \text{upper limit} = 6 + 7 = 13$

8. The width of each of five continuous classes in a frequency distribution is 5 and the lower class-limit of the lowest class is 10. The upper class-limit of the highest class is:

(a) 15 (b) 25 (c) 35 (d) 40

Ans. (c) 35

Given: Lower class limit is 10.

Width of each of five continuous classes is 5.

Total width till upper class limit = $5 \times 5 = 25$

Therefore, the upper class limit of the highest class = $10 + 25 = 35$

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

9. **Assertion (A):** Histogram is a resultant graph that appears like a solid figure, with consecutive rectangles having no gap in between.

Reason (R): Histogram is a graphical representation of a grouped frequency distribution with consecutive classes.

Ans. (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Histogram is a graph that represent grouped frequency with continuous classes in the form of rectangles with class intervals as bases (x-axis) and corresponding frequency as height (y-axis).

There is no gap in between any two consecutive rectangles.

Hence, both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

10. **Assertion (A):** Frequency polygons can be drawn independently without the histogram by joining the midpoints of the class-marks. These midpoint of the class marks are called class intervals.

Reason (R): Class mark = $(\text{Upper limit} + \text{Lower limit})/2$

Ans. (d) Assertion (A) is false but reason (R) is true.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Convert the given frequency distribution into a continuous grouped frequency distribution:

Class interval	Frequency
150 – 153	7
154 – 157	7
158 – 161	15
162 – 165	10
166 – 169	5
170 – 173	6

In which intervals would 153.5 and 157.5 be included?

Ans. Consider the classes 150 – 153 and 154 – 157.

The lower limit of 154 – 157 = 154

The upper limit of 150 – 153 = 153

The difference = 154 – 153 = 1

Half the difference = $\frac{1}{2} \times 1 = 0.5$

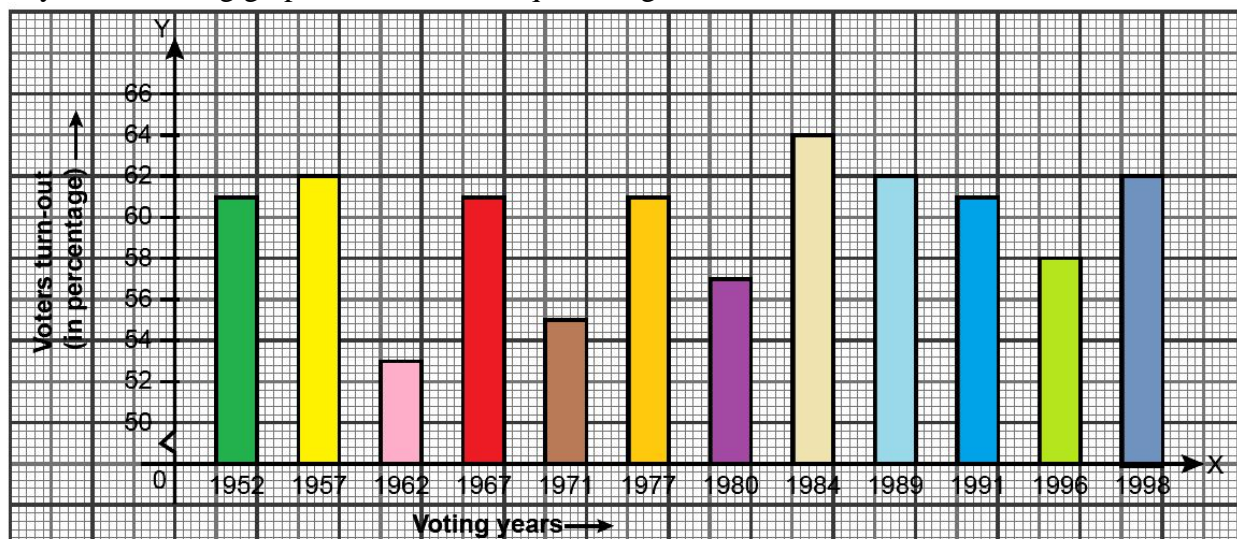
So, the new class interval formed from 150 – 153 is $(150 - 0.5) - (153 + 0.5)$, i.e., 149.5 – 153.5.

