WBBSE Class 10 Madhyamik Maths Question Paper 2020

2020

Mathematics

Time - Three Hours Fifteen Minutes

(First **fifteen** minutes for reading the question paper only)

Full Marks - 90

(For Regular and Sightless Regular Candidates)

Full Marks - 100

(For External and sightless External Candidates)

Special credits will be given for answers which are brief and to the point.

Marks will be deducted for spelling mistakes, untidiness and bad handwriting

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The answer of the question no, 1, 2, 3 and 4 are to be given at the beginning of the answer script mentioning the question number in the serial order. Necessary calculation and drawing, if any, must be given on the right hand side by drawing margins on the first few pages on the answer - script. Tables and calculator are not allowed. Approximate value of $\pi = \frac{22}{7}$, *if necessary. Graph paper will be supplied if required.*

(Alternative question of 11 is given for sightless candidates)

[Addition Question number 16 only for external candidates is given on the last page]

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

[1 x 6 = 6]

(i) If a principal becomes twice of it in 10 years, then the rate of simple interest per annum is :

(a) 5% (b) 10%

(b) 15% (d) 20%

(ii) The product of two roots of the equation $x^2 - 7x + 3 = 0$ is :

(a) 7 (b) -7

(c) 3 (d) -3

(iii) The length of two chords AB and CD of a circle of centre O are equal and $\angle AOB = 60^o$, then $\angle COD$ is :

(a) 30^o (b) 60^o

(c) 120^o (d) 180^o

(iv) If the ratio of the volume of two right circular cones is 1 : 4 and the ratio of radii of their bases is 4:5, then the ratio of their heights is :

(a) 1 : 5 (b) 5 : 4

(c) 25 : 16 (d) 25 : 64

(v) If $\sin\theta - \cos\theta = 0$, $(0^o < \theta < 90^o)$ and $\sec\theta + \text{cosec}\theta = x$, then the value of x is :

(a) 1 (b) 2

(c) $\sqrt{2}$ (d) $2\sqrt{2}$

(vi) The mode of 1, 3, 2, 8, 10, 8, 3, 2 ,8 , 8, is :

(a) 2 (b) 3

(c) 8 (d) 10

2. Fill up the blanks (*any five*) **[1 x 5 = 5]**

(i) Anisur invests Rs 500 for 9 months in a business and devid invests Rs 600 for 5 months in the same business, the ratio of their profits will be _____.

(ii) The roots of the quadratic equation $ax^2 + 2bx + c = 0$ $(a \neq 0)$ are real and unequal, then b^2 = _____.

(iii) If sum of two angles is _____, then they are called supplementary

angles.

(iv) Maximum value of sin 3θ is _____.

(v) One solid sphere is melted and a solid right circular cylinder is made, then _____ of sphere and the cylinder will be equal.

(vi) Ages of some students are (in years) 10, 11, 9, 7, 13, 8, 14; the median of the ages of those students is _____ years.

3. Write True or False (*any five*) **[1 x 5 = 5]**

(i) The amount of Rs 2p in t years at the rate of simple interest of $\frac{r}{2}\%$ per annum is Rs $\left(2p+\frac{prt}{100}\right)$.

(ii) If 2a = 3b = 4c then a : b : c = 2 : 3 : 4.

(iii) If the ratio of the lengths of three sides of a triangle is 5 : 12 : 13, then the triangle will always be a right angled triangle.

(iv) The angle formed by rotating a ray about it end point in anticlockwise direction is positive.

(v) If *n* is even number, then median is the mean of $\left(\frac{n}{2}\right)$th and $\left(\frac{n}{2}-1\right)$th observation.

(vi) If the length of the radius of the base of a right circular cone be halved and its height be doubled, then the volume remains same.

4. Answer any ten question **[2 x 10 = 20]**

(i) If the ratio of a principal and the amounts for 5 years is 5 : 6, then find the rate of simple interest per annum.

