S. B. DAV

MATHEMATICS
CLASS-X

TIME ALLLOWED: 3 Hours   Maximum Marks 90

General Instructions:-

(1) All questions are compulsory
(2) The question paper consists of 31 questions divided into four sections A,B, C and D. Section-A comprises of 4 questions of 1 mark each; Section-B comprises of 6 questions of 2 marks each; section-C comprises of 10 questions of 3 marks each and section-D comprises of questions of 4 marks each.
(3) There is no overall choice in this question paper.
(4) Use of calculator is not permitted.

Section-A

1. If $\tan\theta = \cot(30° + \theta)$; find θ .

2. For a given data with 70 observations the 'less than 'ogive' and 'more than ogive' intersect at $(20.5, 35)$. What is the median of the data?

3. $\triangle ABC$ is similar to $\triangle DEF$. $ar(\triangle ABC) = 225 cm^2, ar(\triangle DEF) = 81 cm^2$, $AB = 30 cm$. Find the length of DE .

4.
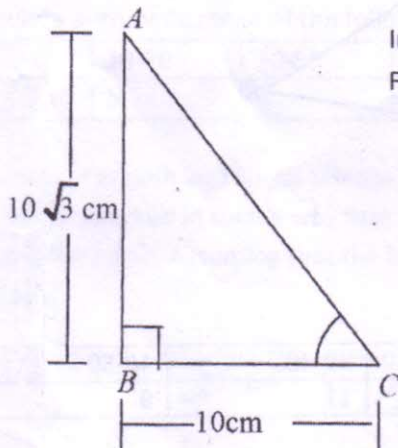
In the adjoining figure $\triangle ABC$ is right angled at B . Find $\angle ACB$.

10 $\sqrt{3}$ cm

B
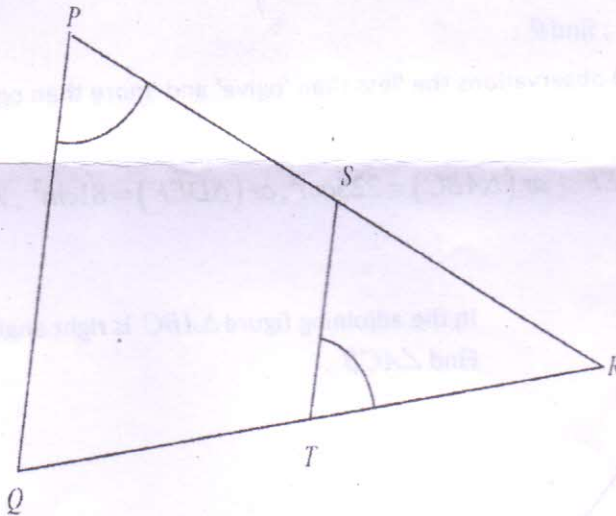
C

10cm

SECTION-B

5. Show that any positive odd integer is of the form $6q + 1$ or $6q + 3$ or $6q + 5$ where q is some integer.

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(1)

In the figure given below, ABC is right angled triangle, right angled at C. D is the mid-point of BC. Show that $\dfrac{\tan\theta}{\tan\phi} = \dfrac{1}{2}$
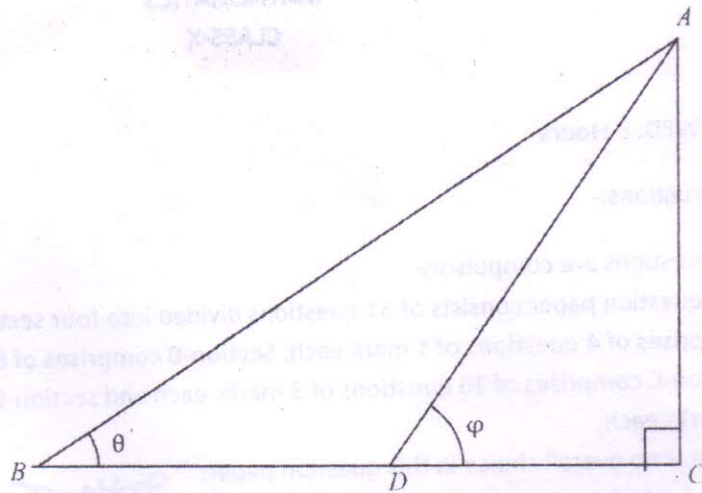
S and T are points on sides PR and QR of $\triangle PQR$ such that $\angle P = \angle RTS$. Show that

