

Karnataka Public School, Masthi, Malur(Tq), Kolar

Sub : Mathematics

MCQ Questions for Class 10th

1. Pair of Linear Equations in Two Variables

- The pairs of equations $x+2y-5=0$ and $-4x-8y+20=0$ have:
(a) Unique solution (b) Exactly two solutions (c) Infinitely many solutions (d) No solution
- If a pair of linear equations is consistent, then the lines are:
(a) Parallel (b) Always coincident (c) Always intersecting (d) Intersecting or coincident
- The pairs of equations $9x+3y+12=0$ and $18x+6y+26=0$ have
(a) Unique solution (b) Exactly two solutions (c) Infinitely many solutions (d) No solution
- If the lines $3x+2ky-2=0$ and $2x+5y+1=0$ are parallel, then what is the value of k?
(a) $4/15$ (b) $15/4$ (c) $4/5$ (d) $5/4$
- If one equation of a pair of dependent linear equations is $-3x+5y-2=0$. The second equation will be:
(a) $-6x+10y-4=0$ (b) $6x-10y-4=0$ (c) $6x+10y-4=0$ (d) $-6x+10y+4=0$
- The solution of the equations $x-y=2$ and $x+y=4$ is:
(a) 3 and 1 (b) 4 and 3 (c) 5 and 1 (d) -1 and -3
- A fraction becomes $1/3$ when 1 is subtracted from the numerator and it becomes $1/4$ when 8 is added to its denominator. The fraction obtained is:
(a) $3/12$ (b) $4/12$ (c) $5/12$ (d) $7/12$
- The solution of $4/x+3y=14$ and $3/x-4y=23$ is:
(a) $1/5$ and -2 (b) $1/3$ and $1/2$ (c) 3 and $1/2$ (d) 2 and $1/3$
- Ritu can row downstream 20 km in 2 hours, and upstream 4 km in 2 hours. Her speed of rowing in still water and the speed of the current is:
(a) 6km/hr and 3km/hr (b) 7km/hr and 4km/hr (c) 6km/hr and 4km/hr (d) 10km/hr and 6km/hr
- The angles of cyclic quadrilaterals ABCD are: $A=(6x+10)^\circ$, $B=(5x)^\circ$, $C=(x+y)^\circ$ and $D=(3y-10)^\circ$. The value of x and y is:
(a) $x=20^\circ$ and $y=10^\circ$ (b) $x=20^\circ$ and $y=30^\circ$ (c) $x=44^\circ$ and $y=15^\circ$ (d) $x=15^\circ$ and $y=15^\circ$

2. Quadratic Equations

- Equation of $(x+1)^2-x^2=0$ has number of real roots equal to:
(a) 1 (b) 2 (c) 3 (d) 4
- The roots of $100x^2-20x+1=0$ is:
(a) $1/20$ and $1/20$ (b) $1/10$ and $1/20$ (c) $1/10$ and $1/10$ (d) None of the above
- The sum of two numbers is 27 and product is 182. The numbers are:
(a) 12 and 13 (b) 13 and 14 (c) 12 and 15 (d) 13 and 24
- If $1/2$ is a root of the quadratic equation $x^2-mx-5/4=0$, then value of m is:

- (a)2 (b)-2 (c)-3 (d)3

5. The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, the other two sides of the triangle are equal to:

- (a)Base=10cm and Altitude=5cm (b)Base=12cm and Altitude=5cm
(c)Base=14cm and Altitude=10cm (d)Base=12cm and Altitude=10cm

6. The roots of quadratic equation $2x^2 + x + 4 = 0$ are:

- (a)Positive and negative (b)Both Positive (c)Both Negative (d)No real roots

7. The value of $\sqrt{6+\sqrt{6+\sqrt{6+\dots}}}$ is

- (a)4 (b)3 (c)3.5 (d)-3

8. The sum of the reciprocals of Rehman's ages 3 years ago and 5 years from now is $\frac{1}{3}$. The present age of Rehman is:

- (a)7 (b)10 (c)5 (d)6

9. A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.

- (a)30 km/hr (b)40 km/hr (c)50 km/hr (d)60 km/hr

10. If one root of equation $4x^2-2x+k-4=0$ is reciprocal of other. The value of k is:

- (a)-8 (b)8 (c)-4 (d)4

3. Arithmetic Progressions

1. In an Arithmetic Progression, if $a=28$, $d=-4$, $n=7$, then a_n is:

- (a)4 (b)5 (c)3 (d)7

2. If $a=10$ and $d=10$, then first four terms will be:

- (a)10,30,50,60 (b)10,20,30,40 (c)10,15,20,25 (d)10,18,20,30

3. The first term and common difference for the A.P. 3,1,-1,-3 is:

- (a)1 and 3 (b)-1 and 3 (c)3 and -2 (d)2 and 3

4. 30th term of the A.P: 10,7, 4, ..., is

- (a)97 (b)77 (c)-77 (d)-87

5. 11th term of the A.P. -3, -1/2, 2 Is

- (a)28 (b)22 (c)-38 (d)-48

6. The missing terms in AP: __, 13, __, 3 are:

- (a)11 and 9 (b)17 and 9 (c)18 and 8 (d)18 and 9

7. Which term of the A.P. 3, 8, 13, 18, ... is 78?

- (a)12th (b)13th (c)15th (d)16th

8. The 21st term of AP whose first two terms are -3 and 4 is:

- (a)17 (b)137 (c)143 (d)-143

9. If 17th term of an A.P. exceeds its 10th term by 7. The common difference is:

- (a)1 (b)2 (c)3 (d)4

10. The number of multiples of 4 between 10 and 250 is:

- (a)50 (b)40 (c)60 (d)30

11. 20th term from the last term of the A.P. 3, 8, 13, ..., 253 is:

- (a)147 (b)151 (c)154 (d)158

12. The sum of the first five multiples of 3 is:

- (a)45 (b)55 (c)65 (d)75

4. Triangles

1. Which of the following triangles have the same side lengths?

- (a)Scalene (b)Isosceles (c)Equilateral (d)None of these

2. Area of an equilateral triangle with side length a is equal to:

- (a) $\sqrt{3}/2a$ (b) $\sqrt{3}/2a^2$ (c) $\sqrt{3}/4 a^2$ (d) $\sqrt{3}/4 a$

3. D and E are the midpoints of side AB and AC of a triangle ABC, respectively and BC=6cm. If DE || BC, then the length of DE is:

- (a)2.5 (b)3 (c)5 (d)6

4. The diagonals of a rhombus are 16cm and 12cm, in length. The side of rhombus in length is:

- (a)20cm (b)8cm (c)10cm (d)9cm

5. Corresponding sides of two similar triangles are in the ratio of 2:3. If the area of small triangle is 48 sq.cm, then the area of large triangle is:

- (a)230 sq.cm. (b)106 sq.cm (c)107 sq.cm. (d)108 sq.cm

6. If perimeter of a triangle is 100cm and the length of two sides are 30cm and 40cm, the length of third side will be:

- (a)30cm (b)40cm (c)50cm (d)60cm

7. If triangles ABC and DEF are similar and AB=4cm, DE=6cm, EF=9cm and FD=12cm, the perimeter of triangle is:

- (a)22cm (b)20cm (c)21cm (d)18cm

8. The height of an equilateral triangle of side 5cm is:

- (a)4.33 (b)3.9 (c)5 (d)4

9. If ABC and DEF are two triangles and AB/DE=BC/FD, then the two triangles are similar if

- (a) $\angle A = \angle F$ (b) $\angle B = \angle D$ (c) $\angle A = \angle D$ (d) $\angle B = \angle E$

