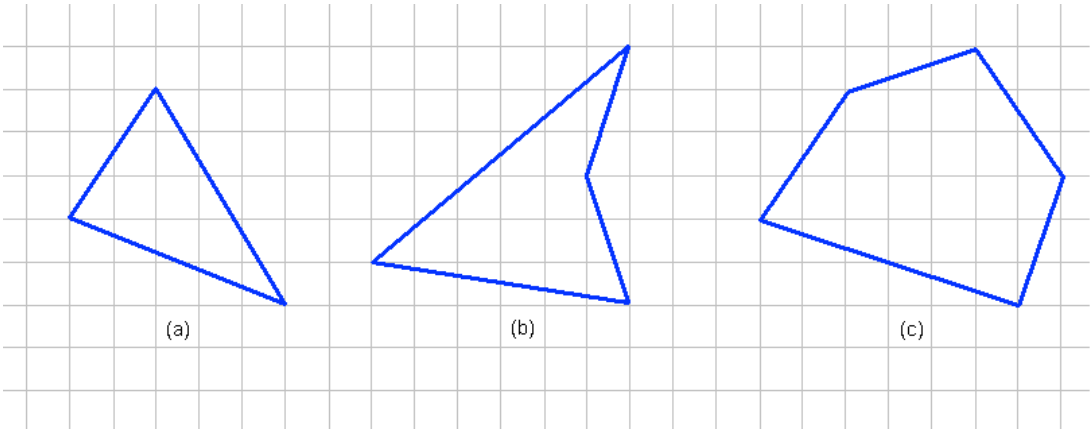
Finding Area in Different Ways

1. Look at the polygons below.



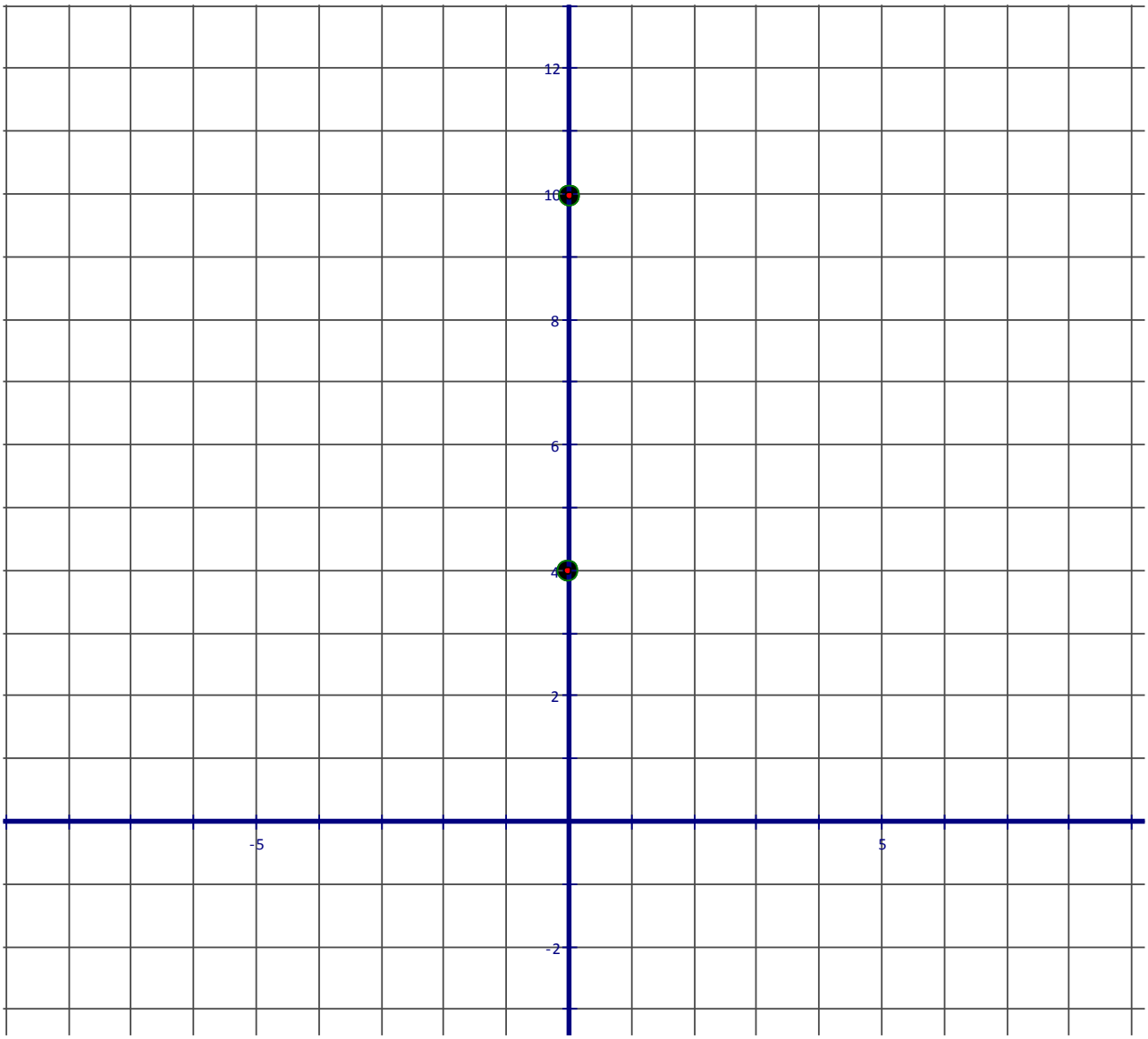
a) Describe at least three different methods for calculating the areas of these polygons. While each method does not necessarily have to work for all three figures, each method should work for at least one of the figures.

