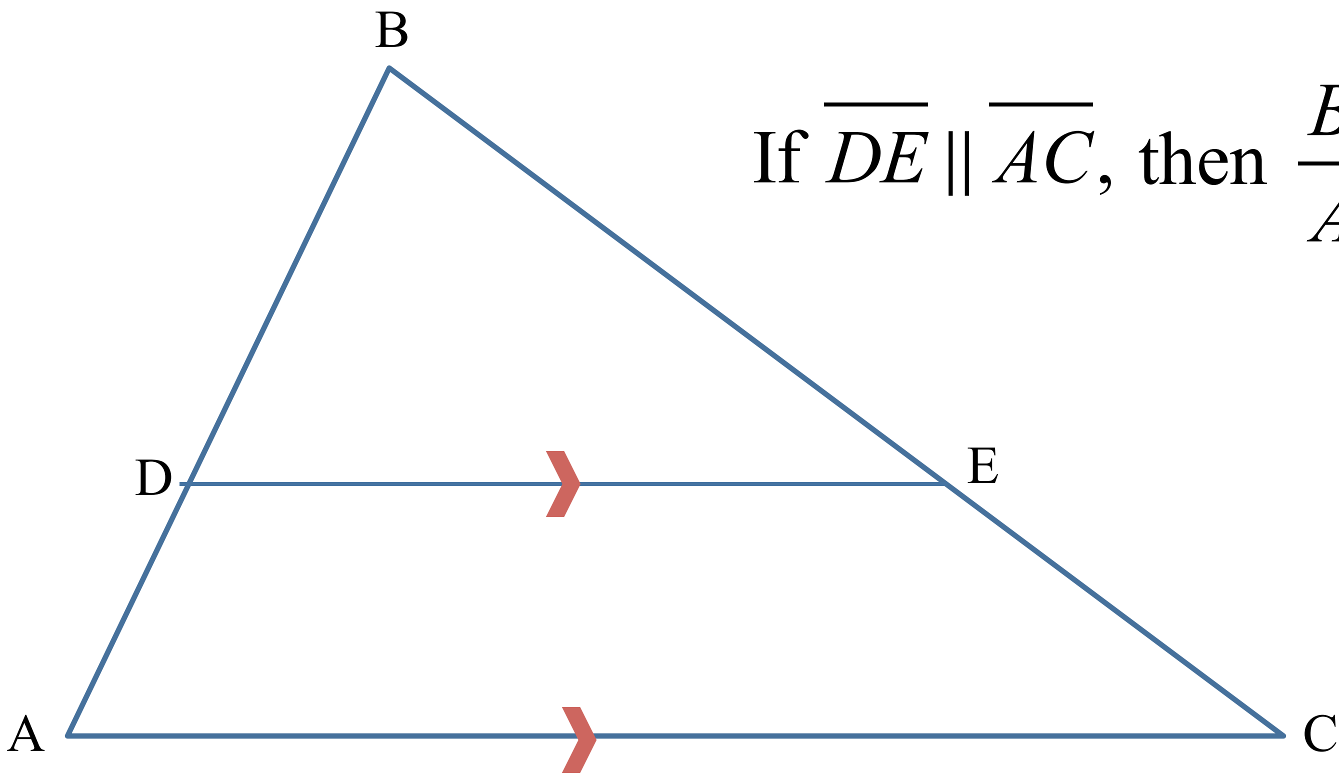
Applying Properties of Similar Triangles

