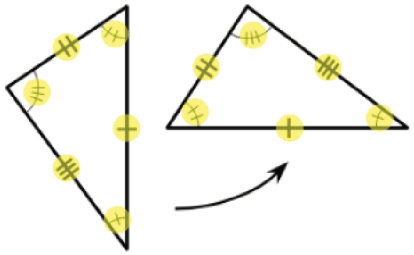
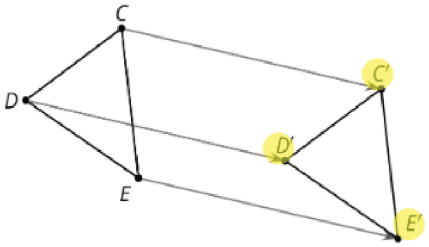
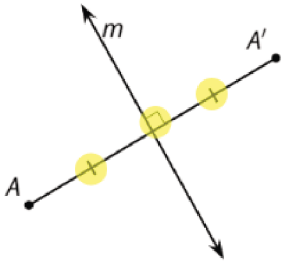
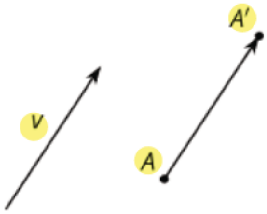
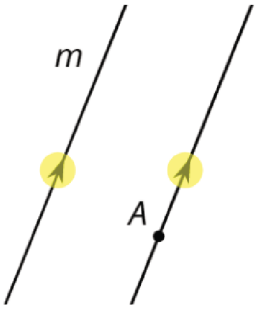
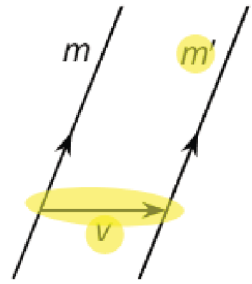
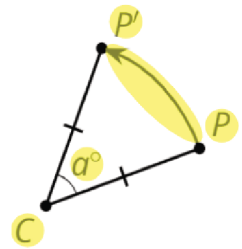
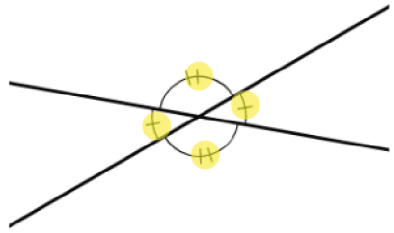
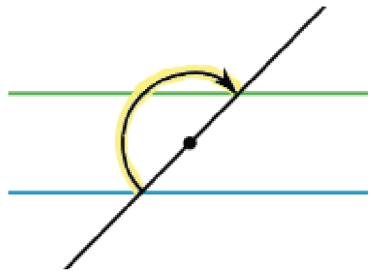
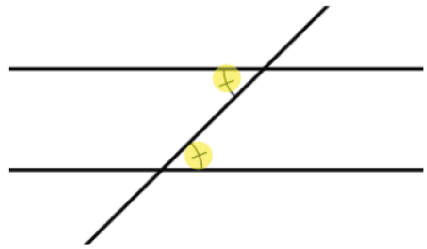
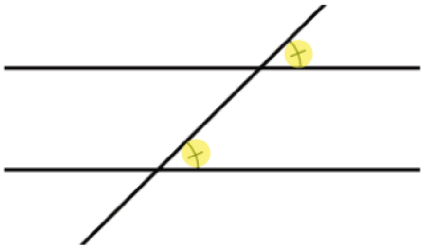
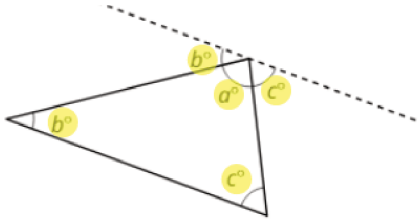
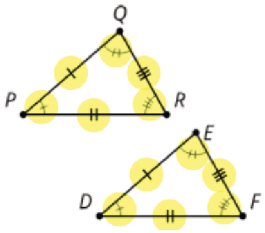
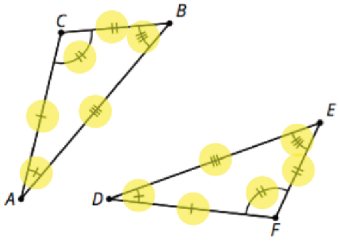
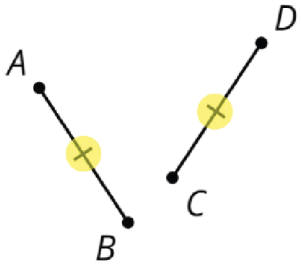
date, type	statement	diagram

