

Constructions: Honors Geometry

INSTRUCTIONS FOR CONSTRUCTIONS.
NOT TO LEAVE THE TABLE.

TABLE _____

1) Copy a Line Segment:

Given: (Line Segment) AB

Task: To construct a line segment congruent to (line segment) AB

Directions:

- 1) If a reference line does not already exist, draw a reference line with your straightedge upon which you will make your construction. Place a starting point on the reference line.
- 2) Place the point of the compass on point A.
- 3) Stretch the compass so the pencil is exactly on B.
- 4) Without changing the span of the compass, place the compass point on the starting point on the reference line and swing the pencil so that it crosses the reference line. Label your copy.

Your copy and (line segment) AB are congruent, or equal in length.

2) Copy an Angle:

Given: $\angle BAC$

Task: To construct an angle congruent to $\angle BAC$.

Directions:

- 1) If a reference line does not already exist, draw a reference line with your straightedge upon which you will make your construction. Place a starting point on the reference line.
- 2) Place the point of the compass on the vertex of $\angle BAC$ (point A).
- 3) Stretch the compass to any length so long as it stays ON the angle.
- 4) Swing an arc with the pencil that crosses both sides of $\angle BAC$.
- 5) Without changing the span of the compass, place the compass point on the starting point of the reference line and swing an arc that will intersect the reference line and go above the reference line.
- 6) Go back to $\angle BAC$ and measure the width (span) of the arc from where it crosses one side of the angle to where it crosses the other side of the angle.
- 7) With this width, place the compass point on the reference line where your new arc crosses the reference line and mark off the width on your new arc.
- 8) Connect this new intersection point to the starting point on the reference line.
- 9) Your new angle is congruent to $\angle BAC$.

3) Bisect a Line Segment:

Given: (Line Segment) AB

Task: Bisect AB

Directions:

- 1) Place your compass point on A and stretch the compass MORE THAN half way to point B, but not beyond B.

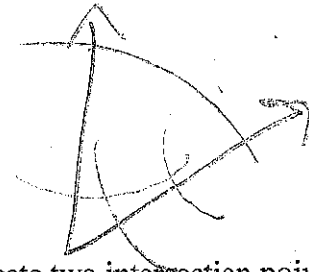
- 2) With this length, swing a large arc that will go BOTH above and below AB.
- 3) Without changing the span on the compass, place the compass point on B and swing the arc again. The two arcs you created should intersect.
- 4) With your straightedge, connect the two points of intersection.
- 5) This new straight line bisects AB. Label the point where the new line and AB cross as C.

AB has now been bisected and $AC = CB$. (It could also be said that the segments are congruent, $AC = CB$.)

4) Bisect an Angle:

Given: $\angle BAC$

Task: Bisect $\angle BAC$



Directions:

- 1) Place the point of the compass on the vertex of $\angle BAC$ (point A).
- 2) Stretch the compass to any length so long as it stays ON the angle.
- 3) Swing an arc so the pencil crosses both sides of $\angle BAC$. This will create two intersection points with the sides (rays) of the angle.
- 4) Place the compass point on one of these new intersection points on the sides of $\angle BAC$.
- 5) Without changing the width of the compass, place the point of the compass on the other intersection point on the side of the angle and make the same arc. Your two small arcs in the interior of the angle should be crossing.
- 6) Connect the point where the two small arcs cross to the vertex A of the angle.

You have now created two new angles that are of equal measure (and are each $\frac{1}{2}$ the measure of $\angle BAC$).

5) Perpendicular Lines – from a point ON a line:

Given: Point P is on a given line

Task: Construct a line through P perpendicular to the given line.

Directions:

- 1) Place your compass point on P and sweep an arc of any size that crosses the line twice (below the line). You will be creating (at least) a semicircle.
- 2) Stretch the compass larger.
- 3) Place the compass point where the arc crossed the line on one side and make a small arc below the line.
- 4) Without changing the span on the compass, place the compass point where the arc crossed the line on the OTHER side and make another arc. Your two small arcs should be crossing.
- 5) With your straightedge, connect the intersection of the two small arcs to point P.

The new line is perpendicular to the given line.

6) Perpendicular Lines – from a point OFF a line:

Given: Point P is on a given line

Task: Construct a line through P perpendicular to the given line.

Directions:

- 1) Place your compass point on P and sweep an arc of any size that crosses the line twice.

- 2) Place the compass point where the arc crossed the line on one side and make an arc ON THE OPPOSITE SIDE OF THE LINE.
- 3) Without changing the span of the compass, place the compass point where the arc crossed the line on the OTHER side and make another arc. Your two new arcs should be crossing on the opposite side of the line.
- 4) With your straightedge, connect the intersection of the two new arcs to point P.

This new line is perpendicular to the given line.

7) Parallel Lines:

Given: Point P is off a given line

Task: Construct a line through P parallel to the given line.

Directions:

- 1) With your straightedge, draw a transversal through point P. This is simply a straight line which runs through P and intersects the given line.
- 2) Using your knowledge of the construction COPY AN ANGLE, construct a copy of the angle formed by the transversal and the given line such that the copy is located UP at point P. The vertex of your copied angle will be point P.
- 3) When the copy of the angle is complete, you will have two parallel lines.

This new line is parallel to the given line.

8) Constructing an Isosceles Triangle:

When constructing an isosceles triangle, you may be given pre-determined segment lengths to use for the triangle (as in this example), or you may be allowed to determine your own segment lengths. Either way, the construction process is the same.

Given: Pre-determined length of legs and base, reference line.

Task: Construct an isosceles triangle.

Directions:

- 1) Using your compass measure the length of the given "base".
- 2) Do not change the size of the compass. Place your compass point on the reference line point and scribe a small arc which will cross the line.
- 3) Using your compass, measure the length of the given "leg". Place the compass point where the previous arc crosses the reference line and scribe another arc above the reference line.
- 4) Without changing the size of the compass, move the compass point to the point on the reference line. Scribe an arc above the line such that it intersects with the previous arc.
- 5) You now have three points which will define the isosceles triangle.

9) Construct an Equilateral Triangle:

When constructing an isosceles triangle, you may be given pre-determined segment lengths to use for the triangle (as in this example), or you may be allowed to determine your own segment lengths. Either way, the construction process is the same.

Given: Pre-determined length of a side and reference line.