WBBSE Class 10 Maths Madhyamik Question Paper 2016

2016

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.

General Instructions :

The answer of this question of PART I are to be given at the beginning of the answer script mentioning the question numbers in serial order. Necessary calculation and drawings, if any, must be given in the right hand side of the drawing margins at the first few pages in 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.*

PART - I

1. Answer all questions : **[1 x 6 = 6]**

(i) At simple rate interest of Rs 9,999 amounts to its double in 10 yrs. What is the rate of interest ?

(ii) What is the coefficient of x° in polynomial $2x^3 - 3x^2 + 4x + 5$?

(iii) What is the H.C.F of $4p^2qr^3$ and $6p^3q^2r^4$?

(iv) Find the mixed ratio of a : bc, b : ca and c : ab.

(v) ABCD is a cyclic trapezium and AD||BC. If $\angle ABC = 70°$, find the value

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of $\angle BCD$.

(vi) Which one in the following is correct ?

If $\tan\theta = 0$ then :

(a) $\sin\theta = 0$ (b) $\cos\theta = 0$ (c) $\cot\theta = 0$ (d) None of these

2. Answer all questions: **[2 x 7 = 14]**

(i) The average of first 21 natural number is 11. what will be the average of first 20 natural numbers ?

(ii) If xy > 0, then in which quadrant (x, y) will lie ?

(iii) If x is a perfect square number and $0 < \frac{x-3}{2} < 1$.

(iv) In ΔABC, the straight line parallel to the side BC meets AB and AC at the point D and E respectively. If AE = 2AD ; find DB : EC.

(v) The length of radius of a circle with centre O is 5 cm and the length of the chord AB is 8 cm. What is the distance of the chord AB from the point O ?

(vi) The volume and area of the base of a right pyramid are 40 cubic cm and 24 sq. cm respectively. Find its height.

(vii) From the result $\tan(90^0 - \theta) = \cot\theta, \quad (0 < \theta < 90^0)$, show that $\cot(90^0 - \theta) = \tan\theta$.

PART - II

3. Answer any TWO questions (algebraic method may be applied) :

[5 x 2 = 10]

(a) A man borrowed a sum of money at 5% compound interest per annum. He repays Rs. 3,150 at the end of the first year and Rs 4,410 at the end of the second year so as to clear the entire loan. How much rupees did he borrow ?

(b) Milk contains 89% of water. If a sample of milk is found to contain 90% of water ; what is the amount of excess water in 22 litres of such a sample of milk?

(c) In mobile phone business of a reputed company, the manufacturer, wholesaler and retailer each of them gains 20%. if a customer purchases a mobile phone of that company for Rs. 8,640, find its manufacturing cost.

(d) The value of machine in a factory depreciates at the rate of 10% of its value at the beginning of the year. If its value becomes Rs. 43,740 after 3 years, what is its present value ?

4. Answer any ONE question: **[4 x 1 = 4]**

(a) Find the H.C.F of $x^2 - y^2$, $x^3 - y^3$, $3x^2 - 5xy + 2y^2$

(b) Find the L.C.M of $ab^4 - 8ab$, $a^2b^4 + 8a^2b$, $ab^4 - 4ab^2$

5. Solve (any ONE) : **[3 x 1 = 3]**

(a) $\frac{1}{x}+\frac{5}{y}=\frac{21}{4}$; $\frac{x+y}{x-y}=\frac{5}{3}$

(b) $(2x + 1)^2 + (x + 1)^2 = 6x + 47$

6. Answer any ONE question: **[4 x 1 = 4]**

(a) Two numbers are such that one is less than the other by 3 and their product is 70. Find the numbers.

(b) Length and breadth of rectangular plot are 5 m more and 3 m less respectively than the length of side of a square plot. Area of the rectangular plot is than twice the area of the square plot by 78 sq. m. Find the length of side of the square plot.

7. Draw the graphs of the following inequations and indicate the solution region (any ONE) : **[4 x 1 = 4]**

(a) $x+y \le 15;\quad x \ge 2;\quad y \le -3$

(b) $x \ge -7;\quad x \le 7;\quad y \ge -8;\quad y \le 9$

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

(a) If $\frac{x}{y}=\frac{a+2}{a-2}$; then show that $\frac{x^2-y^2}{x^2+y^2}=\frac{4a}{a^2+4}$.

(b) If bcx = cay = abz, then prove that $\frac{ax+by}{a^2+b^2}=\frac{by+cz}{b^2+c^2}$.

9. Answer any ONE question: **[3 x 1 = 3]**

(a) If $\left(x^3-\frac{1}{y^3}\right)\alpha\left(x^3+\frac{1}{y^3}\right)$ then show that $x\,\alpha\,\frac{1}{y}$.

