1 Relations and Functions

Multiple choice questions

1. If $n(A \times B) = 6$ and $A = \{1,3\}$ then $n(B)$ is
   (1) 1 (2) 2 (3) 3 (4) 6

2. $A = \{a,b,p\}$, $B = \{2,3\}$, $C = \{p,q,r,s\}$ then $n[(A \cup C) \times B]$ is
   (1) 8 (2) 20 (3) 12 (4) 16

3. If $A = \{1,2\}$, $B = \{1,2,3,4\}$, $C = \{5,6\}$ and $D = \{5, 6, 7, 8\}$ then state which of the following statement is true.
   (1) $(A \times C) \subset (B \times D)$ (2) $(B \times D) \subset (A \times C)$
   (3) $(A \times B) \subset (A \times D)$ (4) $(D \times A) \subset (B \times A)$

4. If there are 1024 relations from a set $A = \{1, 2, 3, 4, 5\}$ to a set B, then the number of elements in B is
   (1) 3 (2) 2 (3) 4 (4) 8

5. The range of the relation $R = \{(x, x^2) \mid x$ is a prime number less than $13\}$ is
   (1) {2,3,5,7} (2) {2,3,5,7,11}
   (3) {4,9,25,49,121} (4) {1,4,9,25,49,121}

6. If the ordered pairs $(a + 2, 4)$ and $(5, 2a + b)$ are equal then (a,b) is
   (1) (2, −2) (2) (5,1) (3) (2,3) (4) (3, −2)

7. Let $n(A) = m$ and $n(B) = n$ then the total number of non-empty relations that can be defined from A to B is
   (1) m^n (2) n^m (3) $2^{mn} - 1$ (4) 2^{mn}

2 Numbers and Sequences

1. Euclid's division lemma states that for positive integers a and b, there exist unique integers q and r such that $a = bq + r$, where r must satisfy.
   (1) $1 < r < b$ (2) $0 < r < b$ (3) $0 \leq r < b$ (4) $0 < r \leq b$

2. Using Euclid's division lemma, if the cube of any positive integer is divided by 9 then the possible remainders are
   (1) 0, 1, 8 (2) 1, 4, 8 (3) 0, 1, 3 (4) 1, 3, 5

3. If the HCF of 65 and 117 is expressible in the form of $65m - 117$, then the value of m is
   (1) 4 (2) 2 (3) 1 (4) 3

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4. The sum of the exponents of the prime factors in the prime factorization of 1729 is

(1) 1 (2) 2 (3) 3 (4) 4

7. Given $F_1 = 1$, $F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_5 is

(1)3 (2)5 (3)8 (4)11

8. The first term of an arithmetic progression is unity and the common difference is 4. Which of the following will be a term of this A.P.

(1) 4551 (2) 10091 (3) 7881 (4) 13531

9. If 6 times of 6^{th} term of an A.P. is equal to 7 times the 7^{th} term, then the 13^{th} term of the A.P. is

(1) 0 (2) 6 (3) 7 (4) 13

10. An A.P. consists of 31 terms. If its 16^{th} term is m, then the sum of all the terms of this A.P. is

(1) 16 m (2) 62 m (3) 31 m (4) $\frac{31}{2}$ m

11. In an A.P., the first term is 1 and the common difference is 4. How many terms of the A.P. must be taken for their sum to be equal to 120?

(1) 6 (2) 7 (3) 8 (4) 9

3 Algebra

1. A system of three linear equations in three variables is inconsistent if their planes

(1) intersect only at a point (2) intersect in a line

(3) coincides with each other (4) do not intersect

2. The solution of the system $x + y - 3x = -6$, $-7y + 7z = 7$, $3z = 9$ is

(1) $x = 1, y = 2, z = 3$ (2) $x = -1, y = 2, z = 3$

(3) $x = -1, y = -2, z = 3$ (4) $x = 1, y = 2, z = 3$

3. If $(x - 6)$ is the HCF of $x^2 - 2x - 24$ and $x^2 - kx - 6$ then the value of k is

(1) 3 (2) 5 (3) 6 (4) 8

4. $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is

(1) $\frac{9y}{7}$ (2) $\frac{9y^3}{(21y-21)}$ (3) $\frac{21y^2-42y+21}{3y^3}$ (4) $\frac{7(y^2-2y+1)}{y^2}$