Continuous classes formed are:

Class interval	Frequency
149.5 – 153.5	7
153.5 – 157.5	7
157.5 – 161.5	15
161.5 – 165.5	10
165.5 – 169.5	5
169.5 – 173.5	6

153.5 is included in the class interval 153.5 – 157.5 and 157.5 in 157.5 – 161.5.

12. Study the following graph and answer the question given below



(i) In which years is the highest and lowest ever voters turn-out (in %)?

(ii) For which two years, the numeric difference in voters turn-out (in %) was nearly equal to 10%?

Ans. From the given graph, we have

(i) In the year 1984 the voters turn-out (in %) is the highest and in the year 1962 the voters turn-out (in %) is the lowest ever.

(ii) The years 1962 and 1984.

13. The table given below shows the number of persons from various age groups who participated in a campaign for promoting "USE OF CLEAN FUEL".

Age Group	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40
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No. of persons	12	25	22	37	48	30
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- (i) Determine the class size.
(ii) Write the class limits of first class interval.
(iii) What is the class mark of fourth class interval?
(iv) Which class interval has maximum frequency?

Ans. (i) Class size is 5.

(ii) First class interval is 10 – 15.

Lower limit = 10, Upper limit = 15

(iii) Class mark of 25 – 30 = $(25 + 30)/2 = 27.5$

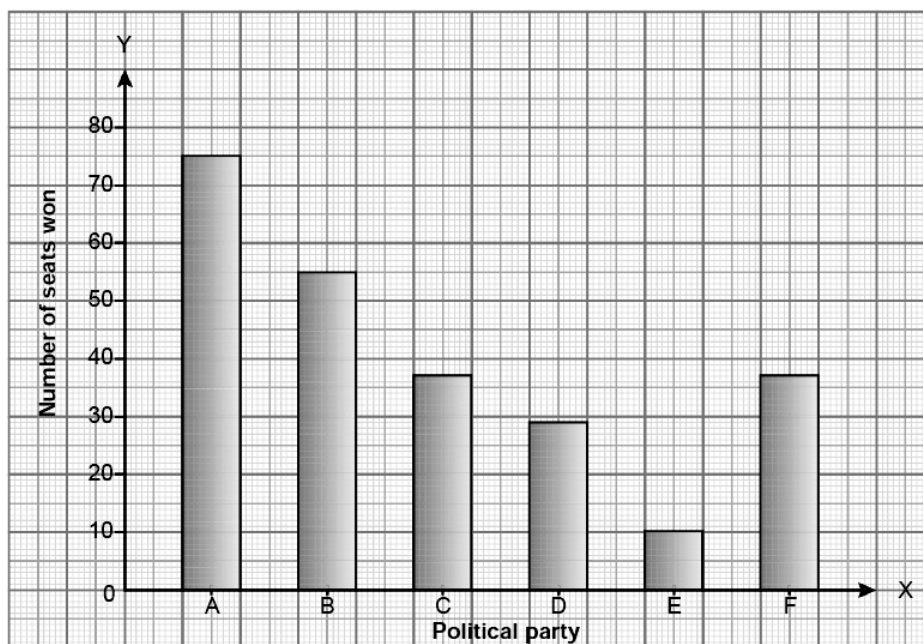
(iv) 30 – 35 has maximum frequency, i.e., 48.

14. Given below are the seats won by different political parties in the polling outcome of a state assembly elections:

Political party	A	B	C	D	E	F
Seats won	75	55	37	29	10	37

Draw a bar graph to represent the polling results.

Ans.



SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Draw a frequency polygon for the following distribution:

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of marks	7	10	6	8	12	3	2	2

Ans.