(ii) In a business, A and B get Rs 1,050 as profit. If the principal and profit

of A be Rs 900 and Rs 630 respectively. Find the principal of B.

(iii) If $x \propto y$, $y \propto z$ and $z \propto x$, find the product of three variation constants.

(iv) If the roots of the quadratic equation $5x^2 - 2x + 3 = 0$ be α and β, find the value of $\frac{1}{\alpha}+\frac{1}{\beta}$.

(v) The point O is situated within the rectangular region ABCD in such a way that OB = 6 cm, OD = 8 cm and OA = 5 cm. Determine the length of OC.

(vi) In a right angled triangle ABC, $\angle ABC = 90^{\circ}$, AB = 3 cm, BC = 4 cm and the perpendicular BD on the side AC from the point B which meets the side AC at the point D. Determine the length of BD.

(vii) The lengths of radii of two circles are 8 cm and 3 cm and the distance between two centres is 13 cm. What is the length of the direct common tangent of two circles?

(viii) What is the circular measure of an angle formed by the rotation of hour hand of a clock in one hour duration?

(ix) If $\tan 4\theta \tan 6\theta = 1$ and 6θ is a positive acute angle, find the value of θ.

(x) The height of a right circular cone is 12 cm and its volume is 100π cm^3. Find the lateral height of the cone.

(xi) Curved surface areas of two spheres are in a ratio 1 : 4. Find the ratio of their volumes.

(xii) If $u_i = \frac{x_i - 35}{10}$, $\Sigma f_i u_i = 30$ and $\Sigma f_i = 60$, then determine the value of $\bar{x}$.

5. Answer *any one* question **[5 x 1 = 5]**

(i) The price of a machine in a factory of your uncle depreciates at the rate

of 10% every year. If its present price is Rs 6,000 then what will be its price after 3 years?

(ii) Three friends invested Rs 1,20,000 Rs 1,50,000 and Rs, 1,10,000 respectively to purchase a bus. The first person is a driver and the other two are conductors. They decided to divide $\frac{2}{5}$ th of the profit among themselves in the ratio of 3 : 2 : 2 according to their work and remaining in the ratio of their capitals. If they earn Rs 29,260 in one month, find the share of each of them.

6. Answer *any one* question **[3 x 1 = 3]**

(i) Solve : $\frac{1}{x-3}+\frac{1}{x+5}=\frac{1}{6}$

(ii) The product of two consecutive positive odd number is 143. Construct the equation and determine the numbers by applying Sridhara Acharyaa's formula.

7. Answer *any one* question **[3 x 1 = 3]**

(i) $x = 2 + \sqrt{3}$ and $x + y = 4$, then find the simplest value of $xy + \frac{1}{xy}$.

(ii) If $a \propto b$ and $b \propto c$, then prove that $a^3 + b^3 + c^3 \propto 3abc$.

8. Answer *any one* question **[3 x 1 = 3]**

(i) If $x : a = y : b = z : c$, then show that $\frac{x^3}{a^3}+\frac{y^3}{b^3}+\frac{z^3}{c^3}=\frac{3xyz}{abc}$.

(ii) If $\frac{ay-bx}{c}=\frac{cx-az}{b}=\frac{bz-cz}{a}$, then prove that $\frac{x}{a}=\frac{y}{b}=\frac{z}{c}$

9. Answer *any one* question **[5 x 1 = 5]**

(i) Prove that angles in the same segment of a circle are equal.

(ii) Prove that if two tangents are drawn to a circle from a point outside it, then the line segments joining the point of contacts and the exterior point are point.

10. Answer *any one* question **[3 x 1 = 3]**

(i) Two circles intersect each other at the points P and Q. If the diameters of the two circles are PA and PB respectively, then prove that A, Q, B are collinear.

(ii) ABC is a right angled triangle whose $\angle A = 90^{\circ}$, AD is perpendicular on BC.

11. Answer *any one* question **[5 x 1 = 5]**

(i) Draw the mean proportional of line segments of lengths 4 cm and 3 cm.

