Geometer's Sketchpad Master Tips File

Sections: 2.2, 6.4, 9.1, 9.2, 10.1, 10.2, 11.1 and 11.2

to accompany the

Bennett-Burton-Nelson Math Investigation *Sketchpad* Files

GSP TIPS 2.2

Read about **Labels** in the GSP help file for tips on changing and formatting labels.

Selecting Objects in a GSP Sketch
Click on any single object to select a single object OR drag a bounding box around a group of objects to select the group of objects OR select one object at a time by holding down the **Shift** key as you click on each object you wish to select.

Hiding Objects in a GSP Sketch
1. Select the object(s) you wish to hide.

2. Use **Display > Hide Objects** (right click for a single object to hide the object(s).

   See the GSP Help File on Hide Objects.

Changing Colors in a GSP Sketch
Right click on any object and select **Color >** to change the color of the object (including labels).

Adding Text to a GSP Sketch
Select the big **A** in the left tool bar to start a text box. Double click where you wish to place the text and start typing.

You can select the text in your text box and adjust the font and style using the **Text Palette** tool bar at the bottom of the GSP sketch. Read about **Text** and the **Text Palette** in the GSP help file.

Select the arrow tool in the left tool bar and drag your text or labels when you wish to move them.

GSP Formatting for Printing
You can print any page in Geometer's Sketchpad by using the **File > Print** menu.

However, it is important to look first at **File > Print Preview** to see how your page will look.

Notice the "**Fit to Page**" and **Scale** buttons at the top of the **Print Preview**. Use these buttons to adjust the view to show your sketch and prevent your work from being split horizontally across two pages.

Geometer's Sketchpad is not a word processing program and it will not word wrap or add line returns for you.

When typing text and drawing pictures, work down (not over), this will create a sketch or page that is easier to print.

The pages in the Bennett-Burton-Nelson Math Investigation *Sketchpad* files are designed to print nicely using the **Fit to Page** option in **Print Preview**; however, as you work and add text and sketches, it is easy to alter the original set up. You can grab and move text boxes and sketches, and adjust the scale on the Print Preview to adjust your document for quality printing.

Creating New Pages in GSP
Our Sketchpad files have multiple pages, read about adding a new page under **Document Pages** in the GSP help file.

Copying into Word
You can select objects in GSP and copy them into a Word or Paint program. Read about **Copying and Pasting Graphics** in the GSP help file.

GSP TIPS 6.4

Copying Objects in a GSP Sketch
1. Select the object(s) you wish to copy.

2. Use **Edit > Copy** (or Ctrl C) to duplicate your selection.

3. Use **Edit > Paste** (or Ctrl V) to paste a copy of your selection in the work area.

4. Move your selection as needed and hide any objects that you do not wish to show.

Constructing an approximately Horizontal or Vertical Segment, Ray or Line
1. Choose the **Segment** (or other straightedge) tool on the left tool bar.

2. Click to locate the first endpoint of the segment, ray or line, hold the **Shift** key down and drag the segment right (or left) to create a horizontal line or up or down to create a vertical line. Don't let go of the **Shift** key until you have released the mouse.

Note that straight objects created in this fashion can be moved and won't stay horizontal or vertical.

Constructing a Right Triangle
You can draw a vertical line segment at either end of the horizontal line segment by holding down the **Shift** key and dragging the mouse up; HOWEVER, this will not assure a perpendicular relationship between the two line segments as you can move all of the segment endpoints.

1. Select the horizontal segment and the right endpoint (but not the left endpoint). Use **Construct > Perpendicular Line** to construct a perpendicular line. The perpendicular line will be highlighted.

2. Use **Construct > Point on Object** to create a new point on the perpendicular line. Move the point if needed.

3. Select this new point and the original right endpoint on the line segment and use **Construct > Segment** to create a (perpendicular) line segment. Hide the perpendicular line.

4. Select the endpoints and use **Construct > Segment** to create the third line segment to complete the right triangle.

Note: All three endpoints of the triangle may be moved and will change the triangle. Grab a line segment edge to move the entire triangle on the workspace.

