4.03 Toolbox

Part 1- Splitting the Distance

To find a point that splits a length into a portion, we follow these steps:

STEP 1 – Identify the _____
Each portion is listed as either a fraction like 2/5 or a ratio like 2:3. If your portion is listed as a ratio, we will need to change it to a fraction.

Remember a ratio of 2:3 means you have 2 part on the left and 3 parts on the right with a total of _____ parts. So the fraction representing this would be _____. Meaning 2 parts out of 5 total parts.

STEP 2 – Find the distance between the _____

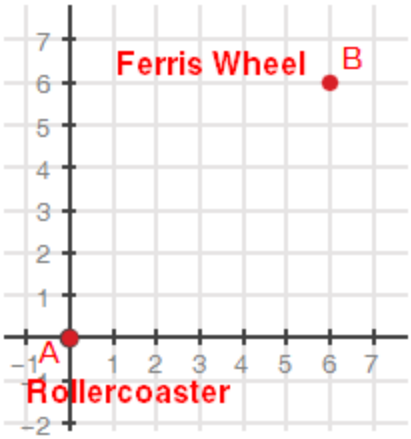
STEP 3 – Multiply the _____ by the distance between the x-coordinates

STEP 4 – Find the distance between the _____

STEP 5 – Multiply the _____ by the distance between the y-coordinates

STEP 6 – Begin with the original point and "move" the x and y by the answers from step 3 & 5 to identify the _____.

Video: Geo403-video1



Example:
Find the point C that is located 4:1 from point A to point B in the image below:

STEP 1 –

STEP 2 –

STEP 3 –

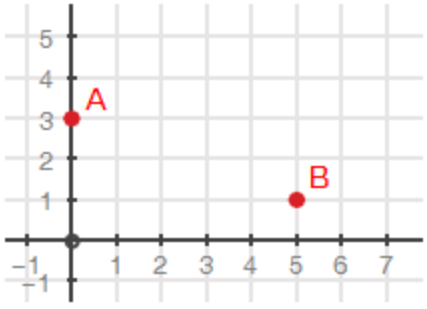
STEP 4 –

STEP 5 –

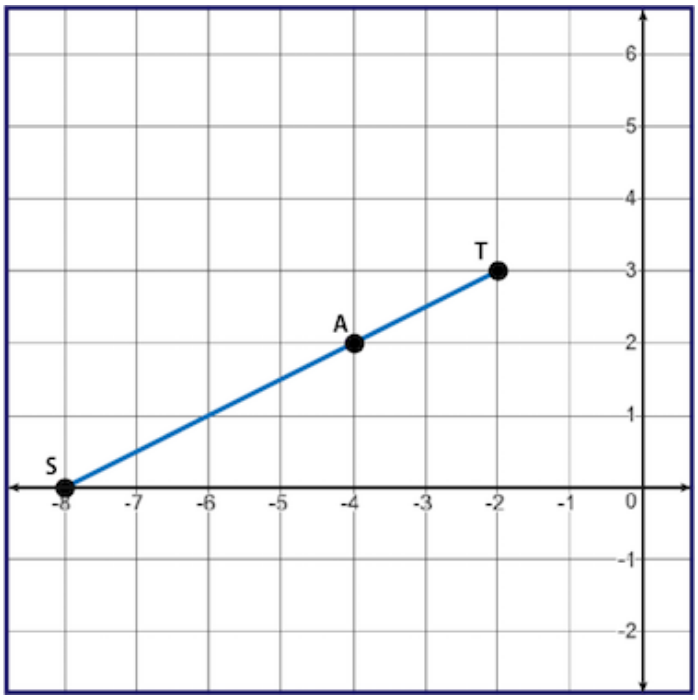
STEP 6 –

The location of point C is _____.

Video: Geo403-video2



Ratios and Distance

Find the ratio in which point A partitions ST.  	**Video:** Geo403-video3
Line segment AB is divided by point C in the ratio 1:2. Point A is at (−3, 5), and point C is at (0, 4). What are the coordinates of point B?	**Video:** Geo403-video4

Weighted Average

By partitioning line segments based on ratios, you have been able to find different locations for points on lines and graphs. This is also referred to as a _____ _____. Weighted averages may be used when calculating course grades, batting averages, and financial calculations. It is a calculation that recognizes that not all data points are considered _____ in importance.	**Video:** V22_403-video1

Steps to Calculate a Weighted Average

Step 1: Find the weight of each data point.

