## Lesson 1.09 Constructions (Triangles & Angle Bisectors)

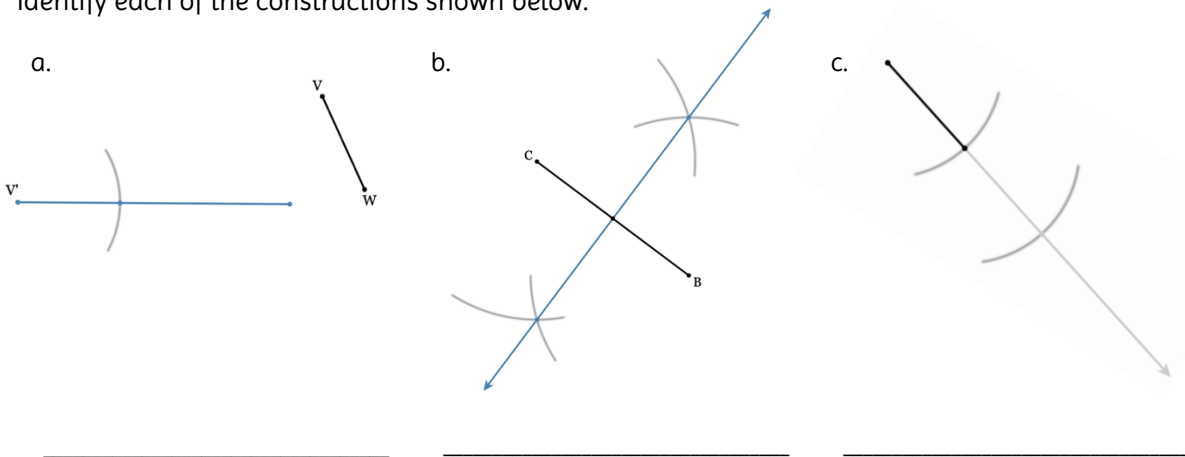Students will be able to:

- ▪ <u>Content Objective:</u> Construct a triangle given side lengths and an equilateral triangle.  Also, students will construct an angle bisector.

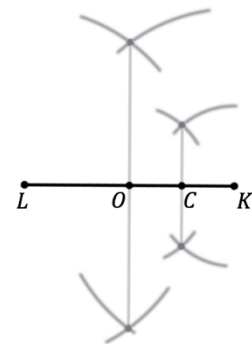- ▪ <u>Language Objective</u>: Read and understand the steps for constructing congruent segments and angle bisectors.

### Warm Up

1. Identify each of the constructions shown below.

a.

b.

c.



_____     _____     _____

2. Gordon constructed the following below.  If the lengths of $OC = 3x + 1$ and $CK = x + 4$, solve for the length of $\overline{LO}$.
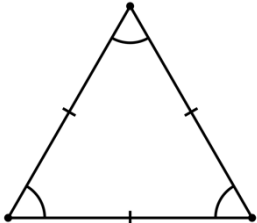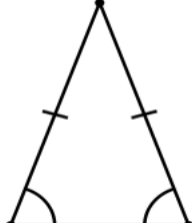


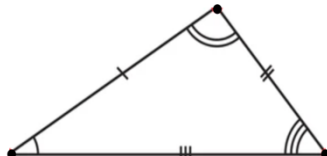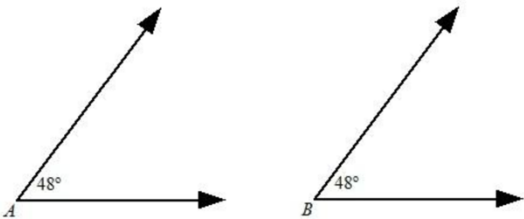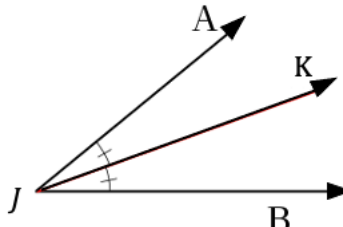### Vocabulary Review

Identify whether each statement below is true or false by writing "T" for true and "F" for false.

1. _____To construct the midpoint of a line segment, place the compass on one endpoint and extend the radius less than half the length of the segment.

2. _____The construction used to identify the perpendicular bisector and midpoint are the same.

3. _____ To copy a segment, first you construct a segment longer than the one you are trying to copy.

4. _____ Pen is the best writing utensil to use for constructions.

5. _____ It's OK for the radius on the compass to move or slide while constructing an arc.

## Graphic Organizer

| Equilateral Triangle | Isosceles Triangle | Scalene Triangle |
|---|---|---|
| A triangle with three congruent or equal sides and angles | A triangle with at least two congruent or equal sides and base angles. | A triangle with no congruent sides or angles. |

### Congruent Angles

Angles that are equal in measure.

$48°$

$48°$

### Angle Bisector

A segment, ray, or line that divides an angle into two congruent or equal angles.

- $\overrightarrow{JK}$ is the angle bisector of $\angle AJB$.

- $\angle AJK \cong \angle BJK$

### Constructing Equilateral Triangles

1. Given a line segment, place the center of the compass on one endpoint and measure the length of the segment with the radius.

2. Construct a circle.

3. Without adjusting the compass, construct a congruent circle at the other endpoint.

4. Mark one of the intersection points of the circle and connect each point to form an equilateral triangle.
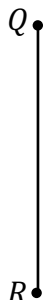
## Skill 1: Constructing Equilateral Triangles

Given $\overline{AB}$ below, construct $\Delta ABC$ such that $\overline{AB} \cong \overline{BC} \cong \overline{AC}$.  Leave all construction marks.

