

# WBBSE Class 10 Maths Madhyamik Question Paper 2015

2015

## 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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### 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.*

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### PART - I

**1. Answer all questions :**

**[1 x 6 = 6]**

(i) If principal : amount for 1 yr = 20 : 21, then find the rate of interest per annum.

(ii) If  $x + 1 = 0$ , what is the value of  $x^9 - 1$  ?

(iii) If  $a \propto \frac{1}{b^2}$ ; then the correct statement is :

(a)  $b \propto \sqrt{a}$    (b)  $b \propto \frac{1}{\sqrt{a}}$    (c)  $b \propto \frac{1}{-\sqrt{a}}$    (d)  $b \propto \frac{1}{\pm \sqrt{a}}$

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(iv)  $(x - 2)^2 + (x + y)^2 = 0$  then what is the value of  $y$  ?

[ $x$  and  $y$  are real numbers]

(v) Angle between the diagonals of a rhombus is  $x^\circ$ ; what is the value of  $x$  ?

(vi) If  $x = 3\cos \theta$ ;  $y = 3\sin \theta$ , then  $x^2 + y^2 = ?$

**2. Answer all question**

[2 x 7 = 14]

(i) The ratio of copper and zinc in a type of brass is 5: 3. What will be the ratio of copper and zinc in 24 kg of brass, if 3 kg of copper is added to it ?

(ii) If  $x : y = 3 : 4$ , then find the value of  $\{(x + 3y)/(3x - y)\}$ .

(iii) Find the solution set of the inequation  $x - 5 < 3$  if  $x$  is a natural number.

(iv) Side AB of cyclic quadrilateral ABCD is produced to the point X. If

$\angle XBC = 82^\circ$  and  $\angle ADB = 47^\circ$ , find the measure of  $\angle BAC$ .

(v) Find the measurement of the first and third angles if the ratio of the consecutive three angles of a cyclic quadrilateral is 1 : 2 : 3.

(vi) Find the radius of the right circular cylinder if the numerical value of the volume of that cylinder and numerical value of the curved surface area of the cylinder are equal.

(vii) If  $\sin (2x + y) = \cos (4x - y)$ . then find the value of  $\tan 3x$ .

**PART - II**

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

[5 x 2 = 10]

(a) A person borrows Rs. 4,000 at 7% simple interest per annum. Just one year after, he borrows Rs. 4,000 at 8% simple interest per annum. In how many years after the first loan, will the interest on the two loans be equal ?

- (b) Weight of a man is 80 kg. In order to reduce his weight, he started regular morning walk. He decided to reduce his weight every year by 5% of his weight at the beginning of the year. What will be his weight after 3 years ?
- (c) The ratio of weights of copper, zinc and nickel in an alloy is 5 : 3 : 3; find the weight of the amount of nickel that needs to be mixed with 110 kg of the alloy so that the ratio of weights of the same metals of the new alloy be 5 : 3 : 4.
- (d) By selling a computer at Rs. 23,000, a computer manufacturing company gets a 15% profit. If there is a 12% increase in the production cost, find the price at which each computer should be sold to get a profit of 10%.

**4. Answer any ONE question:**

**[4 x 1 = 4]**

- (a) Find the H.C.F of  $x^2 - 1$ ,  $x^3 - 1$ ,  $1 - x^4$
- (b) Find the L.C.M of  $x^2 - 2x + 1$ ,  $x^3 - 1$ ,  $(x + 1)^2$ .

**5. Solve (any ONE) :**

**[3 x 1 = 3]**

(a)  $\frac{2x+5y}{xy} = 6, \quad \frac{4x-5y}{xy} = -3$

*[ by the method of cross multiplication or elimination ]*

(b)  $\frac{x+2}{x-2} + 6\frac{x-2}{x+2} = 5$

**6. Answer any ONE question:**

**[4 x 1 = 4]**

- (a) Two places are 200 km apart. A Jeep takes 2 hours less than a motor car in travelling from one place to another. If the speed of the Jeep be more than that of the motor car by 5 km/hr. find the speed of the motor car.
- (b) Divide 50 into two parts such that the sum of their reciprocals is  $\frac{1}{12}$

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

(a)  $8x - 13y + 104 \geq 0$ ;  $x \leq 0$ ;  $12x + 13y + 156 \geq 0$

(b)  $x + 4y \leq 12$ ;  $x \geq 0$ ;  $y \geq 0$

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

(a) If  $\frac{x}{y+z} = \frac{y}{z+x} = \frac{z}{x+y}$  then show that each ratio is either  $\frac{1}{2}$  or -1.

