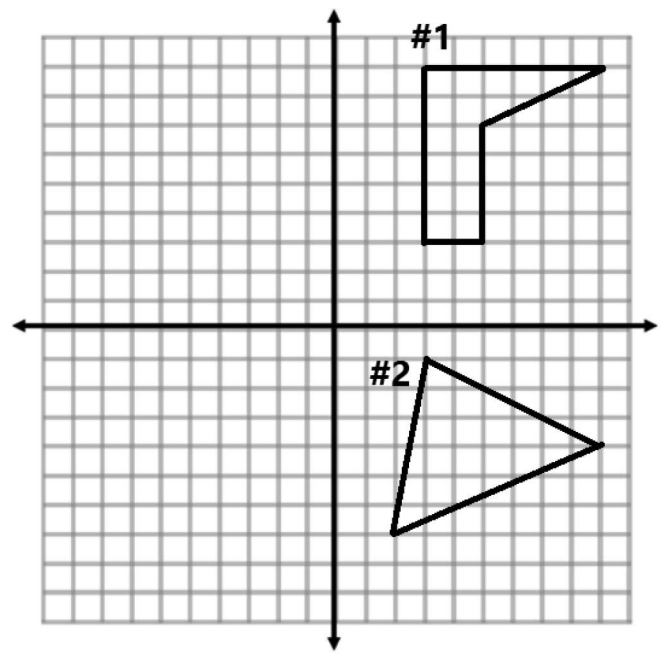
Name _____ Date _____

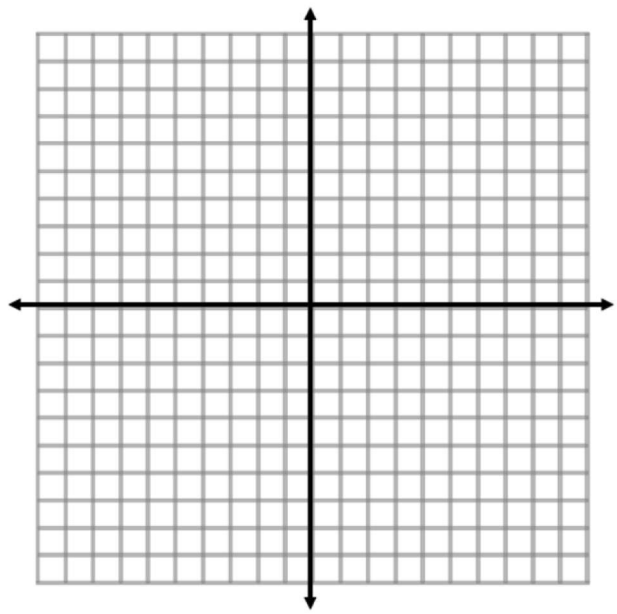
Drawing Polygons on the Coordinate Plane

Determine the area of both polygons on the coordinate plane, and explain why you chose the methods you used. Then write an expression that could be used to determine the area of the figure. Explain how each part of the expression corresponds to the situation.

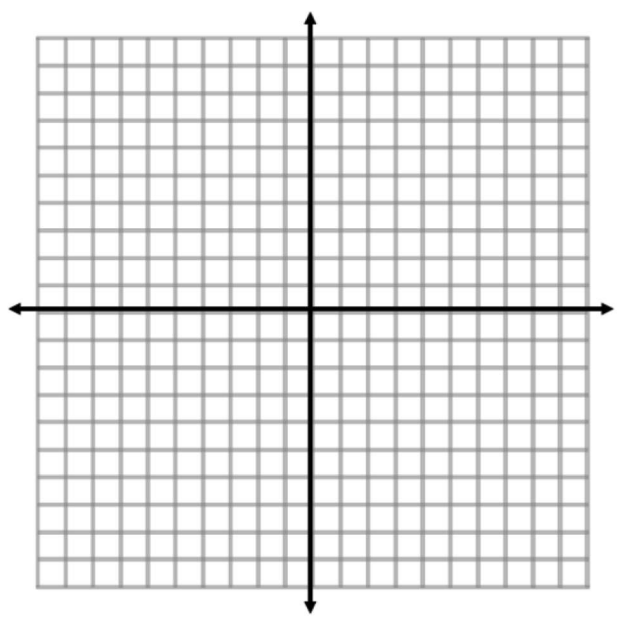


Plot the points for each shape, determine the area of the polygon, and then write an expression that could be used to determine the area of the figure. Explain how each part of the expression corresponds to the situation.

