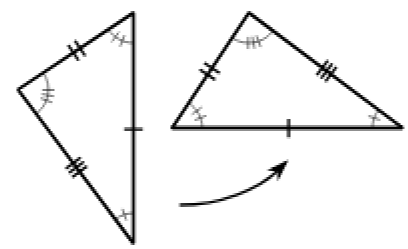
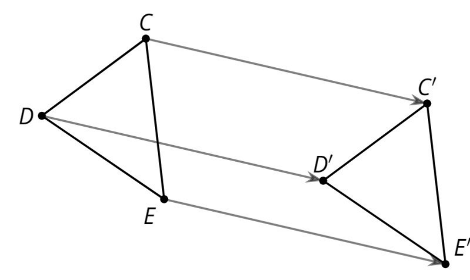
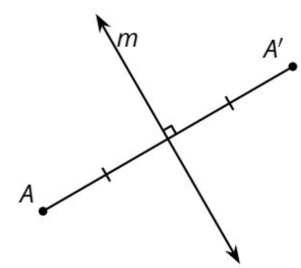
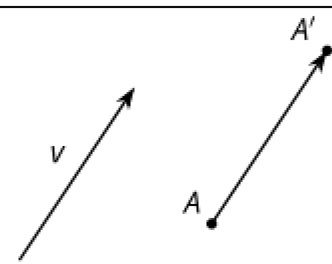
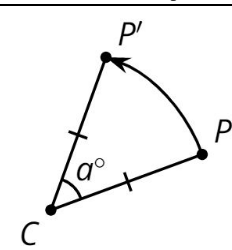
The Reference Chart

Lesson, Type	Statement	Diagram
U1, L10 (students write the date) Assertion	A rigid transformation is a translation, reflection, rotation, or any sequence of the three. Rigid transformations take lines to lines, angles to angles of the same measure, and segments to segments of the same length.	
U1, L10 Definition	One figure is **congruent** to another if there is a sequence of translations, rotations, and reflections that takes the first figure exactly onto the second figure. The second figure is called the image of the rigid transformation.	 △*EDC* ≅ △*E′D′C′*
U1, L11 Definition	**Reflection** is a rigid transformation that takes a point to another point that is the same distance from the given line, is on the other side of the given line, and so that the segment from the original point to the image is perpendicular to the given line. Reflect _(object)_ across line _(name)_.	 Reflect *A* across line *m*.
U1, L12 Definition	**Translation** is a rigid transformation that takes a point to another point so that the directed line segment from the original point to the image is parallel to the given line segment and has the same length and direction. Translate _(object)_ by the directed line segment _(name or from [point] to [point])_.	 Translate *A* by the directed line segment *v*.
U1, L14 Definition	**Rotation** is a rigid transformation that takes a point to another point on the circle through the original point with the given center. The two radii to the original point and the image make the given angle. Rotate _(object)_ (clockwise or counterclockwise) by _(angle or angle measure)_ using center _(point)_.	 Rotate *P* counterclockwise by *a*° using center *C*.

Proving the Triangle Congruence Theorems
Sentence Frames for Proofs

Transformations:

- Translate ______ from ______ to ______.
- Rotate ______ using ______ as the center by angle ______.
- Rotate ______ using ______ as the center so that ______ coincides with ______.
- Reflect ______ across ______.
- Reflect ______ across the perpendicular bisector of ______.
- Segments ______ and ______ are the same length so they are congruent. Therefore, there is a rigid motion that takes ______ to ______. Apply that rigid motion to ______.

Justifications:

- We know the image of ______ is congruent to ______ because rigid motions preserve measure.
- Points ______ and ______ coincide after translating because we defined our translation that way!
- Since points ______ and ______ are the same distance along the same ray from ______ they have to be in the same place.
- Rays ______ and ______ coincide after rotating because we defined our rotation that way!
- The image of ______ must be on ray ______ since both ______ and ______ are on the same side of ______ and make the same angle with it at ______.
- Points ______ and ______ coincide because they are both at the intersection of the same lines, and 2 distinct lines can only intersect in 1 place.
- ______ is the perpendicular bisector of the segment connecting ______ and ______, because the perpendicular bisector is determined by 2 points that are both equidistant from the endpoints of a segment.

Conclusion statement:

- We have shown that a rigid motion takes ______ to ______, ______ to ______, and ______ to ______, therefore triangle ______ is congruent to triangle ______.

