

# Basic Geometry

We know when students are just beginning their study of geometry, the basic concepts can be difficult to grasp. These activities are written for teachers to use in their basic geometry classes.

When you find other helpful exercises, add these to your own eActivities.

## This file includes eActivities on:

**Area** – Divide and conquer to find the area of irregularly shaped polygons.

**Point on the Graph** – Change the coordinates and watch the point change, or move the point and see the coordinates respond to the new position.

**Distance** – How do you find the distance between two points? Check your result with the measurement box.

**Midpoint** – Finding the midpoint in more than one way can be easy.

**Parallel and Perpendicular** – Find the slopes and discover which lines are parallel and which are perpendicular.

**Perpendicular Bisector** – We'll show you how to find the perpendicular bisector and then it's your turn!

**Similar Figure Length** – The shapes are similar and some lengths are known. Using this knowledge, calculate the length of the unknown side.

**Similar Figure Perimeter and Area** – Discover the perimeter and area of these similar squares.

**Circle** – Change the equation or move the circle. Either way, you will see the results graphically and algebraically.

**Trig Sine** – Find length AC when you know angle A and length BC.

**Trig Cosine** – Now, find length AC when you know angle A and AB.

**Trig Tangent** – Finally, find length BC when you know angle A and the length of side AB.

**Pythagorean Theorem** – What is the distance from second base to home plate?

## Area

Divide and conquer to find the area of irregularly shaped polygons.

The 'Area' eActivity interface consists of two main windows. The left window is titled 'Area' and contains the following text: '<Example> Find the area of the given shape.' Below this is a 'Shape' input field. Further down, it says 'Divide the shape.' followed by a 'Divided shape' input field. The calculation is shown as: 'Area = ΔABC + □ADCHG + ΔFIE + □IHDJ +', 'Area = 4 + 8 + 2 + 1 + 1/2', and 'Area = 15.5'. At the bottom, it says 'Try your own shape.' with an 'Exercise' input field. The right window is titled '<Example> Find the area of the given shape.' and has a 'Shape' input field. Below that, it says 'Divide the shape.' followed by a 'Divided shape' input field. The main area of the right window shows a grid with an irregular polygon divided into several shapes labeled with letters A through J.

## Point on the Graph

Change the coordinates and watch the point change, or move the point and see the coordinates respond to the new position.

The 'Point on the Graph' eActivity interface consists of two main windows. The left window is titled 'Point on the Graph' and contains the following text: 'Change the value below, or move the point on the Geometry window.' Below this is a coordinate input field: 'Tap [ -1, 1 ]'. The right window is titled 'Change the value below, or move the point on the Geometry window.' and has a coordinate input field: 'Tap [ -1, 1 ]'. The main area of the right window shows a grid with a point plotted at (-1, 1).

## Distance

How do you find the distance between two points? Check your result with the measurement box.

File Edit Insert Action

Distance

<Example>  
Find the distance between  $\begin{bmatrix} -1 \\ 5 \end{bmatrix}$  and  $\begin{bmatrix} 5 \\ -2 \end{bmatrix}$ .

Geometry window -->

Distance =  $\sqrt{((-1)-5)^2 + (5-(-2))^2}$

You can find the distance with the Geometry measurement box.

Try your own.  
Find the distance between

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File Edit Insert Action

Geometry window -->

Distance =  $\sqrt{((-1)-5)^2 + (5-(-2))^2}$

You can find the distance with the Geometry measurement box.

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## Midpoint

Finding the midpoint in more than one way can be easy.

File Edit Insert Action

Midpoint

Two points

Select points A and B on the Geometry window and tap Draw/Construct/Midpoint. You will find the midpoint C.

Select point A and drop it into eActivity. You will find  $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ .

Select point B and drop it into eActivity. You will find  $\begin{bmatrix} 7 \\ 4 \end{bmatrix}$ .

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File Edit View Draw

$\begin{bmatrix} 4 \\ 2.5 \end{bmatrix}$

Select point C and drop it into eActivity. You will find  $\begin{bmatrix} 4 \\ 2.5 \end{bmatrix}$ .

The midpoint is,  $\left( \frac{\begin{bmatrix} 1 \\ 1 \end{bmatrix} + \begin{bmatrix} 7 \\ 4 \end{bmatrix} }{2} \right)$

[4, 2.5]

## Parallel and Perpendicular

Find the slopes and discover which lines are parallel and which are perpendicular.

