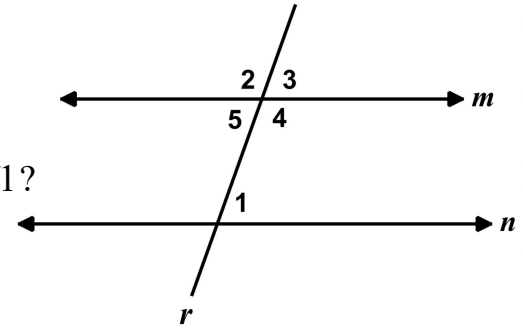
Name: _____ Date: _____

SIMILAR TRIANGLES AND PARALLEL LINES
N-GEN MATH® 8

In the last lesson, we saw that two triangles that have two pairs of congruent angles must be similar, the **angle-angle criterion** for **triangle similarity**. Since **parallel lines** create **congruent angle pairs** they often then involve similar triangles. Let's begin with some review.

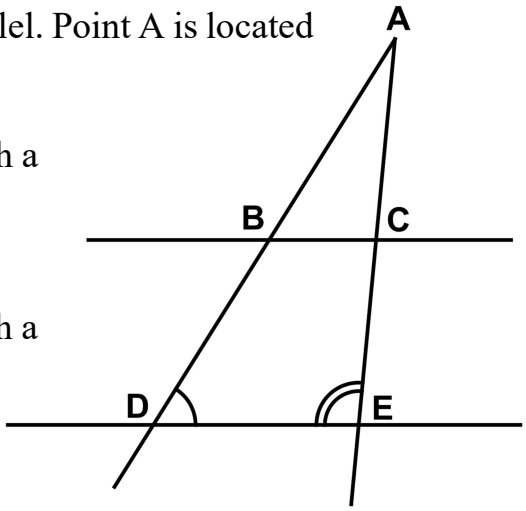
***Exercise* #1:** In the diagram shown, lines *m* and *n* are parallel and are crossed by transversal line *r*.



Which angles that are created by *r* and *m* are congruent to $\angle 1$?

There are many situations where two corresponding sides of triangles lie parallel to one another, often giving rise to similar triangles. In the rest of this lesson we will look at various cases of this.

***Exercise* #2:** In the diagram below, lines $\overleftrightarrow{BC}$ and $\overleftrightarrow{DE}$ are parallel. Point A is located such that ΔABC and ΔADE are formed.



(a) What angle in ΔABC is congruent to $\angle ADE$ (marked with a single arc)? Mark this angle as well with a single arc.

(b) What angle in ΔABC is congruent to $\angle AED$ (marked with a double arc)? Mark this angle as well with a double arc.

(c) Why must ΔABC and ΔADE be similar?

(d) If a dilation with a center at A was used to map ΔABC onto ΔADE, which of the following ratios would be the correct scaling factor?

(1) $\frac{BD}{AB}$ (3) $\frac{AC}{BC}$

(2) $\frac{DE}{BC}$ (4) $\frac{AC}{AE}$

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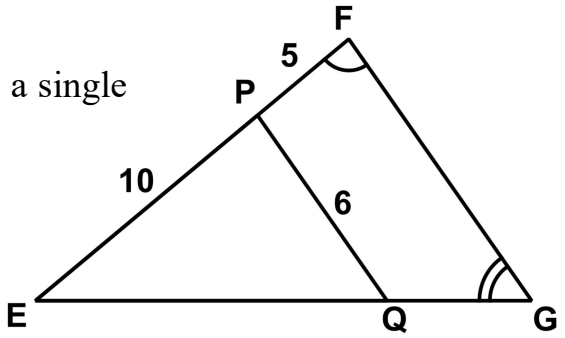
The diagram we saw in *Exercise* #2 arises often with one triangle **embedded** within the other triangle. Let's take a look at another example of this.

***Exercise* #3:** In the diagram shown points P and Q are located on the sides of ΔEFG such that $\overline{PQ}$ is parallel to $\overline{FG}$.



