

Geometric Construction

1. The set of points equidistant from the endpoints of a line segment is the _____ of the line segment.
2. By definition, the distance from a point to a line is always the _____ distance.
3. The set of points equidistant from the rays of an angle is the _____.

Basic Constructions

For each problem, start by drawing the given, then do the construction in GeoGebra.
The construction is not correct if you can ruin it by moving the given. Construct:

4. All points at a given distance from a given point. (The distance is the length of a given segment.)
5. All points equidistant from the endpoints of a given segment.
6. The distance from a given point to a given line.
7. All points equidistant from the sides of a given angle.
8. An equilateral triangle.
9. An isosceles triangle that is not equilateral.

Circles Through Points

10. Given a segment, construct a circle that has the segment as its diameter.
11. Given two points, construct three different circles that go through both.
Hint: first find where the centers should be located.
12. Given three points, construct a circle that goes through all three.
Hint: use what you learned in problem 11.

Tangent Circles

13. Given a line and a point not on it, construct a circle centered at the point and tangent to the line.
Hint: first find the point of tangency.
14. Given two lines, construct three different circles tangent to both.
Hint: use what you learned in problem 13.
15. Given a triangle, construct a circle tangent to all three sides.
Hint: use what you learned in problem 14.

Triangle Centers

Patty Paper

The *circumscribed circle* is the circle through the vertices of a triangle.

1. Using a straightedge, draw a large triangle on patty paper. Make the perpendicular bisectors of all three sides by folding. Their meeting point is called the *circumcenter*.
2. Using a compass, draw the circumscribed circle.

The *inscribed circle* is the circle tangent to the three sides of a triangle.

3. Using a straightedge, draw a large triangle on patty paper. Make the angle bisectors of all three angles by folding. Their meeting point is called the *incenter*.
4. Drop a perpendicular by folding, from P to one of the sides of the triangle.
5. Using a compass, draw the inscribed circle.

Patty Paper or GeoGebra

You can continue working with patty paper and compass, or switch to GeoGebra.

In a triangle, the line connecting a vertex to the midpoint of the opposite side is called a *median*.

6. Draw a large triangle and its medians. The medians of a triangle meet in a single point, called the *centroid* or center of gravity of the triangle.

In a triangle, the perpendicular to a side through the opposite vertex is called the *altitude*.

7. Draw a large triangle and its altitudes. The altitudes of a triangle meet in a single point, called the *orthocenter*.

GeoGebra

8. In GeoGebra, draw a large triangle. Construct all four centers, but hide all the construction lines. Which three centers are *always* collinear (on one line)?