Step 2: Multiply the weight by the associated value.

Step 3: Add the results from step 2 together to calculate the weighted average.

Example: What is the weighted average of the numbers -2 and 7 with weight $\frac{1}{3}$ on the first number and $\frac{2}{3}$ on the second?

Step 1: Find the weight of each data point.	
Step 2: Multiply the weight by the associated value.	
Step 3: Add the results from step 2 together to calculate the weighted average.	

Practice

A point F is on segment AZ with endpoints A(1, −3) and Z(5, 1). F partitions the segment in a 3:1 ratio. What point is F?

Video: [Geo403-video11]

A student's grades and their respective weights are shown in the table. What is the student's overall course grade?

	Grade	Weight Value
Quizzes	85	25%
Exams	91	30%
Research Project	74	40%
Attendance	100	5%

Video: [V22_403-video4]

A student's course grades and their weights are given below. What is the minimum grade needed on the final exam to earn an overall grade of 85% in the class?

	Grade	Weight Value
Attendance	100%	10%
Exams	75%	30%
Quizzes	95%	20%
Final Exam		40%

Video: V22_403-video5

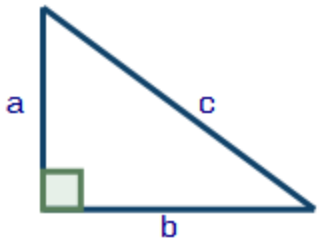
Part 2-Pythagorean Theorem Review

The Pythagorean theorem states that a^2 + b^2 = c^2 for a right triangle with sides a, b, and c.

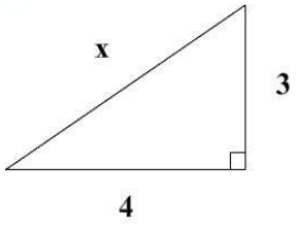
The _____ of the right triangle, which is the side opposite the right angle, is always _____ in the formula.

The other two sides of the right triangle are labeled _____ and _____. It doesn't matter which side is which as long as the hypotenuse is c.

Video: Geo403-video5



Example: Solve for x.



Perimeter Review and Formulas

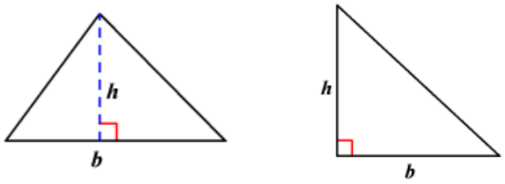
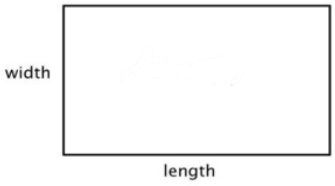
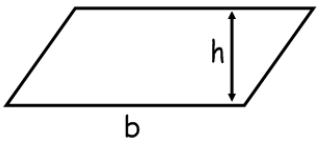
Perimeter is the _____ around the figure.

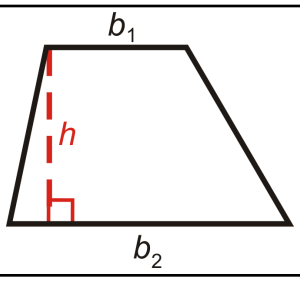
To find the perimeter you can add up all the _____ _____ of the figure.
Remember, if the side length isn't straight horizontal or vertical, you will need to use the _____ _____ to find the perimeter.
Here's a reminder of the distance formula:

Video: Geo403-video6

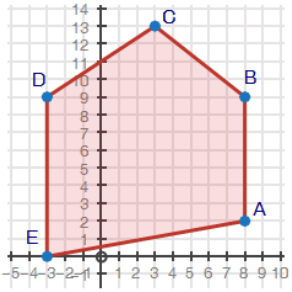
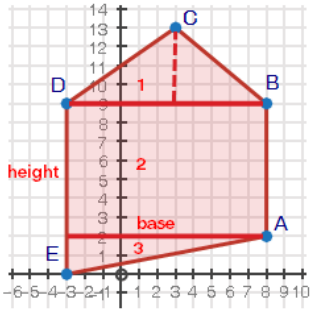
$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ **Here are a few perimeter formula shortcuts*:	
Perimeter of a Square 4s where s = _____	
Perimeter of a Rectangle 2L + 2W where L= _____ and W = _____	
Perimeter of a regular polygon P = ns, where n is the number of _____ and s is the _____	