Sections 7-4 & 7-5

Triangle Proportionality Theorem

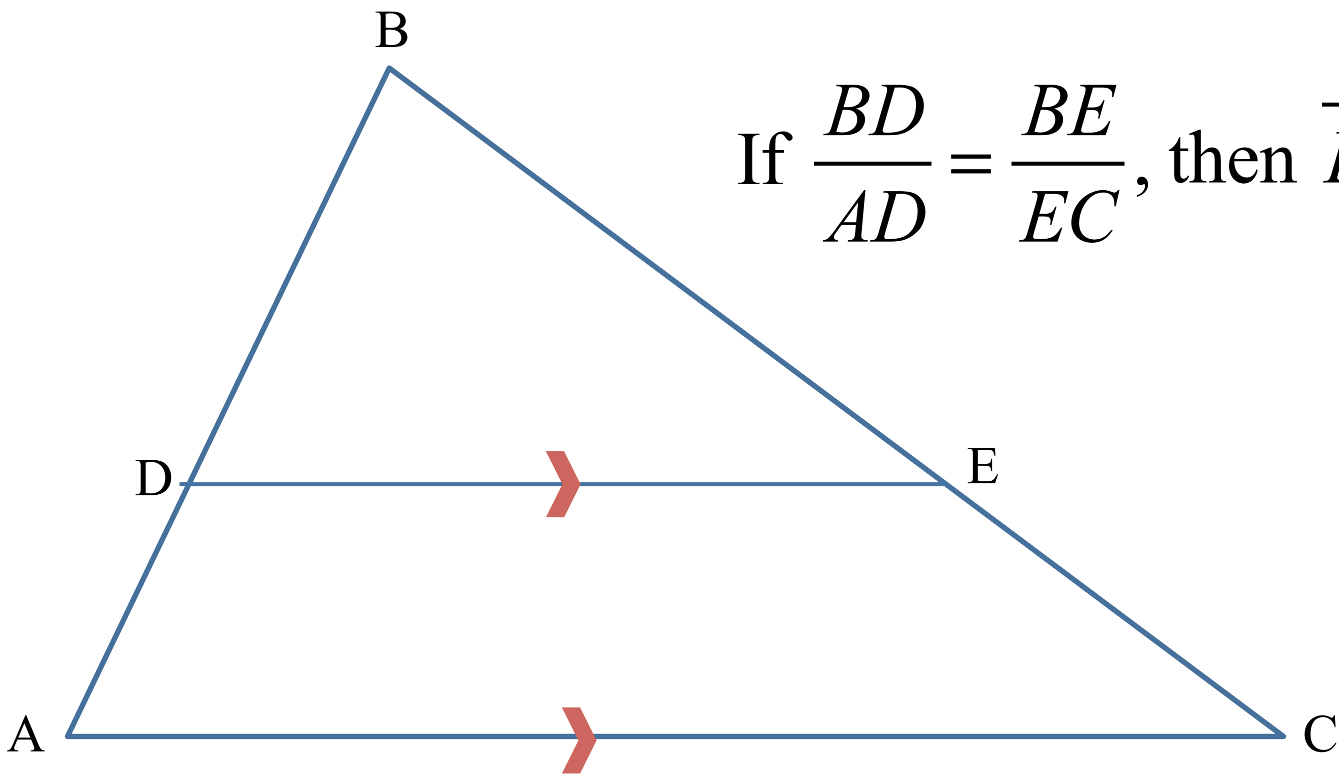
If a line parallel to one side of a triangle intersects the other two sides, then it divides the sides proportionally.



If $\overline{DE} \parallel \overline{AC}$, then $\dfrac{BD}{AD} = \dfrac{BE}{EC}$.