10. Sides of two similar triangles are in the ratio 4: 9. Areas of these triangles are in the ratio

- (a)2: 3 (b)4: 9 (c)81: 16 (d)16: 81

5. Coordinate Geometry

1. The points (- 1, - 2), (1, 0), (- 1, 2), (- 3, 0) forms a quadrilateral of type:

- (a)Square (b)Rectangle (c)Parallelogram (d)Rhombus

2. If the distance between the points A(2, -2) and B(-1, x) is equal to 5, then the value of x is:

- (a)2 (b)-2 (c)1 (d)-1vbg
- 3.The midpoints of a line segment joining two points A(2, 4) and B(-2, -4)
- (a) (-2,4) (b) (2,-4) (c) (0, 0) (d) (-2,-4)
- 4.The distance of point A(2, 4) from x-axis is
- (a)2 (b)4 (c)-2 (d)-4
- 5.The distance between the points P(0, 2) and Q(6, 0) is
- (a) $4\sqrt{10}$ (b) $2\sqrt{10}$ (c) $\sqrt{10}$ (d)20
- 6.If O(p/3, 4) is the midpoint of the line segment joining the points P(-6, 5) and Q(-2, 3). The value of p is:
- (a)7/2 (b)-12 (c)4 (d)-4
- 7.The points which divides the line segment of points P(-1, 7) and (4, -3) in the ratio of 2:3 is:
- (a)(-1, 3) (b)(-1, -3) (c)(1, -3) (d)(1, 3)
- 8.The ratio in which the line segment joining the points P(-3, 10) and Q(6, - 8) is divided by O(-1, 6) is:
- (a)1:3 (b)3:4 (c)2:7 (d)2:5
- 9.The coordinates of a point P, where PQ is the diameter of circle whose centre is (2, - 3) and Q is (1, 4) is:
- (a)(3, -10) (b)(2, -10) (c)(-3, 10) (d)(-2, 10)
- 10.The area of a rhombus if its vertices are (3, 0), (4, 5), (-1, 4) and (-2,-1) taken in order, is:
- (a)12 sq.unit (b)24 sq.unit (c)30 sq.unit (d)32 sq.unit

6. Introduction to Trigonometry

1. In $\triangle ABC$, right-angled at B, $AB = 24$ cm, $BC = 7$ cm. The value of $\tan C$ is:
- (a) $12/7$ (b) $24/7$ (c) $20/7$ (d) $7/24$
2. $(\sin 30^\circ + \cos 60^\circ) - (\sin 60^\circ + \cos 30^\circ)$ is equal to:
- (a)0 (b) $1+2\sqrt{3}$ (c) $1-\sqrt{3}$ (d) $1+\sqrt{3}$
3. The value of $\tan 60^\circ / \cot 30^\circ$ is equal to:
- (a)0 (b)1 (c)2 (d)3
4. $1 - \cos^2 A$ is equal to:
- (a) $\sin^2 A$ (b) $\tan^2 A$ (c) $1 - \sin^2 A$ (d) $\sec^2 A$
5. $\sin(90^\circ - A)$ and $\cos A$ are:
- (a)Different (b)Same (c)Not related (d)None of the above
6. If $\cos X = \frac{2}{5}$ then $\tan X$ is equal to:
- (a) $5/2$ (b) $\sqrt{5/2}$ (c) $\sqrt{5}/2$ (d) $2/\sqrt{5}$
7. If $\cos X = a/b$, then $\sin X$ is equal to:
- (a) $b^2 - a^2/b$ (b) $b - a/b$ (c) $\sqrt{(b^2 - a^2)}/b$ (d) $\sqrt{(b-a)}/b$
8. The value of $\sin 60^\circ \cos 30^\circ + \sin 30^\circ \cos 60^\circ$ is:

- (a)0 (b)1 (c)2 (d)4

9. $2\tan 30^\circ / 1 + \tan^2 30^\circ =$

- (a)Sin 60° (b)Cos 60° (c)Tan 60° (d)Sin 30°

10. $\sin 2A = 2 \sin A$ is true when $A =$

- (a)30° (b)45° (c)0° (d)60°

7. Some Applications of Trigonometry

1. If the length of the shadow of a tree is decreasing then the angle of elevation is:

- (a)Increasing (b)Decreasing (c)Remains the same (d)None of the above

2. The angle of elevation of the top of a building from a point on the ground, which is 30 m away from the foot of the building, is 30°. The height of the building is:

- (a)10 m (b) $30/\sqrt{3}$ m (c) $\sqrt{3}/10$ m (d)30 m

3. If the height of the building and distance from the building foot's to a point is increased by 20%, then the angle of elevation on the top of the building:

- (a)Increases (b)Decreases (c)Do not change (d)None of the above

4. If a tower 6m high casts a shadow of $2\sqrt{3}$ m long on the ground, then the sun's elevation is:

- (a)60° (b)45° (c)30° (d)90°

5. The angle of elevation of the top of a building 30 m high from the foot of another building in the same plane is 60°, and also the angle of elevation of the top of the second tower from the foot of the first tower is 30°, then the distance between the two buildings is:

- (a) $10\sqrt{3}$ m (b) $15\sqrt{3}$ m (c) $12\sqrt{3}$ m (d)36 m

6. The angle formed by the line of sight with the horizontal when the point is below the horizontal level is called:

- (a)Angle of elevation (b)Angle of depression
(c)No such angle is formed (d)None of the above

7. The angle formed by the line of sight with the horizontal when the point being viewed is above the horizontal level is called:

- (a)Angle of elevation (b)Angle of depression
(c)No such angle is formed (d)None of the above

8. From a point on the ground, which is 15 m away from the foot of the tower, the angle of elevation of the top of the tower is found to be 60°. The height of the tower standing straight is:

- (a) $15\sqrt{3}$ (b) $10\sqrt{3}$ (c) $12\sqrt{3}$ (d) $20\sqrt{3}$

9. The line drawn from the eye of an observer to the point in the object viewed by the observer is said to be

- (a)Angle of elevation (b)Angle of depression (c)Line of sight (d)None of the above

10. The height or length of an object or the distance between two distant objects can be determined with the help of:

- (a)Trigonometry angles (b)Trigonometry ratios

(c) Trigonometry identities

(d) None of the above

8. Circles

1. A circle has a number of tangents equal to

(a) 0

(b) 1

(c) 2

(d) Infinite

2. A tangent intersects the circle at:

(a) One point

(b) Two distinct point

(c) At the circle

(d) None of the above

3. A circle can have _____ parallel tangents at a single time.

(a) One

(b) Two

(c) Three

(d) Four

4. If the angle between two radii of a circle is 110° , then the angle between the tangents at the ends of the radii is:

(a) 90°

(b) 50°

(c) 70°

(d) 40°

5. The length of the tangent from an external point A on a circle with centre O is

(a) always greater than OA

(b) equal to OA

(c) always less than OA

(d) Cannot be estimated

6. AB is a chord of the circle and AOC is its diameter such that angle $ACB = 50^\circ$. If AT is the tangent to the circle at the point A, then BAT is equal to

