[The answers of the Question Nos. 1, 2, 3, 4 are to be written at the beginning of the answer-script mentioning the question numbers in the serial order. Necessary calculation and drawing must be given on the right hand side by drawing margins on the first few pages on the answer-script. Tables and Calculators of any type are not allowed. Approximate value of π may be taken as $\frac{22}{7}$, if necessary. Graph paper will be supplied, if required. Arithmetic problems may be solved by algebraic method.]

[Alternative Question No. 11 is given for sightless candidates on Page No. 15.]

[Additional Question No. 13 on Page No. 15 and 16 is only for external candidates.]

1. Choose the correct option in each case from the following questions : $1 \times 6 = 6$

    (i) At present the population of a village is P and if rate of increase of population per year be $2r\%$, after n years the population will be :

    (a) $P\left(1 + \frac{r}{100}\right)^n$

    (b) $P\left(1 + \frac{r}{50}\right)^n$

    (c) $P\left(1 + \frac{r}{100}\right)^{2n}$

    (d) $P\left(1 - \frac{r}{100}\right)^n$

    (ii) Fatima, Shreya and Smita started a business by investing total Rs. 6,000. After a year Fatima, Shreya and Smita get profit share of Rs. 50, Rs. 100 and Rs. 150 respectively. Smita invested in this business :

    (a) Rs. 1,000

    (b) Rs. 2,000

    (c) Rs. 3,000

    (d) Rs. 4,000

(iii) If $A : B = 2 : 3$, $B : C = 5 : 8$, $C : D = 6 : 7$, then $A : D =$

(a) $2 : 7$ (b) $7 : 2$

(c) $5 : 8$ (d) $5 : 14$

(iv) 'O' is the centre of a circle and PQ is a diameter. R is a point on the circle such that $PR = RQ$. then the value of $\angle RPQ$:

(a) $30°$ (b) $90°$

(c) $60°$ (d) $45°$

(v) If two circles do not intersect or touch each other, then the maximum number of common tangent/tangents is/are :

(a) 2   (b) 1

(c) 3   (d) 4

(vi) The volume of a solid sphere having radius $2r$ units is :

(a) $\dfrac{32\pi r^3}{3}$ cubic unit   (b) $\dfrac{16\pi r^3}{3}$ cubic unit

(c) $\dfrac{8\pi r^3}{3}$ cubic unit   (d) $\dfrac{64\pi r^3}{3}$ cubic unit

2. Fill up the blanks (any *five*) : $1 \times 5 = 5$

(i) The annual rate of compound interest is $r\%$ and if the first year principal is P, then 2nd year principal is _____.

(ii) $7\sqrt{11}$ is an _____ number.

(iii) If radius of a sphere is r and volume v, then $v \propto$ _____.

(iv) Two triangles are similar if their corresponding sides are _____.

(v) If the opposite angles of a quadrilateral be supplementary, then the vertices of the quadrilateral will be _____.

(vi) If the length, breadth and height of a rectangular parallelelopiped are equal. then the special name of this solid is _____.

3.   Write *True* or *False* (any *five*) : $1 \times 5 = 5$

(i)   At least 3 persons are needed in partnership business.

(ii) The relation between principal and amount is principal < amount.

(iii) The two roots of the equation $x^2 = 100$ are ± 10.

(iv) If a and b are in inverse variation, then $\dfrac{a}{b} =$ constant.

(v)   Two concentric circles have only one common tangent.

(vi) The height, radius and slant height of a right circular cone are always the three sides of a right-angled triangle.

4.   Answer any *ten* questions : $2 \times 10 = 20$

(i)   The annual interest is $\dfrac{1}{16}$ part of its principal, then determine the interest of Rs. 690 of 8 months.

(ii) The present population is 13,310. If the population be 17,280 after 3 years what will be the rate of increase ?

(iii) The ratio of capitals of A, B, C is $\dfrac{1}{x} : \dfrac{1}{y} : \dfrac{1}{z}$, after a year there was a loss of Rs. z. Calculate the loss of C.

(iv) Find out the ratio of the sum and the product of two roots of the equation $7x^2 - 66x + 27 = 0$

(v)   Rationalise the surds of denominator :

$$\frac{12}{\sqrt{15} - 3}.$$

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(vi) The radius of the circle with the centre 'O' is 13 cm and a chord AB with the length of 10 cm on it. Calculate the distance of the chord AB from the centre of the circle.

(vii) AOB is a diameter of a circle whose centre is O. The point C lies on the circle. If $\angle OBC = 60°$. Find the value of $\angle OCA$.

(viii) A circle with the centre 'O'. A point P is 26 cm away from the centre of the circle and the length of the tangent drawn from the point P to the circle is 10 cm. Calculate the length of radius of the circle.

(ix) DE || BC of $\triangle ABC$ where D and E are two points on AB and AC respectively. If AD = 5 cm, DB = 6 cm and AE = 7.5 cm. Calculate the length of AC.

(x) If the height of two right circular cylinders are in the ratio of 1 : 2 and perimeters of the base are in the ratio of 3 : 4. Find the ratio of their volumes.

(xi) If the length of radius of a sphere is increased by 50%, find how much percent will be increased of its curved surface area.

(xii) The length of diagonal of a cube is $4\sqrt{3}$ cm. Calculate the total surface area of the cube.

