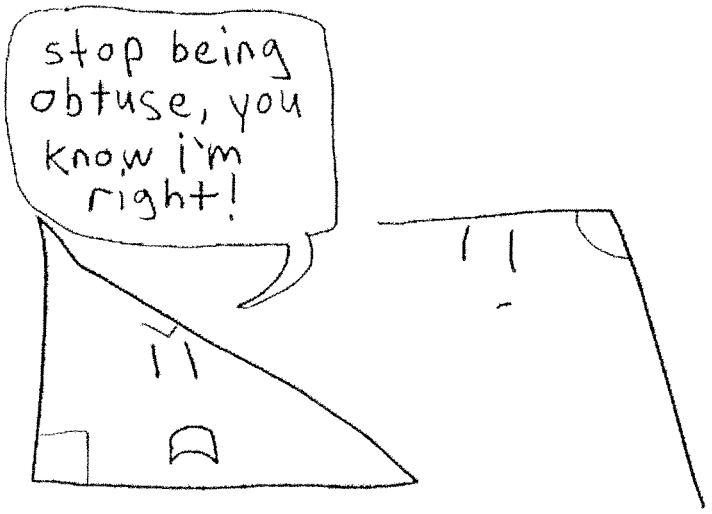
Name: _____ Date: _____ Hour: _____

Unit G
Constructions
(Geometer's Sketchpad)



Name: _____

Constructions Unit - Geometer's Sketchpad

Directions: Use the steps to construct the following figures using Geometer's Sketchpad. Do not move on until your teacher has initialed the previous construction.

#1: Copy a segment

1) *Construct* $\overline{AB}$. This is your given segment.
2) *Construct* point C not on $\overline{AB}$. This is one endpoint of your new segment.
3) Select $\overline{AB}$ and C and choose *Circle By Center+Radius* in the *Construct* Menu.
4) Construct $\overline{CD}$, where D is on the circle.
5) Hide the circle

Teacher's Initials _____

Investigate

Move points C and D. Do they behave as you would expect them to? Move point A or B. What effect does changing the length of $\overline{AB}$ have on $\overline{CD}$?

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#2: Construct a line parallel to a given line through a point not on the line

1) *Construct* $\overleftrightarrow{AB}$ and point C, not on $\overleftrightarrow{AB}$.
2) *Select* $\overleftrightarrow{AB}$ and point C, and *construct* a parallel line.

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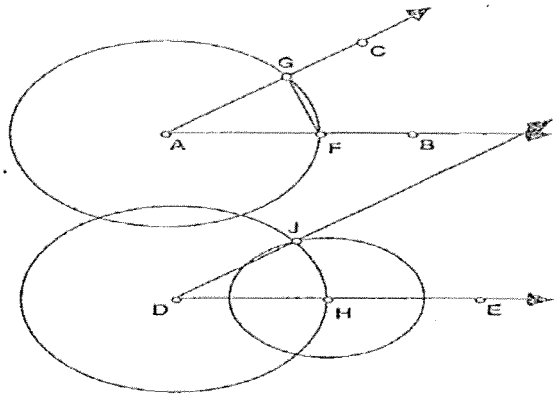
#3: Copy an angle



1) Construct rays $\overrightarrow{AB}$ and $\overrightarrow{AC}$. This is your given angle.
2) Construct $\overrightarrow{DE}$. This is one side of a new angle.
3) Construct point F on $\overrightarrow{AB}$. Then construct segment $\overline{AF}$
4) Construct circle AF by selecting point A and segment $\overline{AF}$, and then choosing *Circle by Center+Radius* from the *Construct* menu.
5) Construct $\overline{FG}$, where G is the point of intersection of the circle and $\overrightarrow{AC}$.
6) Construct a circle with center D and radius AF.
7) Construct H, the point of intersection of this circle with $\overrightarrow{DE}$.
8) Construct a circle with center H and radius FG.
9) Construct $\overrightarrow{DJ}$, where J is the point of intersection of these two circles.

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Investigate

Move points A, B, C, D, or E. Do the angles remain congruent? When you drag J, why doesn't $\angle JDH$ change?

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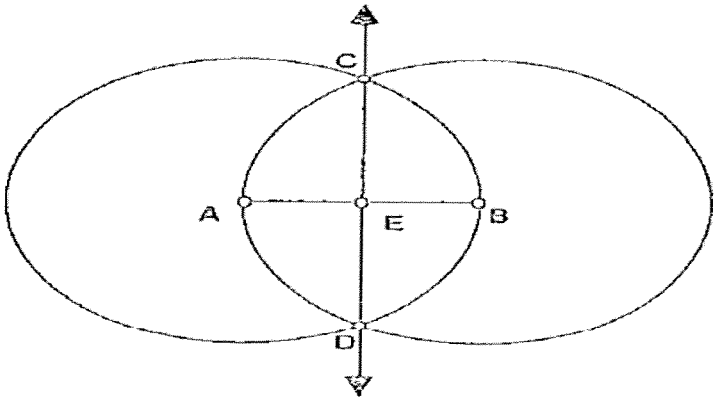
#4: Constructing perpendicular lines & the bisector of a segment

1) Construct segment $\overline{AB}$.
2) Select $\overline{AB}$ and A and choose *Circle By Center+Radius* in the *Construct* Menu.
3) Select $\overline{AB}$ and B and choose *Circle By Center+Radius* in the *Construct* Menu.
4) Construct $\overleftrightarrow{CD}$, where C and D are the points of intersection of the circles.
5) Construct E, the point of intersection of $\overline{AB}$ and $\overline{CD}$.
6) Hide the circles.