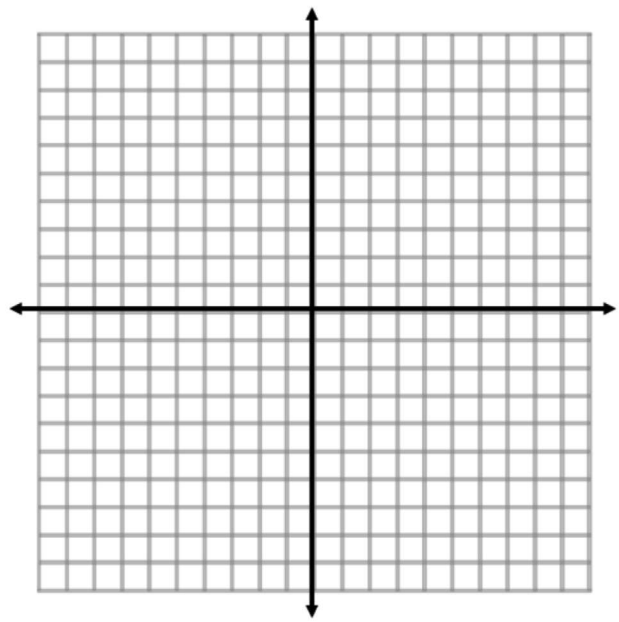
1. $A(1,3)$, $B(2,8)$, $C(8,8)$, $D(10,3)$, and $E(5,-2)$



2. $X(-10,2)$, $Y(-3,6)$, and $Z(-6,-5)$



3. $E(5,7)$, $F(9,-5)$, and $G(1,-3)$

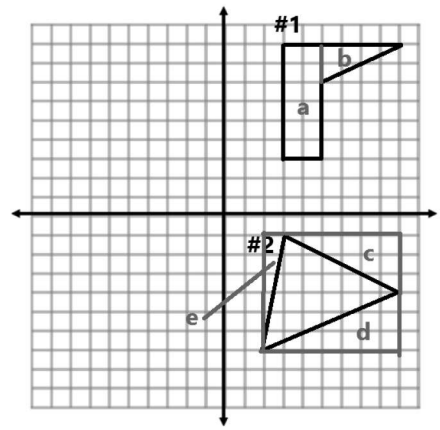


4. Find the area of the triangle in Problem 3 using a different method. Then, compare the expressions that can be used for both solutions in Problems 3 and 4.

5. Two vertices of a rectangle are $(8,-5)$ and $(8,7)$. If the area of the rectangle is 72 square units, name the possible location of the other two vertices.

6. A triangle with two vertices located at $(5,-8)$ and $(5,4)$ has an area of 48 square units. Determine one possible location of the other vertex.

Determine the area of both polygons on the coordinate plane, and explain why you chose the methods you used. Then write an expression that could be used to determine the area of the figure. Explain how each part of the expression corresponds to the situation.



Methods to calculate the answer will vary.

#1 Area of shape a	*Area of shape b*
$A = lw$	$A = \frac{1}{2}bh$
$A = (2 \text{ units})(6 \text{ units})$	$A = \frac{1}{2}(4 \text{ units})(2 \text{ units})$
$A = 12 \text{ units}^2$	$A = \frac{1}{2}(8 \text{ units}^2)$
	$A = 4 \text{ units}^2$

Total Area $= 12 \text{ units}^2 + 4 \text{ units}^2 = 16 \text{ units}^2$

Explanations will vary depending on method chosen.

Expression $(2)(6) + \frac{1}{2}(4)(2)$

The first term represents the area of the rectangle on the left, which makes up part of the figure.
The second term represents the area of the triangle on the right that completes the figure.

#2 Area of outside rectangle	*Area of shape c*	*Area of shape d*	*Area of shape e*
$A = lw$	$A = \frac{1}{2}bh$	$A = \frac{1}{2}bh$	$A = \frac{1}{2}bh$
$A = (7 \text{ units})(6 \text{ units})$	$A = \frac{1}{2}(6 \text{ units})(3 \text{ units})$	$A = \frac{1}{2}(7 \text{ units})(3 \text{ units})$	$A = \frac{1}{2}(1 \text{ units})(6 \text{ units})$
$A = 42 \text{ units}^2$	$A = \frac{1}{2}(18 \text{ units}^2)$	$A = \frac{1}{2}(21 \text{ units}^2)$	$A = \frac{1}{2}(6 \text{ units}^2)$
	$A = 9 \text{ units}^2$	$A = 10.5 \text{ units}^2$	$A = 3 \text{ units}^2$

Total Area $= 42 \text{ units}^2 - 9 \text{ units}^2 - 10.5 \text{ units}^2 - 3 \text{ units}^2$

Total Area $= 19.5 \text{ units}^2$

Explanations will vary depending on method chosen.