(b) If  $\frac{by+cz}{b^2+c^2} = \frac{cz+ax}{c^2+a^2} = \frac{ax+by}{a^2+b^2}$  then show that  $\frac{x}{a} = \frac{y}{b} = \frac{z}{c}$

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

(a) If  $(a + b) \propto (a - b)$ , prove that  $a^2 + b^2 \propto ab$ .

(b)  $y$  is a sum of two variables, one of them varies directly as  $x$  and another varies inversely as  $x$ . If  $x = 1$ , then  $y = -1$  and when  $x = 3$ , then  $y = 5$ . Find the relation between  $x$  and  $y$ .

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

(a) If  $x = \frac{\sqrt{7} + \sqrt{3}}{\sqrt{7} - \sqrt{3}}$  and  $xy = 1$  then show that  $\frac{x^2 + xy + y^2}{x^2 - xy + y^2} = \frac{12}{11}$

(b) if  $x = \sqrt{3} + \sqrt{2}$  show that  $\left(x^2 + \frac{1}{x^2}\right) = 10$

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

(a) Prove that the opposite angles of a cyclic quadrilateral are supplementary.

(b) If two circles touch each other, then prove that the point of contact will lie on the line joining the two centres.

(c) State and prove Pythagoras' theorem.

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

(a) Prove that a cyclic parallelogram is a rectangle.

- (b) AC is the diameter of a circle with centre O, ABC is cyclic triangle and  $OP \perp AB$ ; prove that  $OP : BC = 1 : 2$

**13. Answer any ONE question :**

**[5 x 1 = 5]**

- (a) Draw a circle of radius 2.5 cm. with O as centre. Take a point P at distance 5 cm from the point O. Draw two tangents to the circle from the point P. (Only traces of construction are required)
- (b) Construct a right angled triangle whose hypotenuse is 10 cm and another side is 6.5 cm. Construct incircle of that triangle. (only traces of construction are required)

**14. Answer any ONE question :**

**[3 x 1 = 3]**

- (a) The base of a prism is an equilateral triangle with each side of length 4 cm. Find the height of the prism if its volume is  $60\sqrt{3}$  cubic cm. Also find the total surface area of the prism.
- (b) A gas cylinder used as domestic fuel purpose of length 7.5 dm and of inner diameter 2.8 dm contains gas whose weight per cubic decimeter is 325 gm Find the total weight of gas in the cylinder.

**15. Answer any ONE question :**

**[4 x 1 = 4]**

- (a) The base of a vertical pyramid is a square whose each side is of length 16 cm. Find the volume of the pyramid if its four slant surfaces are equilateral triangles.
- (b) Height of a right circular cylinder is twice of its radius. If the height would be 6 times of its radius, then the volume of the cylinder would be greater by 539 cubic decimeter. What is the height of the cylinder ?

**16. Answer any TWO questions :**

**[3 x 2 = 6]**

- (a) if  $\angle A + \angle B = 90^\circ$  then prove that  $1 + \frac{\tan A}{\tan B} = \operatorname{cosec}^2 B$

(b) If  $\sec^2 \theta + \tan^2 \theta = \frac{13}{12}$  then find the value  $\sec^4 \theta - \tan^4 \theta$

(c) Define radian. Prove that  $1^\circ < 1^c$

(d) Show that  $\sec^2 13^\circ - \cot^2 77^\circ = 1$ .

**17. Answer any ONE question :**

**[5 x 1 = 5]**

- (a) A passenger in an aeroplane flying over a straight road observed two consecutive pillars of 1 kilometer apart on the straight road at  $60^\circ$  and  $30^\circ$  angle of depression respectively. Find the height of the plane from the road at that time.
- (b) The shadow of a tower becomes 60 metres longer when the altitude of the Sun changes from  $45^\circ$  to  $30^\circ$ . What is the height of the tower ?