GEOMETRY AND TRIGONOMETRY (2022)

1. For any triangle with vertices A, B and C, the construction of ΔABC is possible if:

A. AB + BC < AC

B. AB + BC = AC

C. AB + BC > AC

D. $AB + BC \leq AC$

2. What will be the resulting image if the point $(4, -7)$ undergoes three consecutive transformations such as reflection on the line$y = x$, reflection on the $line\ x = -1$ and the translation by the vector $\binom{4}{2}$?

A. $\binom{\mathbf{9}}{\mathbf{6}}$

B. $\binom{-5}{6}$

C. $\binom{2}{6}$

D. $\binom{-7}{6}$

3. Given that the vectors $\begin{pmatrix} 2x-6 \\ 4 \end{pmatrix}$ and $\begin{pmatrix} 6 \\ 2 \end{pmatrix}$ are parallel, find the value of x.

A. 6

B. 8

C. 7

D. 9

4. The vectors perpendicular to $\binom{-3}{6}$, $\boldsymbol{include}$

I. $\binom{6}{3}$

II. $\binom{6}{-3}$

III. $\binom{-6}{-3}$

IV. $\binom{-6}{3}$

A. I, II and III

B. I and III only

C. I , and IV only

D. I, III, and IV only

5. To draw the perpendicular bisector of line segment AB, we open the compass

   A. more than ½ AB

   B. less than ½ AB

   C. equal to ½ AB

   D. full length of AB

6. A triangle has vertices $A(1,3)$, $B(4,2)$, and $C(3,8)$. What unit transformation would produce an image with vertices$A_2(3,-1)$, $B_2(2,-4)$, and $C_2(8,-3)$?

   A. A reflection on the x-axis

   B. A reflection on the y-axis

   C. A rotation of 90^0 clockwise about the origin

   D. A rotation 90^0 anticlockwise about the origin

7. Which of the following is **not** needed to inscribe a triangle in a circle?

A. Locus of points equidistance from a fixed point

B. Locus of points equidistance from two fixed points

C. Locus of points equidistance from two intersecting straight lines

D. Construction of a polygon the minimum number of sides

8. A polygon with 7 non-overlapping triangles is called

A. Hexagon

B. Octagon

C. Nonagon

D. Decagon

9. Which of the following are **true**?

I. The opposite interior angles of a cyclic quadrilateral are supplementary

II. The radius and a tangent of a circle join orthogonally

III. Equal chords subtend the congruent angles at the circumference of a circle

A. I and III only

B. I and II only

C. III and II only

D. I , II and III

10. The bisectors of angles of a parallelogram form a …….

A. Square

B. Kite

C. Rectangle

D. Rhombus

11. The length of a chord of circle of radius 10 cm is 12 cm. Determine the distance of the chord from the centre

A. **8 cm**

B. 7 cm

C. 6 cm

D. 5 cm

12. Which of the following is congruent to the transformation of the point (a, b) by scale factor of -1 about the origin?

A. Reflection on the line $y = 0$

B. Clockwise rotation of 180^0 about the origin

C. Clockwise rotation of 270^0 about the origin

D. Reflection on the line $y = -x$

13. If $Q(1,2)$ $R(4,3)$ $S(6,6)$ are the three vertices of a parallelogram$QRST$, find the co-ordinates of the fourth vertex T.

A. (2,4)

B. (3,5)

C. (4,2)

D. (5,3)

SECTION B

1. (a) Three interior angles of polygons are 150° each. If the remaining interior angles are 45 each, how many sides have the polygon? Hence name the polygon.

Solution

(a) $s = (n - 2) \times 180$

Let k be the unknown number of interior angles of 45^0

Then $n = 3 + \text{k}$

$3(150) + 45k = (n - 2)180$

$450 + 45k = (3 + k - 2) \times 180$

$450 + 45k = (k + 1) \times 180$

$450 + 45k = 180k + 180$

$450 - 180 = 180k - 45k$

$270 = 135k$

$k = \frac{270}{135} = 2$

$\therefore n = 3 + k = 3 + 2 = 5$ sides, which is a pentagon.