(b) Volume of a cone is in joint variation with its square of the radius of the base and heights. Ratio of radii of base of two cone is 3 : 4 and ratio of their height is 6 : 5. Find the ratio of their volumes.

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

(a) Simplify : $\frac{3\sqrt{7}}{\sqrt{5}+\sqrt{2}}-\frac{5\sqrt{5}}{\sqrt{2}+\sqrt{7}}+\frac{2\sqrt{2}}{\sqrt{7}+\sqrt{5}}$

(b) If $x=2+\sqrt{3},\quad y=2-\sqrt{3}$ then find the value of $xy+\frac{1}{xy}$.

11. Answer any TWO question : **[5 x 2 = 10]**

(a) Prove that the angle which an arc of a circle substends at the centre, is doubled the angle substended by it at any point in the remaining part of the circle.

(b) Prove that a line segment drawn from the centre of a circle to bisect a chord which is not a diameter, is at right angles to the chord.

(c) Prove that if a perpendicular is drawn from the vertex containing the right angle of a right angled triangle on the hypotenuse the triangles on each side of the perpendicular are similar to each other.

12. Answer any ONE question : **[3 x 1 = 3]**

(a) There are two concentric circles such that two chords AB and AC of greater circle touch the smaller circle at P and Q respectively. Prove that $PQ = \frac{1}{2}BC$.

(b) ABCD is a rectangle and O is any point within it. Prove that $OA^2 + OC^2 = OB^2 + OD^2$.

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

(a) Draw a circumcircle of a triangle. (Only traces of construction are required)

(b) Find geometrically the value of $\sqrt{21}$. (Only traces of construction are required)

14. Answer any ONE question : **[3 x 1 = 3]**

(a) A hemisphere and a cone are on equal bases and their heights are also equal. Find the ratio of the area of their curved surfaces.

(b) Base of a right prism of height 10 cm is a rectangle whose length and breadth are 5 cm and 3 cm respectively. Find the volume of the prism.

15. Answer any ONE question : **[4 x 1 = 4]**

(a) 77 square metre tarpaulin needed to make a right circular conical tent. If the slant height of the tent be 7 m, find the area of the base of the tent.

(b) By melting two solid sphere of radii 1 cm and 6 cm, a hollow sphere of thickness 1 cm is made. Find the outer curved surface area of the new sphere.

16. Answer any TWO questions : **[3 x 2 = 6]**

(a) A rotating ray revolves in the anticlockwise direction and make two

complete revolutions from its initial position and moves further to trace an angle of 30°. What are the sexagesimal and circular measures of the angle with reference to trigonometrical measure?

(b) If α and β are complementary angles to each other, then find the value of $(1 - \sin^2\alpha)(1 - \cos^2\alpha)(1 + \cot^2\beta)(1 + \tan^2\beta)$

(c) Prove that $\sqrt{\frac{1+\cos 30^\circ}{1-\cos 30^\circ}} = \sec 60^\circ + \tan 60^\circ$.

(d) If $\cos 52^\circ = \frac{x}{\sqrt{x^2+y^2}}$, then find the value of $\tan 38^\circ$.

17. Answer any ONE question : **[5 x 1 = 5]**

(a) From a quay of a river, 600 metres wide, two boats start in two different directions to reach the opposite side of the river. The first boat moves making an angle of 30° with the bank and the second boat moves making an angle of 90° with the direction of the first board. What will be the distance between the two boats when both of them reach the other side ?

(b) The height of two towers are h_1 and h_2 respectively. If the angle of elevation of the top of the first tower from the foot of the second tower is 60°, and the angle of elevation of the top of the second tower from the foot of the first tower is 45°, then show that $h_1^2 = 3h_2^2$

[Alternative Questions for Sightless Candidates]

8. Find the co-ordinates of three points lying in the solution region satisfying the inequation : $4x + 3y \leq 12$; $x \geq 0$, $y \geq 0$. **[4]**

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

(a) Describing the procedure of constructing the circumcircle of a triangle whose length of three sides are given.

18. Answer ALL Question:

(a) 75% of A = 50% of B ; find A : B **[2]**

(b) Find the mean proportion of $6a^3b$ and $24ab^3$ **[1]**

(c) If $\tan(\theta + 15^\circ) = \sqrt{3}$, find $\sin\theta$. **[2]**

(d) Find the value of $\frac{\pi}{12}$ radian in degree. **[1]**

(e) If length of each side of a rhombus is 5 cm and the length of one diagonal is 8 cm, find the length of other diagonal. **[2]**

(f) How may solid right circular cones can be formed by melting a solid cylinder having equal radius and height? **[2]**