

Total No. of Printed Pages—12

**X/20/M (N)**

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**MATHEMATICS**

( New Course )

**( FOR CANDIDATES WITH INTERNAL ASSESSMENT )**

*Full Marks : 80*

*Pass Marks : 24*

**( FOR CANDIDATES WITHOUT INTERNAL ASSESSMENT )**

*Full Marks : 100*

*Pass Marks : 30*

*Time : 3 hours*

**( FOR ALL CATEGORIES OF CANDIDATES )**

*General Instructions :*

- (i) This Question Paper comprises of 32 questions divided into six Sections A, B, C, D, E and F.
- (ii) Marks allocated to every question are indicated against each.
- (iii) Question Nos. **1** to **30** (Section—A to Section—E) are to be answered by all candidates.
- (iv) Question Nos. **31** and **32** of Section—F are to be answered by **Candidates without Internal Assessment.**

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- (v) In question on construction, the drawing should be neat and exactly as per the given measurements.
- (vi) Questions, which are meant for Visually Handicapped (Blind) Students, should be answered by them only.
- (vii) Use of Calculator/Mobile Phone is not permitted.

SECTION—A

( Marks : 8 )

( Question Nos. 1 to 8 carry 1 mark each )

1. What is the sum of exponents of prime factors in the prime factorization of 98? 1
2. Find the zeroes of the polynomial  $49x^2 - 64$ . 1
3. For the AP  $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1, \dots$ , write the first term and common difference. Also, write the fifth term. 1
4. If the altitudes of two similar triangles are in the ratio 2 : 3, what is the ratio of their areas? 1
5. Evaluate :  
 $\cos^2 42^\circ - \sin^2 48^\circ$  1
6. Find the distance between two parallel tangents of a circle of radius 8 cm. 1
7. If the diameter of a semi-circular protractor is 14 cm, then find its perimeter. (Use  $\pi = \frac{22}{7}$ ) 1
8. If  $P(E) = 0.05$ , what is the probability of 'not E'? 1

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SECTION—B

( Marks : 14 )

( Question Nos. 9 to 15 carry 2 marks each )

9. Find the value of  $k$  for which the quadratic equation  $3x^2 - 5x + 2k = 0$  has real and equal roots. 2
10. Find the value of  $x$  ( $0^\circ < x < 90^\circ$ ) in  
 $\sin 2x = \sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ$  2
11. Prove that  $\frac{1 - \sin \theta}{1 + \sin \theta} = (\sec \theta - \tan \theta)^2$ . 2
12. The line segment joining  $A(-2, 9)$  and  $B(6, 3)$  is a diameter of a circle with centre  $C$ . Find the coordinates of  $C$ . 2
13. Two vertices of a triangle are  $(3, -5)$  and  $(-7, 4)$ . If its centroid is  $(2, -1)$ , find the third vertex. 2
14. The perimeters of two similar triangles are 25 cm and 15 cm respectively. If one side of the first triangle is 9 cm, what is the corresponding side of the other triangle? 2
15.  $PQ$  and  $PT$  are tangents to a circle with centre  $O$  and radius 5 cm. If  $PQ = 12$  cm, then prove that the perimeter of the quadrilateral  $PQOT$  is 34 cm. 2

[ For Visually Handicapped (Blind) Students only,  
instead of Question No. 15 given above ]

15. (a) Define a quadrilateral. 1
- (b) A tangent to a circle is perpendicular to the radius through the point of contact.  
( State whether True or False ) 1

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SECTION—C

( Marks : 24 )

( Question Nos. 16 to 23 carry 3 marks each )

16. Using ruler and compass only, construct a circle of radius 3.5 cm and also construct two tangents from a point  $P$  outside the circle at a distance of 6 cm from its centre. (Only traces of construction are required) 3

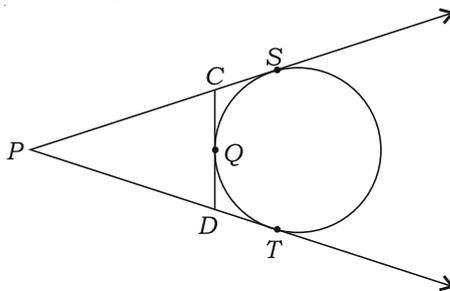
[ For Visually Handicapped (Blind) Students only, instead of Question No. 16 given above ]

