3.1 Using a Compass and Straightedge to duplicate. CONSTRUCTING

http://www.mathopenref.com/

**Compass** is used for:  
- a) Creating Circles.  
- b) Copying a length.

![Compass Diagram](image)

**Straight edge** is used for drawing a line only!!!!!

CONSTRUCT---No measurements are used. You may only use a compass, or straightedge.

Given the following segments:

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A                      B

C                D

E ·                      F
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1. Copy the segment AB.

2. Construct segment $AD$ with $AD = (AB + CD)$.

3. Construct segment 2CD


5. Construct segment ET with ET= 2CD+AB
1. Duplicate $\angle B$.

2. Duplicate $\angle C$

3. Duplicate $\angle P$

4. Construct an equilateral triangle using the segment below as the base.
3.2 Perpendicular bisector. Creates a perpendicular line and finds the midpoint of a line segment.

Our goal is to draw a perpendicular bisector on the line below

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Step 1:

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Step 2:

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Step 3:
1. Construct the perpendicular bisector for the following segments.

2. Cut the following segment into four equal parts.

3. Given:

4. Create the line segment $EQ = \frac{2}{2}CD - \frac{1}{2}AB$

5. Make a triangle ABC and construct medians $\overline{AM}, \overline{BN}, and \overline{CP}$. 
3.3 Using the perpendicular bisector to find distance.

The **DISTANCE FROM A POINT TO A LINE** is the length of the perpendicular segment from the point to the line.

Here is how to construct a line segment through a point and perpendicular to a line:

Now try it again.

Point P is closer to which ray?
**Altitude** is the height of a triangle. The distance from the base to the remaining vertice.

Acute triangle  
Obtuse triangle  
Right triangle

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**Constructing the altitude.**

**Step 1:**

**Step 2:**

Let's do it together:

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Know you try:
1. Construct altitude $sAD$.

2. Construct the altitude $sBE$ (hint: From B to the side opposite)

3. Draw an obtuse triangle $\Delta OBT$ with obtuse angle B. Then construct the altitude $sOE$.

4. Construct a right triangle $\Delta RIG$.

5. Draw a triangle ABC and then construct Altitude BH.
3.4 Using the perpendicular bisector to construct angle bisectors.

Step 1:

Step 2:

Construct the Angle Bisector of \( \angle K \)

1. Bisect \( \angle B \).

2. Bisect \( \angle C \).

3. Bisect \( \angle P \).

4. Construct an equilateral triangle using the segment below as the base.
   What is the measure of each interior angle?
   Bisect one of the angles. What is the measure of that angle?

\[ \text{measure of each interior angle: } 60^\circ \]
Constructing Right angles and 45 degree angles review:

2. Construct angles of measure $90^\circ$, $60^\circ$, $30^\circ$, $45^\circ$, $15^\circ$, $120^\circ$. Work together.
3.5 Constructing parallel lines.

Distance is measured along a perpendicular line.
The distance between two parallel lines is constant.

6. Construct line $PQ \parallel \text{ line } RS$.

7. Construct two perpendicular lines and two parallel lines.

7. Construct Trapezoid ABCD where line $AD \parallel \text{ line } BC$ and $AB \cong CD$.
3.6 Construction problems------Review.

1. Duplicate $\angle B$.

2. Construct the perpendicular bisector of $AB$.

3. Copy the line segment above.

4. Construct triangle ABC using the segments.
   
   A _________________  B

   A _________________  C

   B _________________  C
5. Construct $\triangle PQR$ starting with the point $P$ and the unfinished line segment.

6. Construct an isosceles triangle with congruent sides of $mAB$ and base of $1/2mAB$.

7. Construct a Rhombus.
3.7 Points of Concurrency

Concurrent lines – Lines that share the same point of intersection

1. Construct the incenter and the inscribed circle using angle bisectors.

2. Construct the circumcenter and the circumscribed circle using perpendicular bisectors for each side.

3. Construct the orthocenter using the altitude.
5. Jim is surrounded by three freeways as shown below. He wants his house to be of equal distance to all three freeways. Find the perfect location for his house.

7. Jim realizes that the only on ramps are at the intersection points of the freeway. He wants his house to be of equal distance to all three freeway intersections. Find the perfect location for his house.

3.8 The Centroid (center of mass is found by constructing the three medians)
1. Construct the Centroid using the medians.

The centroid of a triangle divides each median into two parts so that the distance from the centroid to the vertex is **twice** the distance from the centroid to the midpoint.

1. JS=7
   SA=
   SP=3, SR=
   SM=10, HS=
   JM=5, RJ=

2. S is the centroid.
   All measurements are in centimeters.
   SP = 6
   SM = SR + 6
   HS =