Area of a triangle, trapezoid and circle

A trapezoid is a quadrilateral with at least one pair of parallel sides:

$$area = \left(\frac{a+b}{2}\right)(h)$$

A square, rectangle, rhombus or parallelogram is a special case of a trapezoid:

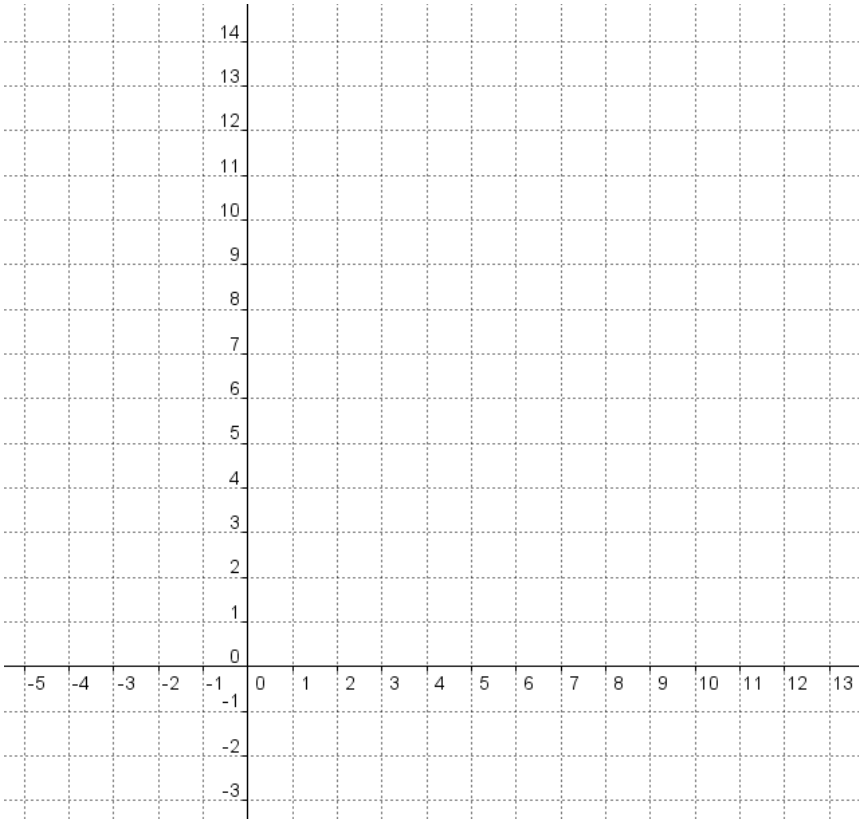
$$area = (b)(h)$$

We must ensure that area is based on lengths of sides not lengths of diagonals.

Example – Determine the area of a rectangle with vertices at A (–5, –6), B (4, –8), C (8, 10) and D (–1, 12).

We must ensure that the “height” of a trapezoid is perpendicular to the “base.”

Example – Determine the area of a trapezoid with vertices at E (–5, –3), F (13, 9), G (1, 14) and H (–2, 12).

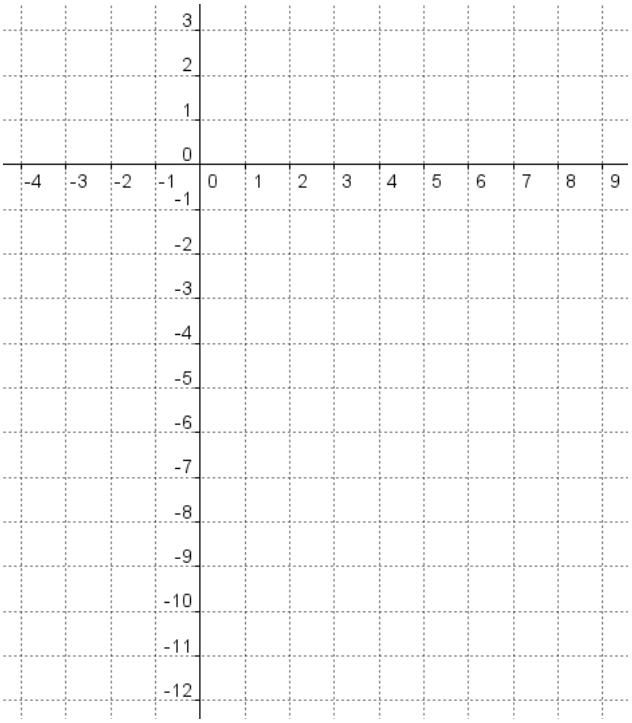


A triangle is a “trapezoid” in which one of the parallel sides has a length of zero:

$$area = \left(\frac{0+b}{2}\right)(h)$$

The “height” of a triangle is represented by a line segment called an altitude (the shortest distance from the “base” to the opposite vertex).