(a) Mark an angle in ΔEPQ that is congruent to $\angle F$ with a single arc.

(b) Mark an angle in ΔEPQ that is congruent to $\angle G$ with a double arc.

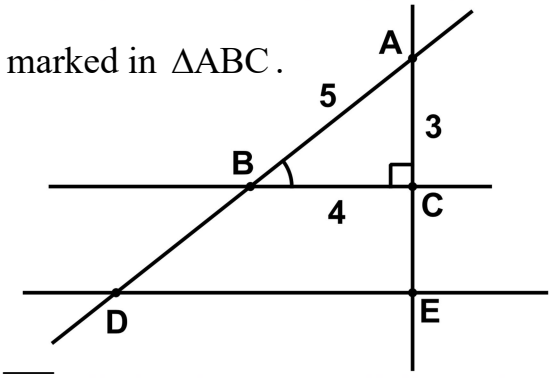
(c) Redraw the two triangles separately below. Label the sides with the known measurements.

(d) What is the length of side $\overline{FG}$? Show how you found your answer.

***Exercise* #4:** Lines $\overleftrightarrow{BC}$ and $\overleftrightarrow{DE}$ are parallel. Point A lies on the same line as B and D, and lines are drawn creating ΔABC and ΔADE.

(a) Mark two angles in ΔADE that are congruent to the two marked in ΔABC.

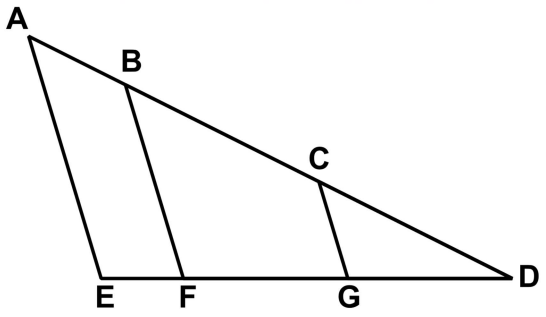
(b) What would the value of the ratio $\frac{AE}{DE}$ be equal to?



***Exercise* #5:** In the diagram shown, segments $\overline{AE}$, $\overline{BF}$, and $\overline{CG}$ are all parallel.

(a) What three triangles must be similar based on this information? Mark congruent angle pairs.

(b) What other ratios of sides must be equal to $\frac{AE}{DE}$?

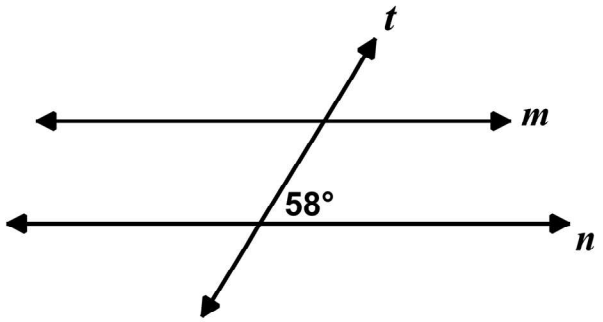


Name: _____ Date: _____

SIMILAR TRIANGLES AND PARALLEL LINES
N-GEN MATH® 8 HOMEWORK

FLUENCY

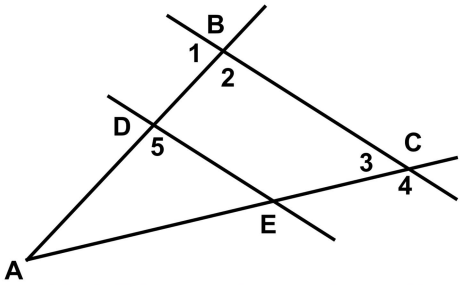
1. Parallel lines *m* and *n* are crossed by transversal line *t* creating the $58°$ angle shown. Fill in any other angle that also measures $58°$.



2. In the picture below, lines $\overleftrightarrow{DE}$ and $\overleftrightarrow{BC}$ are parallel. Which of the numbered angles must be congruent to $\angle 5$?