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5. $y^2+\frac{1}{y^2}$ is not equal to

(1) $\frac{y^4+1}{y^2}$ (2) $\left(y+\frac{1}{y}\right)^2$ (3) $\left(y-\frac{1}{y}\right)^2+2$ (4) $\left(y+\frac{1}{y}\right)^2-2$

6. $\frac{x}{x^2-25}-\frac{8}{x^2+6x+5}$ gives

(1) $\frac{x^2-7x+40}{(x-5)(x+5)}$ (2) $\frac{x^2+7x+40}{(x-5)(x+5)(x+1)}$

(3) $\frac{x^2-7x+40}{(x^2-25)(x+1)}$ (4) $\frac{x^2+10}{(x^2-25)(x+1)}$

7. The square root of $\frac{256x^8y^4z^{10}}{25x^6y^6z^6}$ is equal to

(1) $\frac{16}{5}\left|\frac{x^2z^4}{y^2}\right|$ (2) $16\left|\frac{y^2}{x^2z^4}\right|$ (3) $\frac{16}{5}\left|\frac{y}{xz^2}\right|$ (4) $\frac{16}{5}\left|\frac{xz^2}{y}\right|$

8. Which of the following should be added to make x^4+64 a perfect square

(1) $4x^2$ (2) $16x^2$ (3) $8x^2$ (4) $-8x^2$

9. The solution of $(2x-1)^2=9$ is equal to

(1) -1 (2) 2 (3) $-1, 2$ (4) None of these

10. The values of a and b if $4x^4-24x^3+76x^2+ax+b$ is a perfect square are

(1) 100,120 (2) 10,12 (3) -120,100 (4) 12,10

11. If the roots of the equation $q^2x^2+p^2x+r^2=0$ are the squares of the roots of the equation $qx^2+px+r=0$, then q, p, r are in _____

(1) $A.P$ (2) $G.P$ (3) Both $A.P$ and $G.P$ (4) none of these

12. Graph of a linear polynomial is a

(1) straight line (2) circle (3) parabola (4) hyperbola

13. The number of points of intersection of the quadratic polynomial x^2+4x+4 with the X axis is

(1) 0 (2) 1 (3) 0 or 1 (4) 2

4 Geometry

1. If in triangles ABC and EDF, $\frac{AB}{DE}=\frac{BC}{FD}$ then they will be similar, when

(1) $\angle B=\angle E$ (2) $\angle A=\angle D$ (3) $\angle B=\angle D$ (4) $\angle A=\angle F$

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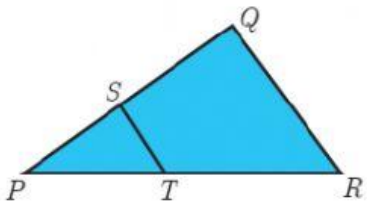
2. In ΔLMN, $\angle L = 60°$, $\angle M = 50°$. If $\Delta LMN \sim \Delta PQR$ then the value of $\angle R$ is

(1) $40°$ (2) $70°$ (3) $30°$ (4) $110°$

3. If ΔABC is an isosceles triangle with $\angle C = 90°$ and $AC = 5$ cm, then AB is

(1) 2.5 cm (2) 5 cm (3) 10 cm (4) $5\sqrt{2}$ cm

4. In a given figure $ST \parallel QR$, $PS = 2$ cm and $SQ = 3$ cm. Then the ratio of the area of ΔPQR to the area of ΔPST is



(1) 25 : 4 (2) 25 : 7

(3) 25 : 11 (4) 25 : 13

5. The perimeters of two similar triangles ΔABC and ΔPQR are 36 cm and 24 cm respectively. If $PQ = 10$ cm, then the length of AB is

(1) $6\frac{2}{3}$ cm (2) $\frac{10\sqrt{6}}{3}$ cm (3) $66\frac{2}{3}$ cm (4) 15 cm