Converse of Triangle Proportionality Theorem

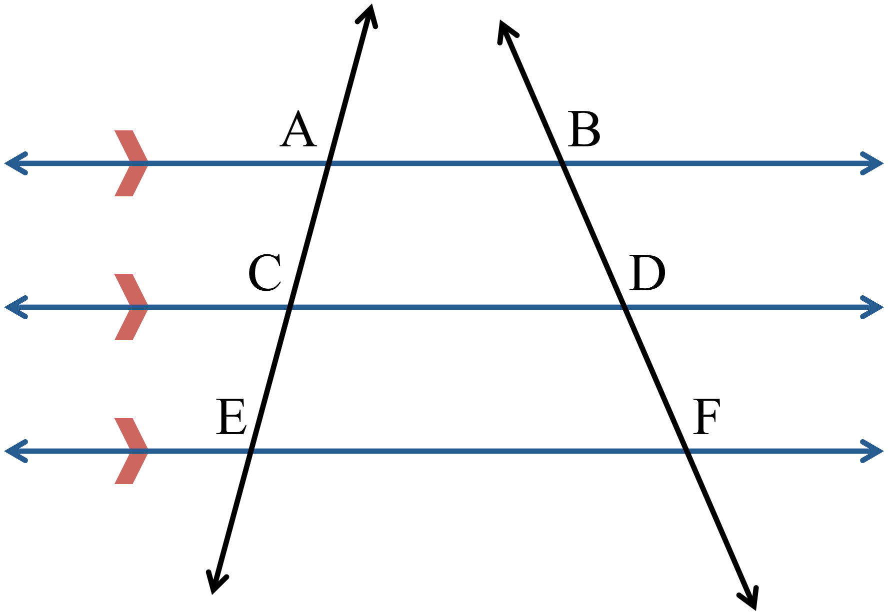
If a line divides the sides of a triangle proportionally, then it is parallel to the third side.



$$\text{If } \frac{BD}{AD} = \frac{BE}{EC}, \text{ then } \overline{DE} \parallel \overline{AC}.$$

Corollary: Two-Transversal Proportionality

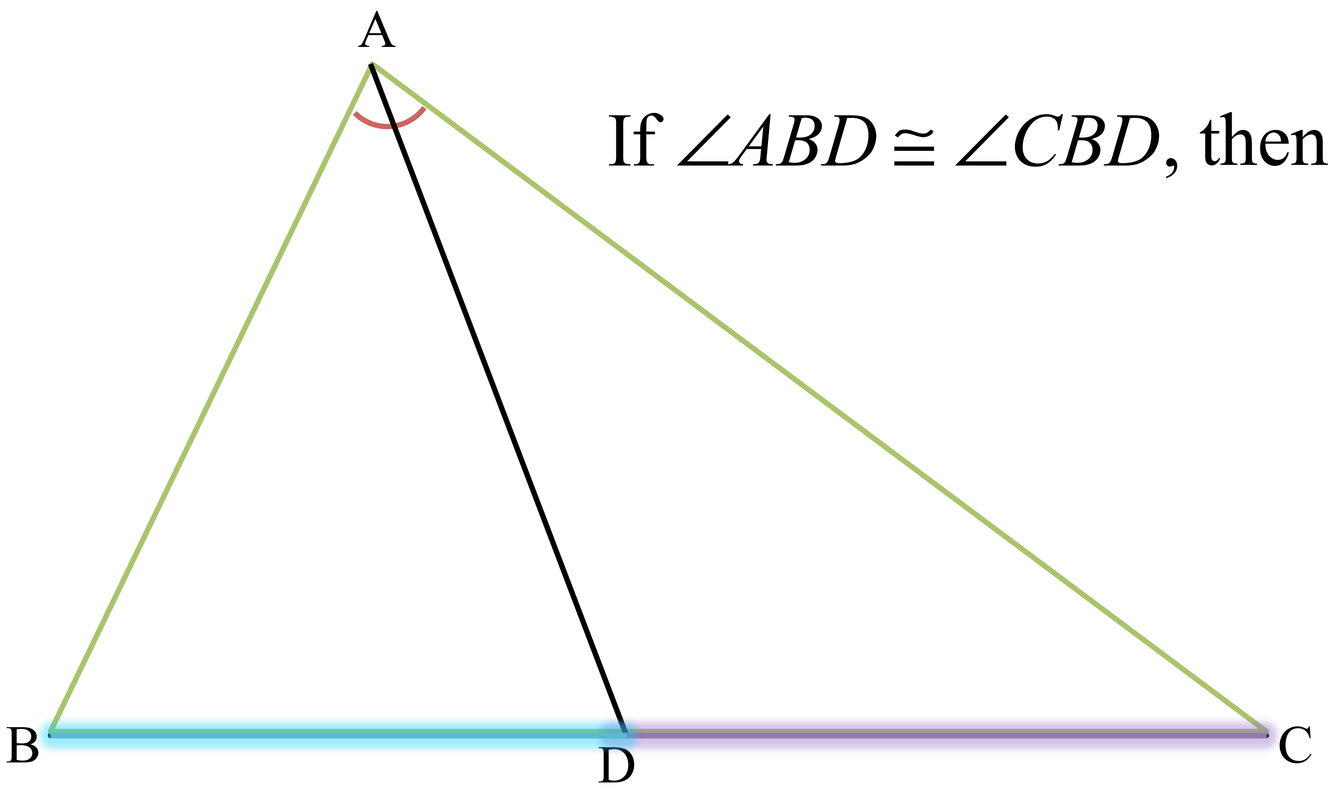
If three or more parallel lines intersect two transversals, then they divide transversals proportionally.