5. Answer any *two* questions :   5×2=10

   (i) At the same rate of simple interest in percent per annum, if a principal becomes the amount of Rs. 7,100 in 7 years and of Rs. 6,200 in 4 years, determine the principal and rate of simple interest in percent per annum.

   (ii) Three friends have started a business by investing Rs. 8,000, Rs. 10,000 and Rs. 12,000 respectively. They also took an amount as bank loan. At the end of one year they made a profit of Rs. 13,400. After paying the annual bank instalment of Rs. 5,000 they divided the remaining money of the profit among themselves in the ratio of their capitals. Calculate the profit share of each.

   (iii) Calculate the difference between compound interest and simple interest on Rs. 20,000 for 2 years at 5% per annum.

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6. Answer any *two* questions : $\qquad$ 3×2=6

(i) Solve : $\dfrac{1}{a+b+x} = \dfrac{1}{a} + \dfrac{1}{b} + \dfrac{1}{x}$, $x \ne 0, -(a+b)$.

(ii) Form the quadratic equation whose roots are -4 and 3.

(iii) If $m + \dfrac{1}{m} = \sqrt{3}$, then find the value of (a) $m^2 + \dfrac{1}{m^2}$ and (b) $m^3 + \dfrac{1}{m^3}$.

7. Answer any *two* questions : $\qquad$ 3×2=6

(i) Find the simplest value of :

$$\dfrac{\sqrt{5}}{\sqrt{3}+\sqrt{2}} - \dfrac{3\sqrt{3}}{\sqrt{2}+\sqrt{5}} + \dfrac{2\sqrt{2}}{\sqrt{3}+\sqrt{5}}.$$

(ii) If $a = \dfrac{\sqrt{5}+1}{\sqrt{5}-1}$ and $ab = 1$, calculate $\left(\dfrac{a}{b} + \dfrac{b}{a}\right)$.

(iii) If 15 farmers can cultivate 18 bighas of land in 5 days, determine by using theory of variation the number of days required by 10 farmers to cultivate 12 bighas of land.

8. Answer any *one* question : $\qquad$ 3

(i) If $a : b = b : c$, prove that $\dfrac{abc(a+b+c)^3}{(ab+bc+ca)^3} = 1$.

(ii) If $\dfrac{a}{1-a} + \dfrac{b}{1-b} + \dfrac{c}{1-c} = 1$, then find the value of $\dfrac{1}{1-a} + \dfrac{1}{1-b} + \dfrac{1}{1-c}$.

(Contd.)

9. Answer any *one* question :

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

   (ii) Prove that the perpendicular drawn to a chord which is not a diameter, from the centre of the circle, bisects the chord.

10. Answer any *one* question :

    (i) *ABCD* is cyclic quadrilateral. Chord *DE* is the external bisector of $\angle BDC$. Prove that *AE* (or produced *AE*) is the external bisector of $\angle BAC$.

    (ii) Two chords, *AB* and *CD* of a circle with centre *O*, when produced intersect each other at the point *P*. Prove that $\angle AOC - \angle BOD = 2\angle BPC$.

11. Answer any *one* question :

    (i) Draw a right-angled triangle having two sides 4 cm and 8 cm length respectively, containing right angle. Then draw the circumcircle of the right-angled triangle. (Only traces of construction are required.)

    (ii) Draw a circle with radius of 2.6 cm length and draw a tangent on this circle from an external point at a distance of 6 cm from the centre of the circle.

12. Answer any *four* questions : $\qquad$ 4×4=16

    (i) Half of a cuboidal water tank with length of 2.1 m and breadth of 1.5 m is filled with water. If 630 litre of water is poured into the tank, then calculate the increased height of water.

    (ii) 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 dcm, calculate the height of the cylinder.

(iii) In a right circular conical tent 11 persons can stay. For each person 4 sq. m. space in the base and 20 cu. m. air are necessary. Determine the height of the tent put up exactly for 11 persons.

(iv) Calculate how many spherical marbles with 1 cm radius each may be formed by melting a solid sphere of iron having 8 cm of radius.

(v) The inner length, breadth and height of a tea box are 7.5 dcm, 6 dcm and 5.4 dcm respectively. If the weight of the box filled with tea is 52 kg 350 gm, but in empty state, its weight is 3.75 kg, then calculate the weight of 1 cubic dcm tea.

[Alternative Question for Sightless Candidates]

11. Answer any *one* question : 5

(i) The lengths of sides containing right angle of a right-angled triangle are given. Describe the procedure of construction of circumcircle of the triangle.

(ii) Describe the process of drawing one tangent to a circle from an external point.

[Additional Question for External Candidates]

13. (a) Answer any *three* questions : 2×3=6

(i) Find the value of a, if one root of the equation $2x^2 + ax + 8 = 0$ is 1.

(ii) What is the rate of simple interest per annum, when the interest of some money in 10 years will be $\frac{2}{5}$ part of its amount ?

(iii) Which one of $\sqrt{8}$, $\sqrt{18}$, $\sqrt{27}$, $\sqrt{72}$ is not a similar surd ?

(iv) Find the total surface area of a cone whose diameter of the base is 20 cm and slant height is 25 cm.

(b) Answer any *four* questions :   1×4=4

    (i) What will be the compound interest and simple interest for one year at the fixed rate of interest on fixed sum of money ?

    (ii) What is the value of semicircular angle ?

    (iii) Find the third proportional of 5,10.

    (iv) What is the name of solid which is composed of only one surface ?

    (v) What is the relation between the opposite angles of a cyclic quadrilateral ?

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