(i) $\triangle RPQ \sim \triangle RTS$

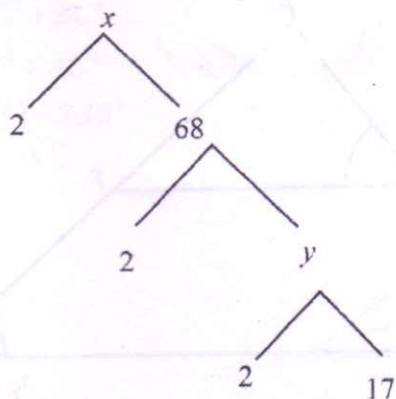(ii) $\dfrac{ST}{QP} = \dfrac{SR}{QR}$

Find the mode of the following frequency distribution.

C.I	0-10	10-20	20-30	30-40	40-50
F	8	12	10	11	9

(2)

9. Complete the following factor tree and find x and y .

10. The paths traced by two points are given by equation $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$. Will the paths cross? Explain.

SECTION-C

11. If $x = r \sin A \cos C, y = r \sin A \sin C, z = r \cos A$, prove that $r^2 = x^2 + y^2 + z^2$.

12. If α, β are zeros of quadratic polynomial $x^2 - 2x - 5$ then form a quadratic polynomial whose zeros are $\dfrac{1}{\alpha}$ and $\dfrac{1}{\beta}$.

13. Find the value of $\cos 45°$ geometrically.

14. A boat covers 25 km upstream and 44 km downstream in 9hours. Also, it covers 15km upstream and 22km downstream in 5hours. Find the speed of the boat in still water and that of stream.

15. Calculate arithmetic mean of the following group distribution by using step deviation method

| Cl	10-30	30-50	50-70	70-90	90-110	110-130	Total
f	5	8	12	20	3	2	50

16. Two sets of English and Social Science books containing 336 and 96 books respectively in a library have to be stacked in such a way that all the books are stored topic wise and the height of each stack is the same. Assuming that the books are of the same thickness, determine the total number of stacks.

17. Verify that $2, 3$ and $\dfrac{1}{2}$ are the zeros of the polynomial $p(x) = 2x^3 - 11x^2 + 17x - 6$
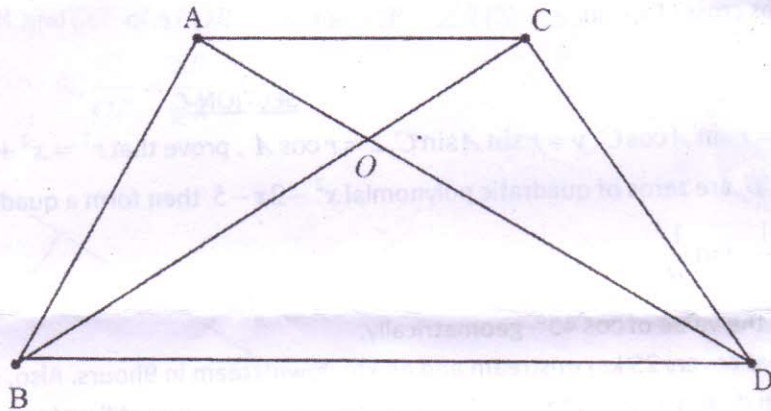
18. In the given figure $\dfrac{PS}{SQ} = \dfrac{PT}{TR}$ and $\angle PST = \angle PRQ$. Prove that PQR is an isosceles triangle.
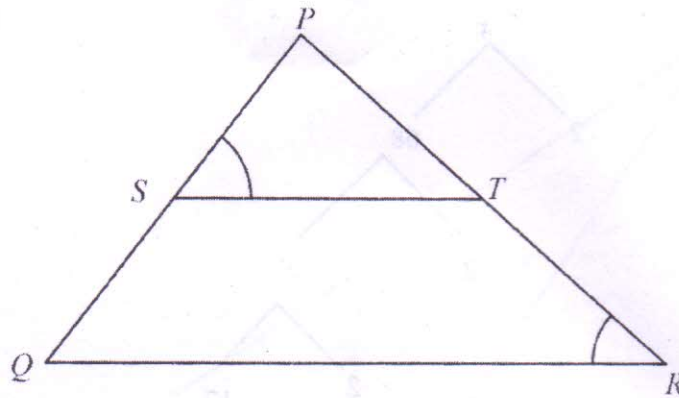
19. ABC and DBC are two triangles on the same base BC. If AD intersects BC at O. Show that
$$\dfrac{ar(\triangle ABC)}{ar(\triangle DBC)} = \dfrac{AO}{DO}$$