CC BY NC 2024 Illustrative Mathematics®

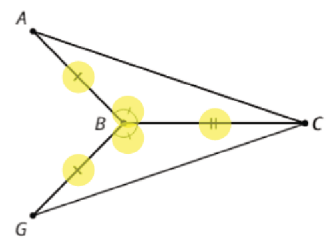
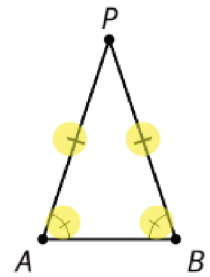
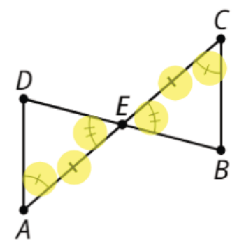
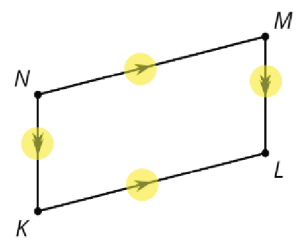
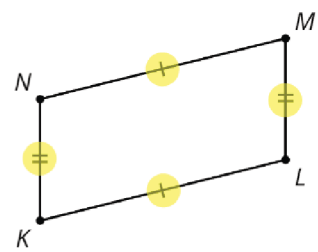
lesson, type	statement	diagram
U1, L10 (students write the date) assertion	A **rigid transformation** is a translation, reflection, rotation, or any sequence of the three. Rigid transformations take lines to lines, angles to angles of the same measure, and segments to segments of the same length.	
U1, L10 definition	Two figures are **congruent** if there is a sequence of translations, rotations, and reflections that takes one figure exactly onto the other. The second figure is called the image of the rigid transformation.	 $\triangle EDC \cong \triangle E'D'C'$
U1, L11 definition	**Reflection** is a rigid transformation that takes a point to another point that is the same distance from the given line, that 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, L12 assertion	**Parallel Postulate:** Given a line *m* and a point *A* that is not on *m*, there is exactly one line that goes through *A* that is parallel to *m*.	

CC BY NC 2024 Illustrative Mathematics®

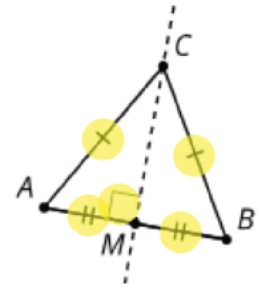
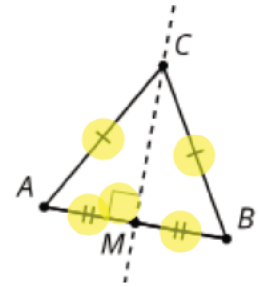
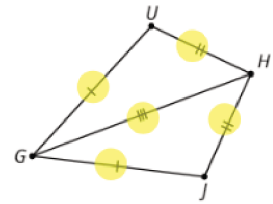
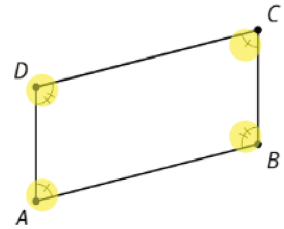
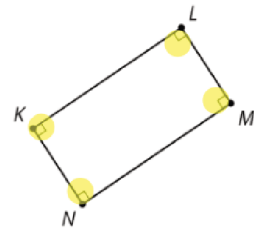
lesson, type	statement	diagram
U1, L12 theorem	Translations take lines to parallel lines or to themselves.	 $m \parallel m'$
U1, L14 definition	**Rotation** is a rigid transformation that takes a point to another point on the circle through the original point with the given center. The two radii, the one from the center to the original point and the one from the center to 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.
U1, L19 theorem	Vertical angles are congruent.	
U1, L20 assertion	Rotation by 180 degrees takes lines to parallel lines or to themselves.	
U1, L20 theorem	**Alternate Interior Angle Theorem:** If two parallel lines are cut by a transversal, then alternate interior angles are congruent. Conversely, if two lines are cut by a transversal and alternate interior angles are congruent, then the lines have to be parallel.	

lesson, type	statement	diagram
U1, L20 theorem	**Corresponding Angle Theorem:** If two parallel lines are cut by a transversal, then corresponding angles are congruent. Conversely, if two lines are cut by a transversal and corresponding angles are congruent, then the lines have to be parallel.	
U1, L21 theorem	**Triangle Angle Sum Theorem:** The three angle measures of any triangle always sum to 180 degrees.	 $a + b + c = 180$
U2, L1 theorem	If two figures are congruent, then **corresponding** parts of those figures must be congruent	 $\triangle DEF \cong \triangle PQR$ so $\overline{PQ} \cong \overline{DE}$, $\overline{PR} \cong \overline{DF}$, $\overline{QR} \cong \overline{EF}$, $\angle P \cong \angle D$, $\angle Q \cong \angle E$, $\angle R \cong \angle F$
U2, L3 theorem	If all pairs of corresponding sides and all pairs of corresponding angles are congruent, then the triangles must be congruent.	 $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, $\overline{AC} \cong \overline{DF}$, $\angle A \cong \angle D$, $\angle B \cong \angle E$, $\angle C \cong \angle F$ so $\triangle ABC \cong \triangle DEF$
U2, L5 theorem	If two segments have the same length, then they are congruent.	 $AB = CD$ so, $\overline{AB} \cong \overline{CD}$

