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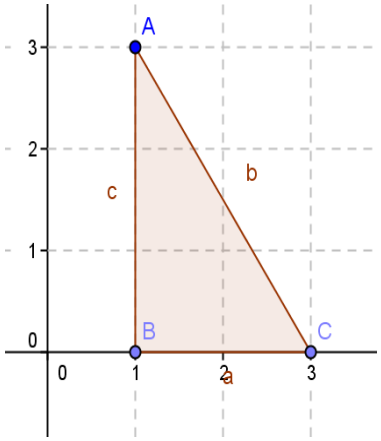
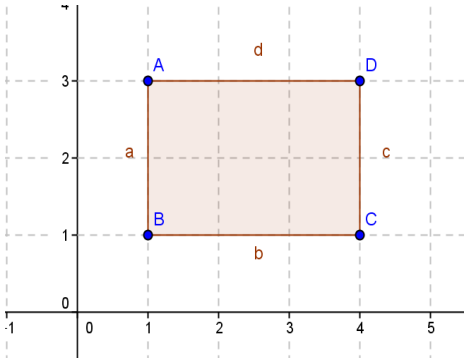
Lesson 9: Perimeter and Area of Triangles in the Cartesian plane

Learning Targets

- I can find the perimeter of a triangle in the coordinate plane using the distance formula or Pythagorean theorem
- I can apply the formula to find the area of any triangle on the coordinate grid

Opening Exercises (5 minutes)

Find the **perimeter** of triangle ΔABC that goes through $A(1,3),\ B(1,0)\ and\ C(3,0)$ Find the **area** of ΔABC	
Find the **perimeter** of rectangle $ABCD$ that goes through points $A(1,3),\ B(1,1),\ C(4,1)\ and\ D(4,3)$ Find the area of rectangle $ABCD$	

Formulas To Remember (others given on formula sheet)

Area Formulas (Cover)

- **Area of**  **or**  -- multiply length times width $\boldsymbol{A = Lw}$
- **Area of** -- multiply radius squared (r^2) times π $\boldsymbol{A = \pi r^2}$
  **if you only need part of the circle then divide
- **Area of**  -- multiply the base times the height then divide by 2 $\boldsymbol{A = \frac{bh}{2}}$

Perimeter/Circumference (around the outside) For  or  add up the sides on the outside and for  multiply the radius by 2 and then times by π. **C = 2r** π

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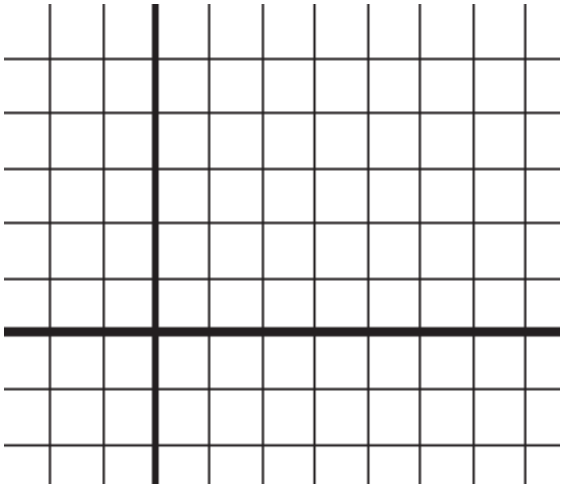
Example 1. Consider a triangular region in the plane with vertices $O(0,0)$, $A(5,2)$, and $B(3,4)$.

a. What is the perimeter of the triangular region?



b. What is the area of the triangular region?

The steps below show how…..

Step 1.	**Step 2.**	**Step 3**
Draw a rectangle enclosing the given triangle ΔOAB, find the area of the rectangle	Find the area of the tree triangles inside the rectangle, number the triangles ①, ②, and ③	Find the area of triangle ΔOAB by subtracting the areas of triangles ①, ②, & ③ from the area of the rectangle.

Word Bank

area, rectangle, surrounding, triangles, subtracting

We can find the_____ of triangles by finding the area of the _____ enclosing the triangle and then _____ the areas of _____ triangles. This method is called **decomposing** or **box method**.