<i>x</i>	<i>f</i>	<i>(x, f)</i>
5	7	(5, 7)
15	10	(15, 10)
25	6	(25, 6)
35	8	(35, 8)
45	12	(45, 12)
55	3	(55, 3)
65	2	(65, 2)
75	2	(75, 2)



16. 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)	118–126	127–135	136–144	145–153	154–162	163–171	172–180
No. of leaves	7	10	6	8	12	3	2

Draw a histogram to represent the given data.

Ans.

Length (in mm)	No. of leaves
117.5 – 126.5	7
126.5 – 135.5	10
135.5 – 144.5	6
144.5 – 153.5	8
153.5 – 162.5	12
162.5 – 171.5	3
171.5 – 180.5	2

Consider the class 118 – 126 and 127 – 135

The lower limit of 127 – 135 = 127

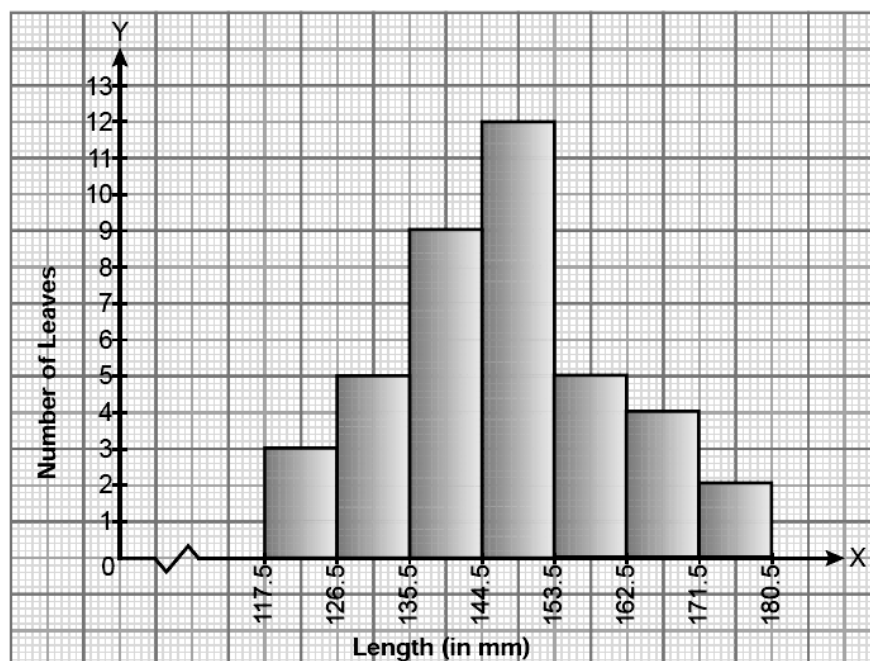
The upper limit of 118 – 126 = 126

Half of the difference = $(127 - 126)/2 = 0.5$

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:

