

2017
MATHEMATICS
(COMPULSORY)
NEW SYLLABUS

Time ---3 Hours 15 Minutes
(First 15 minutes for reading the question paper only)

Full Marks - 90 - (For Regular Candidates) Full Marks - (100 - For External Candidates)

(Alternative Question of 11 is given in page no. 4 for sightless candidates)

[Additional Question (no. 16) for external candidates are given in page no. 5]

1. Choose the correct option in each case from the following questions :

$1 \times 6 = 6$

- (i) If the total interest in 5 years be $\frac{1}{5}$ th of the principal then the rate of simple interest per annum is (a) 4% (v) 5% (c) 10% (d) 25% Model answer for MCQ :
1. i. a) 4%
- (ii) If $\sqrt{3} + \sqrt{2} = x$, then $\sqrt{3} - \sqrt{2}$ is (a) $\frac{2}{x}$ (b) $\frac{x}{2}$ (c) $\frac{1}{x}$ (d) 1 1. ii. c) $\frac{1}{x}$
- (iii) AB is a diameter of a circle with centre O; C is a point on the circle. If $\angle OAC = 45^\circ$ then the measure of $\angle OCB$ is (a) 90° (b) 45° (c) 30° (d) 60°
- (iv) If $\sin 2\theta = \frac{1}{2}$ then the value of θ is (a) 30° (b) 60° (c) 45° (d) 15°
- (v) The sum of the edges of a solid cube is 36cm. The volume of the cube is (a) 27cu.cm (b) 36cu.cm (c) 9 cu.cm (d) 54 cu.cm.
- (vi) In a frequency distribution the classes are 1-10, 11-20, 21-30, 31-40, 41-50. The length of each class is (a) 9 (b) 9.5 (c) 5.5 (d) 10.

2. Fill in the blanks (any five) :

$1 \times 5 = 5$

- (i) The amount on Rs 2P for 2 years at $2r\%$ per annum compound interest is Rs _____ $\times (1 + \frac{2r}{100})^2$
- (ii) If $2A = 3B = 4C$, then $A : B : C = 6 : 4 : \underline{\hspace{2cm}}$
- (iii) Maximum number of tangents can be drawn to a circle from an external point of that circle is _____
- (iv) If $\sec^2 \theta = 4$ then the value of $\tan^2 \theta$ is _____
- (v) Number of plane surfaces of a solid right circular cylinder is _____
- (vi) Median of the data 2, 3, 4, 5 is _____

3. Write True or False (any five) :

$1 \times 5 = 5$

- (i) The present price of an article is Rs 100. The price of the article depreciates each year at the rate of 10%. The price of the article after 2 years is Rs 81.
- (ii) If $x \propto y$ then $x^n \propto y^n$.
- (iii) Through three collinear points only one circle can be drawn.
- (iv) The value of $\sin^2 5\theta + \cos^2 5\theta$ is 5.
- (v) If the volume of a solid right circular cone is V cubic unit and the area of the base is A sq unit, then the height of the cone is $\frac{3V}{A}$ unit.

(vi) The value of mode of the data 4, 6, 4, 5, 4, 7, 4, 8, 5, 9, 5, 7 is 4.

4. Answer the following questions (any ten) :

$2 \times 10 = 20$

- (i) The ratio of the capitals of three persons is 4 : 7 : 9 and the profit of the first person is Rs 100 less than the third person. Find the profit of the second person.
- (ii) Find in what time a sum of money becomes double at the rate of $6\frac{1}{4}\%$ simple interest per annum?
- (iii) Find the sum of $\sqrt{3} - 2$ and its conjugate.
- (iv) If two roots of the equation $5x^2 - 3x + 6 = 0$ be α and β , then find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$
- (v) The length of diameter of a circle is 20 cm. If the distance of a chord from the centre of the circle is 8 cm, find the length of the chord.
- (vi) PQ and PR are two chords of a circle with centre O. Two tangents drawn at the points Q and R intersect each other of the point S. If $\angle QSR = 70^\circ$, find the value of $\angle QPR$.
- (vii) In $\triangle ABC$, a straight line parallel to BC intersect AB and AC at the points P and Q respectively. If $AQ = 2AP$, then find the value of the ratio PB : QC.
- (viii) Find the circular measure of $67\frac{1}{2}^\circ$
- (ix) If $\sec 3\theta = \operatorname{cosec} 2\theta$ and 3θ is a positive acute angle, then find the value of θ .
- (x) The numerical value of the total surface area and volume of a solid hemisphere are equal. Find the length of the radius of the base of the hemispher.
- (xi) The length of the diagonal of a cube is $4\sqrt{3}$ cm. Find the total surface area of the cube.
- (xii) If $u_i = \frac{x_i - 35}{10}$, $\sum f_i u_i = 30$ and $\sum f_i = 10$, then find the value of \bar{x} .

5. Answer any one question :

5

- (i) Find the compound interest on Rs 40000 for 3 years at the rate of 5% compound interest per annum.
- (ii) Rajib started a business with a capital of Rs 3750. After 6 months Sayan joined that business with a capital of Rs 15000. If at the end of the year there was a profit of Rs 6900, find the share of profit of each.

