
Series HRL/1

Code No. 30/1/1

Roll No.

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Candidates must write the Code No.
on the title page of the answer-book

- Please check that this question paper contains 15 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 30 questions.
- Please write down the serial number of the question before attempting it.
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed a 10.15 a. From 10.15 a.m. to 10.30 a.m. the student will read the question paper only and will not write any answer on the answer script during this period.

MATHEMATICS

Time allowed: 3 hours]

[Maximum marks: 80

General Instructions:

- (i) All questions are compulsory.
- (ii) The question paper consists of 30 questions divided into four sections – A, B, C and D. Section A comprises of ten questions of 1 mark each, Section B comprises of five questions of 2 marks each, Section C comprises of ten questions of 3 marks each and Section D comprises of five questions of 6 marks each.
- (iii) All questions in section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- (iv) There is no overall choice. However, an internal choice has been provided in one question of 2 marks each, three questions of 3 marks each and two questions of 6 mark each. You have to attempt only one of the alternatives in all such questions.
- (v) In question on construction, the drawings should be neat and exactly as per the given measurements.
- (vi) Use of calculators is not permitted.

Section – A

Question Number 1 to 10 carry 1 mark each.

- Q1. The decimal expansion of the rational number $\frac{43}{2^4 \cdot 5^3}$, will terminate after how many places of decimals?
- Q2. For what value of k, (-4) is a zero of the polynomial $x^2 - x - (2k + 2)$?
- Q3. For what value of p, are $2p - 1$, 7 and $3p$ three consecutive terms of an A.P.?
- Q4. In Fig. 1, CP and CQ are tangents to a circle with centre O. ARB is another tangent touching the circle at R. If $CP = 11\text{cm}$, and $BC = 7\text{cm}$, then find the length of BR.

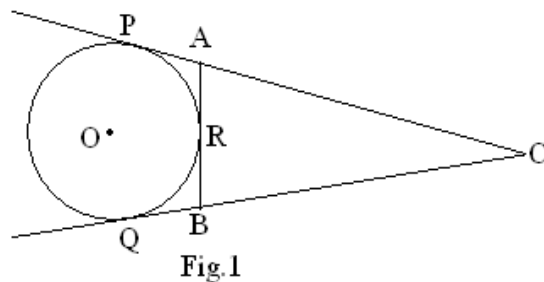


Fig.1

- Q5. In Fig. 2, $\angle M = \angle N = 46^\circ$. Express x in terms of a, b and c where a, b and c are length of LM, MN and NK respectively.

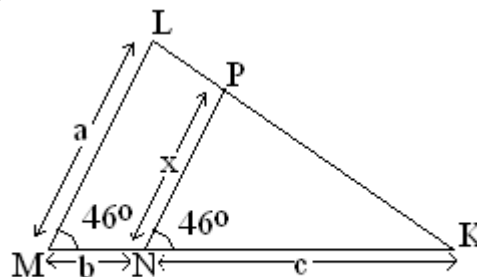


Fig.2

- Q6. If $\sin \theta = \frac{1}{3}$, then find the value of $(2 \cot^2 \theta + 2)$.
- Q7. Find the value of a so that the point (3, a) lies on the line represented by $2 - 3y = 5$.

Q8. A cylinder and a cone are of same base radius and of same height. Find the ratio of the volume of cylinder to that of the cone.

Q9. Find the distance between the points $\left(\frac{-8}{5}, 2\right)$ and $\left(\frac{2}{5}, 2\right)$.

Q10. Write the medium class of the following distribution:

0 – 10	4
10 – 20	4
20 – 30	8
30 – 40	10
40 – 50	12
50 – 60	8
60 – 70	4

Section – B

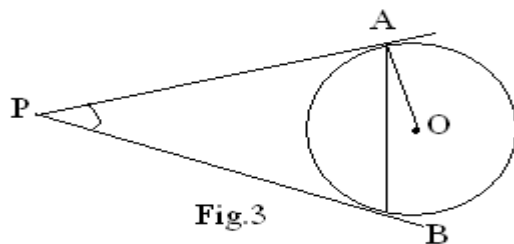
Question Number 11 to 15 carry 2 marks each.

Q11. If the polynomial $6x^4 + 8x^3 + 17x^2 + 21x + 7$ is divided another polynomial $3x^2 + 4x + 1$, the remainder comes out to be $(ax + b)$, find a and b.