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Investigate

$\overleftrightarrow{CD}$ is the perpendicular bisector of $\overline{AB}$. Move points A and B. What's special about point E?

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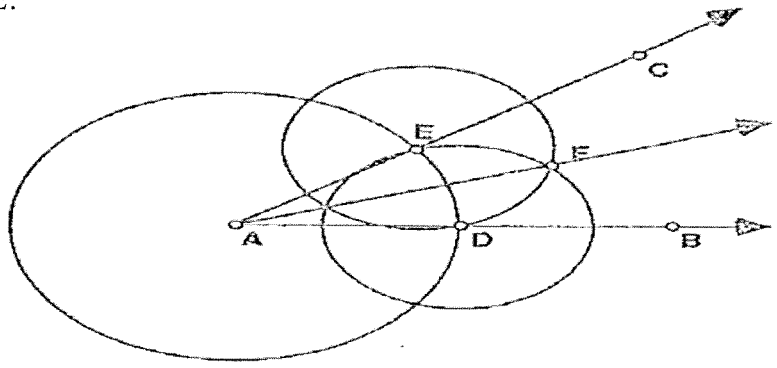
#5: Bisect an angle

1) *Construct* rays $\overrightarrow{AB}$ and $\overrightarrow{AC}$.
2) *Construct* point D, a point on $\overrightarrow{AB}$.
3) *Construct* circle AD by selecting points A and D (in that order) and choosing *Circle By Center+Point* in the *Construct* Menu.
4) *Construct* point E at the intersection of $\overrightarrow{AC}$ and the circle created above.
5) *Construct* circles DE and ED. *(Hint: Refer to step 3 above!)*
6) *Construct* $\overrightarrow{AF}$, where F is the intersection of circles DE and ED that is farthest from A.
7) Hide the circles and points D and E.



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Investigate

Drag point B or C. Does $\overrightarrow{AF}$ continue to bisect the angle?

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#6: Construct a square inscribed in a circle

1) *Construct* circle AB.
2) *Construct* line $\overleftrightarrow{AB}$.
3) Select point A and $\overleftrightarrow{AB}$, then *construct* a perpendicular line.
4) Label the points where the lines meet the circle C, D, and E.
5) Construct line segments $\overline{BC}$, $\overline{CD}$, $\overline{DE}$ and $\overline{EB}$.
6) Hide the circle and the perpendicular lines.

Teacher's Initials _____

Investigate
Drag point B. What happens to the rest of the square? Do the properties of a square remain true?

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#7: Construct the circumscribed circles of a triangle

1) *Construct* a triangle and label the vertices A, B, and C.
2) Select points A and B, then *construct* midpoint.
3) Repeat step 2 for the other two sides of the triangle.
4) *Label* the midpoints D, E, and F.
5) *Construct* lines perpendicular to each side of the triangle through their midpoint.
6) *Label* the point of intersection of the three lines G. *(Hint: Select two of the lines, then choose Intersection from the Construct menu)*
7) Construct circle GA using *Circle By Center+Point* in the *Construct* Menu.
8) Construct circle GB using *Circle By Center+Point* in the *Construct* Menu.
9) Construct circle GC using *Circle By Center+Point* in the *Construct* Menu.

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Investigate
What do you notice about the circles created in steps 7 through 9? What would happen if your triangle was equilateral?

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#8: Construct an equilateral triangle inscribed in a circle

1) *Construct* a circle.
2) *Construct* a segment from the center to a point on the circle to represent the radius.
3) With the selection tool, highlight the radius and the point of intersection with the circle. Then DOUBLE CLICK the center of the circle. There should be a flash of circles around the center.
4) From the menu bar, select the ***Transform*** option and choose ***Rotate***.
5) Enter 120 degrees in the box for the rotation. This will create another segment, 120 degrees around the circle.
6) Highlight the new segment as done in step 3, and repeat the procedure.
7) Connect the three points on the circle with segments.
8) Hide the circle.

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Investigate
Why does rotating the segments work? Can this process be replicated to create other regular polygons?

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#9: Construct a regular hexagon inscribed in a circle

1) *Construct* a circle.
2) *Construct* a segment from the center to a point on the circle to represent the radius.
3) With the selection tool, highlight the radius and the point of intersection with the circle. Then DOUBLE CLICK the center of the circle. There should be a flash of circles around the center.
4) From the menu bar, select the ***Transform*** option and choose ***Rotate***.
5) Enter 60 degrees in the box for the rotation. This will create another segment, 60 degrees around the circle.
6) Highlight the new segment as done in step 3, and repeat the procedure until you have created six points on the circle.
7) Connect the six points on the circle with segments.
8) Hide the circle.

Teacher's Initials _____

Investigate

Why did rotating 60 degrees work in making a regular hexagon?

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#10: Construct the inscribed circle in a triangle

1) *Construct* a triangle. Name it ABC
2) *Construct* the bisector of $\angle B$ by selecting points A, B and C (in that order) and choosing *Angle Bisector* from the construct menu.
3) Repeat steps 2 and 3 for $\angle A$.
4) Label the point of intersection D.
5) Construct the bisector of $\angle C$ using the same procedure as above.
6) Label the point where the line from step 6 meets the opposite side. Call it E.
7) Construct circle DE.

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Investigate
What do you notice about the inscribed circle? What happens when you move one of the vertices of the original triangle?

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