(b) The angles $20 + 2x^0$, $50^0, 3x - 40^0$ and 120^0 form a reflex angle. Find the

i. Range of values of x
ii. least integer value of x
iii. greatest integer value of x

Solution

$i. 180^0 < 20 + 2x + 50^0 + 3x - 40^0 + 120 < 360$

$180^0 < 150 + 5x < 360$

$180^0 - 150^0 < 5x < 360 - 150^0$

$30^0 < 5x < 210^0$

$30^0 < 5x < 210^0$

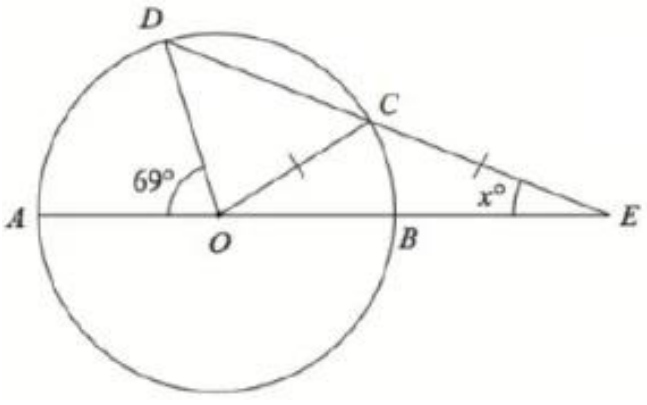
$\frac{30^0}{5} < \frac{5x}{5} < \frac{210^0}{5}$

$6^0 < x < 42^0$

ii. The least integer value of x is $\mathbf{7}^0$.

iii. The greatest integer value of x is $\mathbf{41}^0$

(c) A,B, C and D are points on a circle, centre O as shown in the figure below. AOBE and DCE are straight lines. CO = CE, Angle AOD = 69^0. Find the value of x.



(a) Solution

$< COB = x^0, \quad < OCE = 180^0 - 2x^0, \; < OCD = < ODC = 180^0 - \left(180^0 - 2x^0\right) = 2x^0$

$< DOC = 180^0 - (69^0 + x^0) = 111^0 - x^0, < ODC = < OCD = 2x^0$, *isosceles* Δ

From ΔOCD

$< OCD + < ODC + < DOC = 180^0$

$2x^0 + 2x^0 + 111^0 - x^0 = 180^0$

$3x^0 = 69^0$

$x^0 = \frac{69^0}{3} = 23^0$

2. (a) The dimensions of a cuboid have the ratio of 8:5:3, which has a surface area of 63200cm^2, then what is the volume of the cuboid?

Solution

Let the dimensions be *8x, 5x* and *3x*. Surface area = 63200cm^2

Surface area of a cuboid = $2(LB + LH + BH)$

$63200 = 2\left[(8x + 5x)(8x + 3x)(5x + 3x)\right]$

$63200 = 2\left[40x^2 + 24x^2 + 15x^2\right]$

$63200 = 2\left[79x^2\right]$

$63200 = 158x^2$

$x^2 = 400$

$x = \pm\sqrt{400}$

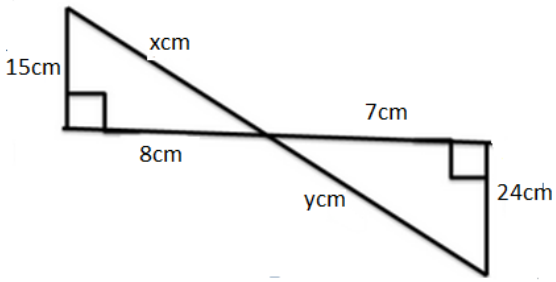
$x = -20$ or $x = 20 \quad \therefore x = 20$

The dimensions are; $8x = 8(20) = 160cm$; $5x = 5(20) = 100cm$; $3x = 3(20) = 60cm$

The volume of the cuboid $= (L \times B \times H) = 160 \times 100 \times 60 = 960000cm^3$

(b) Two people were walking in opposite directions. The first person walked 8 cm and then took right and walked 15cm. The second person walked 7 cm and then took right and walked 24cm. Sketch an appropriate diagram that depicts the problem. How far apart are the two people?

Solution



Solution

$x^2 = 15^2 + 8^2$

$x = \sqrt{225+64} = \sqrt{289} = 17cm$

Also

$y^2 = 7^2 + 24^2$

$y = \sqrt{49+576} = \sqrt{625} = 25cm$

The two people are 17+25 = 42cm apart

(c.) The equation of a given line is $3x - 4y = \frac{2}{3}$. Find the slope and the y-intercept

Solution

$3x - 4y = \frac{2}{3}$

we make y the subject

$4y = 3x - \frac{2}{3}$

$y = \frac{3}{4}x - \frac{1}{6}$

$\therefore m = \frac{3}{4} = slope\ and\ -\frac{1}{6} = y\,\text{intercept} = c$