b) Use one of your methods to calculate the area of figure c.

c) For each of the other methods you described, use it to calculate the area of one of the figures (your choice).

Task 9:
Finding Area in Different Ways

2. Two vertices of a triangle are located at (0,4) and (0,10). The area of the triangle is 12 units^2.



a) What are all possible positions for the third vertex?

b) Explain how you know these vertices create triangles with an area of 12 units^2. Write a convincing mathematical explanation.

c) How do you know there aren't any more?

d) How many right triangles are there? List the coordinates of the third vertex for each of the right triangles.

e) How many isosceles triangles are there? List the coordinates of the third vertex for each of the isosceles triangles.

f) After answering parts d) and e), do you want to make any changes to your answer to part a)? If so, what changes do you want to make?

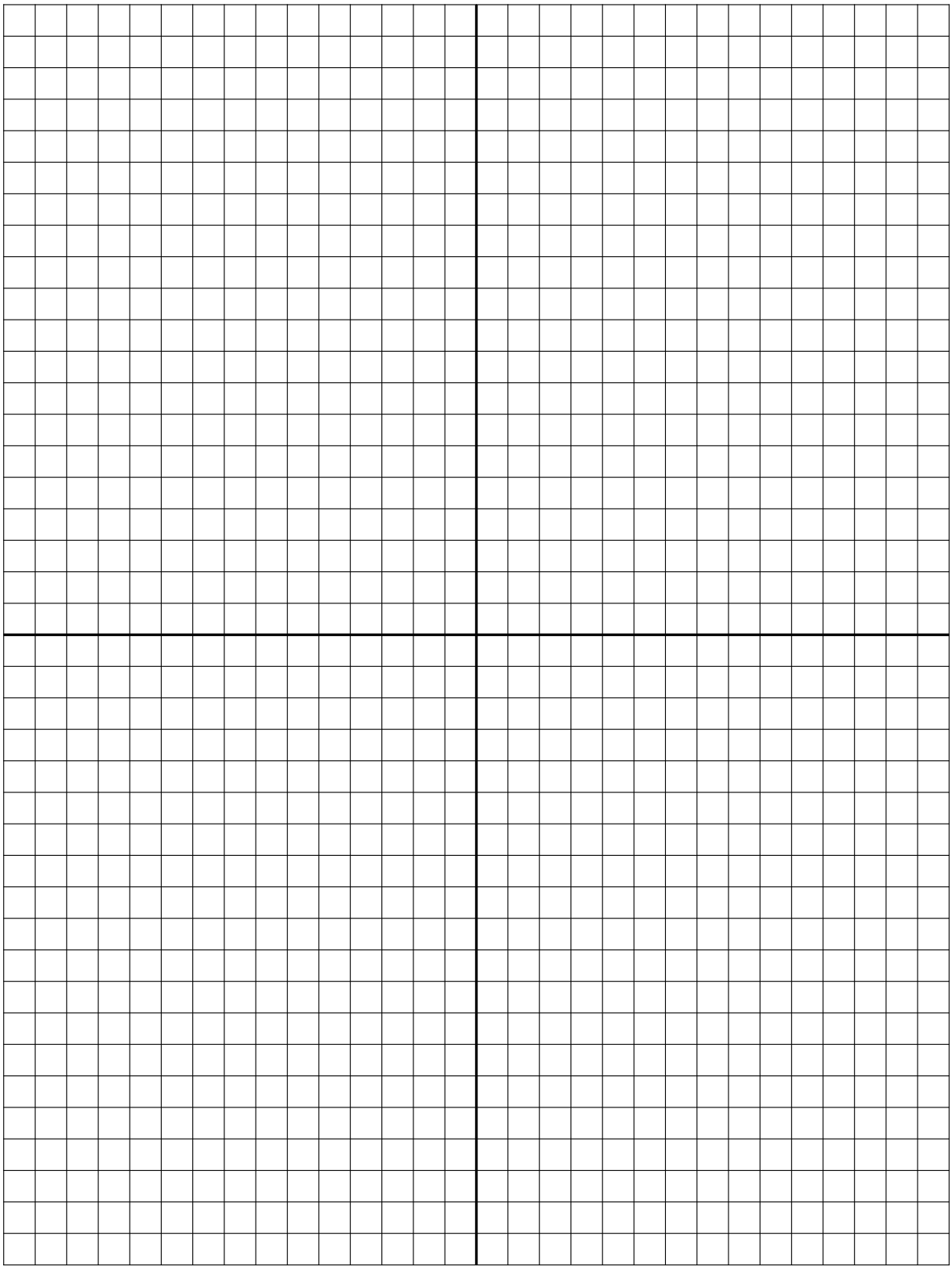
Warm-up for Finding Area in Different Ways

1. On the graph paper provided, mark the points (1,1), (1, 9), and (5,9). Connect them to make a right triangle. How do you know it is a right triangle?

2. What is the area of this triangle? Explain how you found the area.

3. Draw another right triangle, with vertices different from (1,1), (1,9), and (5,9). What is the area of your right triangle? Explain how you found the area.

Warm-up for
Finding Area in Different Ways



Sentence Starters & Frames for Finding Area in Different Ways

Potential Sentence Starters and Frames

Some ideas for sentence frames/starters that could be incorporated into your lesson are listed below. If you think a sentence frame/starter will be helpful, consider how will it support students' mathematical learning and/or development of academic language, and decide which sentence frame/starter (from the list below or that you create) would best support students' learning. You may find that the starters and frames vary in level of difficulty, and plan to provide them to students accordingly.

Starters

(Problem 1)
In order to calculate the area of the polygons, I _____

(Problem 2)
To make a triangle with an area of 12 square units, the third vertex of the triangle must be placed so that

_____

To find triangles with an area of 12 square units, I _____

Frames

(Problem 1)
In order to find the area of the polygons, it is helpful to create or draw _____ around the polygons.

It is helpful to know area formulas of _____ to solve for the areas of the polygons.

