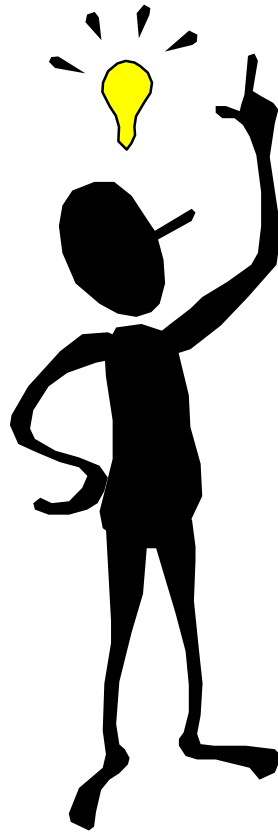


Geometer's Skethchpad 7th Grade Guide to Learning Geometry



This Guide Belongs to:

Date: _____

***a story can be added or one could choose to use the activities alone and add their own fun and games to make it interesting!*

Getting Started with Sketchpad

What is Sketchpad?

Sketchpad is a computer program specially designed for drawing and manipulating geometric figures. Using Sketchpad is a fun way to learn about and experiment with geometry.

Activities in this booklet

There are 14 activities in this booklet covering a wide-range of geometric concepts. You will work with a partner to complete each activity. You and your partner will share unique jobs throughout these activities. For each activity you will be either a **Mouse Operator** or an **Activity Recorder**. At the end of each activity you will change jobs with your partner.

A lot of geometry terms are **not** described in this booklet. When you see words with which you are not familiar, you should look in your textbook to find out more about the subject. Words that you see in **bold** may be new words for you.

Using Sketchpad

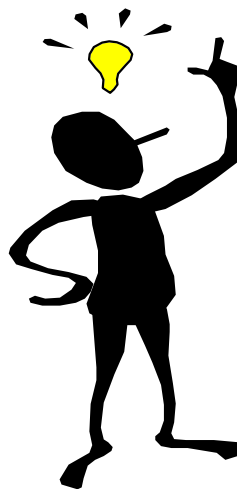
In this section, you will learn some of the basics of using Sketchpad. You will find other information about using Sketchpad in other sections of this booklet. All the information about Sketchpad you need to do the activities can be found in this booklet.

Creating a new sketch

Create a new sketch by clicking on the File menu and selecting New Sketch. A blank sketchpad will appear.

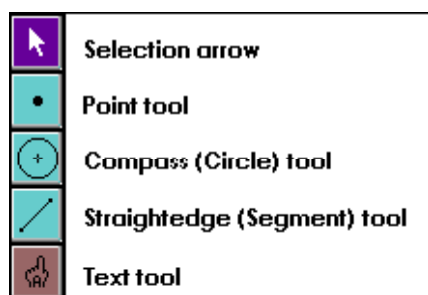
Saving a sketch

During these activities, you may want to save your work to a disk. To save a sketch, click on the File menu and select Save. You will be asked to type in a name for your file. (The name must be 8 characters or less.)



IMPORTANT: Before beginning, turn on Auto Show Labels for points and circles. To do this, click on the Display menu and select preferences. Click on the boxes beside Points and Circles if they are not already selected. Also, while in the Preferences dialog box, change the Distance Unit preference to centimeters (cm) and set the precisions to tenths.

The toolbar



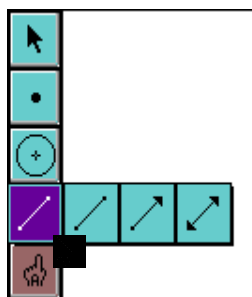
• **Selection arrow**—use this tool to click on objects to move them or resize them. Also use this tool to select (or highlight) objects.

Important: To select one or more objects at the same time, hold down the Shift key and click on all of the objects you want selected.

• **Point tool**—use to place points on your sketch.

• **Compass tool**—use to draw circles.

• **Straightedge tool**—use to draw segments, rays, and lines (you will learn more about these in Activity 1). Click and hold down the Straightedge tool to see the options for segments, rays, or lines.