Constructing a Fixed Square on a Line Segment
To create a square with sides that are fixed in length, start with a *fixed length line segment*. Drop a point, select he point and use **Transform > Translate** to move the point (select the *Rectangular Translation Vector* in the translate pop up menu). Connect the two points with a line segment to finish creating your fixed length line segment.

1. Start with a line segment that you wish to be one of the edges of your square. Double click on either endpoint. A "target" animation will show indicating the point is selected as the **Center of Rotation.**

2. Select the segment and the other endpoint (the first endpoint is not needed).

3. Use **Transform > Rotate** to open the *Degree* box. By default, this is usually set at 90 degrees. If not, for a square, set it at 90 degrees. Before hitting OK, look at the sketch. Is the line segment in the correct spot? If not you may need to adjust the degree measure to -90 degrees. After rotating the first line segment, reselect the **Center of Rotation** and rotate the next line segment.

Constructing a Flexible Square on a Line Segment
Follow Steps 1 - 3 in the previous construction, but start with a general line segment drawn using the **Segment Tool** in the left tool bar.

Constructing a Fixed Regular N-Gon on a Line Segment
To create a regular n-gon with sides that are fixed in length, start with a fixed length line segment. Drop a point, select the point and use **Transform > Translate** to move the point (use the *Rectangular Translation Vector*). Connect the two points with a line segment to finish creating your fixed length line segment.

Start with a line segment that you wish to be one of the edges of your n-gon. Follow the directions for creating a square, but instead of rotating the segment 90 degrees, rotate the segment by the vertex angle measure of the regular n-gon you wish to construct.

Constructing a Flexible N-gon on a Line Segment
Follow the steps in the previous construction, but start with a general line segment drawn using the **Segment Tool** in the left tool bar.

Constructing a Flexible Regular N-Gon on a Circle
1. Draw a circle with the circle tool.

2. Mark the center of the circle as the *Center of Rotation* by double clicking on it (a "target" will show).

3. Select a point on the circle and rotate it by 360/n degrees using **Transform > Rotate**. Repeat until all *n* vertices are drawn.

4. Hide the circle and use line segments to complete the regular n-gon. All of the vertices and the center of the polygon can be used to flex the polygon.

Constructing the Interior of a Polygon.
Click on the vertices of the polygon, in order, while holding down the **Shift** key and then use **Construct > Polygon Interior** to create the interior region. If you select three points the menu will say "*Triangle Interior*," four points "*Quadrilateral Interior*," etc.

GSP TIPS 9.1

Measuring in GSP
Read about **Measurement** in the GSP help file

LENGTH
To measure the length of a line segment, you have two options. ONE--you may select the line segment and use **Measure > Length**. TWO--you may select both endpoints of the line segment and use **Measure > Distance**

ANGLES
Select the three vertices of the angle, in order, and then use **Measure > Angle**.

AREA
To measure area, you must first create the interior region of an object. For example, if you have triangle composed of three line segments and you select the three vertices; the **Measure** menu will only let you measure the **Angle**. If you select the three line segments, you can only measure **Length** and if you select all three segments and all three vertices, you will not be able to measure anything. To measure the area of the triangle, first select the three vertices of the triangle and construct the triangle interior (**Construct > Triangle Interior**), next select the triangle interior and finally use **Measure > Area**.

Using the GSP Calculator
Read about **Calculations** in the GSP help file

GSP will store measurements for you and you can use them in the GSP calculator. To use this feature, first use the **Measure** menu to compute some measurements, next select the measurements and finally open the calculator using **Measure > Calculate**. Use the drop down menu "**Values**" on the calculator to access the measurements you have selected.

GSP TIPS 9.2

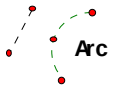
Adding Points to Objects
Select any object or set of objects and use **Construct > Points on Object** to add a point at a time to the selected object or objects. These points will be moveable.

Circles
Read about **Circles** in the GSP help file. When you draw a circle with the circle tool, it will always show both a moveable center and a moveable point on the circle. To define a circle with a specific radius, drop a point with the point tool and use **Transform > Translate** (select the *Rectangular Translation Vector*) to move the point the desired radius length horizontally (and 0 cm vertically). Select both points and use **Construct > Circle by Center + Point** This will create a circle with a fixed center and a fixed point on the circle. To create other fixed points on the circle, select the center of the circle as the center of rotation and rotate the point on the circle. To create moveable points on the circle, select the circle and add a point to the circle.