6. Answer any one question :

3

- (i) Solve: $\frac{x}{x+1} + \frac{x+1}{2} = 2\frac{1}{2}$, $x \neq 0, -1$
- (ii) A train travels 200 k m. at a uniform speed. If the speed would have been 5 km./hr more, it would have taken 2 hours less for the same journey. Find the speed of the train.

7. Answer any one question :

3

- (i) If $x = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$ and $y = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$, find the value of $(x^2 - xy + y^2)$.
- (ii) If $x \propto y$ and $y \propto z$, prove that $(x^2 + y^2 + z^2) \propto (xy + yz + zx)$.

8. Answer any one question : 3

- (i) If a, b, c, d are in continued proportion, show that $(b^2 + d^2) : (b^2 - d^2) = (ab + cd) : (ab - cd)$
(ii) If $\frac{a+b-c}{a+b} = \frac{b+c-a}{b+c} = \frac{c+a-b}{c+a}$ and $a+b+c \neq 0$, prove that $a = b = c$.

9. Answer any one question : 5

- (i) Prove that angles in the same segment are equal.
(ii) Prove that, if a perpendicular is drawn on the hypotenuse from the right angular point of a right angled triangle, the two triangles so formed on the two sides of the perpendicular are each similar to the original triangle and also similar to each other.

10. Answer any one question : 3

- (i) QR is a chord of a circle with centre O. Two tangents are drawn at the points Q and R intersect each other at the point P. If QM is the diameter of the circle, prove that, $\angle QPR = 2 \angle RQM$
(ii) In the triangle ABC, $\angle BAC$ is right angle. If CD is the median, prove that $BC^2 = CD^2 + 3AD^2$.

11. Answer any one question : 5

- (i) Draw a triangle ABC whose $BC = 7\text{cm}$, $AB = 5\text{cm}$ and $AC = 6\text{cm}$. Draw the circumcircle of that triangle. (Only traces of Construction are required).
(ii) Find the mean proportion of 4 cm and 3 cm by geometrical method. (Only traces of construction are required).

12. Answer any two questions : $3 \times 2 = 6$

- (i) If $\tan \theta = \frac{4}{3}$, find the value of $(\sin \theta + \cos \theta)$.
(ii) Find the value of : $3 \tan^2 45^\circ - \sin^2 60^\circ - \frac{1}{3} \cos^2 30^\circ - \frac{1}{8} \sec^2 45^\circ$
(iii) If $\sin 53^\circ = \frac{x}{\sqrt{x^2 + y^2}}$, find the value of $\cot 37^\circ$.

13. Answer any one question : 5

- (i) From a point on the roof of a house 11 metre high, it is observed that the angles of depression of the top and foot of a lamp post are 30° and 60° respectively. Find the height of the lamp post.
(ii) When sun's altitude increases from 45° to 60° , the length of the shadow of a post decreases by 3 metre. Find the height of the post.

14. Answer any two questions : $4 \times 2 = 8$

- (i) The ratio of the length, breadth and height of a solid cuboid is $4 : 3 : 2$ and the area of a whole surface is 468 sq. cm . Find the volume of the cuboid.
(ii) The length of radius of the base of a solid right circular rod is 3.2 dm . By melting the rod 21 solid spheres are made. If the length of the radius of each sphere is 8 cm , find the length of the rod.
(iii) The slant height of a solid right circular cone is 7 cm . and the total surface area is 147.84 sq. cm . Find the length of radius of the base of the cone.

15. Answer any two questions :

$4 \times 2 = 8$

(i) Find the mean from the following frequency distribution table :

Class interval	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
Frequency	10	16	20	30	13	11

(ii) Find the median from the following frequency distribution table :

Class interval	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35
Frequency	2	3	6	7	5	4	3

(iii) Find the mode from the following frequency distribution table :

Class interval	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40
Frequency	2	6	10	16	22	11	8	5

[Alternative Question for Sightless Candidates]

11. Answer any one Question :

5

- (i) Describe the procedure of Constructing the circumcircle of a triangle whose length of three sides are given.
- (ii) Describe the procedure of finding geometrically the mean proportion of two line segments of given length.

[Additional Questions for External Candidates]

16.a Answer any THREE questions :

$2 + 2 + 2$

- (i) Find the simple interest on Rs 6000 for 2 years at the rate of 10% per annum.
- (ii) If $a \propto b$ then show that $(a + b) \propto (a - b)$.
- (iii) Find the value of :
 $\cos 60^\circ + \sin 30^\circ + \tan 45^\circ + \sin 90^\circ$
- (iv) PQRS is a cyclic quadrilateral. PQ is a diameter of the circle. If $\angle PRS = 40^\circ$, what is the value of $\angle QPS$?

16.b Answer any FOUR questions :

1+ 1 + 1 +1

- (i) Express $\frac{\pi}{6}$ radian in degree.
- (ii) The ratio of annual profit of two persons in a joint business is 2 : 3. If the capital of the first person is Rs 2000, find the capital of the second person.
- (iii) The length of the radius of the base of a solid right circular cylinder is r unit and the height is h unit. Write the curved surface area of the cylinder.
- (iv) Find the mixed ratio of $x : yz$, $y : zx$ and $z : xy$.
- (v) Write the mode of the data 3, 1, 2, 5, 3.