Warm Up

Solve each proportion.

1. $\frac{x}{22} = \frac{10}{4}$

2. $\frac{5}{23} = \frac{n}{5}$

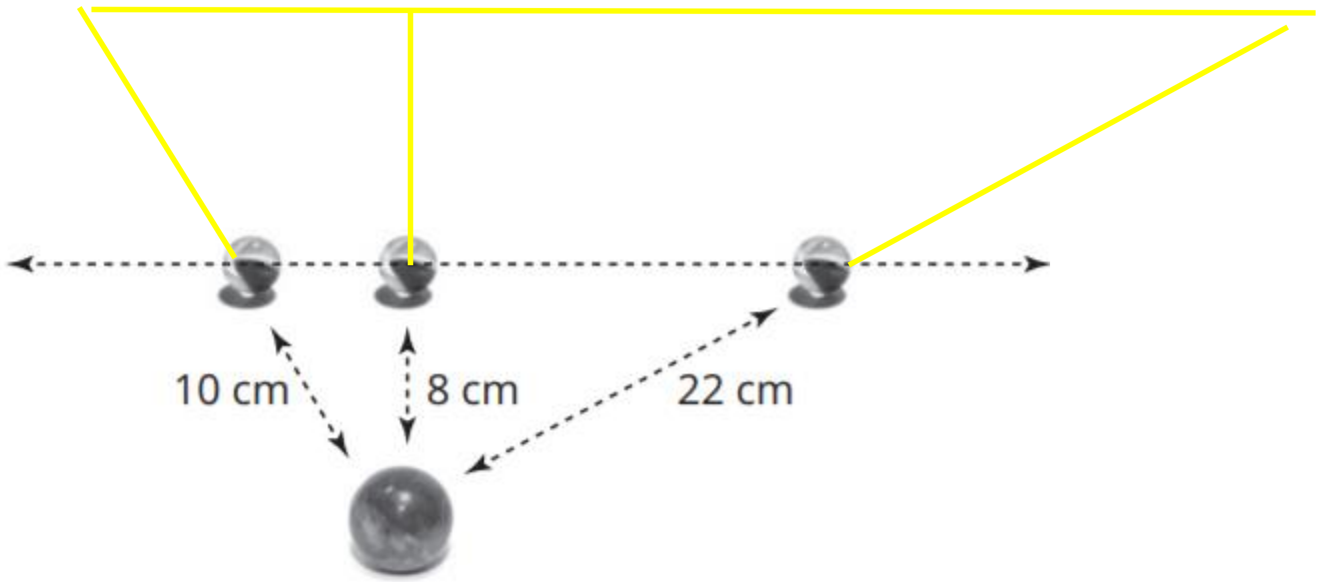
3. $\frac{16}{16} = \frac{8}{y}$

4. $\frac{22}{4} = \frac{p}{10}$

The game of marbles is played in a circle. The goal is to knock your opponents marbles outside of the circle by flicking a shooter marble at the other marbles in the circle. The shooter marble is often larger than the other marbles.

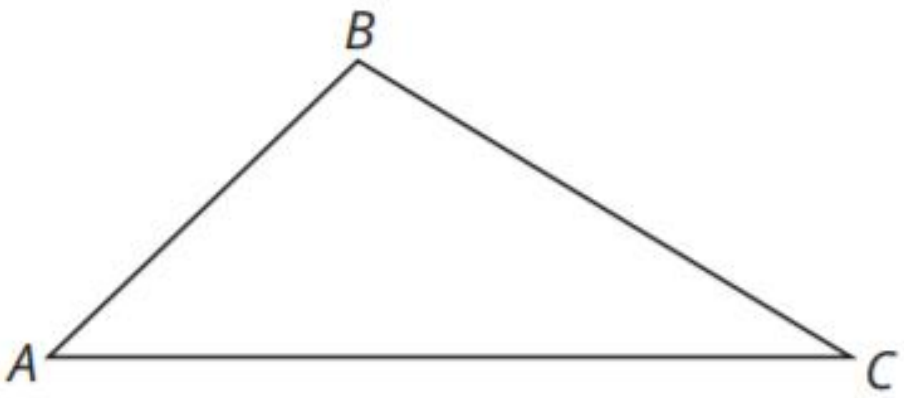
Ravi placed a shooter marble near three smaller marbles as shown.

