## MATHEMATICS

*(Two Hours and a half)*

*Answers to this Paper must be written on the paper provided separately.*

*You will **not** be allowed to write during the first **15** minutes.*

*This time is to be spent in reading the question paper.*

*The time given at the head of this Paper is the time allowed for writing the answers.*

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*Attempt **all** questions from **Section A** and **any four** questions from **Section B**.*

***All working, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answer. Omission of essential working will result in the loss of marks.***

*The intended marks for questions or parts of questions are given in brackets [ ].*

***Mathematical tables are provided.***

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### SECTION A (40 Marks)

*Attempt **all** questions from this Section.*

**Question 1**

(a) Kiran purchases an article for Rs. 5,400 which includes 10% rebate on the marked price and 20% sales tax on the remaining price. Find the marked price of the article. [3]

(b) If $\frac{3x+5y}{3x-5y} = \frac{7}{3}$, find $x : y$ [3]

(c) A person invests Rs.10,000 for two years at a certain rate of interest compounded annually. At the end of one year this sum amounts to Rs. 1,200. Calculate:-

(i) the rate of interest per annum

(ii) the amount at the end of the second year [4]

**Question 2**

(a) Show that $2x + 7$ is a factor of $2x^3 + 5x^2 - 11x - 14$. Hence factorise the given expression completely, using the factor theorem. [3]

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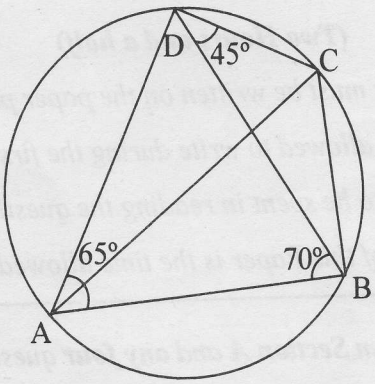
(b) The median of the following observations 11, 12, 14, 18, (x + 4), 30, 32, 35, 41 arranged in ascending order is 24. Find x. [3]

(c)




In the above figure, $\angle BAD = 65^\circ$, $\angle ABD = 70^\circ$ and $\angle BDC = 45^\circ$.
Find:-

(i) $\angle BCD$

(ii) $\angle ADB$

Hence show that AC is a diameter [4]

**Question 3**

(a) Mohan deposits Rs. 80 per month in a cumulative deposit account for six years. Find the amount payable to him on maturity, if the rate of interest is 6% per annum. [3]

(b) A rectangular playground has two semicircles added to its outside with its smaller sides as diameters. If the sides of the rectangle are 120 m and 21 m, find the area of the playground.
($\pi = 22/7$). [3]

(c) Use graph paper for this question.
The points A (2, 3), B (4, 5) and C (7, 2) are the vertices of Δ ABC.

(i) Write down the coordinates of A′, B′, C′ if Δ A′ B′ C′ is the image of Δ ABC, when reflected in the origin.

(ii) Write down the co-ordinates of A″, B″, C″ if Δ A″ B″ C″ is the image of Δ ABC, when reflected in the x-axis.

(iii) Mention the special name of the quadrilateral BCC″B″ and find its area. [4]

**Question 4**

(a) Without using tables, evaluate:-

$$\frac{2\tan 53°}{\cot 37°} - \frac{\cot 80°}{\tan 10°}$$ [3]

(b) Given that $x \in R$, solve the following inequality and graph the solution on the number line: $-1 \leq 3 + 4x < 23$ [3]

(c) Find the mean of the following distribution:-

| Class interval | 20 – 30 | 30 - 40 | 40- 50 | 50 - 60 | 60 – 70 | 70 – 80 |
|---|---|---|---|---|---|---|
| Frequency | 10 | 6 | 8 | 12 | 5 | 9 |

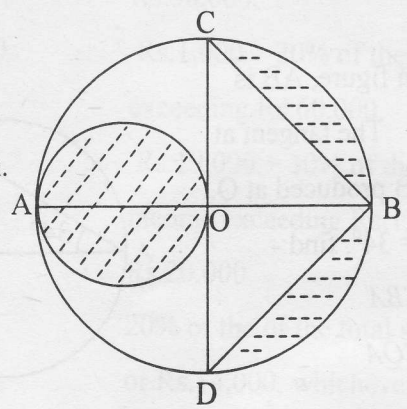
[4]

## SECTION B (40 Marks)

*Attempt any **four** questions from this Section.*

**Question 5**

(a) In the given figure, AB is the diameter of a circle with centre O and OA = 7 cm. Find the area of the shaded region.