(a) 65°

(b) 60°

(c) 50°

(d) 40°

7. If TP and TQ are the two tangents to a circle with centre O so that $\angle POQ = 110^\circ$, then $\angle PTQ$ is equal to

(a) 60°

(b) 70°

(c) 80°

(d) 90°

8. The length of a tangent from a point A at a distance 5 cm from the centre of the circle is 4 cm. The radius of the circle is:

(a) 3cm

(b) 5cm

(c) 7cm

(d) 10cm

9. If a parallelogram circumscribes a circle, then it is a:

(a) Square

(b) Rectangle

(c) Rhombus

(d) None of the above

10. Two concentric circles are of radii 5 cm and 3 cm. The length of the chord of the larger circle which touches the smaller circle is:

(a) 8

(b) 10

(c) 12

(d) 18

9. Constructions

1. To divide a line segment AB in the ratio 3:4, first, a ray AX is drawn so that $\angle BAX$ is an acute angle and then at equal distances points are marked on the ray AX such that the minimum number of these points is:

(a) 5

(b) 7

(c) 9

(d) 11

2. To divide a line segment AB of length 7.6cm in the ratio 5:8, a ray AX is drawn first such that $\angle BAX$ forms an acute angle and then points A1, A2, A3, are located at equal distances on the ray AX and the point B is joined to:

(a) A5

(b) A6

(c) A10

(d) A13

3. To construct a triangle similar to a given ΔPQR with its sides $\frac{5}{8}$ of the similar sides of ΔPQR , draw a ray QX such that $\angle QRX$ is an acute angle and X lies on the opposite side of P with respect to QR . Then locate points Q_1, Q_2, Q_3, \dots on QX at equal distances, and the next step is to join:

- (a) Q_{10} to C (b) Q_3 to C (c) Q_8 to C (d) Q_4 to C

4. To construct a triangle similar to a given ΔPQR with its sides, $\frac{9}{5}$ of the corresponding sides of ΔPQR draw a ray QX such that $\angle QRX$ is an acute angle and X is on the opposite side of P with respect to QR . The minimum number of points to be located at equal distances on ray QX is:

- (a) 5 (b) 9 (c) 10 (d) 14

5. To construct a pair of tangents to a circle at an angle of 60° to each other, it is needed to draw tangents at endpoints of those two radii of the circle, the angle between them should be:

- (a) 100° (b) 90° (c) 180° (d) 120°

6. To divide a line segment PQ in the ratio $m:n$, where m and n are two positive integers, draw a ray PX so that $\angle PQX$ is an acute angle and then mark points on ray PX at equal distances such that the minimum number of these points is:

- (a) $M+n$ (b) $M-n$ (c) $M+n-1$ (d) Greater of m and n

7. To draw a pair of tangents to a circle which are inclined to each other at an angle of 45° , it is required to draw tangents at the endpoints of those two radii of the circle, the angle between which is:

- (a) 135° (b) 155° (c) 160° (d) 120°

8. A pair of tangents can be constructed from a point P to a circle of radius 3.5 cm situated at a distance of _____ from the centre.

- (a) 3.5 (b) 2.5 (c) 5 (d) 2

9. To construct a triangle ABC and then a triangle similar to it whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle. A ray AX is drawn where multiple points at equal distances are located. The last point to which point B will meet the ray AX will be:

- (a) A_1 (b) A_2 (c) A_3 (d) A_4

10. To construct a triangle similar to a given ΔPQR with its sides $\frac{3}{7}$ of the similar sides of ΔPQR , draw a ray QX such that $\angle QRX$ is an acute angle and X lies on the opposite side of P with respect to QR . Then locate points Q_1, Q_2, Q_3, \dots on QX at equal distances, and the next step is to join:

- (a) Q_{10} to C (b) Q_3 to C (c) Q_7 to C (d) Q_4 to C

10. Surface Areas and Volumes

1. The shape of an ice-cream cone is a combination of:

- (a) Sphere + cylinder (b) Sphere + cone (c) Hemisphere + cylinder (d) Hemisphere + cone

2. If a cone is cut parallel to the base of it by a plane in two parts, then the shape of the top of the cone will be a:

- (a) Sphere (b) Cube (c) Cone itself (d) Cylinder

3. If we cut a cone in two parts by a plane parallel to the base, then the bottom part left over is the:

- (a) Cone (b) Frustum of cone (c) Sphere (d) Cylinder

4. If r is the radius of the sphere, then the surface area of the sphere is given by;
 (a) $4\pi r^2$ (b) $2\pi r^2$ (c) πr^2 (d) $\frac{4}{3}\pi r^2$
5. If we change the shape of an object from a sphere to a cylinder, then the volume of cylinder will
 (a) Increase (b) Decrease (c) Remains unchanged (d) Doubles
6. Fifteen solid spheres are made by melting a solid metallic cone of base diameter 2cm and height 15cm. The radius of each sphere is:
 (a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{1}{3}\sqrt{2}$ (d) $\frac{1}{3}\sqrt{4}$
7. The radius of the top and bottom of a bucket of slant height 35 cm are 25 cm and 8cm. The curved surface of the bucket is:
 (a) 4000 sq.cm (b) 3500 sq.cm (c) 3630 sq..cm (d) 3750 sq.cm
8. If a cylinder is covered by two hemispheres shaped lid of equal shape, then the total curved surface area of the new object will be
 (a) $4\pi rh + 2\pi r^2$ (b) $4\pi rh - 2\pi r^2$ (c) $2\pi rh + 4\pi r^2$ (d) $2\pi rh + 4\pi r$
9. A tank is made of the shape of a cylinder with a hemispherical depression at one end. The height of the cylinder is 1.45 m and radius is 30cm. The total surface area of the tank is:
 (a) 30m (b) 3.3m (c) 30.3m (d) 3300m
10. If we join two hemispheres of same radius along their bases, then we get a;
 (a) Cone (b) Cylinder (c) Sphere (d) Cuboid

11. Statistics

1. If $x_1, x_2, x_3, \dots, x_n$ are the observations of a given data. Then the mean of the observations will be:
 (a) Sum of observations/Total number of observations
 (b) Total number of observations/Sum of observations
 (c) Sum of observations + Total number of observations
 (d) None of the above
2. If the mean of frequency distribution is 7.5 and $\sum f_i x_i = 120 + 3k$, $\sum f_i = 30$, then k is equal to:
 (a) 40 (b) 35 (c) 50 (d) 45
3. The mode and mean is given by 7 and 8, respectively. Then the median is:
 (a) $\frac{1}{13}$ (b) $\frac{13}{3}$ (c) $\frac{23}{3}$ (d) 33
4. The mean of the data: 4, 10, 5, 9, 12 is;
 (a) 8 (b) 10 (c) 9 (d) 15
5. The median of the data 13, 15, 16, 17, 19, 20 is:
 (a) $\frac{30}{2}$ (b) $\frac{31}{2}$ (c) $\frac{33}{2}$ (d) $\frac{35}{2}$
6. If the mean of first n natural numbers is $\frac{3n}{5}$, then the value of n is:
 (a) 3 (b) 4 (c) 5 (d) 6
7. If AM of $a, a+3, a+6, a+9$ and $a+12$ is 10, then a is equal to;
 (a) 1 (b) 2 (c) 3 (d) 4
8. The class interval of a given observation is 10 to 15, then the classmark for this interval will be:

- (a)11.5 (b)12.5 (c)12 (d)14

9. If the sum of frequencies is 24, then the value of x in the observation: x, 5,6,1,2, will be;

- (a)4 (b)6 (c)8 (d)10

10. The mean of following distribution is:

x_i	11	14	17	20
f_i	3	6	8	7

- (a)15.6 (b)17 (c)14.8 (d)16.