(ii) Draw a circle of radius 3 cm. Construct a tangent to the circle at a point A on the circle.

12. Answer *any two* question **[3 x 2 = 6]**

(i) If $\sin 17^{\circ} = \frac{x}{y}$, show that $\sec 17^{\circ} - \sin 73^{\circ} = \frac{x^2}{y\sqrt{y^2 - x^2}}$.

(ii) If the sum of two angle is 135° and their difference is $\frac{\pi}{12}$, then determine the sexagecimal and circular value of two angles.

(iii) Find the value of :

$$\frac{5\cos^2\frac{\pi}{3}+4\sec^2\frac{\pi}{6}-\tan^2\frac{\pi}{4}}{\sin^2\frac{\pi}{6}+\cos^2\frac{\pi}{6}}$$

13. Answer *any one* question **[5 x 1 = 5]**

(i) If the angle of elevation of a cloud from a point *h* metres above a lake is α and the angle of depression of its reflection in the lake is β. Prove that the distance of the cloud from the point of observation is $\frac{2h\sec\alpha}{\tan\beta-\tan\alpha}$.

(ii) The heights of two towers are 180 metres and 60 metres respectively. If the angle of elevation of the top of the first tower from the foot of the second tower is 60^o, then find the angle of elevation of the top of the second tower from the foot of the first.

14. Answer *any two* questions **[4 x 2 = 8]**

(i) The length of outer and inner radii of a hollow right circular pipe are 5 cm 4 cm respectively. If the total surface area of the pipe is 1188 sq. cm. find the length of the pipe.

(ii) A hemisphere pot with internal radius of 9 cm is completely filled with water in cylindrical bottles with a diameter of 3 cm and height of 4 cm, then find the number of bottles to be required to make the pot empty.

(iii) The diameter of the base of a right circular cone is 21 metres and height is 14 metres. What will be the expenditure to colour the curved surface at the rate of Rs 1.50 per square metre?

15. Answer *any two* question **[4 x 2 = 8]**

(i) Find the mean of marks obtained by the girl students if their cumulative frequencies are as follows :

Marks	<10	<20	<30	<40	<50
No. Of girl students	6	10	18	30	46

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

Class Int	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	7	10	15	10	8	5

(iii) Find the mode of data from the following frequency distribution table

Class	3 - 6	6 - 9	9 - 12	12 - 15	15 - 18	18 - 21	21 - 24
Frequency	2	6	12	24	21	12	3

[Alternative Question for Sightless Candidates]

11. Answer *any one* question **[5 x 1 = 5]**

(i) Describe the process of drawing mean proportional of two line segments of given length.

(ii) A circle is given, describe the process of drawing a tangent to this circle at a point on it.

[Additional Question For External Candidates]

16. (a) Answer *any three* question **[2 x 3 = 6]**

(i) If the percentage of profit on sale price is 20%, then what is the

percentages of profit on cost price?

(ii) If $x = 3\cos\theta$; $y = 3\sin\theta$, then find the value of $x^2 + y^2$.

(iii) Simplify : $\sqrt{98} + \sqrt{8} - 2\sqrt{32}$.

(iv) The ratio of the lengths of the radii of the bases a right circular cylinder and a right circular cone 3 : 4 and the ratio of their heights is 2 : 3; what is the ratio of their volume?

(b) Answer *any four* questions **[1 x 4 = 4]**

(i) Find the number of years for which a principal become double at the rate of simple interest of $6\frac{1}{4}\%$ per annum.

(ii) AB is a diameter of a circle and P is any point on the circle, if $\angle PAB = 30^\circ$ find the value of $\angle PBA$.

(iii) Express $22^\circ 30'$ in radian.

(iv) If the radius of a solid sphere be 10.5 cm, then what is the area of its whole surface?

(v) If x : y = 2 : 3 and y : z = 4 : 7, then fin x : z.