**Mathematics**
**Class-X**

Time: *3 hrs* Max. Marks-*100*

General Instructions:

1.Section A has each question of 3 marks; Section B has each question of 4 marks and Section C has each question of 6 marks.
2.There are 4 printed sides in this paper.
3.All questions are necessary, internal choices have been given.
4.Write the serial number of the question before attempting it.
5.Use of calculator is not permitted.

## Section A

**1)** If (x-2)(x+3) is the HCF of $(x^2 - 3x + 2)$ $(ax^2+7x+3)$ and $(3x^2 + 8x - 3)$ $(x^2+6x+6)$, Find the value of 'a' and 'b'.

**2)** Reduce the following rational expression to it's lowest term:

$$\frac{y}{x - y} - \frac{2y^2}{x^2 + y^2} - \frac{y}{x + y}$$

**3)** For what value of 'k' the given equation $kx^2 - 4x + 2 = 0$ has real and equal roots?

**4)** How many terms of the AP 17, 15, 13, 11… must be added to get the sum 72? Explain the double answer.

**Or**

Which term of the AP 24, 21, 18, 15… is the first negative term?

**5)** Is 36 a term of the AP 5, 9, 13, 17…?

**6)** Gunn borrowed Rs.6880 at 15% per annum, compounded annually. She paid it back in two equal annual installments. Calculate the value of each installment.

**Or**

Manan borrowed a certain sum of money at 12% per annum compounded annually. He paid it back in two equal annual installments of Rs3920 each. What sum did he borrow?

**7)** Prove the following identity:

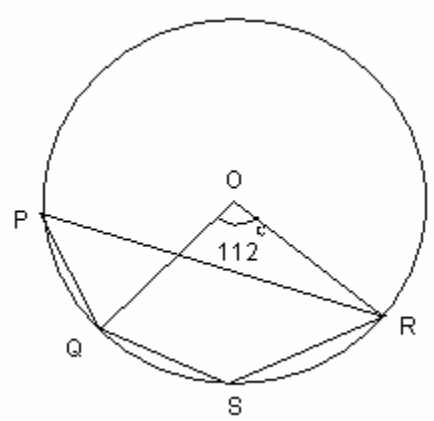
$$\frac{1+\sin A}{\cos A} + \frac{\cos A}{1-\sin A} = 2\sec^2 A$$

**Or**

Without using trigonometric tables, prove that:

$$\tan 22^\circ \tan 35^\circ \tan 45^\circ \tan 55^\circ \tan 68^\circ = 1$$

**8)** In the figure given figure, If O the centre of the circle, find $\angle$QSR.




**9)** Solve the following system of equations:

$2x + 5y = 8/3$,
$3x - 2y = 5/6$

**10)** Cost of an article is Rs2000; Samdarsh agrees to pay Rs500 in cash, followed by 4 equal monthly installments of Rs380 each. What rate of interest does he pay?

## Section B

**11)** Use a single graph and draw the graph of the following equations:
$2y - x - 8 = 0$,
$y - 2x - 1 = 0$
Calculate the area of the triangle so formed. Also, find the coordinates of the points where the lines intersect the 'y' axis.

Solve for 'u' and 'v' (where 'u' and 'v' $\neq 0$)
$6u = -3v + 7uv$,
$3u = -9v + 11uv$

**12)** 540 cubic cm of brass is to be drawn into a cylinder of 12 cm in diameter. Find its lateral surface area.

**14)** The bisectors of the angles Q and R of a $\Delta$ PQR meet the opposite sides at X and Y respectively. If YX | | QR, prove that the triangle is isosceles.

**15)** Construct $\Delta$XYZ, in which YZ = 5cm, $\angle$XYZ = $60^\circ$ and the median XP through X is 4 cm long. Construct a $\Delta$ X`YZ` similar to $\Delta$XYZ with YZ` = 7cm.