16. (a) Define radius of a circle. 1  
(b) In a triangle, if the square of one side is equal to the sum of the squares of the other two sides, then the angle opposite to the first side is a right angle. ( State whether True or False ) 1  
(c) A line which intersects a circle in two distinct points is called the \_\_\_\_\_ of the circle. ( Fill in the blank ) 1

17.  $\triangle ABC$  is an isosceles triangle with  $AB = AC = 13$  cm. The length of the altitude from  $A$  on  $BC$  is 5 cm. Find  $BC$ . 3

Or

In the adjoining figure,  $PS$  and  $PT$  are tangents to the circle drawn from an external point  $P$ .  $CD$  is a third tangent touching the circle at  $Q$ . If  $PT = 10$  cm and  $CQ = 2$  cm, find the perimeter of  $\triangle PCD$  : 3



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[ For Visually Handicapped (Blind) Students only,  
instead of Question No. 17 given in Page No. 4 ]

17. (a) State Pythagoras theorem. 2
- (b) If a line divides any two sides of a triangle in the \_\_\_\_\_ ratio, then the line is parallel to the third side.  
( Fill in the blank ) 1
18. An arc of length  $20\pi$  cm subtends an angle of  $144^\circ$  at the centre of a circle. Find the radius of the circle. 3
- Or*
- A drain cover is made from a circular metal plate of radius 14 cm having 21 holes each of diameter 0.5 cm. Find the area of the remaining plate. (Use  $\pi = \frac{22}{7}$ ) 3
19. A bag contains 6 red balls and some blue balls. If the probability of drawing a blue ball is twice that of red ball, find the number of blue balls in the bag. 3
20. Find the smallest number which when increased by 11 is exactly divisible by 15, 20 and 54. 3
21. If the zeroes of the quadratic polynomial  $p(x) = 3x^2 + (2k - 1)x - 5$  are equal in magnitude but opposite in sign, then find the value of  $k$ . 3
22. How many terms of the AP 18, 16, 14, ... should be taken so that their sum is zero? 3

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23. Prove that

$$\tan 10^\circ \tan 25^\circ \tan 45^\circ \tan 65^\circ \tan 80^\circ = 1 \quad 3$$

Or

Eliminate 'θ' for the equations :

$$x = \sin \theta + \cos \theta$$

$$\text{and } y = \sin \theta - \cos \theta \quad 3$$

SECTION—D

( Marks : 16 )

( Question Nos. 24 to 27 carry 4 marks each )

24. Divide 16 into two parts such that twice the square of the larger part exceeds the square of the smaller part by 164. 4

Or

A two-digit number is 4 times the sum of its digits. If 18 is added to the number, the digits are reversed. Find the number. 4

25. From the top of a building 60 m high, the angles of depression of the top and bottom of a tower are observed to be  $30^\circ$  and  $60^\circ$ . Find the height of the tower. 4

Or

The angle of elevation of the top of a tree from a point A on the ground is  $60^\circ$ . On walking 20 m away from its base, to a point B, the angle of elevation changes to  $30^\circ$ . Find the height of the tree. (Use  $\sqrt{3} = 1.732$ ) 4

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[ For Visually Handicapped (Blind) Students only,  
instead of Question No. 25 given in Page No. 6 ]

25. (a) Express  $\cos 65^\circ + \tan 65^\circ$  in terms of angles between  $0^\circ$  and  $30^\circ$ . 2  
(b) Write the value of  $\operatorname{cosec}^2(90^\circ - \theta) - \tan^2 \theta$ . 2
26. Find the ratio in which the point  $P(-6, a)$  divides the join of  $A(-3, -1)$  and  $B(-8, 9)$ . Also, find the value of  $a$ . 4
27. Prove that the lengths of tangents drawn from an external point to a circle are equal. 4

[ For Visually Handicapped (Blind) Students only,  
instead of Question No. 27 given above ]

27. (a) Define a circle. 2  
(b) Two triangles are similar, if their corresponding sides are \_\_\_\_\_.  
( Fill in the blank ) 1  
(c) The greatest side of a right-angled triangle is called hypotenuse.  
( State whether True or False ) 1

SECTION—E

( Marks : 18 )

( Question Nos. 28 to 30 carry 6 marks each )

28. Solve the following system of linear equations graphically :

$$3x + y - 11 = 0$$

$$x - y - 1 = 0$$

Also, find the area bounded by these lines and  $y$ -axis.  
(Plot at least three points for each graph) 6

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[ For Visually Handicapped (Blind) Students only,  
instead of Question No. 28 given in Page No. 7 ]