GSP TIPS 10.1

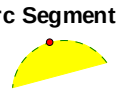
Setting Decimal Places of Accuracy for Computations
Use the **Edit > Preferences** menu to set units (cm or in) and decimal places of accuracy.

Constructing Arcs and Arc Interiors
To construct an arc, or an arc on a circle, you need three points.



To create the arc; select the three points and use **Construct > Arc Through 3 points**.

To create the arc interior, select the arc and use **Construct > Arc Interior > Segment** to create the arc segment.



Use **Construct > Arc Interior > Sector** to create the arc sector.

GSP TIPS 10.2

Constructing Flexible Rectangles, Kites, Parallelograms and Trapezoids

RECTANGLE
1. Use the **Line** tool in the left toolbar and create a line.

2. Select the line and a point on the line and use **Construct > Perpendicular Line** to create a perpendicular line.

3. Keep adding points (if necessary) and constructing perpendicular lines until you have two sets of two parallel lines intersecting at right angles. Mark all four intersections, hide the lines and use line segments to complete the rectangle.

KITE

1. Use the **Line** tool in the left toolbar and create a line.

2. Select the line and a point and use **Construct > Perpendicular Line** to create a perpendicular line.

3. Use **Construct > Point on Line** to create a point on the perpendicular line. Mark the original line as the mirror (line of reflection) by double clicking on the line. Select the point (on the perpendicular line) and use **Transform > Reflect** to mirror the point across the vertical line.

4. Add another point (move it to the opposite side of the perpendicular line if needed) on the original line.

5. Hide the original line, the perpendicular line and the point of intersection. Use the four vertices to create the line segments to complete the kite.

PARALLELOGRAM

1. Repeat Steps 1 - 3 for the **Kite** construction.

2. Repeat Step 3 from the **Kite** construction, but mark the perpendicular line as the mirror and reflect the point that is not the intersection point on the original line across the perpendicular line.

3. Hide the original line, the perpendicular line and the point of intersection. Use the four vertices to create the line segments to complete the parallelogram.

TRAPEZOID

1. Use the **Line** tool in the left toolbar and create a line.

2. Use the **Point** tool in the left toolbar and create a point that is not on the line you just drew.

3. Select the line and the point and use **Construct > Parallel Line** to create a pair of parallel lines.

4. Use **Construct > Point on Line** to create a point on the second (parallel) line. Both lines should now have two points on each of them. If not, add the points.

5. Hide the original pair of parallel lines. Use the four vertices to create the line segments to complete the trapezoid.

GSP TIPS FOR 11.1

Perpendicular Bisectors

1. Select a segment and use **Construct > Midpoint** to bisect the line segment.

2. Select the point and the segment and use **Construct > Perpendicular Line** to construct a perpendicular line through the center of the line segment.

3. (If you wish to construct a perpendicular bisector in a triangle or other polygon) Select the perpendicular line and the other side of the triangle or polygon it passes though. Use **Construct > Intersection** to create the intersection of the perpendicular line and the other side of the polygon. Hide the perpendicular line and use **Construct > Segment** to connect the two points you have formed.

Altitudes of Triangles
An altitude in a triangle is the line through a vertex that is perpendicular to the opposite side of the triangle.

1. Select a side of a triangle and the vertex opposite the side. Use **Construct > Perpendicular Line** to create the perpendicular line.

2. (If you wish to construct only the perpendicular altitude segment for the triangle) Select the perpendicular line and the side of the triangle it passes though. Use **Construct > Intersection** to create the intersection of the perpendicular line and the side of the triangle. Hide the perpendicular line and use **Construct > Segment** to connect the vertex and the intersection points.

GSP TIPS FOR 11.2

All the tips needed for 11.2 are contained in the tips for 2.2 - 11.1

Read about **Color** under **Tips 2.2**

Read about **Rotation** under **Constructing a Fixed Square on a Line Segment** in **Tips 6.4**

Read about **Constructing the Interior of a Polygon** under **Tips 6.4**