20. The mean of the following distribution is 27, find the value of p

Classes	0-10	10-20	20-30	30-40	40-50
Frequency	8	p	12	13	10

SECTION-D

21. Some people collected money to be donated in two old age homes. A part of the donation is fixed and the remaining depends on the numbers of old people in the home. If they donated ₹14,500 in the home having 60 people and ₹19,500 with 85 people. Find the fixed part of the donation and amount donated for each person. Also find amount to be donated for 100 people. Do you think that these people are working for a good cause? How?

22. Prove that $\left(\dfrac{\sin A}{1+\cos A} + \dfrac{1+\cos A}{\sin A}\right)\left(\dfrac{\cos A}{1+\sin A} + \dfrac{1+\sin A}{\cos A}\right) = 4\sec A\operatorname{cosec} A$

23. Prove that $\sqrt{3}$ is an irrational number and hence show that $7+\sqrt{3}$ is also irrational.

24. $\sqrt{3}$ and $-\sqrt{3}$ are two zeros of polynomial $x^4 + x^3 - 9x^2 - 3x + 18$. Find the other two zeros of the polynomial.

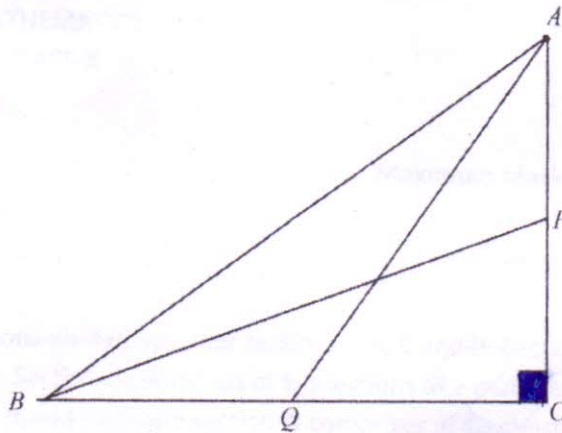25. P and Q are mid-points of the sides CA and CB respectively of $\triangle ABC$, right angled at C. Prove that

(i) $4AQ^2 = 4AC^2 + BC^2$

(ii) $4BP^2 = 4BC^2 + AC^2$

(iii) $4\left(AQ^2 + BP^2\right) = 5AB^2$

26. Prove " If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio"

27. Evaluate $\dfrac{\cot\left(90° - \theta\right)\sin\left(90° - \theta\right)}{\sin\theta} + \dfrac{\cot 40°}{\tan 50°} - \left(\cos^2 20° + \cos^2 70°\right)$.

28. If $\cot\theta = \dfrac{15}{8}$, find the value of $\dfrac{4\cot\theta - 15\sec\theta + 8\csc\theta}{15\tan\theta + \dfrac{4}{3}\cot\theta - 17\sin\theta}$

29. Draw the graph of $2x + y = 6$ and $2x - y + 2 = 0$. Shade the region bounded by the two lines and $x-axis$. Find the area of the shaded region.

30. If the median of the following distribution is 28.5, find the missing frequencies

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60	Total
Frequency	5	f_1	20	15	f_2	5	60

31. Following table shows marks(out of 100) of students in attest.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of Students	3	5	7	10	12	15	12	6	2	8

Convert the above data to less than type distribution and draw its ogive. Also, find the median from the graph.

$2x - y = 2$
$2x = 2 + y$
$x = \dfrac{2+y}{2}$

$2x + y = 6$
$2x = 6 - y$
$x = \dfrac{6-y}{2}$

$2x - 2 - 2x = 2$
$2x - 2 = 2$
$2x = 4$
$x = \dfrac{4}{2} = 2$

(5)