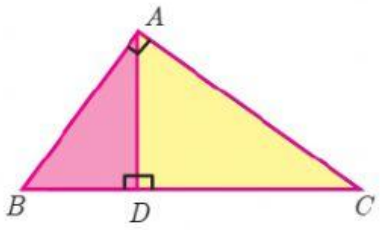
6. If in ΔABC, $DE \parallel BC$. $AB = 3.6$ cm, $AC = 2.4$ cm and $AD = 2.1$ cm then the length of AE is

(1) 1.4 cm (2) 1.8 cm (3) 1.2 cm (4) 1.05 cm

7. In a ΔABC, AD is the bisector of $\angle BAC$. If $AB = 8$ cm, $BD = 6$ cm and $DC = 3$ cm. The length of the side AC is

(1) 6 cm (2) 4 cm (3) 3 cm (4) 8 cm

8. In the adjacent figure $\angle BAC = 90°$ and $AD \perp BC$ then



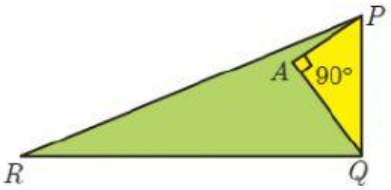
(1) $BD \cdot CD = BC^2$ (2) $AB.AC = BC^2$

(3) $BD \cdot CD = AD^2$ (4) $AB \cdot AC = AD^2$

9. Two poles of heights 6 m and 11 m stand vertically on a plane ground. If the distance between their feet is 12 m, what is the distance between their tops?

(1) 13 m (2) 14 m (3) 15 m (4) 12.8 m

10. In the given figure, $PR = 26$ cm, $QR = 24$ cm, $\angle PAQ = 90°$, $PA = 6$ cm and $QA = 8$ cm. Find $\angle PQR$



(1) $80°$ (2) $85°$ (3) $75°$ (4) $90°$

11. A tangent is perpendicular to the radius at the

(1) centre (2) point of contact (3) infinity (4) chord

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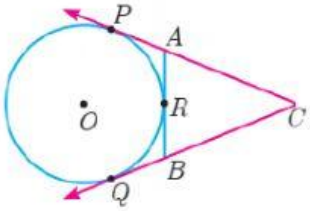
12. How many tangents can be drawn to the circle from an exterior point?

(1) one (2) two (3) infinite (4) zero

13. The two tangents from an external points P to a circle with centre at O are PA and PB. If $\angle APB = 70°$ then the value of $\angle AOB$ is

(1) $100°$ (2) $110°$ (3) $120°$ (4) $130°$

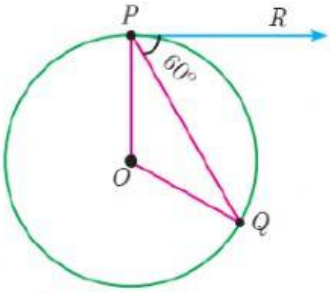
14. In figure CP and CQ are tangents to a circle with centre at O. ARB is another tangent touching the circle at R. If $CP = 11$ cm and $BC = 7$ cm, then the length of BR is



(1) 6 cm (2) 5 cm

(3) 8 cm (4) 4 cm

15. In figure if PR is tangent to the circle at P and O is the centre of the circle, then $\angle POQ$ is



(1) $120°$ (2) $100°$

(3) $110°$ (4) $90°$

5 Coordinate Geometry

1. The area of triangle formed by the points $(-5,0)$, $(0,-5)$ and $(5,0)$ is

(1) 0 sq.units (2) 25 sq.units (3) 5 sq.units (4) none of these

2. A man walks near a wall, such that the distance between him and the wall is 10 units. Consider the wall to be the Y axis. The path travelled by the man is

(1) $x = 10$ (2) $y = 10$ (3) $x = 0$ (4) $y = 0$

3. The straight line given by the equation $x = 11$ is

(1) parallel to X axis (2) parallel to Y axis

(3) passing through the origin (4) passing through the point $(0,11)$

4. If $(5,7)$, $(3,p)$ and $(6,6)$ are collinear, then the value of p is

(1) 3 (2) 6 (3) 9 (4) 12

5. The point of intersection of $3x - y = 4$ and $x + y = 8$ is

(1) $(5,3)$ (2) $(2,4)$ (3) $(3,5)$ (4) $(4,4)$

6. The slope of the line joining $(12,3)$, $(4,a)$ is $\frac{1}{8}$. The value of 'a' is

(1) 1 (2) 4 (3) -5 (4) 2

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8. If slope of the line PQ is $\frac{1}{\sqrt{3}}$ then the slope of the perpendicular bisector of PQ is