Key Answer

4. Pair of Linear Equations in Two Variables

1. Answer: **(c)**

Explanation:

$$a_1/a_2 = 1/-4$$

$$b_1/b_2 = 2/-8 = 1/-4$$

$$c_1/c_2 = -5/20 = -1/4$$

This shows:

$$a_1/a_2 = b_1/b_2 = c_1/c_2$$

Therefore, the pair of equations has infinitely many solutions.

2. Answer: **d**

Explanation: Because the two lines definitely have a solution.

3. Answer: **d**

Explanation: Given, $9x + 3y + 12 = 0$ and $18x + 6y + 26 = 0$

$$a_1/a_2 = 9/18 = 1/2$$

$$b_1/b_2 = 3/6 = 1/2$$

$$c_1/c_2 = 12/26 = 6/13$$

Since, $a_1/a_2 = b_1/b_2 \neq c_1/c_2$

So, the pairs of equations are parallel and the lines never intersect each other at any point, therefore there is no possible solution.

4. Answer: **(b)**

Explanation: The condition for parallel lines is:

$$a_1/a_2 = b_1/b_2 \neq c_1/c_2$$

$$\text{Hence, } 3/2 = 2k/5$$

$$k=15/4$$

5. Answer: **a**

Explanation: The condition for dependent linear equations is:

$$a_1/a_2 = b_1/b_2 = c_1/c_2$$

For option a,

$$a_1/a_2 = b_1/b_2 = c_1/c_2 = \frac{1}{2}$$

6. Answer: **a**

Explanation: $x - y = 2$

$$x = 2 + y$$

Substituting the value of x in the second equation we get;

$$2 + y + y = 4$$

$$2 + 2y = 4$$

$$2y = 2$$

$$y = 1$$

Now putting the value of y , we get;

$$x = 2 + 1 = 3$$

Hence, the solutions are $x = 3$ and $y = 1$.

7. Answer: **c**

Explanation: Let the fraction be x/y

So, as per the question given,

$$(x - 1)/y = 1/3 \Rightarrow 3x - y = 3 \dots\dots\dots(1)$$

$$x/(y + 8) = 1/4 \Rightarrow 4x - y = 8 \dots\dots\dots(2)$$

Subtracting equation (1) from (2), we get

$$x = 5 \dots\dots\dots(3)$$

Using this value in equation (2), we get,

$$4 \times 5 - y = 8$$

$$y = 12$$

Therefore, the fraction is $5/12$.

8. Answer: **a**

Explanation: Let $1/x = m$

$$4m + 3y = 14$$

$$3m - 4y = 23$$

By cross multiplication we get;

$$m/(-69 - 56) = y/(-42 - (-92)) = 1/(-16 - 9)$$

$$m/-125 = y/50 = -1/25$$

$$m/-125 = -1/25 \text{ and } y/50 = -1/25$$

$$m = 5 \text{ and } y = -2$$

$$m=1/x \text{ or } x=1/m = 1/5$$

9. Answer: **c**

Explanation: Let, Speed of Ritu in still water = x km/hr

Speed of Stream = y km/hr

Now, speed of Ritu, during,

Downstream = $x + y$ km/h

Upstream = $x - y$ km/h

As per the question given,

$$2(x+y) = 20$$

$$\text{Or } x + y = 10 \dots\dots\dots(1)$$

$$\text{And, } 2(x-y) = 4$$

$$\text{Or } x - y = 2 \dots\dots\dots(2)$$

Adding both the equations, we get,

$$2x=12$$

$$x = 6$$

Putting the value of x in eq.1, we get,

$$y = 4$$

Therefore,

Speed of Ritu in still water = 6 km/hr

Speed of Stream = 4 km/hr

10. Answer: **b**

Explanation: We know, in cyclic quadrilaterals, the sum of the opposite angles are 180° .

Hence,

$$A + C = 180^\circ$$

$$6x+10+x+y=180 \Rightarrow 7x+y=170^\circ$$

$$\text{And } B+D=180^\circ$$

$$5x+3y-10=180 \Rightarrow 5x+3y=190^\circ$$

By solving the above two equations we get;

$$x=20^\circ \text{ and } y = 30^\circ.$$

5. Quadratic Equations

1. Answer: **(a)**

Explanation: $(x+1)^2-x^2=0$

$$X^2+2x+1-x^2 = 0$$

$$2x+1=0$$

$$x=-1/2$$

Hence, there is one real root

2. Answer: **(c)**

Explanation: Given, $100x^2 - 20x + 1 = 0$

$$100x^2 - 10x - 10x + 1 = 0$$

$$10x(10x - 1) - 1(10x - 1) = 0$$

$$(10x - 1)^2 = 0$$

$$\therefore (10x - 1) = 0 \text{ or } (10x - 1) = 0$$

$$\Rightarrow x = 1/10 \text{ or } x = 1/10$$

3. Answer: **(b)**

Explanation: Let x is one number

Another number = $27 - x$

Product of two numbers = 182

$$x(27 - x) = 182$$

$$\Rightarrow x^2 - 27x - 182 = 0$$

$$\Rightarrow x^2 - 13x - 14x + 182 = 0$$

$$\Rightarrow x(x - 13) - 14(x - 13) = 0$$

$$\Rightarrow (x - 13)(x - 14) = 0$$

$$\Rightarrow x = 13 \text{ or } x = 14$$

4. Answer: **(b)**

Explanation: Given $x = \frac{1}{2}$ as root of equation $x^2 - mx - \frac{5}{4} = 0$.

$$\left(\frac{1}{2}\right)^2 - m\left(\frac{1}{2}\right) - \frac{5}{4} = 0$$

$$\frac{1}{4} - m/2 - 5/4 = 0$$

$$m = -2$$

5. Answer: **(b)**

Explanation: Let the base be x cm.

Altitude = $(x - 7)$ cm

In a right triangle,

Base² + Altitude² = Hypotenuse² (From Pythagoras theorem)

$$\therefore x^2 + (x - 7)^2 = 13^2$$

By solving the above equation, we get;

$$\Rightarrow x = 12 \text{ or } x = -5$$

Since the side of the triangle cannot be negative.

Therefore, base = 12cm and altitude = $12 - 7 = 5$ cm

6. Answer: **(d)**

Explanation: $2x^2 + x + 4 = 0$

$$\Rightarrow 2x^2 + x = -4$$

Time required to cover 360 km = $360/x$ hr.