• **Text tool**—use to change object labels. Click on an object to display or hide its label. Double click on a label to change it.

Clicking and dragging

Something you will be doing a lot in Sketchpad is “clicking and dragging” objects. **Click** means to position the pointer over an object and press the mouse button (and not let go) to select it. **Drag** means to then move the mouse to move the object on the sketchpad.

Investigating Points & Lines

How to draw a point

1. Select the Point tool by clicking on it in the toolbar.
2. Position the cursor where you want to place the point. Click. The point appears on your sketchpad.

How to draw a line segment

1. Select the Segment tool by clicking on it in the toolbar.



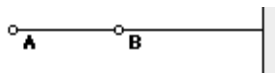
2. Click and drag the mouse across the page to draw a line segment.

How to draw a ray

1. Click and hold the Segment tool on the toolbar. Select the Ray tool.



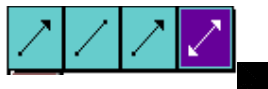
2. Click and drag the mouse across the page to draw a ray.



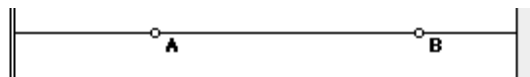
Notice how the ray starts at point A, passes through point B and extends off the sketchpad on one side.

How to draw a line

1. Click and hold the Segment tool on the toolbar. Select the Line tool.



2. Click and drag the mouse across the page to draw a line.



Notice that the line extends off the page on both sides.

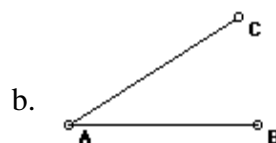
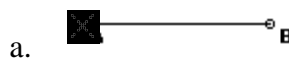
Investigating Angles

How to draw an angle

1. Select the Segment Tool by clicking on it in the toolbar.
2. Click and drag the mouse across the page to draw a line segment.

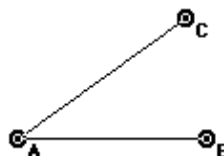


3. While the segment tool is still selected, move the mouse cursor over point A, then click the mouse button and drag to make a new line segment above the first line segment (like Figure b. below).



How to measure an angle

1. Click the selection arrow in the toolbar. Click on one of the endpoints (for example C or B below), then hold the Shift key down and click on the **vertex** and then the other endpoint. (You must select the vertex second.)



2. Click on the Measure menu and select Angle.

You should now see the measure of the angle in the upper left-hand corner of your sketch. Notice the way the angle is labeled. The letters should be in the same order as you selected them.



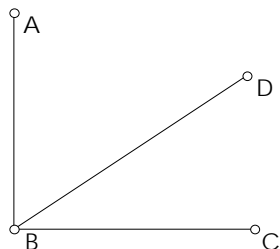
Activity 1

Meets SOL 6.??

Swap jobs with your partner.

1. Open a new sketch and draw a right angle.
2. Starting at the vertex, draw a new line segment between the two line segments that form the right angle. (Make sure you click on the vertex and drag to draw a new segment between the other two line segments.)
3. How many angles do you see now?

Your sketch should look similar to this one:



4. Measure the two small angles. You should see three angle measures on your sketchpad. One for the large (right) angle, and one for each of the two smaller angles.

5. After deselecting the angle, drag the endpoint of the center line segment to the right or left. What happened to the measures of the three angles?

Did the 90° angle change? Explain.

6. Add the two smaller angles together. What is the sum of the two angles?

What can you say about the relationship between the two small angles and the larger angle?

To learn more about adjacent and complementary angles, look in your textbook!

7. Name two **adjacent angles**.

Two angles formed inside an original right angle are adjacent and complementary. The two small angles you have in your sketch are acute, adjacent, and complementary no matter how you drag the middle segment's endpoint.