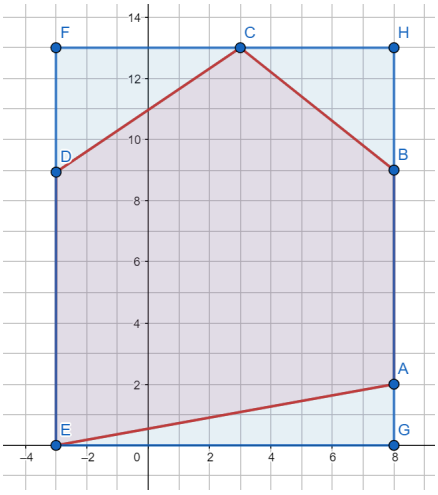
Area Review and Formulas

The area of a polygon is the space _____ the boundary of a 2-dimensional object and it is measured in square units. **Area Formulas:**	**Video:** Geo403-video7
Area of a _____ = = $\frac{1}{2}$bh where b is the base and h is the height	
Area of a _____ = lw where l is the length and w is the width	
Area of a _____ = bh where b is the base and h is the height	

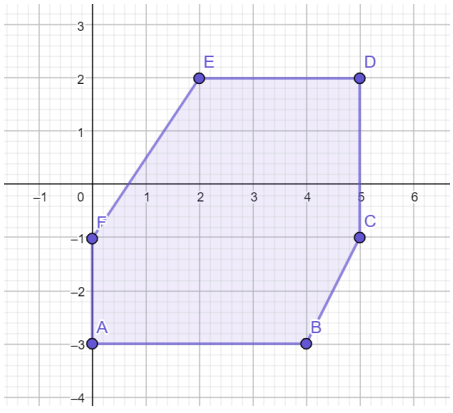
Area of a _____ is A = $\frac{1}{2}h$(b1 + b2) — where b1 is base 1, b2 is base 2, and h is the height	

Area of irregular shapes

We can calculate the area of irregular shapes by breaking it into smaller shapes like triangles, rectangles, and quadrilaterals. For example, to calculate the area of figure ABCDE, we can break it into 2 _____ and 1 _____. The area of each smaller piece can be found and then _____ together to find the area of figure ABCDE.	**Video:** Geo403-video8 
Area of triangle "1": The base of the triangle DCB is side _____, which measures 11 units. The height can be found using the dashed line. The height of the triangle is _____ units. A = $\frac{1}{2}$(b)(h) = $\frac{1}{2}$(___)(___) = $\frac{1}{2}$(___) = _____ units squared	 **Video:** Geo403-video9
Area of rectangle "2": A = (b)(h) = (11)(7) = _____ units squared	
Area of triangle "3": The base of triangle 3 can be found by using the red line joining point A with side _____. The base is 11 units. The height can be found by looking at the left side of the triangle from point E to the red line that is the base of this triangle. The height of the triangle is _____ units. A = $\frac{1}{2}$(b)(h) = $\frac{1}{2}$(11)(2) = $\frac{1}{2}$(22) = _____ units squared	

Area of ABCDE: 22 + 77 + 11 = _____ units squared	
Alternate Method: Here is an alternate way to find the area of the irregular polygon: Calculate the _____ area around the polygon. Notice the three _____ of "extra" space. Calculate the area of each of these. Last, subtract these triangle areas from the total. A=(b)(h)= Triangle DFC Area = ½(b)(h) = Triangle CHB Area = ½(b)(h) = Triangle AGE Area = ½(b)(h) = Irregular Polygon = ____ - _____ - _____ - _____ =_____	**Video:** Geo403-video10 

Practice

Find the area of the following shape. 	**Video:** Geo403-video12
Right triangle DOG has an area of 15 square units. D is on the origin at (0,0) and side DO is 5 units long. G lies on the line x=-5. Find a possible coordinate for O and G.	**Video:** Geo403-video13

EXTRA PRACTICE for 4.03