As per the question given,

$$\Rightarrow (x + 5)(360 - 1/x) = 360$$

$$\Rightarrow 360 - x + 1800 - 5/x = 360$$

$$\Rightarrow x^2 + 5x + 10x - 1800 = 0$$

$$\Rightarrow x(x + 45) - 40(x + 45) = 0$$

$$\Rightarrow (x + 45)(x - 40) = 0$$

$$\Rightarrow x = 40, -45 \text{ (Negative value is not considered for speed hence the answer is 40km/hr.)}$$

10. Answer: **b**

Explanation: If one root is reciprocal of others, then the product of roots will be:

$$\alpha \times 1/\alpha = (k-4)/4$$

$$k-4=4$$

$$k=8$$

3. Arithmetic Progressions

1. Answer: **a**

Explanation: For an AP,

$$a_n = a + (n-1)d$$

$$= 28 + (7-1)(-4)$$

$$= 28 + 6(-4)$$

$$= 28 - 24$$

$$a_n = 4$$

2. Answer: **b**

Explanation: $a = 10, d = 10$

$$a_1 = a = 10$$

$$a_2 = a_1 + d = 10 + 10 = 20$$

$$a_3 = a_2 + d = 20 + 10 = 30$$

$$a_4 = a_3 + d = 30 + 10 = 40$$

3. Answer: **c**

Explanation: First term, $a = 3$

Common difference, $d = \text{Second term} - \text{First term}$

$$\Rightarrow 1 - 3 = -2$$

$$\Rightarrow d = -2$$

4. Answer: **c**

Explanation: Given,

A.P. = 10, 7, 4, ...

First term, $a = 10$

$$\text{Common difference, } d = a_2 - a_1 = 7 - 10 = -3$$

As we know, for an A.P.,

$$a_n = a + (n-1)d$$

Putting the values;

$$a_{30} = 10 + (30-1)(-3)$$

$$a_{30} = 10 + (29)(-3)$$

$$a_{30} = 10 - 87 = -77$$

5. Answer: **b**

Explanation: A.P. = -3, -1/2, 2 ...

First term $a = -3$

Common difference, $d = a_2 - a_1 = (-1/2) - (-3)$

$$\Rightarrow (-1/2) + 3 = 5/2$$

n^{th} term;

$$a_n = a + (n-1)d$$

Putting the values;

$$a_{11} = 3 + (11-1)(5/2)$$

$$a_{11} = 3 + (10)(5/2)$$

$$a_{11} = -3 + 25$$

$$a_{11} = 22$$

6. Answer: **(c)**

Explanation: $a_2 = 13$ and $a_4 = 3$

The n^{th} term of an AP;

$$a_n = a + (n-1)d$$

$$a_2 = a + (2-1)d$$

$$13 = a + d \dots\dots\dots (i)$$

$$a_4 = a + (4-1)d$$

$$3 = a + 3d \dots\dots\dots (ii)$$

Subtracting equation (i) from (ii), we get,

$$-10 = 2d$$

$$d = -5$$

Now put value of d in equation 1

$$13 = a + (-5)$$

$$a = 18 \text{ (first term)}$$

$$a_3 = 18 + (3-1)(-5)$$

7. Answer: **(d)**

Explanation: Given, 3, 8, 13, 18, ... is the AP.

First term, $a = 3$

Common difference, $d = a_2 - a_1 = 8 - 3 = 5$

Let the n th term of given A.P. be 78. Now as we know,

$$a_n = a + (n-1)d$$

Therefore,

$$78 = 3 + (n-1)5$$

$$75 = (n-1)5$$

$$(n-1) = 15$$

$$n = 15 + 1$$

$$n = 16$$

8. Answer: **b**

Explanation: First term = -3 and second term = 4

$$a = -3$$

$$d = 4 - a = 4 - (-3) = 7$$

$$a_{21} = a + (21-1)d$$

$$= -3 + (20)7$$

$$= -3 + 140$$

$$= 137$$

9. Answer: **(a)**

Explanation: n th term in AP is:

$$a_n = a + (n-1)d$$

$$a_{17} = a + (17-1)d$$

$$a_{17} = a + 16d$$

In the same way,

$$a_{10} = a + 9d$$

Given,

$$a_{17} - a_{10} = 7$$

Therefore,

$$(a + 16d) - (a + 9d) = 7$$

$$7d = 7$$

$$d = 1$$

Therefore, the common difference is 1.

10. Answer: **(c)**

Explanation: The multiples of 4 after 10 are:

12, 16, 20, 24, ...

So here, $a = 12$ and $d = 4$

Now, $250/4$ gives remainder 2. Hence, $250 - 2 = 248$ is divisible by 2.

12, 16, 20, 24, ..., 248

So, n th term, $a_n = 248$

As we know,

$$a_n = a + (n-1)d$$

$$248 = 12 + (n-1) \times 4$$

$$236/4 = n-1$$

$$59 = n-1 \Rightarrow n = 60$$

11. Answer: **(d)**

Explanation: Given, A.P. is 3, 8, 13, ..., 253

Common difference, $d = 5$.

In reverse order,

253, 248, 243, ..., 13, 8, 5

So,

$$a = 253$$

$$d = 248 - 253 = -5$$

$$n = 20$$

By n^{th} term formula,

$$a_{20} = a + (20-1)d$$

$$a_{20} = 253 + (19)(-5)$$

$$a_{20} = 253 - 95$$

$$a_{20} = 158$$

12. Answer: **(a)**

Explanation: The first five multiples of 3 is 3, 6, 9, 12 and 15

$$a=3 \quad \text{and} \quad d=3 \quad n=5$$

$$\text{Sum, } S_n = n/2[2a + (n-1)d]$$

$$S_5 = 5/2[2(3) + (5-1)3]$$

$$= 5/2[6 + 12]$$

$$= 5/2[18]$$

$$= 5 \times 9$$

$$= 45$$

4. Triangles

1. Answer: (c)

Explanation: Equilateral triangles have all its sides and all angles equal.

2. Answer: c

3. Answer: b

Explanation: By midpoint theorem,

$$DE = \frac{1}{2} BC$$

$$DE = \frac{1}{2} \text{ of } 6$$

$$DE = 3\text{cm}$$

4. Answer: c

Explanation: Here, half of the diagonals of a rhombus are the sides of the triangle and side of the rhombus is the hypotenuse.

By Pythagoras theorem,

$$\left(\frac{16}{2}\right)^2 + \left(\frac{12}{2}\right)^2 = \text{side}^2$$

$$8^2 + 6^2 = \text{side}^2$$

$$64 + 36 = \text{side}^2$$

$$\text{side} = 10\text{cm}$$

5. Answer: d

Solution: Let A_1 and A_2 are areas of the small and large triangle.

Then,

$$\frac{A_2}{A_1} = \left(\frac{\text{side of large triangle}}{\text{side of small triangle}}\right)^2$$

$$\frac{A_2}{48} = \left(\frac{3}{2}\right)^2$$

$$A_2 = 108 \text{ sq.cm.}$$

6. Answer: a

Solution: Perimeter of triangle = sum of all its sides

$$P = 30 + 40 + x$$

$$100 = 70 + x \Rightarrow 100 - 70 = 30$$

$$x = 30\text{cm}$$

7. Answer: d

Explanation: $ABC \sim DEF$

$AB = 4\text{cm}$, $DE = 6\text{cm}$, $EF = 9\text{cm}$ and $FD = 12\text{cm}$

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

$$\frac{4}{6} = \frac{BC}{9} = \frac{AC}{12}$$

$$BC = \frac{(4 \cdot 9)}{6} = 6\text{cm}$$

$$AC = \frac{(4 \cdot 12)}{6} = 8\text{cm}$$

$$\text{Perimeter} = AB + BC + AC$$

$$= 4+6+8$$

$$=18\text{cm}$$

8. Answer: a

Explanation: The height of the equilateral triangle ABC divides the base into two equal parts at point D.