[3]

(b) Prove that $\frac{\sin\theta \tan\theta}{1-\cos\theta} = 1 + \sec\theta$. [3]

(c) Mr. Ashok has an account in the Central Bank of India. The following entries are from his pass book:-

| Date | Particulars | Withdrawals Rs. P. | Deposits Rs. P. | Balance Rs. P. |
|---|---|---|---|---|
| 01.01.05 | B/F | -- | -- | 1200.00 |
| 07.01.05 | By cash | | 500.00 | 1700.00 |
| 17.01.05 | To cheque | 400.00 | -- | 1300.00 |
| 10.02.05 | By cash | -- | 800.00 | 2100.00 |
| 25.02.05 | To cheque | 500.00 | -- | 1600.00 |
| 20.09.05 | By cash | -- | 700.00 | 2300.00 |
| 21.11.05 | To cheque | 600.00 | -- | 1700.00 |
| 05.12.05 | By cash | -- | 300.00 | 2000.00 |

If Mr. Ashok gets Rs.83.75 as interest at the end of the year where the interest is compounded annually, calculate the rate of interest paid by the bank in his Savings Bank Account on 31st December, 2005. [4]

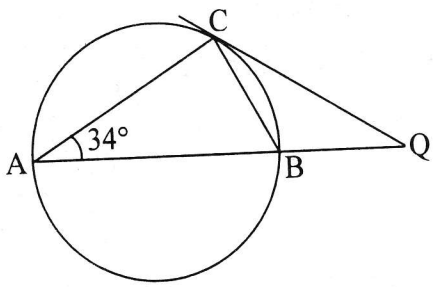
**Question 6**

(a) In the given figure, AB is a diameter. The tangent at C meets AB produced at Q.

If $\angle CAB = 34^\circ$, find:-

(i) $\angle CBA$

(ii) $\angle CQA$




[3]

(b) If the lines $y = 3x + 7$ and $2y + px = 3$ are perpendicular to each other, find the value of p. [3]

(c) Let $A = \begin{bmatrix} 4 & -2 \\ 6 & -3 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 2 \\ 1 & -1 \end{bmatrix}$ and $C = \begin{bmatrix} -2 & 3 \\ 1 & -1 \end{bmatrix}$

Find $A^2 - A + BC$. [4]

**Question 7**

(a) Mr. Sanjeev Chopra gets a monthly salary of Rs.16,000.

Savings:

- Contribution towards Provident Fund: Rs.45,000 per year.

Donations:

- To Prime Minister's Relief Fund : Rs.3,100 (eligible for 100% tax exemption)

Calculate:-

(i) Mr. Chopra's taxable income.

(ii) The tax rebate on Mr. Chopra's savings.

(iii) The tax Mr. Chopra has to pay in the last month of the year, if he has been paying a tax of Rs.1,200 per month in the first eleven months of the year.

**Tax slab**:-

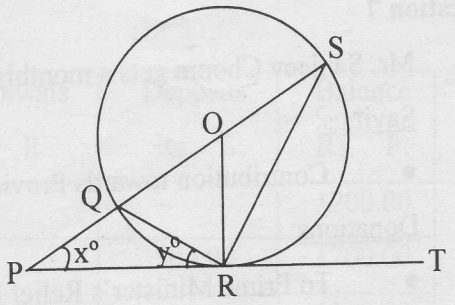
| | | |
|---|---|---|
| Upto Rs.50,000 | : | No tax. |
| Rs.50,001 to Rs. 60,000 | : | 10% of the income exceeding Rs.50,000. |
| Rs.60,001 to Rs.1,50,000 | : | Rs.1,000 + 20% of the income exceeding Rs.60,000. |
| Above Rs.1,50,000 | : | Rs.19,000 + 30% of the income exceeding Rs.1,50,000. |
| Standard Deduction | : | Rs.20,000. |
| Rebate in tax | : | 20% of the of the total savings or Rs.14,000, whichever is less. |
| Surcharge | : | 10% of the total tax payable after rebate |