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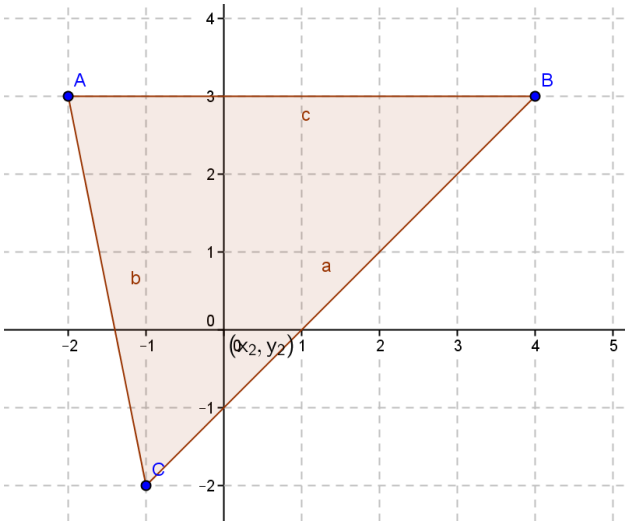
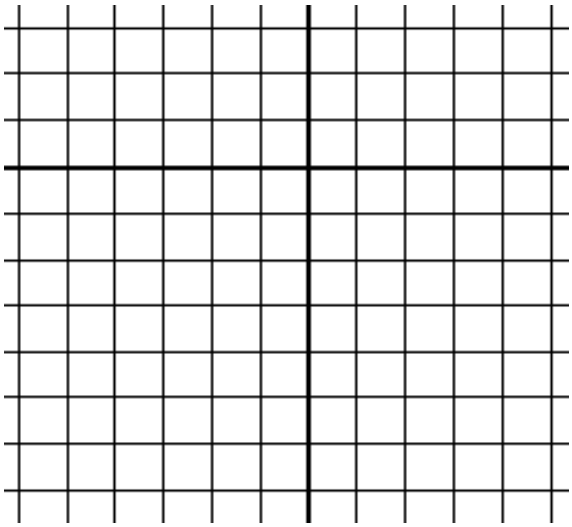
Example 2. Given the triangle below with vertices $A(-2,3)$, $B(4,4)$, and $C(-1,-2)$. Calculate its area.



Example 3. Draw a rectangle with vertices $A(-1,1), B(3,-3), C(0,-6), and\ D(-4,-2)$.

a. Find the perimeter of rectangle $ABCD$

b. Find the area of rectangle $ABCD$



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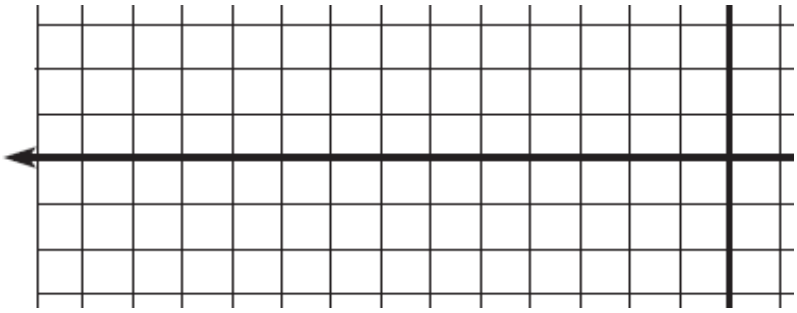
On your own

1. Draw Triangle ΔVEX that has vertices $V(-5,2), E(-11,-1)\ and\ X(-3,-1)$.

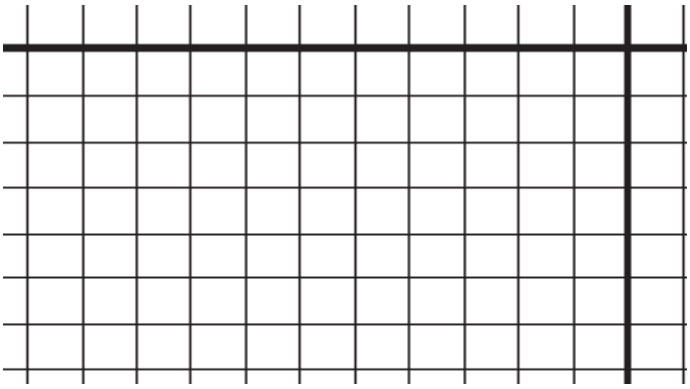
a. Find the perimeter of ΔVEX



b. Find the area of ΔVEX

2. Draw the polygon that has vertices at $A(-7,-2), B(-4,-4), C(-6,-6)\ and\ D(-9,-6)$.

a. Find the perimeter of the polygon in the simplest radical form



b. Find the area of the polygon

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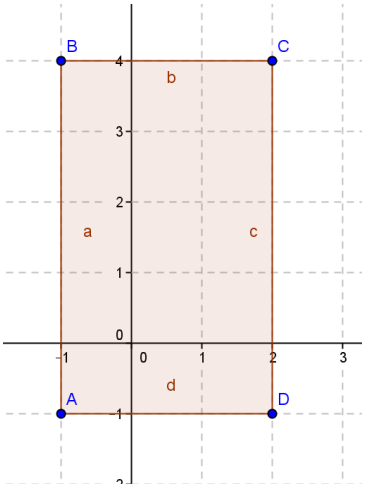
Classwork