Sample 1:

Two figures are congruent if there is a rigid motion that takes the first figure exactly to the second. First, translate segment AB by the directed line segment from A to C. Point A’ will coincide with C because we defined our transformation that way! Then rotate the image, segment A’B’, by the angle B’CD, so that rays A”B” and CD coincide. Translation and rotation both preserve distance so segment A”B” is the same length as segment AB, which means segment CB” is the same length as segment CD. Since points B” and D are the same distance along the same ray from C they have to coincide. Therefore, there is a rigid motion that takes AB to CD and the segments must be congruent.

Sample 2:

We need to find a rigid motion that works. Translate point A to point C. Rotate around that point so that the segments overlap. This will line up the image of point B with point D since the segments have the same length and our rigid motions don’t change lengths. So, there is a rigid motion that takes AB to CD. The segments must be congruent.

Invisible Triangles

Transformer

Listen to hear which parts of the triangles correspond. Then give instructions to take one triangle onto the other.

Possible instructions:

- Translate _______ from _______ to _______.
- Rotate _______ using _______ as the center by angle _______.
- Rotate using _______ as the center so that _______ coincides with _______.
- Reflect _______ across _______.
- Reflect _______ across the perpendicular bisector of _______.

Player 1: You are the transformer. Take the transformer card.

Player 2: Select a triangle card. Do not show it to anyone. Study the diagram to figure out which sides and which angles correspond. Tell Player 1 what you have figured out.

Player 1: Take notes about what they tell you so that you know which parts of their triangles correspond. Think of a sequence of rigid motions you could tell your partner to get them to take one of their triangles onto
the other. Be specific in your language. The notes on your card can help with this.

Player 2: Listen to the instructions from the transformer. Follow their instructions. Draw the image after each step. Let them know when they have lined up 1, 2, or all 3 vertices on your triangles.

Geometry
Unit 2: Congruent Triangles
Lesson 6: Side-Angle-Side Triangle Congruence

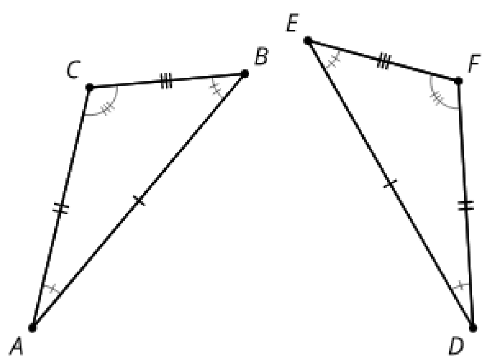
6.1: Information Overload?

Highlight each piece of given information that is used in the proof, and each line in the proof where that piece of information is used.

- $\overline{AB} \cong \overline{DE}$
- $\overline{AC} \cong \overline{DF}$
- $\overline{BC} \cong \overline{EF}$

- $\angle A \cong \angle D$
- $\angle B \cong \angle E$
- $\angle C \cong \angle F$

1. Segments AB and DE are the same length so they are congruent. Therefore, there is a rigid motion that takes AB to DE.
2. Apply that rigid motion to triangle ABC. The image of A will coincide with D, and the image of B will coincide with E.
3. We cannot be sure that the image of C coincides with F yet. If necessary, reflect the image of triangle ABC across DE to be sure the image of C, which we will call C', is on the same side of DE as F. (This reflection does not change the image of A or B.)
4. We know the image of angle A is congruent to angle D because rigid motions don't change the size of angles.
5. C' must be on ray DF since both C' and F are on the same side of DE, and make the same angle with it at D.
6. Segment DC' is the image of AC and rigid motions preserve distance, so they must have the same length.
7. We also know AC has the same length as DF. So DC' and DF must be the same length.
8. Since C' and F are the same distance along the same ray from D, they have to be in the same place.
9. We have shown that a rigid motion takes A to D, B to E, and C to F; therefore, triangle ABC is congruent to triangle DEF.



6.2: Proving the Side-Angle-Side Triangle Congruence Theorem

1. Two triangles have 2 pairs of corresponding sides congruent, and the corresponding angles between those sides are congruent. Sketch 2 triangles that fit this description and label them LMN and PQR, so that:
    a. Segment LM is congruent to segment PQ
    b. Segment LN is congruent to segment PR
    c. Angle L is congruent to angle P

2. Use a sequence of rigid motions to take LMN onto PQR. For each step, explain how you know that one or more vertices will line up.

3. Look back at the congruent triangle proofs you've read and written. Do you have enough information here to use a proof that is like one you saw earlier? Use one of those proofs to guide you in writing a proof for this situation.