28. Solve the following system of linear equations : 6

$$\begin{aligned}x + y &= 3 \\4x - 3y &= 26\end{aligned}$$

29. A wooden toy is made by scooping out a hemisphere of same radius from each end of a solid cylinder. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the volume of wood in the toy. (Use  $\pi = \frac{22}{7}$ ) 6

Or

The difference between the outer and inner curved surface areas of a hollow right circular cylinder 14 cm long is  $88 \text{ cm}^2$ . If the volume of metal used in making the cylinder is  $176 \text{ cm}^3$ , find the outer and inner diameters of the cylinder. (Use  $\pi = \frac{22}{7}$ ) 6

30. The mean of the following frequency distribution is 62.8 and the sum of all frequencies is 50. Find the missing frequencies  $f_1$  and  $f_2$  : 6

<i>Class Interval</i>	0-20	20-40	40-60	60-80	80-100	100-120
<i>Frequency</i>	7	$f_1$	12	$f_2$	7	8

Or

Find the median of the following distribution : 6

<i>Class Interval</i>	0-10	10-20	20-30	30-40	40-50	50-60
<i>Frequency</i>	3	6	8	15	10	8

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SECTION—F

( Marks : 20 )

[ For Candidates without Internal Assessment ]

31. Answer the following as directed (any *eight*) :  $1 \times 8 = 8$

(a) The prime factors of 408 are

(A)  $2^3 \times 3 \times 17$

(B)  $2^3 \times 3^2 \times 17$

(C)  $2^3 \times 3 \times 17^2$

(D)  $2^3 \times 3^3 \times 17$

( Choose the correct option )

(b) The sum of the zeroes of the polynomial

$$p(x) = 5x^2 + 2x - 3 \text{ is}$$

(A)  $\frac{2}{5}$

(B)  $-\frac{3}{5}$

(C)  $\frac{3}{5}$

(D)  $-\frac{2}{5}$

( Choose the correct option )

(c) The system of equations  $2x + 5y = 17$  and  $5x + 3y = 14$  has

(A) unique solution

(B) infinitely many solutions

(C) no solution

(D) None of the above

( Choose the correct option )

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(d) The discriminant of the quadratic equation

$$x^2 + 8x + 16 = 0 \text{ is}$$

(A) -1

(B) 0

(C) 1

(D) 2

( Choose the correct option )

(e) Is the following an AP?

3, 3, 3, 3, .....

(f) What is the area of an equilateral triangle of side 'a'?

(g) If the area of a triangle is \_\_\_\_\_ square units, then its vertices are collinear.

( Fill in the blank )

(h) Solve for  $\theta$ ,  $0^\circ < \theta < 90^\circ$ , if  $2\cos\theta = 1$ .

(i)  $1 + \operatorname{cosec}^2\theta = \cot^2\theta$ .

( State whether True or False )

(j) Define a tangent to a circle.

(k) Find the area of a circle of radius 10.5 cm.  
(Use  $\pi = \frac{22}{7}$ )

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- (l) Write the formula for the area of a sector of angle  $\theta^\circ$  of a circle of radius ' $r$ '.
- (m) Find the distance between the points (5, 8) and (-3, 2).
- (n) Find the probability of getting a head when a coin is tossed once.

**32.** Answer any six from the following : 2×6=12

- (a) The HCF of two numbers is 16 and their product is 3072. Find their LCM.
- (b) Find a quadratic polynomial whose zeroes are -5 and -7.
- (c) Solve the quadratic equation  $x^2 + 3x - 18 = 0$  by factorization.
- (d) What is the 19th term of the sequence defined by  $a_n = \frac{n(n-2)}{n+3}$  ?
- (e) Find the coordinates of the centroid of the triangle whose vertices are (-3, 0), (5, -2), (-8, 5).
- (f) Evaluate :
- $$\sin^2 30^\circ + \sin^2 45^\circ + \sin^2 60^\circ$$
- (g) The circumference of a circle is 39.6 cm. Find its radius. (Use  $\pi = \frac{22}{7}$ )

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- (h) If  $\sec\theta + \tan\theta = m$  and  $\sec\theta - \tan\theta = n$ , prove that  $mn = 1$ .
- (i) Find the value of  $k$  for which the given value  $x = -\frac{5}{3}$  is a solution of the equation  $3x^2 + kx + 5 = 0$ .
- (j) Find two consecutive natural numbers whose product is 20.

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