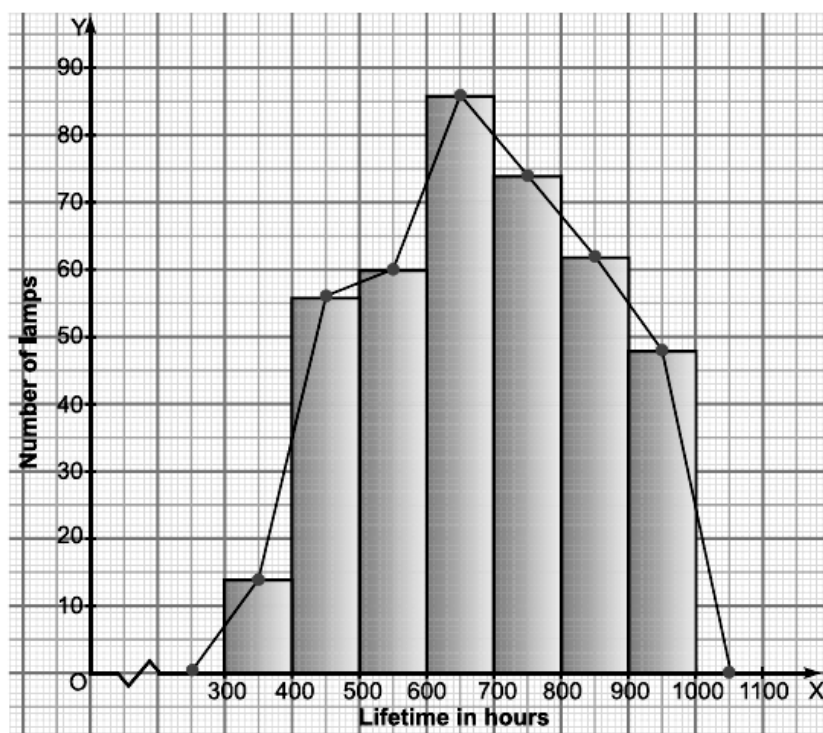


17. The following table gives the lifetimes of 400 neon lamps:

Lifetime (in hours)	Number of lamps
300 – 400	14
400 – 500	56
500 – 600	60
600 – 700	86
700 – 800	74
800 – 900	62
900 – 1000	48

- (i) Represent the given information with the help of a histogram and a frequency polygon.
(ii) How many lamps have a lifetime of 700 or more hours?

Ans. (i)



- (ii) Number of lamps having life time 700 or more hours = $74 + 62 + 48 = 184$.

SECTION – D

Questions 18 carry 5 marks.

18. The marks obtained (out of 100) by a class of 80 students are given below:

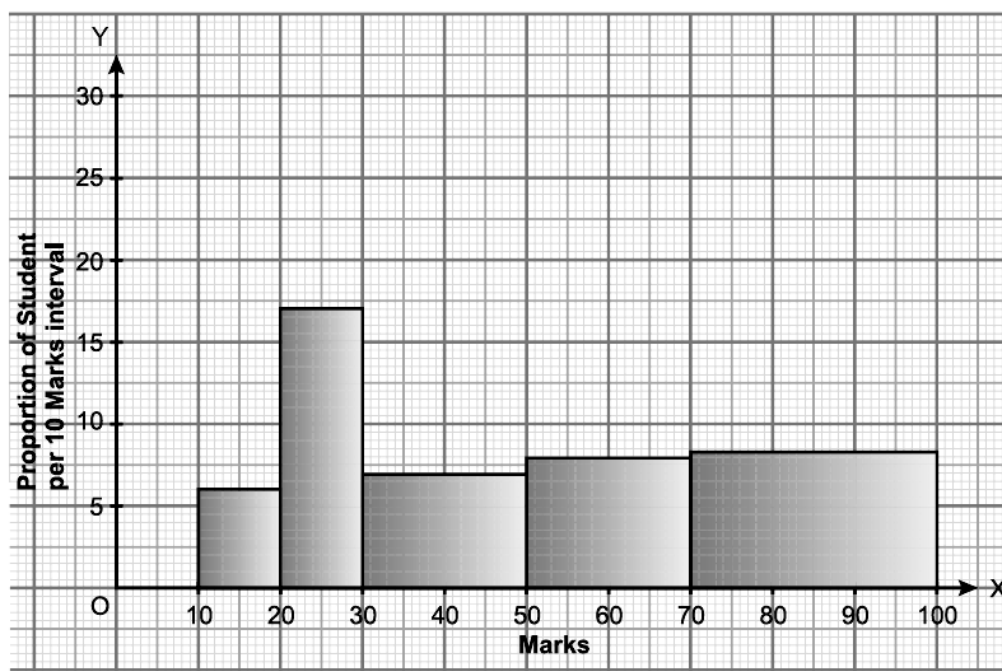
Marks	10 – 20	20 – 30	30 – 50	50 – 70	70 – 100
Number of students	6	17	15	16	26

Construct a histogram to represent the data above.

