

10.3 Other Constructions

Review the definition and properties of a rhombus:

1. A rhombus is a parallelogram in which all sides are congruent.
2. A quadrilateral in which all sides are congruent is a rhombus.
3. Each diagonal of a rhombus bisects the opposite angles.
4. The diagonals of a rhombus are perpendicular.
5. The diagonals of a rhombus bisect each other.

We are now going to use these facts in making several compass and straightedge constructions.

First: CONSTRUCTING PARALLEL LINES

- Construct a line through point P that is parallel to the given line:
Method 1 involves constructing a rhombus where P is a vertex, and one side of the rhombus lies on the given line.

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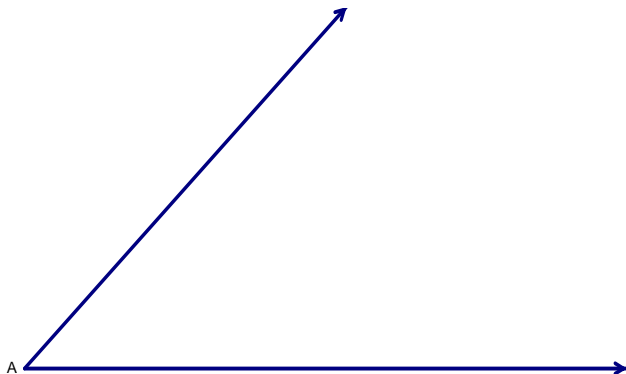
Method 2 involves constructing congruent corresponding angles along a line which intersects the given line and contains point P.

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Second: CONSTRUCTING AN ANGLE BISECTOR

- Construct the ray that is the bisector of $\angle A$:
This involves constructing a rhombus that has A as one of its vertices.



Third: CONSTRUCTING A PERPENDICULAR TO A LINE FROM A POINT NOT ON THE LINE

- Construct a perpendicular to line m through point P.
This involves constructing the diagonals of a rhombus that has point P as one of its vertices.

P •



Fourth: BISECTING A LINE SEGMENT

- Bisect \overline{AB} .
This involves constructing the perpendicular bisector of the segment. We will do this by constructing a rhombus which has \overline{AB} as one of its diagonals.



Fifth: CONSTRUCTING A PERPENDICULAR TO A GIVEN LINE FROM A POINT ON THE LINE

- Construct a perpendicular to line m through point P .

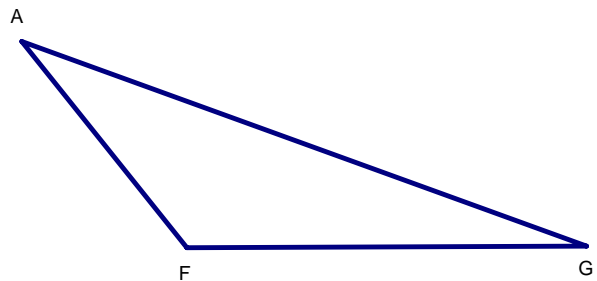
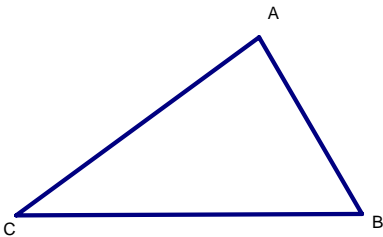
This involves constructing a rhombus whose diagonals intersect at P . We do this by constructing a segment on m whose midpoint is point P , and then constructing the perpendicular bisector of this segment.



Sixth: CONSTRUCTING ALTITUDES OF TRIANGLES

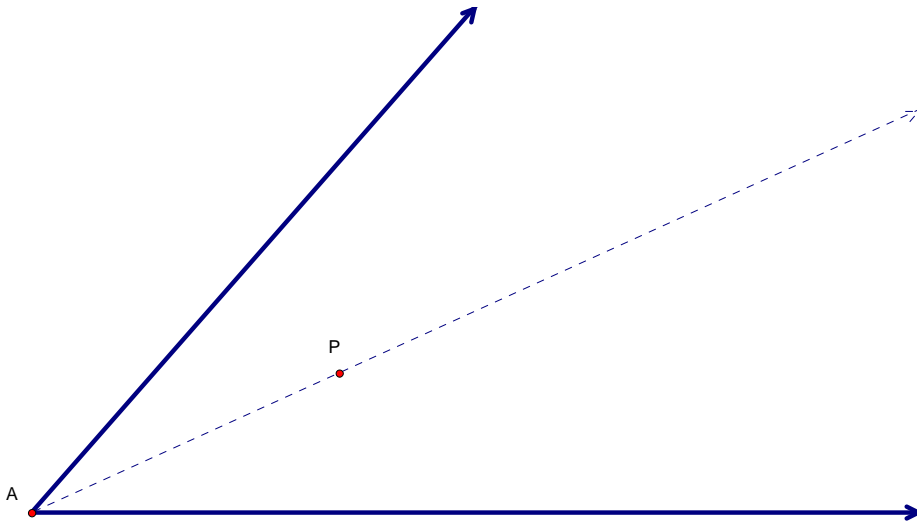
- Construct the altitude from vertex A in each of these triangles.

This construction is the same as constructing a perpendicular to a line from a point not on the line.



PROPERTIES OF ANGLE BISECTORS

Consider that \overrightarrow{AP} is the bisector of $\angle A$. If you constructed perpendiculars from point P to each side of $\angle A$, could you prove that point P is equidistant from those two rays? (The distance from a point to a line is the length of the perpendicular segment from the point to the line.)



We have just proven part a) of **Theorem 10-3**:

- a) Any point P on an angle bisector is equidistant from the sides of the angle.
- b) Any point that is equidistant from the sides of an angle is on the angle bisector of the angle.

Now let's try # 19 on page 678.

Lastly, we will use another technique, Paper Folding.

The construction we will do will be:

- 1) Constructing a line perpendicular to a given line.
- 2) Constructing an angle bisector.