$A$ ———————— $B$

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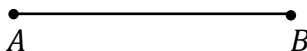
## Exercise 1: Constructing Equilateral Triangles

Given $\overline{QR}$ below, construct $\Delta QRZ$ such that $\angle Q \cong \angle R \cong \angle Z$.  Leave all construction marks.

$Q$

$R$

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### Constructing Triangles Given Lengths

1. Given three line segments, using a compass, copy the first segment and be sure to label endpoints.

2. Copy the second segment using one of the endpoints of the first segment you have already constructed.   Make sure you create an arc either above the segment or below the segment.

3. Copy the third segment using the other endpoint of the first segment you copied. Construct an arc so that it intersects the arc you created in step 2.

4. Connect all three points to form a triangle.

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## Skill 2: Constructing Triangles Given Lengths

Construct $\Delta XYZ$, such that the lengths of the sides are congruent to the three segments shown below.

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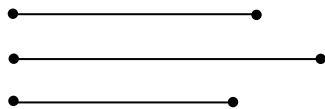
Exercise 2: Constructing Triangles Given Lengths

Construct $\Delta XYZ$, such that the lengths of the sides are congruent to the three segments shown below.



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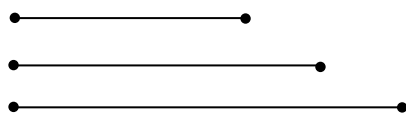
**Constructing Angle Bisector**

1. Place your compass on the vertex of the angle you want to bisect.

2. Stretch the radius of the compass and make an arc so that it intersects both rays of the angle. Label these intersection points.

3. Without adjusting your compass, place the center at one of the intersection points and make an arc inside the angle.

4. Repeat step 3 at the other intersection point and mark the intersection point that the two arcs make inside the angle.

5. Draw a ray from the vertex of the angle through the intersection point found in step 4. This is called the angle bisector.
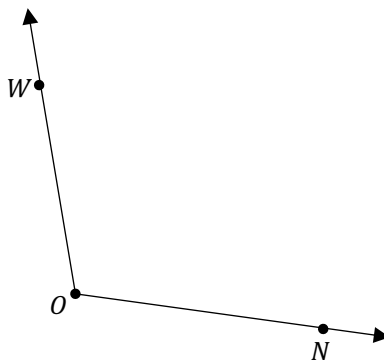
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Skill 3: Constructing Angle Bisector

Given angle $RUN$ shown below, construct $\overrightarrow{UP}$, the angle bisector of $\angle RUN$.

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math instruction
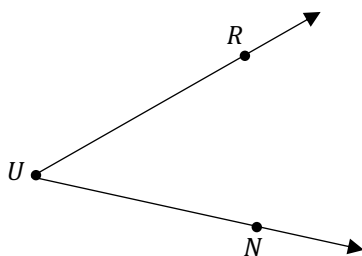
**Exercise 3: Constructing Angle Bisector**

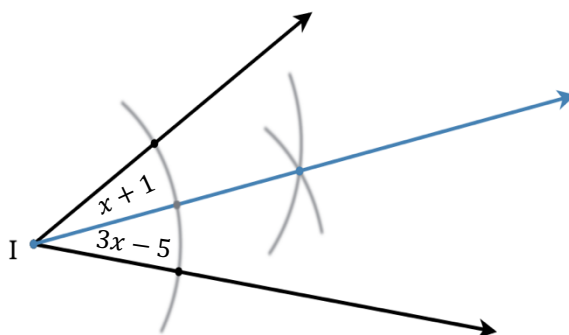Use the angle shown below to complete the following.



a.   Name the angle shown.

b.   Construct the angle bisector and label it $\overrightarrow{OT}$.  Be sure to leave all construction marks

**Check Point**

Based on the construction shown below, solve for the value of $x$. Diagram is not drawn to scale.
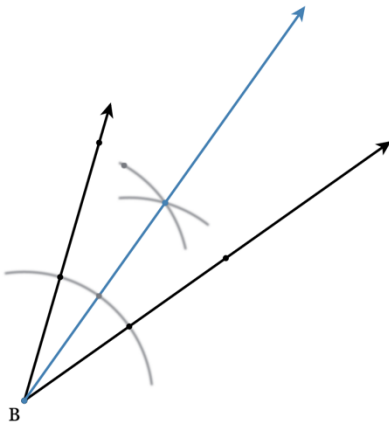


$x + 1$

$3x - 5$

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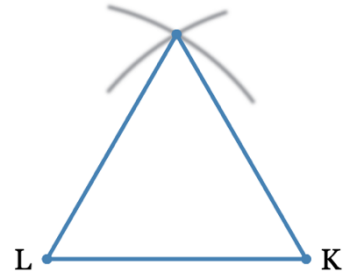
**1.09- Problem Set**

Name: _____

1. Identify the construction shown in each example below.

   a.

   

   b.
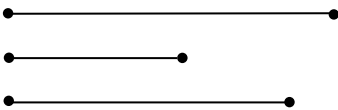
   

   _____          _____

2. Using the three line segments shown below, use a compass and straight edge to construct a triangle. Be sure to leave all construction marks

   

3. Using a compass and straight edge, construct $\overrightarrow{AT}$, the angle bisector of $\angle BAC$ shown below, then write a congruence statement. Be sure to leave all construction marks.