File Edit Insert Action

Parallel and Perpendicular

<Example>  
Open Geometry to see the polygon formed by  $\begin{bmatrix} x \\ y \end{bmatrix} \begin{bmatrix} -4 & -3 & 2 & 2 & 1 \\ 1 & -2 & -2 & 2 & 5 \end{bmatrix}$

Geometry window ->

In the Geometry window, find the slope for each line segment.

Slope AB : -3  
Slope BC : 0  
Slope CD : 0  
Slope DE : -3

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File Edit View Draw

In the Geometry window, find the slope for each line segment.

Slope AB : -3  
Slope BC : 0  
Slope CD : 0  
Slope DE : -3  
Slope EA : 0.8

AB and DE are parallel.

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## Perpendicular Bisector

We'll show you how to find the perpendicular bisector and then it's your turn!

**Perpendicular Bisector**

<Example>  
Find the equation of the perpendicular bisector for AB of the triangle

$$\begin{bmatrix} x \\ y \end{bmatrix} \begin{bmatrix} -3 & 6 & 1 \\ 1 & 3 & -3 \end{bmatrix}$$

Geometry window-->

Select AB and tap Draw/Construct/Midpoint. You will find the midpoint D to be  $\begin{bmatrix} 1.5 \\ 2 \end{bmatrix}$ .

Select AB and tap

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Geometry window-->

Select AB and tap Draw/Construct/Midpoint. You will find the midpoint D to be  $\begin{bmatrix} 1.5 \\ 2 \end{bmatrix}$ .

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## Similar Figure Length

The shapes are similar and some lengths are known. Using this knowledge, calculate the length of the unknown side.

**Similar Figure Length**

<Example>  
Tap ----->

Figure  $ABCD \sim A'B'C'D'$  and  
so  $\frac{AB}{A'B'} = \frac{AD}{A'D'}$ .

When  $AB=4$ ,  $AD=3$ ,  
 $A'B'=1.6$ , we have  
 $\frac{4}{1.6} = \frac{3}{x}$

ansx\*

$$\frac{5}{2} = \frac{3}{x}$$

$$\frac{5 \cdot x}{2} = 3$$

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**Similar Figure Length**

<Example>  
Tap ----->

Figure  $ABCD \sim A'B'C'D'$  and  
so  $\frac{AB}{A'B'} = \frac{AD}{A'D'}$ .

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**Similar Figure Length**

Figure  $ABCD \sim A'B'C'D'$  and  
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 $\frac{4}{1.6} = \frac{3}{x}$

ansx\*

$$\frac{5}{2} = \frac{3}{x}$$

$$\frac{5 \cdot x}{2} = 3$$

ans/5x2

$$x = \frac{6}{5}$$

ans=6/5

Alg Standard Real Rad

## Similar Figure Perimeter and Area

Discover the perimeter and area of these similar squares.

**Similar Figure Perimeter and Area**

<Example>  
 $\square ABCD \sim \square EFGH$  -->

Perimeter of  $\square ABCD=4$ .  
 $AB=4$

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**Similar Figure Perimeter and Area**

$\square ABCD \sim \square EFGH$  -->

Perimeter of  $\square ABCD=4$ .  
 $AB=4$

$$\frac{1}{2} = \frac{4}{P}$$

ansxP

$$\frac{P}{2} = 4$$

ansx2

$$P=8$$

$\square$   
The perimeter of  $\square EFGH$  is 8.

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**Similar Figure Perimeter and Area**

Area of  $\square ABCD=1$ .  
 $\frac{AB^2}{EF^2} = \frac{1}{A}$

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

ansxA

$$\frac{1}{4} = \frac{1}{A}$$

ansx4

$$A=4$$

$\square$   
The area of  $\square EFGH$  is 4.

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### Circle

Change the equation or move the circle. Either way, you will see the results graphically and algebraically.

File Edit Insert Action

Circle

$$x^2 + y^2 = 1$$

Geometry window -->

$$x^2 + y^2 - 1 = 0$$

Change the equation and tap EXE.