Therefore,

$$BD=DC= 2.5\text{cm}$$

In triangle ABD, using Pythagoras theorem,

$$AB^2=AD^2+BD^2$$

$$5^2=AD^2+2.5^2$$

$$AD^2 = 25-6.25$$

$$AD^2=18.75$$

$$AD=4.33 \text{ cm}$$

9. Answer: b

10. Answer: d

Explanation: Let ABC and DEF are two similar triangles, such that,

$$\Delta ABC \sim \Delta DEF$$

$$\text{And } AB/DE = AC/DF = BC/EF = 4/9$$

As the ratio of the areas of these triangles will be equal to the square of the ratio of the corresponding sides,

$$\therefore \text{Area}(\Delta ABC)/\text{Area}(\Delta DEF) = AB^2/DE^2$$

$$\therefore \text{Area}(\Delta ABC)/\text{Area}(\Delta DEF) = (4/9)^2 = 16/81 = 16: 81$$

Coordinate Geometry

1. Answer: a

Explanation: Let A(- 1, - 2), B(1, 0), C(- 1, 2) and D(- 3, 0) are the four vertices of quadrilateral.

By distance formula, we know:

$$AB=(1+1)^2+(0+2)^2=\sqrt{4+4}=\sqrt{8}$$

$$BC=(-1-1)^2+(2-0)^2=\sqrt{4+4}=\sqrt{8}$$

$$CD=(-3+1)^2+(0-2)^2=\sqrt{4+4}=\sqrt{8}$$

$$DA=(-3+1)^2+(2)^2=\sqrt{4+4}=\sqrt{8}$$

$$AC=(-1+1)^2+(2+2)^2=\sqrt{0+16}=\sqrt{16}=4$$

$$BD=(1+3)^2+(0-0)^2=\sqrt{16+0}=\sqrt{16}=4$$

$$\text{Hence, the length of the sides} = 2\sqrt{2}$$

$$\text{Diagonals} = 4$$

Hence, the given points form a square.

2. Answer: a

Explanation: By distance formula, we know:

$$5\sqrt{(-1-2)^2+(x+2)^2} = \sqrt{59+(x+2)^2}$$

$$9+(x+2)^2=25$$

$$(2+x)^2=16$$

Take square root on both the sides,

$$2+x=4$$

$$x=2$$

3. Answer: c

Explanation: As per midpoint formula, we know;

$$x=[2+(-2)]/2 = 0/2 = 0$$

$$y=[4+(-4)]/2=0/2=0$$

Hence, (0,0) is the midpoint of of AB.

4. Answer: b

Explanation: Distance of a point from x-axis is equal to the ordinate of the point.

5. Answer: b

Explanation: By distance formula we know:

$$PQ=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

$$PQ = \sqrt{[(6-0)^2+(0-2)^2]}$$

$$PQ = \sqrt{(6^2+2^2)}$$

$$PQ=\sqrt{(36+4)}$$

$$PQ=\sqrt{40}=2\sqrt{10}$$

6. Answer: b

Explanation: Since, (p/3, 4) is the midpoint of line segment PQ, thus;

$$p/3 = (-6-2)/2$$

$$p/3 = -8/2$$

$$p/3 = -4$$

$$p = -12$$

Therefore, the value of p is -12.

7. Answer: d

Explanation: By section formula we know:

$$x=[(2.4)+(3.(-1))]/(2+3) = (8-3)/5 = 1$$

$$y=[(2.(-3))+3(7)]/(2+3) = (-6+21)/5 = 3$$

Hence, the required point is (1,3)

8. Answer: c

Explanation: Let the ratio in which the line segment joining P(-3, 10) and Q(6, -8) is divided by point O(-1, 6) be k :1.

$$\text{So, } -1 = (6k-3)/(k+1)$$

$$-k - 1 = 6k - 3$$

$$7k = 2$$

$$k = 2/7$$

Hence, the required ratio is 2:7.

9. Answer: a

Explanation: By midpoint formula, we know;

$$[(x+1)/2,(y+4)/2] = (2,-3) \text{ (Since, O is the midpoint of PQ)}$$

$$(x+1)/2 = 2$$

$$x+1=4$$

$$x=3$$

$$(y+4)/2 = -3$$

$$y+4=-6$$

$$y=-10$$

So, the coordinates of point P is (3, -10).

10. Answer: 24

Explanation: To find the area of the rhombus, we need to find the length of its diagonals and use the below formula:

$$\text{Area} = \frac{1}{2} (\text{Diagonal}_1)(\text{Diagonal}_2)$$

$$\text{Area} = (1/2) (AC)(BD)$$

$$\text{Diagonal}_1 = \sqrt{[(3-(-1))^2 + (0-4)^2]} = 4\sqrt{2}$$

$$\text{Diagonal}_2 = \sqrt{[(4-(-2))^2 + (5-(-1))^2]} = 6\sqrt{2}$$

$$\text{Area} = \frac{1}{2} \times 4\sqrt{2} \times 6\sqrt{2} = 24 \text{ sq.unit.}$$

Introduction to Trigonometry

1. Answer: (b)

Explanation: $AB=24\text{cm}$ and $BC = 7\text{cm}$

$\tan C = \text{Opposite side/Adjacent side}$

$$\tan C = 24/7$$

2. Answer: c

Explanation: $\sin 30^\circ = \frac{1}{2}$, $\sin 60^\circ = \frac{\sqrt{3}}{2}$, $\cos 30^\circ = \frac{\sqrt{3}}{2}$ and $\cos 60^\circ = \frac{1}{2}$

Putting these values, we get:

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

$$= 1 - \sqrt{3}$$

3. Answer: b

Explanation: $\tan 60^\circ = \sqrt{3}$ and $\cot 30^\circ = \sqrt{3}$

Hence, $\tan 60^\circ / \cot 30^\circ = \sqrt{3} / \sqrt{3} = 1$

4. Answer: a

Explanation: We know, by trigonometry identities,

$$\sin^2 A + \cos^2 A = 1$$

$$1 - \cos^2 A = \sin^2 A$$

5. Answer: b

Explanation: By trigonometry identities.

$\sin(90^\circ - A) = \cos A$ [comes in the first quadrant of unit circle]

6. Answer: (c)

Explanation: By trigonometry identities, we know:

$$1 + \tan^2 X = \sec^2 X$$

$$\text{And } \sec X = 1/\cos X = 1/(\frac{2}{3}) = \frac{3}{2}$$

Hence,

$$1 + \tan^2 X = (\frac{3}{2})^2 = \frac{9}{4}$$

$$\tan^2 X = \frac{9}{4} - 1 = \frac{5}{4}$$

$$\tan X = \sqrt{5}/2$$

7. Answer: (c)

Explanation: $\cos X = a/b$

By trigonometry identities, we know that:

$$\sin^2 X + \cos^2 X = 1$$

$$\sin^2 X = 1 - \cos^2 X = 1 - (a/b)^2$$

$$\sin X = \sqrt{(b^2 - a^2)/b^2}$$

8. Answer: b

Explanation: $\sin 60^\circ = \sqrt{3}/2$, $\sin 30^\circ = 1/2$, $\cos 60^\circ = 1/2$ and $\cos 30^\circ = \sqrt{3}/2$

Therefore,

$$\sqrt{3}/2 \times \sqrt{3}/2 + 1/2 \times 1/2$$

$$= 3/4 + 1/4$$

$$= 1$$

9. Answer: a

Explanation: $\tan 30^\circ = 1/\sqrt{3}$

Putting this value we get;

$$2(1/\sqrt{3})/1 + (1/\sqrt{3})^2 = (2/\sqrt{3})/4/3 = 6/4\sqrt{3} = \sqrt{3}/2 = \sin 60^\circ$$

10. Answer: (c)

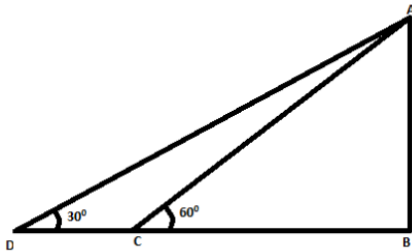
Explanation: $\sin 2A = \sin 0^\circ = 0$

$$2\sin A = 2\sin 0^\circ = 0$$

Some Applications of Trigonometry

1. Answer: a

Explanation: See the following figure:



As the shadow reaches from point D to C towards the direction of the tree, the angle of elevation increase from 30 to 60.