8. What do you think adjacent means?
What do you think complimentary means?

Classifying Quadrilaterals

Quadrilaterals can be classified into the following categories:



Trapezoid ONLY two sides parallel (see below)

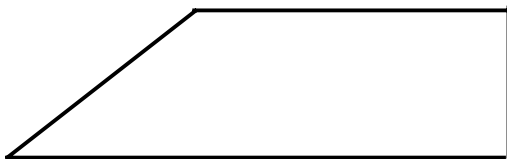
Parallelogram Opposite sides are parallel and congruent
Opposite angles are congruent

Rhombus Opposite sides are parallel and congruent
All sides are congruent
Opposite angles are congruent
Rhombus is a **parallelogram**

Rectangle Opposite sides are parallel and congruent
All angles are right angles
Rectangle is a **parallelogram**

Square Opposite sides parallel and congruent
All sides are congruent
All angles are right angles
Square is a **parallelogram** and a **rectangle** and a **rhombus**

Trapezoids



Activity 2

Swap jobs with your partner.

1. Open the sketch named **Activ2.gsp**. For the first part of this activity, you will **work on the intersecting lines**.

In this sketch:

Line n is parallel to segment CD

Line m is parallel to segment AB .

2. Holding down the shift key, click on points H , E , G , and F and then select Polygon Interior from the Construct Menu.

What do you notice about the relationship among the angles?

3. Click and drag point C or D around to the left and right and up and down.

What happens to the measures of the opposite angles?

Add consecutive angles (like angles FHE and HEG). What do they sum to?

What happens to the measures of the sides?

Quadrilateral $HEGF$ is a **parallelogram**. How would you write the definition of a parallelogram?

4. Click on point D and drag until all angles in parallelogram HEGF all = 90 degrees.

What type of quadrilateral do you see?

Is HEGF still a parallelogram? Explain.

How would you write the definition of a rectangle?

5. Click on segment AB drag until all sides of parallelogram HEGF are equal.

What type of quadrilateral do you see?

Is HEGF still a parallelogram? Is it still a rectangle? Explain.

How would you write the definition of a square?

6. Scroll down in the sketch and **work on the yellow quadrilateral.**
-

7. Click and drag point D and then point B,

What do you observe about the angles and the sides of the quadrilateral? Are the opposite sides always the same length?

Are the opposite angles always the same length?

Is quadrilateral ABCD a parallelogram? Why or why not?

Are ALL the sides always the same length?

Can you make it into a square?

This is a special kind of quadrilateral called a **rhombus**.

What would be a good definition of a rhombus?

Activity 3



Meets SOL 7.11

Change jobs with your partner.

Open a new sketch and draw all of the polygons using the line segment tool.

- Triangle
- Quadrilateral
- Pentagon
- Hexagon
- Septagon
- Octagon

Washington D.C. is a city full of polygons. Open “Activ3.gsp” and look at the pictures of the Washington D.C. area. Can you identify examples of the above polygons? Please record the names of the polygons and number of sides below.

| NAME: | # of sides: |
|----------|-------------|
| A) _____ | _____ |
| B) _____ | _____ |
| C) _____ | _____ |
| D) _____ | _____ |
| E) _____ | _____ |
| F) _____ | _____ |



Congratulations!! You have now completed Activity 3!

Activity 4

Swap jobs with your partner. Create a new sketch.

How to draw a polygon

Use the line segment tool to click and draw segments connected at the vertices.

1. Construct the following polygons:

- triangle
- quadrilateral
- pentagon
- hexagon
- heptagon
- octagon

2. Write the number of sides that make up each polygon.

- triangle _____
- quadrilateral _____
- pentagon _____
- hexagon _____
- heptagon _____
- octagon _____

Are all the sides of these polygons equal to each other? That will tell you if the polygon is regular or irregular - which is important to know!!

3. Classify your polygons as **regular** or **irregular**.

- triangle _____
- quadrilateral _____
- pentagon _____
- hexagon _____
- heptagon _____
- octagon _____

END OF ACTIVITY 4

Activity 5

Your turn.

Try to design activities to cover SOL 7.8 and 7.12.

7.8 The student, given appropriate dimensions, will estimate and find the area of polygons by subdividing them into rectangles and right angles.

7.12 The student will determine if geometric figures (quadrilaterals and triangles) are similar and write proportions to express the relationships between corresponding parts of similar figures.