[6]

(b) The shadow of a vertical tower on a level ground increases by 10 m when the altitude of the sun changes from $45^{\circ}$ to $30^{\circ}$. Find the height of the tower, correct to two decimal places. [4]

**Question 8**

(a) In the given figure, PT touches a circle with centre O at R. Diameter SQ when produced meets PT at P. If $\angle SPR = x^o$ and $\angle QRP = y^o$, show that $x^o + 2y^o = 90^o$.




[3]

(b) The line segment joining A (2,3) and B (6, -5) is intercepted by the X axis at the point K. Write the ordinate of the point K. Hence find the ratio in which K divides AB. [3]

(c) Mr. Ram Gopal invested Rs. 8,000 in 7% Rs.100 shares at Rs.80. After a year he sold these shares at Rs.75 each and invested the proceeds (including his dividend) in 18%, Rs. 25 shares at Rs.41.

Find:-

(i) his dividend for the first year

(ii) his annual income in the second year

(iii) the percentage increase in his return on his original investment. [4]

**Question 9**

(a) $A = \{ -2, -1, 1, 2 \}$ and $f = \{(x, \frac{1}{x}), x \varepsilon A\}$

(i) List the domain of f

(ii) List the range of f

(iii) Is f a function? Give reasons for your answer. [3]

(b) Solve the equation $2x - \frac{1}{x} = 7$. Write your answer correct to two decimal places. [3]

(c) A vessel in the form of an inverted cone is filled with water to the brim. Its height is 20 cm and diameter is 16.8 cm. Two equal solid cones are dropped in it so that they are fully submerged. As a result, one third of the water in the original cone overflows. What is the volume of each of the solid cones submerged? [4]

The daily wages of 160 workers in a building project are given below:-

| Wages in Rs. | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 |
|---|---|---|---|---|---|---|---|---|
| No. of Workers | 12 | 20 | 30 | 38 | 24 | 16 | 12 | 8 |

Using a graph paper, draw an Ogive for the above distribution.

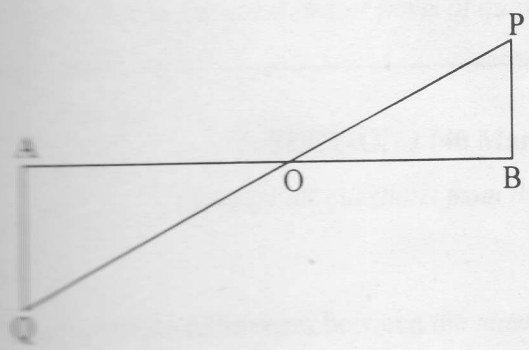
Use your Ogive to estimate:- [3]

(i) the median wage of the workers

(ii) the upper quartile wage of the workers

(iii) the lower quartile wage of the workers [3]

(iv) the percentage of workers who earn more than Rs.45 a day. [6]




In the figure given above, PB and QA are perpendiculars to the line segment AB. If PO = 6 cm, QO = 9 cm and the area of Δ POB = 120 $cm^2$, find the area of Δ QOA. [4]

Find the coordinates of the centroid of a triangle whose vertices are: [3]

A(–1, 3), B ( 1, -1) and C (5, 1) [3]

Use a ruler and a pair of compasses to construct Δ ABC in which BC = 4.2 cm, $\angle ABC = 60^\circ$ and AB = 5 cm. Construct a circle of radius 2 cm to touch both the arms of $\angle ABC$ of Δ ABC. [3]

A shop keeper buys a certain number of books for Rs.720. If the cost per book was Rs.5 less, the number of books that could be bought for Rs.720 would be 2 more. Taking the original cost of each book to be Rs. x, write an equation in x and solve it. [4]