Ans. In the given frequency distribution, the class intervals are not of equal width. Therefore, we would make modification in the lengths of the rectangle in the histogram so that the areas of rectangle are proportional to the frequencies. Thus we have:

Marks	Frequency	Class width	Adjusted Frequency
10 – 20	6	10	$\frac{10}{10} \times 6 = 6$
20 – 30	17	10	$\frac{10}{10} \times 17 = 17$
30 – 50	15	20	$\frac{10}{20} \times 15 = 7.5$
50 – 70	16	20	$\frac{10}{20} \times 16 = 8$
70 – 100	26	30	$\frac{10}{30} \times 26 = 8.67$

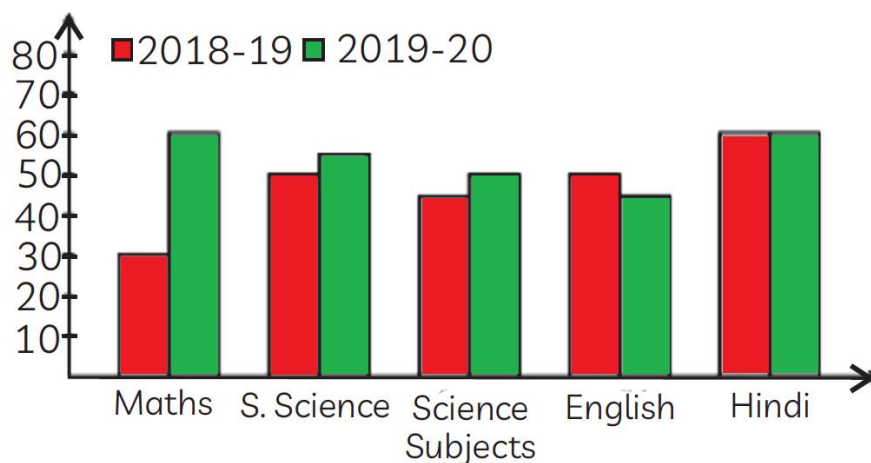
Now, we draw rectangles with lengths as given in the last column. The histogram of data is given below:



SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. The Class Teacher of Class X is diligently preparing a comprehensive result analysis for a student. To gain a clearer understanding of the student's academic progress, she compares the marks obtained in Class IX (2018-19) and Class X (2019-20) across various subjects. Using a double bar graph, the teacher visually represents the data to identify trends, such as improvements, consistency, or areas requiring attention. This graphical comparison helps in drawing meaningful insights into the student's performance over the two years, enabling the teacher to provide personalized feedback and guidance for further improvement. The double bar graph is illustrated below, showcasing the subject-wise comparison of marks.



On the basis of the above information solve the following questions.

- In which subject has the performance improved the most?
- In which subject has the performance deteriorated?
- What is the difference of marks in Maths in the given academic years?
- What is the percentage of marks obtained by a student in Class X (2019-20)?

Ans. (a) According to the double bar graph given absolute difference for two sessions is maximum for maths. Hence performance in Maths have improved the most.

(b) Performance has deteriorated in English

(c) Difference of marks in maths = $60 - 30 = 30$

(d) Percentage of marks obtained by student in (2019-20) is given by

$$\% \text{ mark} = (60 + 55 + 50 + 45 + 60)/5 = 54\%$$

- 20.** In order to monitor and reduce reckless driving on Delhi roads, authorities have taken proactive measures by installing advanced speed-monitoring cameras at strategic locations prone to over speeding. These cameras aim to enhance road safety and ensure compliance with traffic regulations. Below is a frequency distribution table representing the speeds of cars observed passing through a specific monitoring spot on a particular day in Delhi. This data provides insights into driving patterns and helps identify areas where enforcement or awareness campaigns may be required.



Speed (in km/h)	Numbers of four-wheeler
30 – 40	3
40 – 50	6
50 – 60	25
60 – 70	65
70 – 80	50
80 – 90	28
90 – 100	14

- Draw a Histogram for the frequency distribution table. (2)
- Draw a frequency polygon using Histogram for the frequency distribution table. (2)

Ans.

Speed (in km/h)	Numbers of four-wheeler
20 – 30	0
30 – 40	3
40 – 50	6
50 – 60	25
60 – 70	65
70 – 80	50
80 – 90	28
90 – 100	14
100 – 110	0

Joining the midpoints successively, we obtain the required frequency polygon ABCDEFGHI, as shown below.

