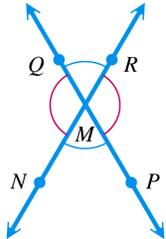# Section 1.2:  Angle Relationships and Similar Triangles
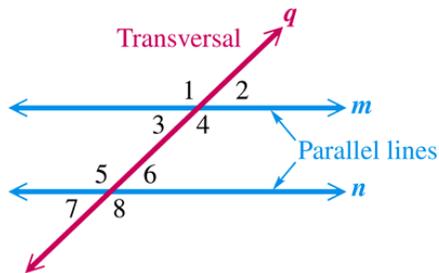
**Geometric Properties**

- **Vertical angles** have equal measures.

  For example, the pair of angles *NMP* and *RMQ* are vertical angles.

- **Parallel lines** are lines that lie in the same plane and do not intersect.

- When a line $q$ intersects two parallel lines, $q$ is called a **transversal.**

A **Chart of Properties** to know.

| Name | Sketch | Rule |
|:---:|:---:|:---:|
| **Alternate interior angles** |  (also 3 and 6) | Angle measures are equal. |
| **Alternate exterior angles** |  8   (also 2 and 7) | Angle measures are equal. |
| **Interior angles on same side of transversal** |  (also 3 and 5) | Angle measures add to 180°. |
| **Corresponding angles** |  (also 1 and 5, 3 and 7, 4 and 8) | Angle measures are equal. |

**Example 1:** Find the measures of angles 1, 2, 3, and 4 in the figure, given that lines *m* and *n* are parallel.
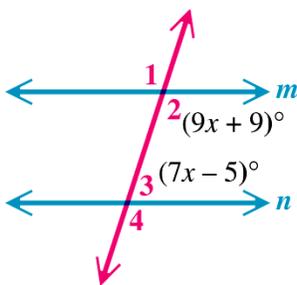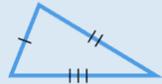
**Triangles**

- The **sum of the measures** of the angles of any triangle is 180°.

**Example 2:** The measures of two of the angles of a triangle are 33° and 26°. Find the measure of the third angle.

A Chart of the **Types of Triangles**

| Types of Triangles | | |
|---|---|---|
| | All acute | One right angle | One obtuse angle |
| Angles | Acute triangle | Right triangle | Obtuse triangle |

| Types of Triangles | | |
|---|---|---|
| | All sides equal | Two sides equal | No sides equal |
| Sides | Equilateral triangle | Isosceles triangle | Scalene triangle |

- **Similar triangles** are triangles of the same shape, but not the same size.

- Triangles that are both the same shape and size are called **congruent triangles**.

## Conditions for Similar Triangles

For triangle *ABC* to be **similar** to triangle *DEF*, the following **conditions** must hold.

1. Corresponding angles must have the same measure.

2. Corresponding sides must be proportional. (That is, the ratios of their corresponding sides must be equal.)

**Example 3 (Finding Angle Measure):** In the figure, triangles *DEF* and *GHI* are similar. Find the measures of angles *G* and *I*.
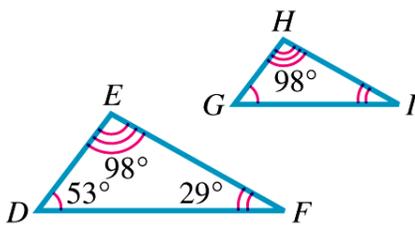
**Example 4 (Finding Side Lengths):** Given that triangle *MNP* and triangle *QSR* are similar, find the lengths of the unknown sides of triangle *QSR*.
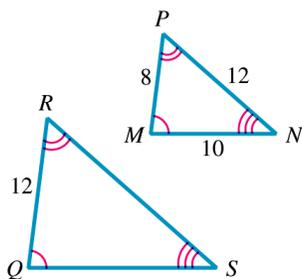


**Example 5 (Application):** Joey wants to know the height of a tree in a park near his home. The tree casts a 38-ft shadow at the same time that Joey, who is 63 in. tall, casts a 42-in. shadow. Find the height of the tree.



*Not to scale*