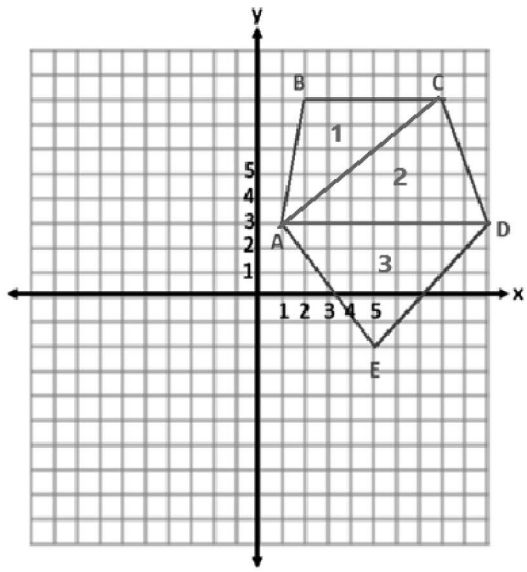
Expression $(7)(6) - \frac{1}{2}(6)(3) - \frac{1}{2}(7)(3) - \frac{1}{2}(1)(6)$

The first term in the expression is the area of a rectangle that goes around the triangle.

Each of the other terms represents the triangles that need to be subtracted from the rectangle so that we are left with just the figure in the center.

Plot the points for each shape, determine the area of the polygon, and then write an expression that could be used to determine the area of the figure. Explain how each part of the expression corresponds to the situation.

1. $A(1,3)$, $B(2,8)$, $C(8,8)$, $D(10,3)$, and $E(5,-2)$



Area of Triangle 1

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(6 \text{ units})(5 \text{ units})$

$A = \frac{1}{2}(30 \text{ units}^2)$

$A = 15 \text{ units}^2$

Area of Triangle 3

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(9 \text{ units})(5 \text{ units})$

$A = \frac{1}{2}(45 \text{ units}^2)$

$A = 22.5 \text{ units}^2$

Area of Triangle 2

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(9 \text{ units})(5 \text{ units})$

$A = \frac{1}{2}(45 \text{ units}^2)$

$A = 22.5 \text{ units}^2$

Pentagon total area $= 15 \text{ units}^2 + 22.5 \text{ units}^2 + 22.5 \text{ units}^2$

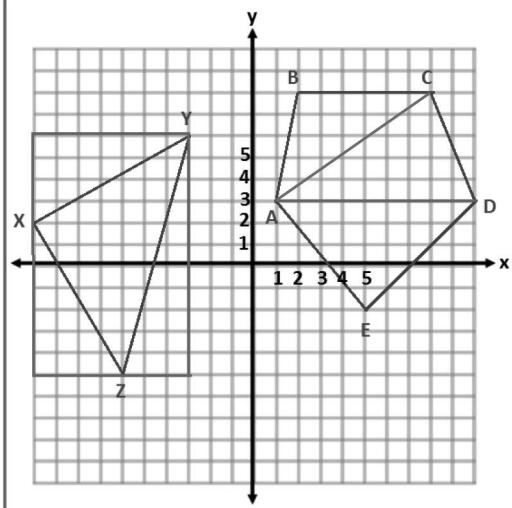
Total Area $= 60 \text{ units}^2$

Expression

$\frac{1}{2}(6)(5) + \frac{1}{2}(9)(5) + \frac{1}{2}(9)(5)$

Each term in the expression represents the area of one of the triangular pieces that fits inside the pentagon. They are all added together to form the complete figure.

2. $X(-10, 2)$, $Y(-3, 6)$, and $Z(-6, -5)$



Area of Outside Rectangle

$A = lw$

$A = (11 \text{ units})(7 \text{ units})$

$A = 77 \text{ units}^2$

Area of Top Triangle

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(7 \text{ units})(4 \text{ units})$

$A = \frac{1}{2}(28 \text{ units}^2)$

$A = 14 \text{ units}^2$

Area of Bottom Left Triangle

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(4 \text{ units})(7 \text{ units})$

$A = \frac{1}{2}(28 \text{ units}^2)$

$A = 14 \text{ units}^2$

Area of Bottom Right Triangle

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(3 \text{ units})(11 \text{ units})$