**16)** Find the missing frequencies ('x' and 'y') in the following frequency distribution table, it being given that the mean of this distribution is 50.

| | | | | | | |
|---|---|---|---|---|---|---|
| Frequency | 17 | x | 32 | y | 19 | 120 |

**17)** The following data represents the results of a survey conducted of teenagers asking about their role models.

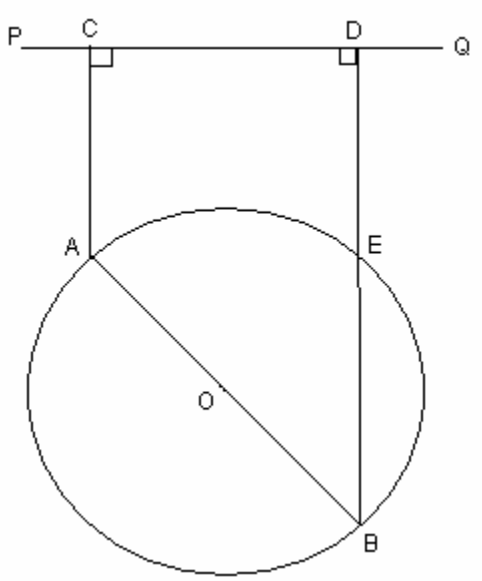
| Role Model | Shahrukh Khan | Sachin Tendulkar | Ambani Brothers | Others |
|---|---|---|---|---|
| Marks | 31% | 45% | 12% | 12% |

Represent the above data by a pie chart.

**18)** From a pack of 52 cards all the hearts and the face cards (ace, king, queen, and jack) are removed. Then one card is drawn at random, what is the probability of getting:

(i) A red card.
(ii) A queen. What is this event called?
(iii) A black card
(iv) '5' of red .

**19)** In the given figure, AB is a diameter of the circle with centre 'o'. If AC and BD are perpendiculars on a line PQ, and BD meets the circle at E, prove that *AC = ED.*




**20)** Show that the points (2,1), (5,2), (6,4) and (3,3) are the angular points of a parallelogram. Is this figure a rectangle?

**Or**

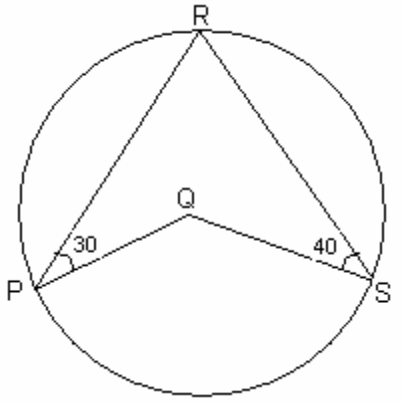
Find the coordinates of the points of trisection of the line segment joining (3, 2) and (6,-7).

## Section C

**21)** A hollow sphere of external and internal diameters 8 cm and 4 cm respectively is melted into a cone of base diameter 8 cm. Find the height of the cone.

**Or**

The diameter of a solid sphere is 60 cm. It is melted and drawn into a wire of diameter 2mm. Find the length of the wire.



**22)** From the top of a tower 60m high, the angles of depression of the top and bottom of a building are observed to be $30^\circ$ and $60^\circ$. Find the height of the building and the distance between them.

**Or**

If the angle of elevation of the cloud from a point 'h' m above a lake is 'A' and the angle of depression of it's reflection in the lake is 'B', prove that the height of the cloud is

$$\frac{h(\tan B + \tan A)}{\tan B - \tan A}$$

**23)** State and prove the Basic proportionality theorem.
Using the above result, prove that the diagonals of a trapezium divide each other in the same ratio.

**24)** Prove that the angle subtended by an arc of a circle at its centre is double the angle subtended by it at any point on the remaining part of the circle.
Using the above result, if Q is the centre of the circle and $\angle RPQ = 30^\circ$ and $\angle RSQ = 40^\circ$. Find $\angle PQS$?

**25)** The annual income of Avinesh (excluding HRA) is Rs. 1,60,000. He contributes Rs.4000 per month in his Provident Fund and pays an annual premium of Rs. 16,000 towards his Life Insurance Policy. Calculate the income tax paid by Avinesh in the last month of the year if his earlier deductions for first 11 months for income tax were @ Rs 300 per month.