(1) $\angle 1$ (3) $\angle 3$

(2) $\angle 2$ (4) $\angle 4$



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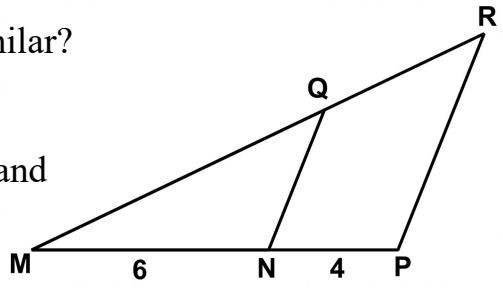
3. Points N and Q lie on sides $\overline{MP}$ and $\overline{MR}$ of triangle MPR such that $\overline{QN}$ is parallel to $\overline{RP}$.

(a) Based on this information, what two triangles are similar?

(b) Redraw the two triangles from (a) separately below and label with any known measurements.



(c) Which of the following is the value of the ratio $\frac{QN}{RP}$ in simplest form?

(1) $\frac{3}{5}$ (3) $\frac{5}{3}$

(2) $\frac{2}{3}$ (4) $\frac{3}{2}$

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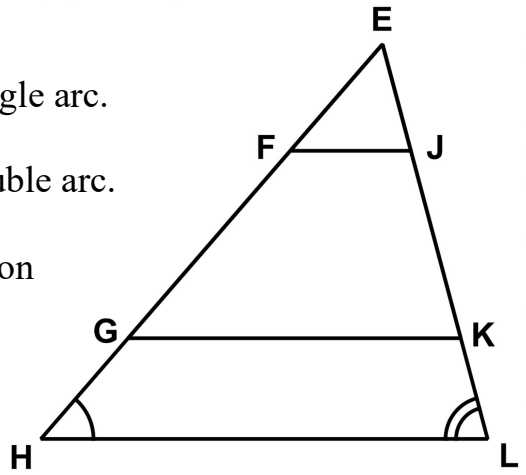
4. In triangle EHL shown below, points have been located on sides $\overline{EH}$ and $\overline{EL}$ such that segments $\overline{FJ}$, $\overline{GK}$, and $\overline{HL}$ are parallel to one another.



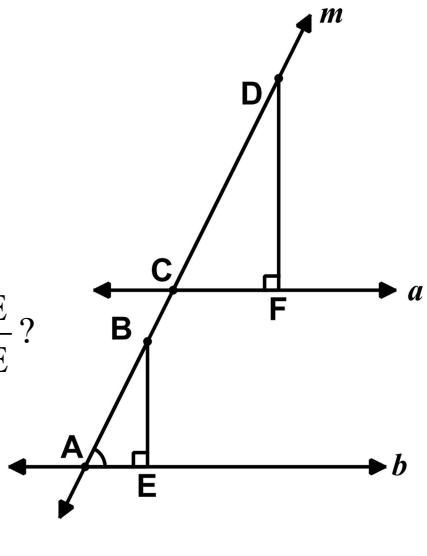
(a) Mark all angles that are congruent to $\angle H$ with a single arc.

(b) Mark all angles that are congruent to $\angle L$ with a double arc.

(c) List the three triangles that must be similar based on the angle-angle criterion.

(d) List two additional ratios that **must** be equal to $\frac{HE}{HL}$.

5. Line *m* has four points marked on it, A, B, C, and D. Lines *a* and *b* pass through points A and C such that the two lines are parallel. Segment $\overline{DF}$ is perpendicular to line *a* and segment $\overline{BE}$ is perpendicular to line *b*.



(a) Mark an angle in ΔCDF that is congruent to $\angle BAE$.

(b) Why are ΔABE and ΔCDF similar?

(c) What ratio of side lengths in ΔCDF is equal to the ratio $\frac{BE}{AE}$?

(d) If $CF = 9$, $DF = 12$ and $CD = 15$, then find the value of $\frac{BE}{AE}$ in simplest form.