1. * Use coordinates to compute the perimeter and area of each polygon.

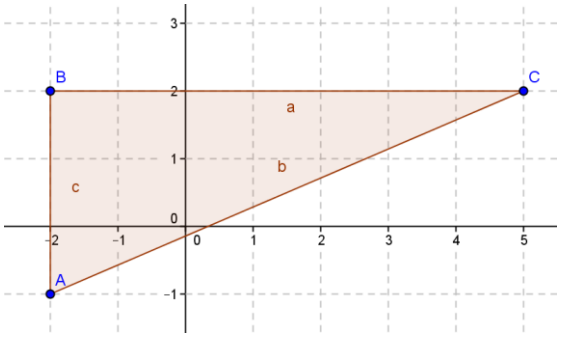
a)



Perimeter:

Area:

b)

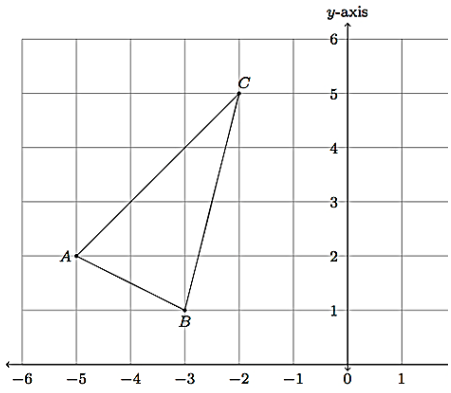


Perimeter:

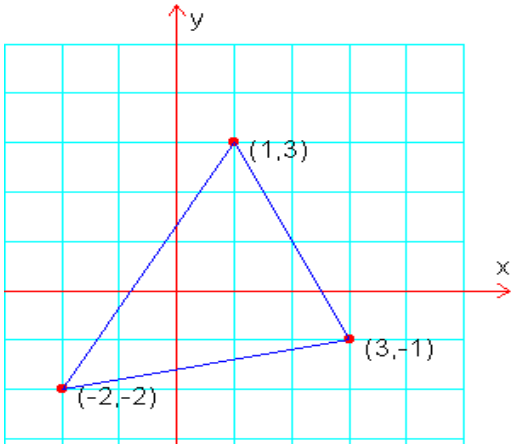
Area:

2. * Determine the **areas** of the following triangles

a)



b)



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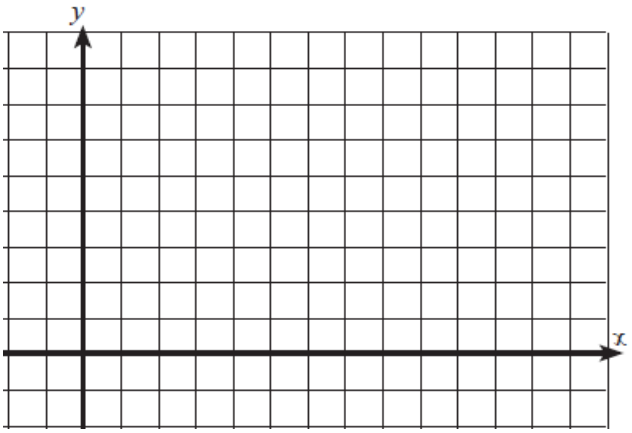
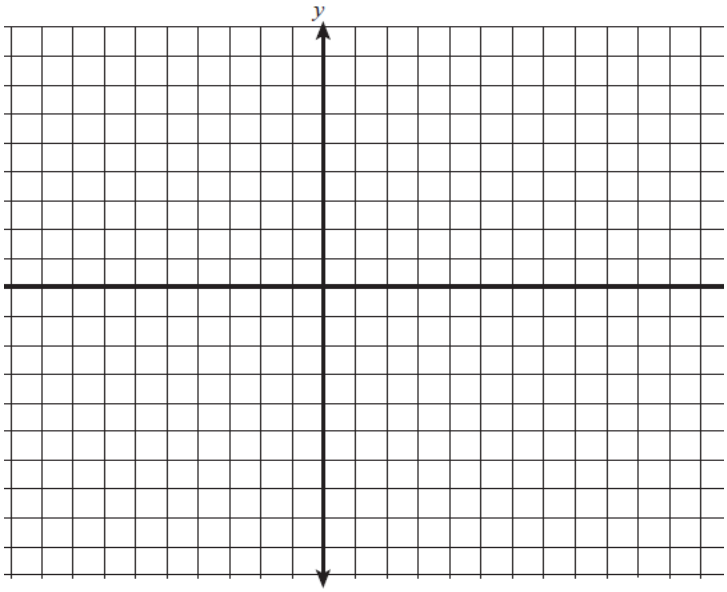
3. ** A polygon has vertices at $A(2,5), B(5,3), C(5,3)$ and $D(0,4)$. Find the perimeter of the polygon in the simplest radical form