Sentence Starters & Frames for Finding Area in Different Ways

Academic Language

Students should have opportunities to see, hear, and write key mathematical ideas during this activity. There are some specific terms that students need to understand in order to engage in this task, and there are some additional terms and phrases that may surface as the students engage with the task. You may think of additional words or phrases that are key to this activity. As the task is introduced, solved by the students, and discussed, ensure that students have opportunities to experience (i.e., through discussion, pictures, and the use of gestures) and to build understanding for key words and phrases. Examples of words and phrases that may be involved in work on this problem include:

- break down or decompose the figure into triangles and rectangles
- base of the triangle
- height of the triangle
- obtuse triangle
- right triangle
- isosceles triangle
- count
- either side of the Y-axes
- reflect the triangle
- different; at least; vertices; located at; possible positions; convincing; change
- subtract; remove

Word Chart for Finding Area in Different Ways

Spanish, French, Portuguese
* = Cognate

Words and Phrases	Academic Language Meaning	Everyday Language Version	Other Forms of the Word or Phrase	Related Words or Phrases	Translation	Examples of word use with students
Polygon	A geometric figure formed from three or more points joined by three or more line segments.	---	Polygons Polygonal	Shape 2-D figure	*Polígono *Polygone *Polígono	
Area	The number of square units contained in the interior of a figure; the extent of a two-dimensional surface enclosed within a boundary	The space something occupies, two-dimensional	---	Enclosed Space Two-dimensional size	*Area *Aire/ Superficie *Área	

Mathematical Thinking
FOR ENGLISH LANGUAGE LEARNERS

Word Chart for Finding Area in Different Ways

Words and Phrases	Academic Language Meaning	Everyday Language Version	Other Forms of the Word or Phrase	Related Words or Phrases	Translation	Examples of word use with students
Vertices	The points where the sides of a geometric figure intersect.	---	Vertex	Intersection Corner	*Vértices Sommets *Vértices	
Triangle	A polygon with exactly three sides.	---	Triangles Triangular	Isosceles Equilateral Scalene	*Triángulo *Triangle *Triângulo	
Convincing	Persuading or assuring by argument or evidence	Causing one to believe the truth of something; plausible	Convince Convinced Convincingly Convincer Convincible	Persuasive Believable Credible Plausible	*Convincente *Convaincant(e) *Convincente	
Right Triangle	A triangle in which one interior angle is a right angle, that is, 90 degrees. The other two angles are complementary, which means that they add up to 90 degrees.	A triangle having a right angle.	Right Triangles Right Triangular	---	Triángulo Rectángulo Triangle Rectangle Triângulo Retângulo	

Mathematical Thinking
FOR ENGLISH LANGUAGE LEARNERS

Word Chart for Finding Area in Different Ways

Words and Phrases	Academic Language Meaning	Everyday Language Version	Other Forms of the Word or Phrase	Related Words or Phrases	Translation	Examples of word use with students
Coordinates	A set of numbers that describe locations in space.	Points on a grid.	Coordinate Coordinated Coordinating	Locations on a plane. Locations on a plane. Latitude Longitude	*Coordenadas *Coordonnées *Coordenadas	
Isosceles Triangle	A triangle that has two equal sides. The angles opposite these sides are also equal.	A triangle with two equal sides.	---	---	Triángulo isosceles Triangle isocèle Triångulo isósceles	
Subtract	To calculate the difference between numbers or quantities	To withdraw or take away; to remove a part from a whole.	Subtracted Subtracting Subtracts Subtraction	Decrease Take away Remove	Restar/ *Sustraer (formal) *Soustraire/ Déduire *Subtrair	
Remove	---	To take, or move away from an occupied place or position; To eliminate.	Removed Removing Removes	Take away Subtract Eliminate Erase Withdraw	*Remover/ Quitar Retirer *Remover	

Mathematical Thinking
FOR ENGLISH LANGUAGE LEARNERS

Word Chart for Finding Area in Different Ways

Words and Phrases	Academic Language Meaning	Everyday Language Version	Other Forms of the Word or Phrase	Related Words or Phrases	Translation	Examples of word use with students
Count	To calculate the numbers of objects in a group.	To recite numbers in ascending order.	Counts Counting Counted	Tally Number Enumerate	*Contar *Compter *Contar	
Rectangle	A parallelogram with four right angles	-----	Rectangular Rectangles	Parallelogram Quadrilateral Quadrangle	*Rectángulo *Rectangle *Retângulo	