(1) $\sqrt{3}$ (2) $-\sqrt{3}$ (3) $\frac{1}{\sqrt{3}}$ (4) 0

9. If A is a point on the Y axis whose ordinate is 8 and B is a point on the X axis whose abscissae is 5 then the equation of the line AB is

(1) $8x + 5y = 40$ (2) $8x - 5y = 40$ (3) $x = 8$ (4) $y = 5$

12. A straight line has equation $8y = 4x + 21$. Which of the following is true

(1) The slope is 0.5 and the y intercept is 2.6

(2) The slope is 5 and the y intercept is 1.6

(3) The slope is 0.5 and the y intercept is 1.6

(4) The slope is 5 and the y intercept is 2.6

13. When proving that a quadrilateral is a trapezium, it is necessary to show

(1) Two sides are parallel.

(2) Two parallel and two non-parallel sides.

(3) Opposite sides are parallel.

(4) All sides are of equal length.

14. When proving that a quadrilateral is a parallelogram by using slopes you must find

(1) The slopes of two sides

(2) The slopes of two pair of opposite sides

(3) The lengths of all sides

(4) Both the lengths and slopes of two sides

15. (2, 1) is the point of intersection of two lines.

(1) $x - y - 3 = 0;\ 3x - y - 7 = 0$ (2) $x + y = 3;\ 3x + y = 7$

(3) $3x + y = 3;\ x + y = 7$ (4) $x + 3y - 3 = 0;\ x - y - 7 = 0$

6 Trigonometry

10. If the ratio of the height of a tower and the length of its shadow is $\sqrt{3} : 1$, then the angle of elevation of the sun has measure

(1) 45° (2) 30° (3) 90° (4) 60°

11. The electric pole subtends an angle of 30° at a point on the same level as its foot. At a second point 'b' metres above the first, the depression of the foot of the tower is 60°. The height of the tower (in metres) is equal to

(1) $\sqrt{3}\ b$ (2) $\frac{b}{3}$ (3) $\frac{b}{2}$ (4) $\frac{b}{\sqrt{3}}$

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12. A tower is 60 m height. Its shadow is x metres shorter when the sun's altitude is $45°$ than when it has been $30°$, then x is equal to

(1) 41.92 m (2) 43.92 m (3) 43 m (4) 45.6 m

13. The angle of depression of the top and bottom of 20 m tall building from the top of a multistoried building are $30°$ and $60°$ respectively. The height of the multistoried building and the distance between two buildings (in metres) is

(1) 20, $10\sqrt{3}$ (2) 30, $5\sqrt{3}$ (3) 20, 10 (4) 30, $10\sqrt{3}$

14. Two persons are standing 'x' metres apart from each other and the height of the first person is double that of the other. If from the middle point of the line joining their feet an observer finds the angular elevations of their tops to be complementary, then the height of the shorter person (in metres) is

(1) $\sqrt{2}\ x$ (2) $\frac{x}{2\sqrt{2}}$ (3) $\frac{x}{\sqrt{2}}$ (4) $2x$

15. The angle of elevation of a cloud from a point h metres above a lake is β. The angle of depression of its reflection in the lake is $45°$. The height of location of the cloud from the lake is

(1) $\frac{h(1+\tan\beta)}{1-\tan\beta}$ (2) $\frac{h(1-\tan\beta)}{1+\tan\beta}$ (3) $h\tan(45°-\beta)$ (4) none of these

7 Mensuration

1. The curved surface area of a right circular cone of height 15 cm and base diameter 16 cm is

(1) 60π cm^2 (2) 68π cm^2 (3) c) 120π cm^2 (4) 136π cm^2

2. If two solid hemispheres of same base radius r units are joined together along their bases, then curved surface area of this new solid is

(1) $4\pi r^2$ sq. units (2) $6\pi r^2$ sq. units (3) $3\pi r^2$ sq. units (4) $8\pi r^2$ sq. units