Can you describe the 3 smaller marbles as being collinear?



When an interior angle of a triangle is bisected, you can observe proportional relationships among the sides of the triangles formed. You will be able to prove that these relationships apply to all triangles. M2-42

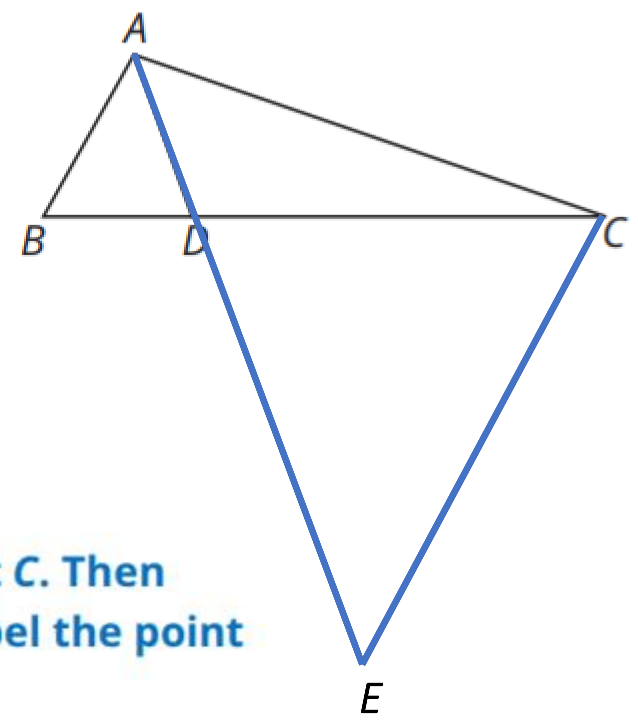
1. Consider $\triangle ABC$.



5. **Consider the given statement and diagram to prove that a bisector of an angle divides the opposite side into two segments whose lengths are proportional to the lengths of the sides adjacent to the angle.**

Given: $\overline{AD}$ **bisects** $\angle BAC$

Prove: $\frac{AB}{AC} = \frac{BD}{CD}$



a. Draw an auxiliary line parallel to $\overline{AB}$ through point C. Then extend $\overline{AD}$ until it intersects the auxiliary line. Label the point of intersection, point E.

b. Complete the proof to prove the conjecture.

Statements	Reasons
1. $\overline{AD}$ bisects $\angle BAC$	1. Given
2. $\overline{CE} \parallel \overline{AB}$	2. Construction
3. $\angle BAE \cong \angle CAD$	3. Definition of angle bisector
4. $\angle BAE \cong \angle CEA$	4. Alternate Interior Angle Theorem
5. $\angle CEA \cong \angle CAD$	5. Transitive Property
6. $\overline{AC} \cong \overline{EC}$	6. Isosceles Triangle Base Angles Converse Theorem

Statements	Reasons
7. $AC = EC$	7. Definition of congruent segments
8. $\angle BCE \cong \angle ABC$	8. Alternate Interior Angle Theorem
9. $\triangle DAB \sim \triangle DEC$	9. $AA \sim$
10. $\frac{AB}{EC} = \frac{BD}{CD}$	10. Corresponding sides of similar triangles are proportional
11. $\frac{AB}{AC} = \frac{BD}{CD}$	11. Substitution

Because your conjecture has been proved to be true, you can now refer to it as a theorem. The **Angle Bisector/Proportional Side Theorem** states: "A bisector of an angle in a triangle divides the opposite side into two segments whose lengths are in the same ratio as the lengths of the sides adjacent to the angle."