2. Answer: b

Explanation: Say x is the height of the building.

a is a point 30 m away from the foot of the building.

Here, height is the perpendicular and distance between point a and foot of building is the base.

The angle of elevation formed is 30.

Hence, $\tan 30 = \text{perpendicular}/\text{base} = x/30$

$$1/\sqrt{3} = x/30$$

$$x = 30/\sqrt{3}$$

3. Answer: c

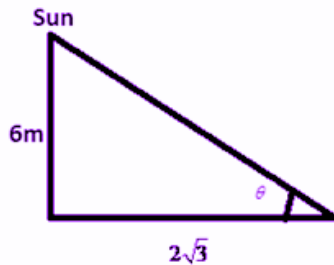
Explanation: We know, for an angle of elevation θ ,

$\tan \theta = \text{Height of building/Distance from the point}$

If we increase both the value of the angle of elevation remains unchanged.

4. Answer: a

Explanation: As per the given question:



Hence,

$$\tan \theta = 6/2\sqrt{3}$$

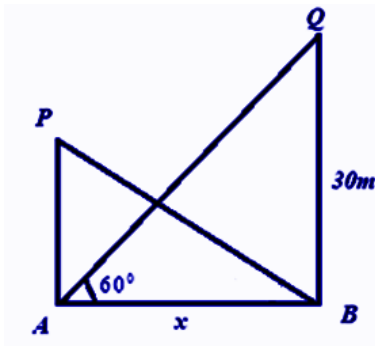
$$\tan \theta = \sqrt{3}$$

$$\tan \theta = \tan 60^\circ$$

$$\theta = 60^\circ$$

5. Answer: a

Explanation: As per the given question:



Hence,

$$\tan 60^\circ = 30/x$$

$$\sqrt{3} = 30/x$$

$$x = 30/\sqrt{3}$$

$$x = 10\sqrt{3}m$$

6. Answer: (b)

7. Answer: (a)

8. Answer: (a)

Explanation: We know:

$\tan (\text{angle of elevation}) = \text{height of tower/its distance from the point}$

$$\tan 60 = h/15$$

$$\sqrt{3} = h/15$$

$$h=15\sqrt{3}$$

9. Answer: (c)

10. Answer: b

Circles

1. Answer: d

Explanation: A circle has infinitely many tangents, touching the circle at infinite points on its circumference.

2. Answer: a

Explanation: A tangent touches the circle only on its boundary and do not cross through it.

3. Answer: b

Explanation: A circle can have two parallel tangents at the most.

4. Answer: c

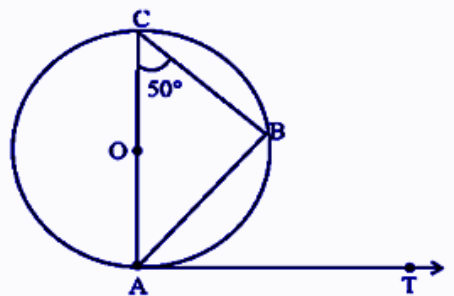
Explanation: If the angle between two radii of a circle is 110° , then the angle between tangents is $180^\circ - 110^\circ = 70^\circ$. (By circles and tangents properties)

5. Answer: (c)

Explanation: Since the tangent is perpendicular to the radius of the circle, then the angle between them is 90° . Thus, OA is the hypotenuse for the right triangle OAB, which is right-angled at B. As we know, for any right triangle, the hypotenuse is the longest side. Therefore the length of the tangent from an external point is always less than the OA.

6. Answer: c

Explanation: As per the given question:



$$\angle ABC = 90 \text{ (Angle in Semicircle)}$$

In $\triangle ACB$

$$\angle A + \angle B + \angle C = 180^\circ$$

$$\angle A = 180^\circ - (90^\circ + 50^\circ)$$

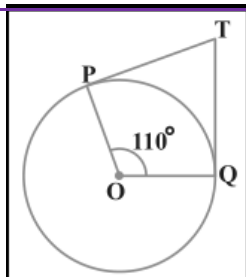
$$\angle A = 40^\circ$$

$$\text{Or } \angle OAB = 40^\circ$$

$$\text{Therefore, } \angle BAT = 90^\circ - 40^\circ = 50^\circ$$

7. Answer: b

Explanation: As per the given question:



We can see, OP is the radius of the circle to the tangent PT and OQ is the radius to the tangents TQ.

So, $OP \perp PT$ and $TQ \perp OQ$

$$\therefore \angle OPT = \angle OQT = 90^\circ$$

Now, in the quadrilateral POQT, we know that the sum of the interior angles is 360°

$$\text{So, } \angle PTQ + \angle POQ + \angle OPT + \angle OQT = 360^\circ$$

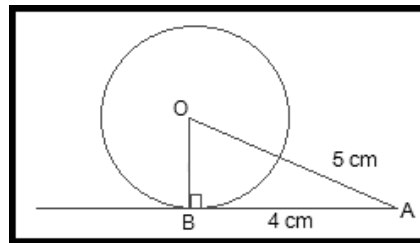
Now, by putting the respective values, we get,

$$\Rightarrow \angle PTQ + 90^\circ + 110^\circ + 90^\circ = 360^\circ$$

$$\Rightarrow \angle PTQ = 70^\circ$$

8. Answer: 3

Explanation: As per the given question:



AB is the tangent, drawn on the circle from point A.

So, $OB \perp AB$

Given, $OA = 5\text{ cm}$ and $AB = 4\text{ cm}$

Now, In $\triangle ABO$,

$$OA^2 = AB^2 + BO^2 \text{ (Using Pythagoras theorem)}$$

$$\Rightarrow 5^2 = 4^2 + BO^2$$

$$\Rightarrow BO^2 = 25 - 16$$

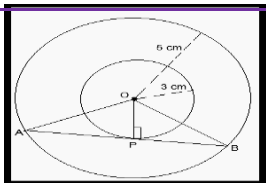
$$\Rightarrow BO^2 = 9$$

$$\Rightarrow BO = 3$$

9. Answer: c

10. Answer: a

Explanation: As per the given question:



From the above figure, AB is tangent to the smaller circle at point P.