$$\frac{AC}{CE} = \frac{BD}{DF}$$

Triangle Angle Bisector Theorem

A triangle's angle bisector divides the opposite side into 2 segments whose lengths are proportional to the lengths of the other 2 sides.



If $\angle ABD \cong \angle CBD$, then $\dfrac{BD}{DC} = \dfrac{AB}{AC}$.

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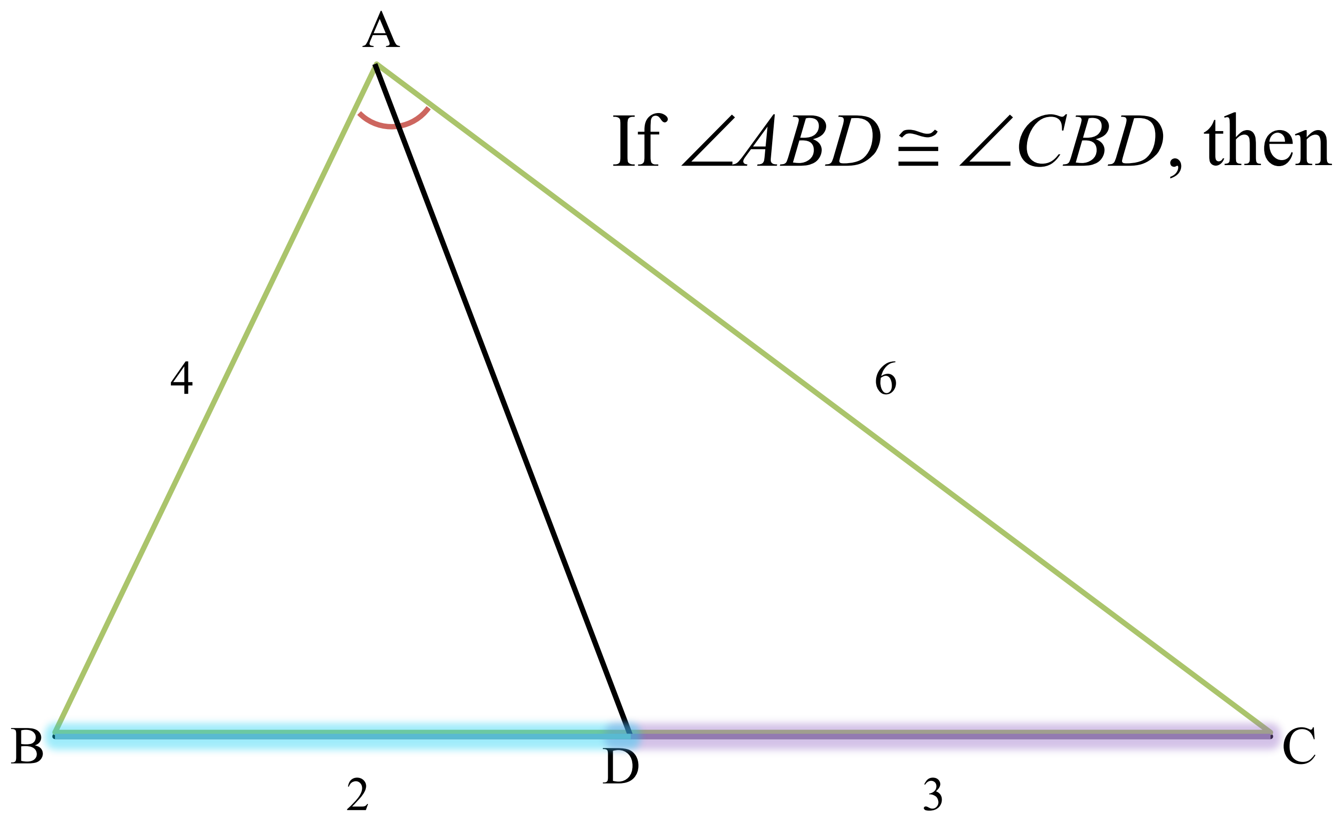