Q12. Find the value (s) of k for which the pair of linear equations $kx + 3y = k - 2$ and $12x + ky = k$ has no solution.

Q13. If S_n the sum of first n terms of an A.P. is given by $S_n = 3n^2 - 4n$, then find its nth term.

Q14. Two tangents PA and PB are drawn to a circle with centre O from an external point P. Prove that $\angle APB = 2 \angle OAB$.



OR

Prove that the parallelogram circumscribing a circle is a rhombus.

Q15. Simplify: $\frac{\sin^3 \theta + \cos^3 \theta}{\sin \theta + \cos \theta} + \sin \theta \cos \theta$

Section – C

Question Number 16 to 25 carry 3 marks each.

Q16. Prove that $\sqrt{5}$ is an irrational number.

Q17. Solve the following pair of equations:

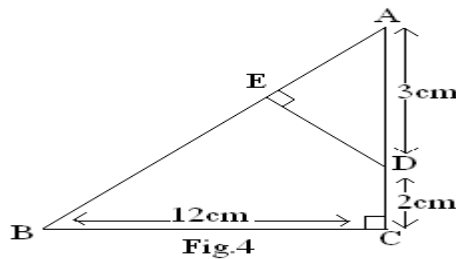
$$\frac{5}{x-1} + \frac{1}{y-2} = 2$$

$$\frac{6}{x-1} - \frac{3}{y-2} =$$

Q18. The sum of 4th and 8th terms of an A.P. is 24 and sum of 6th and 10th terms is 44. Find A.P.

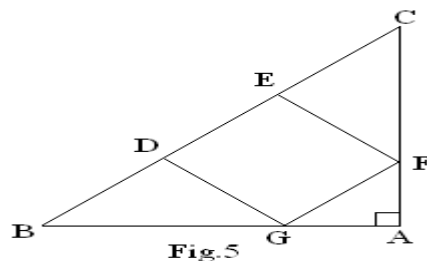
Q19. Construct a ΔABC in which $BC = 6.5\text{cm}$, $AB = 4.5\text{cm}$ and $\angle ABC = 60^\circ$. Construct a triangle similar to this triangle whose sides are $\frac{3}{4}$ of the corresponding sides of the triangle ABC .

Q20. In Fig. 4 ΔABC is right angled at C and $DE \perp AB$. Prove that and hence find the length of AE and DE .



OR

In Fig. 5, $DEFG$ is a square and $\angle BAC = 90^\circ$. Show that $DE^2 = BD \times EC$.



Q21. Find the value of $\sin 30^\circ$ geometrically.

OR

Without using trigonometrically tables, evaluate:

$$\frac{\cos 58^\circ}{\sin 32^\circ} + \frac{\sin 22^\circ}{\cos 68^\circ} - \frac{\cos 38^\circ \cos 52^\circ}{\tan 18^\circ \tan 25^\circ \tan 60^\circ \tan 72^\circ \tan 55^\circ}$$

Q22. Find the point on y-axis which is equidistant from the points (5, -2) and (-3, 2).

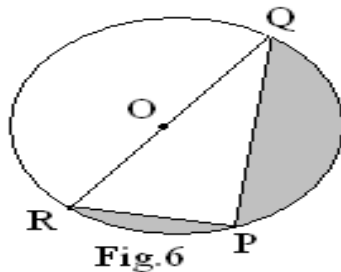
OR

The line segment joining the points A (2, 1) and B (5, -8) is trisected at the points P and Q such that P is nearer to A. If P also lies on the line given by $2x - y + k = 0$, find the value of k.

Q23. If P (x, y) is any point on the line joining the points A (a, 0) and B (0, b), then show that

$$\frac{x}{a} + \frac{y}{b} = 1.$$

Q24. In Fig. 6, $PQ = 24\text{cm}$, $PR = 7\text{cm}$ and O is the centre of the circle. Find the area of shaded region (take $\pi = 3.14$)



Q25. The king, queen and jack of clubs are removed from a deck of 52 playing cards and the remaining cards are shuffled. A card is drawn from the remaining cards. Find the probability of getting a card of (i) heart (ii) queen (iii) clubs.

Section – D

Question Number 26 to 30 carry 6 marks each.

Q26. The sum of the squares of two consecutive odd numbers is 394. Find the numbers.