$\therefore OP \perp AB$

By Pythagoras theorem, in triangle OPA

$$OA^2 = AP^2 + OP^2$$

$$\Rightarrow 5^2 = AP^2 + 3^2$$

$$\Rightarrow AP^2 = 25 - 9$$

$$\Rightarrow AP = 4$$

Now, as $OP \perp AB$,

Since the perpendicular from the center of the circle bisects the chord, AP will be equal to PB

So, $AB = 2AP = 2 \times 4 = 8 \text{ cm}$

Constructions

1. Answer: b

Explanation: We know that to divide a line segment in the ratio $m:n$, first draw a ray AX which makes an acute angle BAX, then marked $m+n$ points at equal distances from each other.

Here $m = 3, n = 4$

So minimum number of these point = $m + n = 3 + 4 = 7$

2. Answer: d

Explanation: The minimum points located in the ray AX is $5+8 = 13$. Hence, point B will join point A13

3. Answer: (c)

Explanation: Here we locate points Q1, Q2, Q3, Q4, Q5, Q6, Q7 and Q8 on QX at equal distances and in next step join the last point Q8 to R

4. Answer: (b)

Explanation: To draw a triangle similar to a given triangle with its sides m/n of the similar sides of a given triangle, the minimum number of points to be located at an equal distance is equal to m or n , whichever is greater.

Here, $m/n = 9/5$

$9 > 5$, therefore the minimum number of points to be located is 9.

5. Answer: (d)

Explanation: The angle between the two radii should be 120° because the figure produced by the intersection point of pair of tangents and the two endpoints of those two radii and the centre of the circle, is a quadrilateral. Hence, the sum of the opposite angles should be 180° .

6. Answer: a

7. Answer: a

8. Answer: c

Explanation: The pair of tangents can be drawn from an external point only, so its distance from the centre must be greater than the radius. Since only 5cm is greater than the radius of 3.5cm. So the tangents can be drawn from the point situated at a distance of 5cm from the centre

9. Answer: A3

Explanation: The greater of 2 or 3 will be the maximum number of points. Hence, the last point will A3.

10. Answer: c

Explanation: Here we locate points Q1, Q2, Q3, Q4, Q5, Q6 and Q7 and QX at equal distances and in next step join the last point Q7 to R.

Surface Areas and Volumes

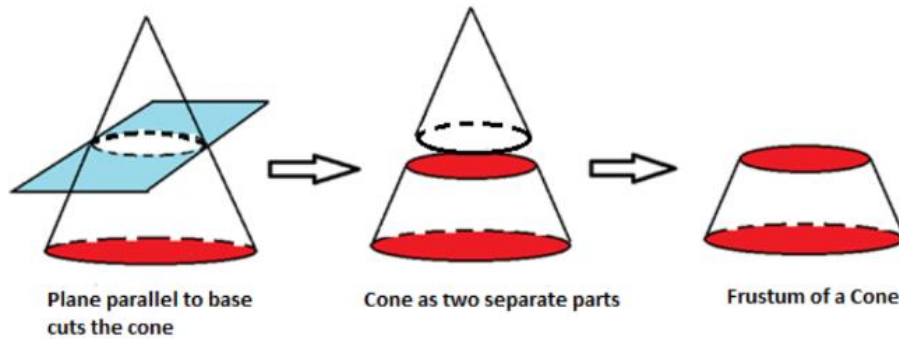
1. Answer: d

2. Answer: c

Explanation: If we cut a cone into two parts parallel to the base, then the shape of the upper part remains the same

3. Answer: b

Explanation: See the figure below



4. Answer: a

5. Answer: c

Explanation: If we change the shape of a three-dimensional object, the volume of the new shape will be same.

6. Answer: d

Explanation: Volume of 15 spheres = Volume of a cone

$$15 \times \left(\frac{4}{3}\right) \pi r^3 = \frac{1}{3} \pi r^2 h$$

$$5 \times 4 \pi r^3 = \frac{1}{3} \pi 1^2 (15)$$

$$20r^3 = 5$$

$$r^3 = \frac{5}{20} = \frac{1}{4}$$

$$r = 1/\sqrt[3]{4}$$

7. Answer: c

Explanation: Curved surface of bucket = $\pi(R_1+R_2) \times$ slant height (l)

$$\text{Curved Surface} = (22/7) \times (25+8) \times 35$$

$$\text{C.S} = 22 \times 33 \times 5 = 3630 \text{ sq. cm.}$$

8. Answer: c

Explanation: Curved surface area of cylinder = $2\pi rh$

The curved surface area of hemisphere = $2\pi r^2$

Here, we have two hemispheres.

$$\text{So, total curved surface area} = 2\pi rh + 2(2\pi r^2) = 2\pi rh + 4\pi r^2$$

9. Answer: b

Explanation: Total surface area of tank = CSA of cylinder + CSA of hemisphere

$$= 2\pi rh + 2\pi r^2 = 2\pi r(h + r)$$

$$= 2 \times 22/7 \times 30(145+30) \text{ cm}^2$$

$$= 33000 \text{ cm}^2$$

$$= 3.3 \text{ m}^2$$

10. Answer: c

Statistics

1. Answer: a

Explanation: The mean or average of observations will be equal to the ratio of sum of observations and total number of observations.

$$X_{\text{mean}} = X_1 + X_2 + X_3 + \dots + X_n / n$$

2. Answer: b

Explanation: As per the given question,

$$X_{\text{mean}} = \sum f_i x_i / \sum f_i$$

$$7.5 = (120 + 3k) / 30$$

$$225 = 120 + 3k$$

$$3k = 225 - 120$$

$$3k = 105$$

$$k = 35$$

3. Answer: c

Explanation: Using Empirical formula,

$$\text{Mode} = 3\text{Median} - 2\text{Mean}$$

$$3\text{Median} = \text{Mode} + 2\text{Mean}$$

$$\text{Median} = (\text{Mode} + 2\text{Mean}) / 3$$

4. Answer: a

$$\text{Explanation: mean} = (4+10+5+9+12)/5 = 40/5 = 8$$

$$\text{Median} = (7+2(8))/3 = (7+16)/3 = 23/3$$

5. Answer: c

Explanation: For the given data, there are two middle terms, 16 and 17.

$$\text{Hence, median} = (16+17)/2 = 33/2$$

6. Answer: c

Explanation: Sum of natural numbers = $n(n+1)/2$

$$\text{Given, mean} = 3n/5$$

$$\text{Mean} = \text{sum of natural numbers}/n$$

$$3n/5 = n(n+1)/2n$$

$$3n/5 = (n+1)/2$$

$$6n = 5n+5$$

$$n=5$$

7. Answer: d

Explanation: Mean of AM = 10

$$(a+a+3+a+6+a+9+a+12)/5 = 10$$

$$5a+30 = 50$$

$$5a=20$$

$$a=4$$

8. Answer: b

Explanation: Class mark = (Upper limit + Lower limit)/2

$$= (15+10)/2$$

$$= 25/2 = 12.5$$

9. Answer: d

Explanation:

Given,

$$\sum f_i = 24$$

$$\sum f_i = x+5+6+1+2=14+x$$

$$24 = 14+x$$

$$x=24-14 = 10$$

10. Answer: d

Explanation:

x_i	f_i	$f_i x_i$
11	3	33

14	6	84
17	8	136
20	7	140
	$\sum f_i = 24$	$\sum f_i x_i = 393$

$$\begin{aligned}x_{\text{mean}} &= \frac{\sum f_i x_i}{\sum f_i} \\ &= \frac{393}{24} \\ &= 16.4\end{aligned}$$

By –

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The End

“Only you can Change your life, No One can do it for you”