4. ** Triangle ΔABC has the vertices at $A(6,5)$, $B(12,3)$ and $C(6,1)$. Find the area of ΔABC



5. *** Rectangle $ABCD$ has an area of 50 units squared. If the coordinates of A are $(1,1)$ and the coordinates of B are $(5,-2)$, what are possible coordinates of C and D, respectively



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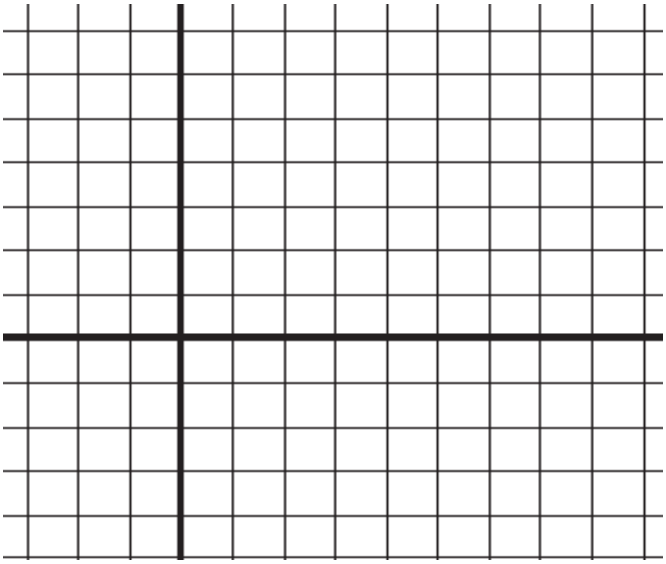
6. *** A textbook has a picture of a triangle with vertices $(3, 6)$ and $(5, 2)$. Something happened in printing the book and the coordinates of the third vertex are listed as $(-1, \_\_\ )$. The answers in the back of the book give the area of the triangle as 6 square units.

What is the y-coordinate of the third vertex?



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Homework

The use of a coordinate grid is optional on all the questions

1. What is the perimeter of triangle ΔABC with vertices $A(-1,-2), B(2,-6), C(-3,-6)$? Give your answer in the simplest radical form

   (1) $\sqrt{5}$ (2) $10+5\sqrt{5}$ (3) $10+2\sqrt{5}$ (4) $30\sqrt{5}$

2. The coordinates of triangle ΔABC are $A(6,5), B(9,1), C(3,1)$. What is the perimeter of triangle ΔABC?

   (1) 8 units (2) 16 units (3) 20 units (4) 32 units

3. The coordinates of triangle ΔABC *are* $A(0,5), B(6,8), C(3,-1)$. What is the perimeter of triangle ΔABC *to the nearest tenth of a unit*?

   (1) 13.4 (2) 22.9 (3) 25.6 (4) 27.0

4. What is the perimeter of a parallelogram with vertices at $A(3,-2), B(7,-4), C(5,-6)$ *and* $D(1,-4)$

   (1) $\sqrt{56}$ units
   (2) $4\sqrt{5}+4\sqrt{2}$ units
   (3) $8\sqrt{2}$ units
   (4) $8\sqrt{5}$ units

5. Plot the coordinates of the triangles with vertices listed $\boldsymbol{O(0,0), A(1,6), B(4,3)}$

   Find the perimeter of $\boldsymbol{\Delta OAB}$

   Find the area of $\boldsymbol{\Delta OAB}$