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File Edit View Draw

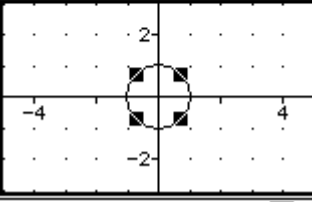
Circle

$$x^2 + y^2 = 1$$

Geometry window -->

$$x^2 + y^2 - 1 = 0$$

Change the equation and tap EXE.



Alg

### Sine

Find length AC when you know angle A and length BC.

File Edit Insert Action

Sine

<Example>

Right Triangle

When  $\angle A = 30^\circ$  and  $BC = 3$ , find the length of AC.

$$\sin(30^\circ) = \frac{3}{AC}$$

$$\frac{1}{2} = \frac{3}{AC}$$

ans\*AC\*2

AC=6

Then AC=6.

Try your own.

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File Edit Insert Action

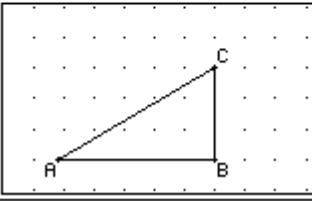
$$\sin(30^\circ) = \frac{3}{AC}$$

$$\frac{1}{2} = \frac{3}{AC}$$

ans\*AC\*2

AC=6

Then AC=6.



Alg Standard Real Deg

### Cosine

Now, find length AC when you know angle A and AB.

File Edit Insert Action

Cosine

<Example>

Right Triangle

When  $\angle A = 23.2^\circ$  and  $AB = 7$ , find the length of AC.

$$\cos(23.2^\circ) = \frac{7}{AC}$$

$$0.9191353393 = \frac{7}{AC}$$

ans\*AC/0.9191353393

AC=7.615853401

Try your own.

When  $\angle B = 25^\circ$  and  $AB = 5$ ,

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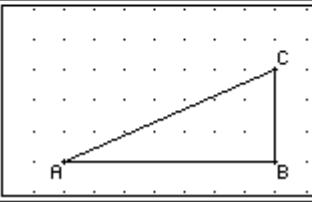
File Edit Insert Action

$$\cos(23.2^\circ) = \frac{7}{AC}$$

$$0.9191353393 = \frac{7}{AC}$$

ans\*AC/0.9191353393

AC=7.615853401



Alg Standard Real Deg

## Tangent

Finally, find length BC when you know angle A and the length of side AB.

File Edit Insert Action

1/20.5 B A

**Tangent**

<Example>

Right Triangle

When  $\angle A=45^\circ$  and  $AB=4$ ,  
find the length of BC.

$$\tan(45^\circ) = \frac{BC}{4}$$

$$1 = \frac{BC}{4}$$

ans\*4

$$4=BC$$

□

**Try your own.**  
When  $\angle B=30^\circ$  and  $BC=6$ ,  
find the length of AC.

Exercise

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File Edit Insert Action

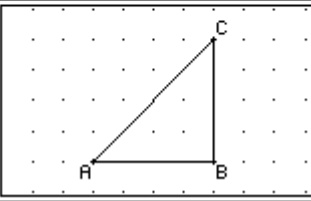
1/20.5 B A

When  $\angle A=45^\circ$  and  $AB=4$ ,  
find the length of BC.

$$\tan(45^\circ) = \frac{BC}{4}$$

$$1 = \frac{BC}{4}$$

ans\*4

$$4=BC$$


Alg Standard Real Deg

## Pythagorean Theorem

What is the distance from second base to home plate?

File Edit Insert Action

1/20.5 B A

**Pythagorean Theorem**

<Example>

Find the length from  
home plate to second  
base on the baseball  
diamond.

Baseball Diamond

When A is home plate,  $AB$   
 $= 90$  ft  
 $BC = 90$  ft and  $\angle ABC=90^\circ$

$$AC^2 = 90^2 + 90^2$$

$$AC^2 = 16200$$

$$\sqrt{16200}$$

$$127.2792206$$

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File Edit Insert Action

1/20.5 B A

Baseball Diamond

When A is home plate,  $AB$   
 $= 90$  ft  
 $BC = 90$  ft and  $\angle ABC=90^\circ$

$$AC^2 = 90^2 + 90^2$$

$$AC^2 = 16200$$

$$\sqrt{16200}$$

$$127.2792206$$

The answer is 127.3 ft.

**Try your own.**  
Find AC when  $AB=50$ ,  
 $BC=35$ , and  $\angle B=90^\circ$ .

Exercise

Alg Standard Cplx Rad