3. The height of a right circular cone whose radius is 5 cm and slant height is 13 cm will be

(1) 12 cm (2) 10 cm (3) 13 cm (4) 5 cm

4. If the radius of the base of a right circular cylinder is halved keeping the same height, then the ratio of the volume of the cylinder thus obtained to the volume of original cylinder is

(1) 1:2 (2) 1:4 (3) 1:6 (4) 1:8

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5. The total surface area of a cylinder whose radius is $\frac{1}{3}$ of its height is

(1) $\frac{9\pi h^2}{8}$ sq.units (2) $24\pi h^2$ sq.units

(3) $\frac{8\pi h^2}{9}$ sq.units (4) $\frac{56\pi h^2}{9}$ sq.units

6. In a hollow cylinder, the sum of the external and internal radii is 14 cm and the width is 4 cm. If its height is 20 cm, the volume of the material in it is

(1) 5600π cm^3 (2) 11200π cm^3 (3) 56π cm^3 (4) 3600π cm^3

7. If the radius of the base of a cone is tripled and the height is doubled then the volume is

(1) made 6 times (2) made 18 times (3) made 12 times (4) unchanged

8. The total surface area of a hemi-sphere is how much times the square of its radius.

(1) π (2) 4π (3) 3π (4) 2π

9. A solid sphere of radius x cm is melted and cast into a shape of a solid cone of same radius. The height of the cone is

(1) $3x$ cm (2) x cm (3) $4x$ cm (4) $2x$ cm

10. A frustum of a right circular cone is of height 16cm with radii of its ends as 8cm and 20cm. Then, the volume of the frustum is

(1) 3328π cm^3 (2) 3228π cm^3 (3) 3240π cm^3 (4) 3340π cm^3

11. A shuttle cock used for playing badminton has the shape of the combination of

(1) a cylinder and a sphere (2) a hemisphere and a cone

(3) a sphere and a cone (4) frustum of a cone and a hemisphere

13. The volume (in cm^3) of the greatest sphere that can be cut off from a cylindrical log of wood of base radius 1 cm and height 5 cm is

(1) $\frac{4}{3}\pi$ (2) $\frac{10}{3}\pi$ (3) 5π (4) $\frac{20}{3}\pi$

14. The height and radius of the cone of which the frustum is a part are h_1 units and r_1 units respectively. Height of the frustum is h_2 units and radius of the smaller base is r_2 units. If $h_2 : h_1 = 1 : 2$ then $r_2 : r_1$ is

(1) 1 : 3 (2) 1 : 2 (3) 2 : 1 (4) 3 : 1

15. The ratio of the volumes of a cylinder, a cone and a sphere, if each has the same diameter and same height is

(1) 1:2:3 (2) 2:1:3 (3) 1:3:2 (4) 3:1:2

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8 Statistics and Probability

9. Which of the following is incorrect?

(1) $P(A) > 1$ (2) $0 \leq P(A) \leq 1$ (3) $P(\phi) = 0$ (4) $P(A) + P(\bar{A}) = 1$

10. The probability a red marble selected at random from a jar containing p red, q blue and r green marbles is

(1) $\frac{q}{p+q+r}$ (2) $\frac{p}{p+q+r}$ (3) $\frac{p+q}{p+q+r}$ (4) $\frac{p+r}{p+q+r}$

11. A page is selected at random from a book. The probability that the digit at units place of the page number chosen is less than 7 is

(1) $\frac{3}{10}$ (2) $\frac{7}{10}$ (3) $\frac{3}{9}$ (4) $\frac{7}{9}$

12. The probability of getting a job for a person is $\frac{x}{3}$. If the probability of not getting the job is $\frac{2}{3}$ then the value of x is

(1) 2 (2) 1 (3) 3 (4) 1.5

13. Kamalam went to play a lucky draw contest. 135 tickets of the lucky draw were sold. If the probability of Kamalam winning is $\frac{1}{9}$, then the number of tickets bought by Kamalam is

(1) 5 (2) 10 (3) 15 (4) 20

14. If a letter is chosen at random from the English alphabets $\{a, b, \ldots, z\}$, then the probability that the letter chosen precedes x

(1) $\frac{12}{13}$ (2) $\frac{1}{13}$ (3) $\frac{23}{26}$ (4) $\frac{3}{26}$

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