$A = \frac{1}{2}(33 \text{ units}^2)$

$A = 16.5 \text{ units}^2$

Area of center triangle $= 77 \text{ units}^2 - 14 \text{ units}^2 - 14 \text{ units}^2 - 16.5 \text{ units}^2$

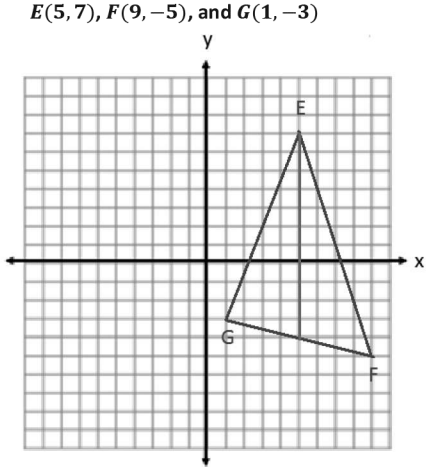
Area of center triangle $= 32.5 \text{ units}^2$

Expression

$(11)(7) - \frac{1}{2}(7)(4) - \frac{1}{2}(4)(7) - \frac{1}{2}(3)(11)$

The first term in the expression represents the area of the rectangle that would enclose the triangle. Then the three terms after represent the triangles that need to be removed from the rectangle so that the given triangle is the only shape left.

3. $E(5, 7)$, $F(9, -5)$, and $G(1, -3)$



Area of Triangle on the Left

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(11)(4)$

$A = 22 \text{ units}^2$

Area of Triangle on the Right

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(11)(4)$

$A = 22 \text{ units}^2$

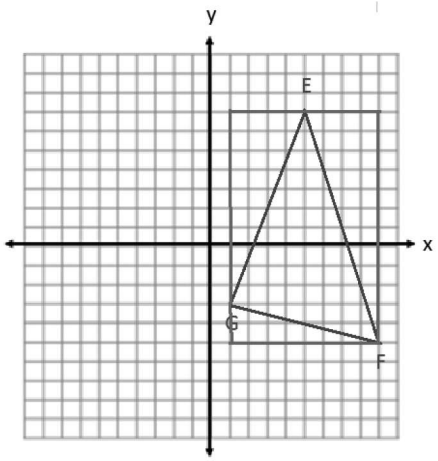
Total Area $= 22 \text{ units}^2 + 22 \text{ units}^2 = 44 \text{ units}^2$

Expression

$\frac{1}{2}(11)(4) + \frac{1}{2}(11)(4)$

Each term in the expression represents the area of a triangle that makes up the total area. The first term is the area of the triangle on the left, and the second term is the area of a triangle on the right.

4. **Find the area of the triangle in Problem 3 using a different method. Then, compare the expressions that can be used for both solutions in Problems 3 and 4.**



Area of Rectangle

$A = lw$

$A = (12 \text{ units})(8 \text{ units})$

$A = 96 \text{ units}^2$

Area of Triangle on Bottom Left

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(8 \text{ units})(2 \text{ units})$

$A = 8 \text{ units}^2$

Area of Triangle on Top Left

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(4 \text{ units})(10 \text{ units})$

$A = 20 \text{ units}^2$

Area of Triangle on Right

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(4 \text{ units})(12 \text{ units})$

$A = 24 \text{ units}^2$

Total Area $= 96 \text{ units}^2 - 20 \text{ units}^2 - 8 \text{ units}^2 - 24\text{units}^2$

Total Area $= 44 \text{ units}^2$

Expression $(12)(8) - \frac{1}{2}(4)(10) - \frac{1}{2}(8)(2) - \frac{1}{2}(4)(12)$

The first term in the expression is the area of a rectangle around the outside of the figure. Then we subtracted all of the extra areas with the next three terms.

The two expressions are different because of the way we divided up the figure. In the first expression, we split the shape into two triangles that had to be added together to get the whole. In the second expression, we enclosed the triangle inside a new figure, and then had to subtract the extra area.

5. **Two vertices of a rectangle are $(8, -5)$ and $(8, 7)$. If the area of the rectangle is 72 square units, name the possible location of the other two vertices.**

$(2, -5)$ *and* $(2, 7)$ *or* $(14, -5)$ *and* $(14, 7)$

6. **A triangle with two vertices located at $(5, -8)$ and $(5, 4)$ has an area of 48 square units. Determine one possible location of the other vertex.**

Answers will vary. Possible solutions include points that are 8 units *from the base.* $(13, -2)$ *or* $(-3, -2)$.