Support Notes for Finding Area in Different Ways

I. Cartesian Coordinates vs. Geographical Coordinates

This math task asks students to list the coordinates of various vertices on a Cartesian grid. Consider addressing the difference and similarity between Cartesian coordinates and 1geographical coordinates. Students may be more familiar with the latter and become confused when prompted to list coordinates in the math task. A simple explanation of the two systems might include the following – *Both types of coordinates are used for describing locations. Geographical coordinates are used to describe locations in terms of latitude and longitude on planet earth. Cartesian coordinates are used to describe locations on a two-dimensional surface or three-dimensional space.*

II. Count – "whether someone matters"

II. Be aware that some students may confuse "to count" – the act of determining the total or sum of something – and "to count" – whether someone or something is valid, of import, or matters.

Ex:

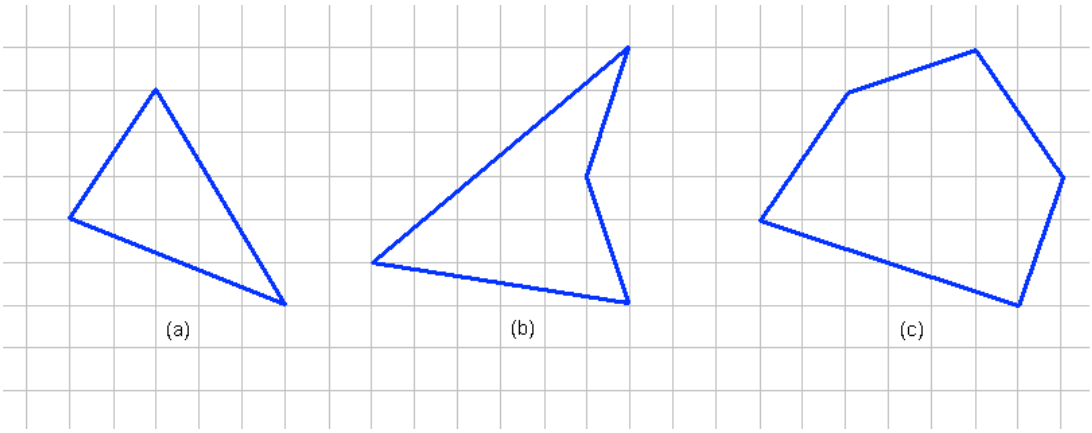
Sally and Bob count by ten to one hundred.

Vs.

Sally says Bob's answers shouldn't count because he copied them from the Internet.

