

PART 1 – The Basics – Show your calculations to earn full credit for your answers.

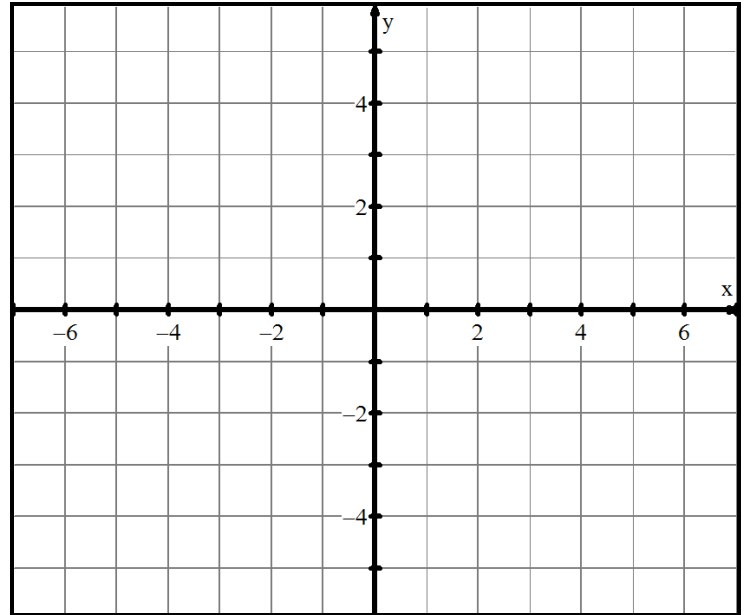
1. Given the 4 points A(-2,5), B(5,-1), C(-2,-4) and D(-5,2), answer the following questions:

(10 points)

a. Graph the 4 points on the grid provided.
(2 points)

b. Calculate the midpoint of line segment AD.
(2 points)

c. Calculate the length of line segment CB.
(2 points)



d. Calculate the slope of line segment DC.
(2 points)

e. Explain how you that AD is/isn't perpendicular to DC.
(2 points)

2. A circle is centered at $(0,0)$ and has a radius of 4 units. Answer the following questions:

(10 points)

a. Determine the equation of the circle.
(1 points)

b. Determine the x- and y-intercepts of the circle.
(2 points)

x-int are →

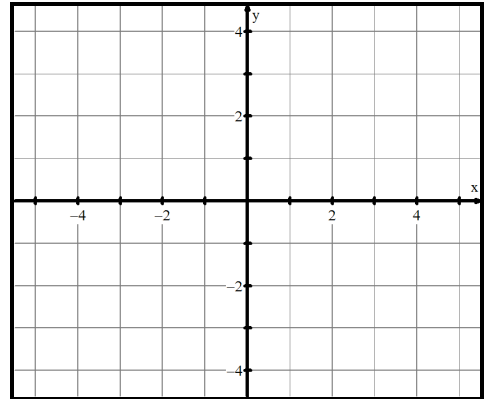
y-int are →

c. The domain and range of this relation.
(2 points)

domain is →

range is →

d. The value(s) of x if $y = 2$.
(2 points)

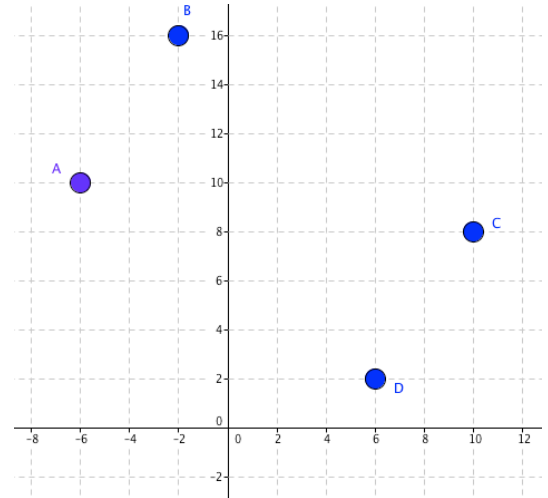


3. Determine the equation of a circle, centered at $(0,0)$, that goes through the point $(4, -6)$.
(3 points)

PART 2 – The Applications – Show your calculations to earn full credit.

4. Mr. Smith is a city planner, who is designing a new park in Maadi. The plan of his rectangular park is shown on the diagram included. The four “corners” of the park are listed:

- i. $A(-6,10)$, ii. $B(-2,16)$, iii. $C(10,8)$ iv. $D(6,2)$



For this park, determine:

- a. The length and width of the park, in meters, given that 1 unit on the grid represents a distance of 10 meters.

(3 points)

- b. The perimeter of the park.

(2 points)

- c. The total area of the park.

(2 points)

Mr. Smith now plans on including one walking path within the park. This walking path will connect the midpoint of the sides AB to corner D (see diagram). Recall that in this question that 1 unit on the grid represents a distance of 10 meters.

- d. Determine the coordinates of the midpoint of AB and label it as X on the diagram. **(2 points)**
- e. Determine the length of the walking path (segment DX) within the park. **(2 points)**
- f. Calculate the triangular area of $\triangle ADX$. **(2 points)**

Mr. Smith plans on planting trees on one side of the park. He would like to arrange these in a semicircle pattern on side DC, as shown on the diagram included. These trees are to be placed at intervals of 2 meters (i.e. all trees are planted 2 meters apart)

- g. Show, on the diagram, where the trees are to be planted.
- h. If trees are to be placed at intervals of 2 meters (i.e. all trees are planted 2 meters apart), how many trees does Mr. Smith need? **(3 points)**

PART 3 – Problem Solving – Show your thinking & reasoning to earn full credit.

5. Mr Santowski is the city engineer who is overseeing the construction of Mr. Smith's park. Mr. S. needs to know two important details in order to get the construction started. He needs to know the:

a. Equation of the circle that the trees are planted on (see question 4g)

(2 points)

b. The total area of the semi-circular region that the trees surround.

(2 points)

Formula sheet

$$\text{Midpoint} \Rightarrow \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$\text{Length} \Rightarrow l = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\text{Circle centered at } (0,0) \Rightarrow x^2 + y^2 = r^2$$

$$\text{Slope} \Rightarrow m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\text{Area} = \text{length} \times \text{width}$$

$$\text{Area} = \frac{\text{base} \times \text{height}}{2}$$

$$\text{perimeter} = 2l + 2w$$

$$\text{Area} = \pi r^2$$

$$\text{circumference} = 2\pi r$$