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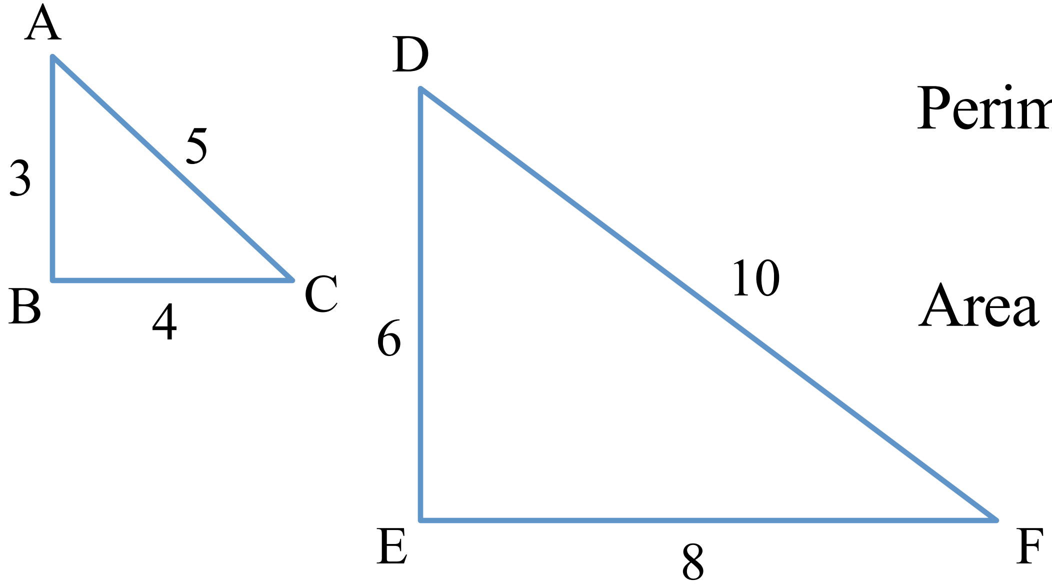
Proportional Perimeters and Areas Theorem

If the ratio of similar figures is $\frac{a}{b}$, then the ratio of their perimeters is $\frac{a}{b}$, and the ratio of their areas is $\frac{a^2}{b^2}$.

$$\triangle ABC \sim \triangle DEF$$



Similarity ratio: $\frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \frac{1}{2}$

Perimeter ratio: $\frac{12}{24} = \frac{1}{2}$

Area ratio: $\frac{6}{24} = \frac{1}{4} = \left(\frac{1}{2}\right)^2$