Encontrando el Area Usando Medios Diferentes

1. Mira los polígonos abajo.



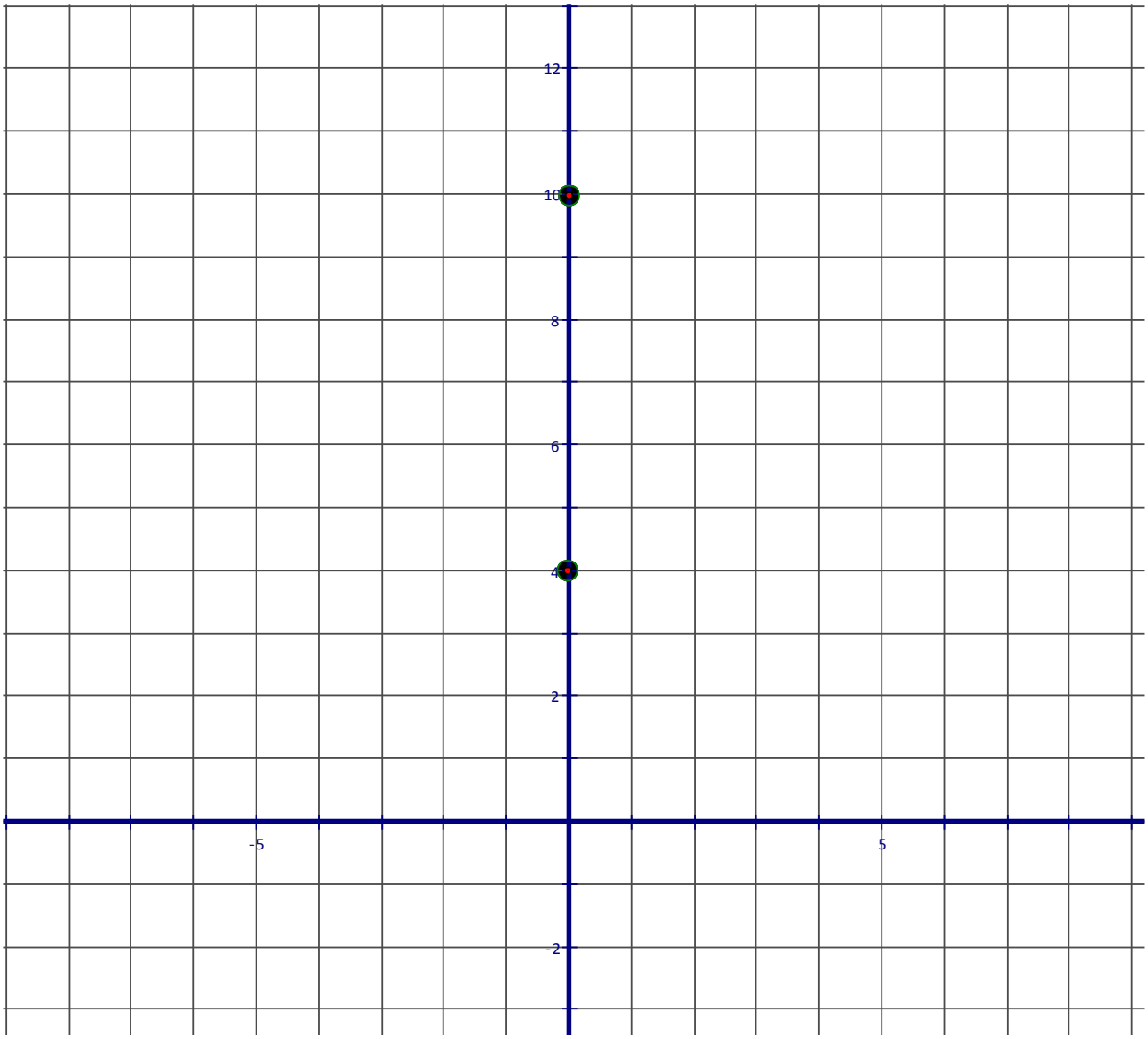
   a. Describe por lo menos tres métodos diferentes para calcular el área de cada polígono. No importa si cada método no funciona por calcular el área de cada polígono, pero cada método debe funcionar por al menos uno de los tres.

   b. Usa uno de tus métodos para calcular el área de la figura c.

   c. Usa cada uno de los otros métodos para calcular el área de una de las figuras que quedan.

Task 9: Encontrando el Area Usando Medios Diferentes

2. Dos vértices de un triángulo están colocadas en (0, 4) y (0, 10). El área del triángulo es 12 unidades^2.



a. ¿Adónde se puede poner la tercera vértice del triángulo? Busca todas las posibilidades.

b. Explica porque las vértices que encontraste crean triángulos con un área de 12 unidades^2.

c. ¿Han otras posibilidades? ¿Cómo lo sabes?

d. ¿Cuántos de los triángulos so rectos? Nota las coordenadas de la tercera vértice de cada triángulo recto.

e. ¿Cuántos de los triángulos son isósceles? Nota las coordenadas de la tercera vértice de cada triángulo isósceles.

f. ¿Después de responder a las partes d) y e), quieres cambiar tu respuesta de la parte a)? ¿Cuáles cambios quieres hacer?