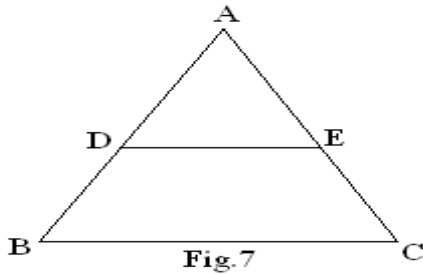
OR

Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 1 hour. What are the speeds of the two cars?

Q27. Prove that, if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points; the other two sides are divided in the same ratio.

Using the above result, do the following:

In Fig. 7, $DE \parallel BC$ and $BD = CE$. Prove that $\triangle ABC$ is an isosceles triangle.

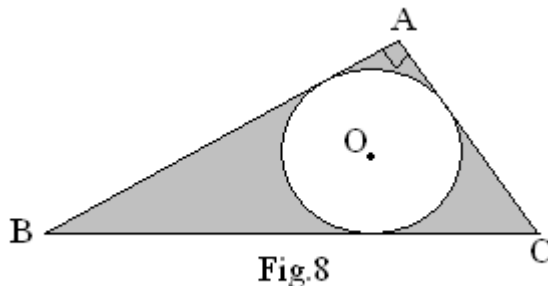


Q28. A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30° , which is approaching the foot of the tower with a uniform speed. Six seconds later the angle of depression of the car is found to be 60° . Find the time taken by the car to reach the foot of the tower from this point.

Q29. From a solid cylinder whose height is 8cm and radius 6cm, a conical cavity of height 8cm and of base radius 6cm, is hollowed out. Find the volume of the remaining solid correct to two places of decimals. Also find the total surface area of the remaining solid. (Take $\pi = 3.14$)

OR

In Fig 8, ABC is a right triangle angled at A. find the area of shaded region if $AB = 6$ cm, $BC = 10$ cm and O is the centre of the incircle of $\triangle ABC$. (Take $\pi = 3.14$)



Q30. The following table gives the daily income of 50 workers of a factory:

Daily income (in Rs)	100 - 120	120 - 140	140 - 160	160 - 180	180 - 200
Number of workers	12	4	8	6	10

Find the Mean, Mode and Median of the above data.

SET – 30 /1 /2

Section – C

Q16. Prove that $\sqrt{3}$ is an irrational number.

Q18. The sum of 5th and 9th terms of an A.P. is 72 and the sum of 7th and 12th terms is 97. Find the A.P.

Q22. Find the point on x-axis which is equidistant from the points (2, -5) and (-2, 9).

Section – D

Q27. Prove that, in a right triangle, the square of the hypotenuse is equal to the sum of squares of the other two sides.

Using the above, do the following:

Prove that, in a ΔABC , if AD is perpendicular to BC, then $AB^2 + CD^2 = AC^2 + BD^2$.

Q28. The angles of depression of the top and bottom of an 8m tall building from the top of a multi-storeyed building are 30° and 45°, respectively. Find the height of the multi-storeyed building and the distance between the two buildings.

SET – 30/1/3

Section – A

Q2. For what value of p, (-4) is a zero of the polynomial $x^2 - 2x - (7p + 3)$?

Section – B

Q11. If the polynomial $x^2 + 2x^3 + 8x^2 + 12x + 18$ is divided by another polynomial $x^2 + 5$, the remainder comes out to be $px + q$. Find the values of p and q.

Section – C

Q16. Prove that $\sqrt{2}$ is an irrational number.

Q17. Solve the following pair of equations:

$$\frac{10}{x+y} + \frac{2}{x-y} = 4$$

$$\frac{15}{x+y} + \frac{5}{x-y} = -2$$

Q19. Construct a ΔABC in which $BC = 6.5\text{cm}$, $AB = 4.5\text{cm}$ and $\angle ACB = 60^\circ$. Construct another triangle similar to ABC such that each side of new triangle is $\frac{4}{5}$ of the corresponding sides of ΔABC .

Section – D

Q27. Prove that the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

Using the above, do the following:

In a trapezium $ABCD$, AC and BD are intersecting at O , $AB \parallel DC$ and $AB = 2 CD$. If area of $\Delta AOB = 84 \text{ cm}^2$, find the area of ΔCOD .

Q28. A pole of height 5m is fixed on the top of a tower. The angle of elevation of the top of the pole as observed from a point A on the ground is 60° and the angle of the point A from the top of tower is 45° . Find the height of the tower. [Take $\sqrt{3} = 1.732$]