Example – Determine the area of a triangle with vertices at I (–4, –3), J (8, –12) and K (6, –1).

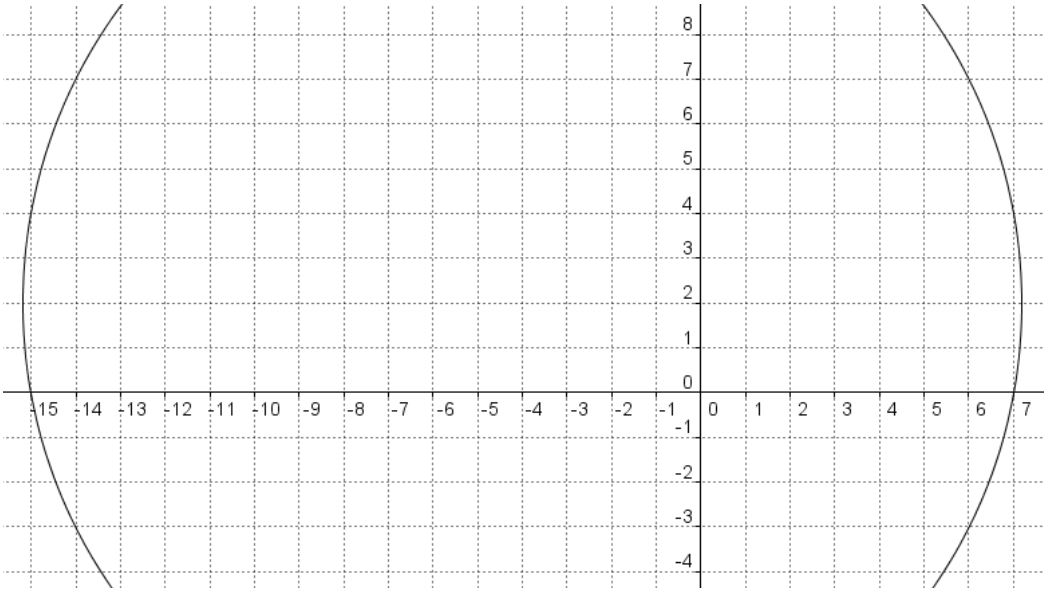


A circle can be described as a “trapezoid” in which:

- one of the parallel sides has a length of zero
- the other parallel side has a length of $2\pi\ r$
- the height is r

$$area = \left(\frac{0 + 2\pi\ r}{2} \right)(r)$$

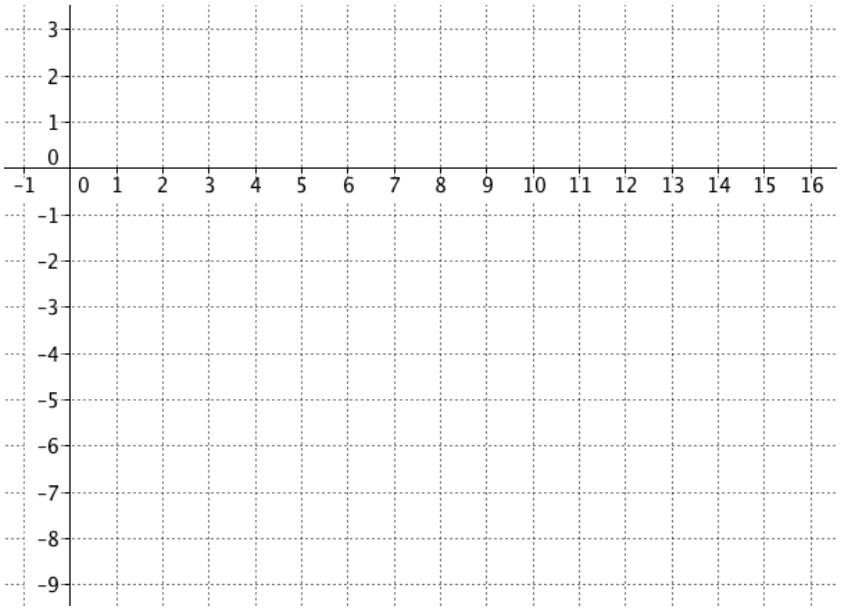
Example – Determine the area of a circle that has a diameter with endpoints at L (–14, 7) and N (6, –3).



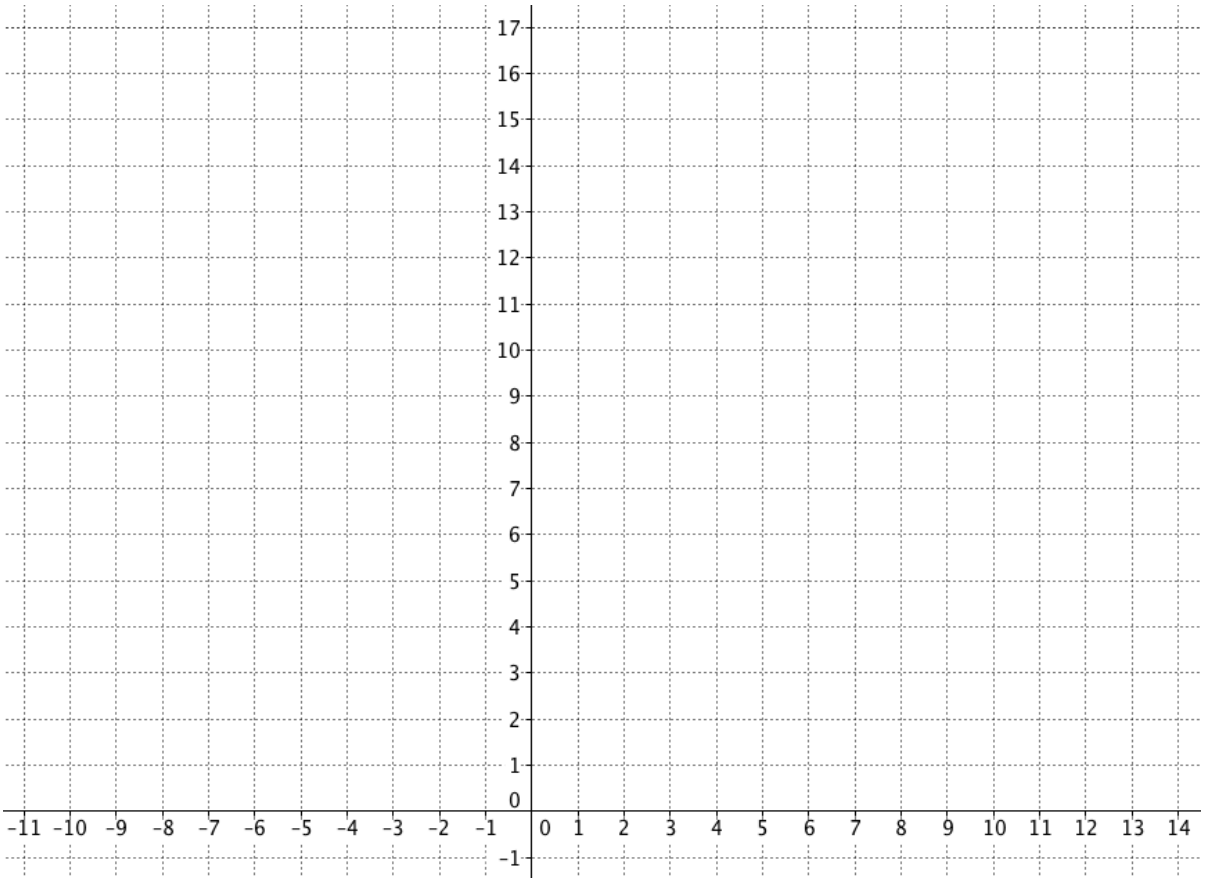
Homework – Please solve the following problems and question # 21c on page 90.

1. Determine the area of a rectangle that has vertices at P (–14, 5), Q (–10, –7), R (8, –1) and S (4, 11).

2. Determine the area of a triangle with vertices T (4, –6), U (16, 3) and V (3, 2).



3. Determine the area of a trapezoid that has vertices at W (–11, 9), X (14, –1), Y (8, 13) and Z (–2, 17).



4. Determine the area of a circle that has a diameter with endpoints at:

   a) A (–9, –2) and B (11, 6)

   b) C (–4, 9) and D (10, –3)

Answers:

1. The area is 240 square units.

2. The area is 52.5 square units.

3. The area is 203 square units.

4. a) The area is 116π square units b) The area is 85π square units