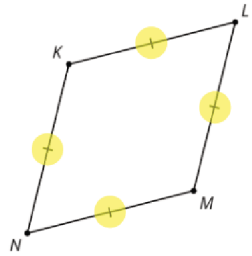
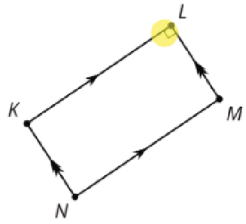
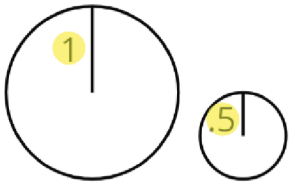
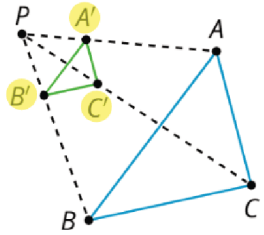
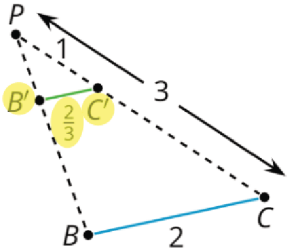
CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U2, L6 theorem	**Side-Angle-Side Triangle Congruence Theorem:** In two triangles, if two pairs of congruent corresponding sides and the pair of corresponding angles between the sides are congruent, then the two triangles are congruent.	 $\overline{AB} \cong \overline{GB}$, $\overline{BC} \cong \overline{BC}$, $\angle ABC \cong \angle GBC$ so $\triangle ABC \cong \triangle GBC$
U2, L6 theorem	**Isosceles Triangle Theorem:** In an isosceles triangle, the base angles are congruent.	 $\overline{AP} \cong \overline{PB}$, so $\angle A \cong \angle B$
U2, L7 theorem	**Angle-Side-Angle Triangle Congruence Theorem:** In two triangles, if two pairs of corresponding angles are congruent and the pair of corresponding sides between the angles is congruent, then the triangles must be congruent.	 $\angle A \cong \angle C$, $\overline{AE} \cong \overline{EC}$, $\angle DEA \cong \angle BEC$, so $\triangle DEA \cong \triangle BEC$
U2, L7 definition	A **parallelogram** is a quadrilateral with two pairs of opposite sides parallel.	 $NM \parallel KL$, $NK \parallel ML$, so $MNKL$ is a parallelogram
U2, L7 theorem	In a parallelogram, pairs of opposite sides are congruent.	 $MNKL$ is a parallelogram, so $\overline{NM} \cong \overline{KL}$, $\overline{NK} \cong \overline{ML}$

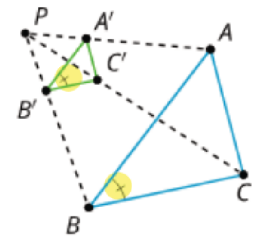
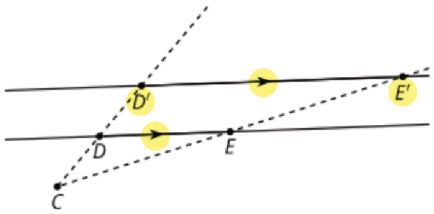
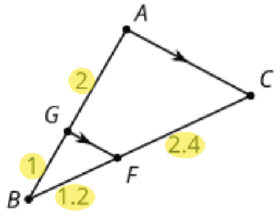
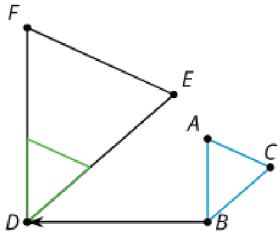
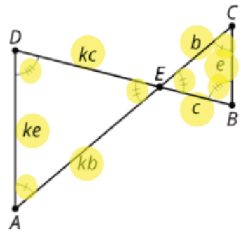
CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U2, L8 theorem	If a point C is the same distance from A as it is from B, then C must be on the perpendicular bisector of AB.	 $\overline{AC} \cong \overline{BC}$, so C is on the line through midpoint M perpendicular to $\overline{AB}$.
U2, L8 theorem	If C is a point on the perpendicular bisector of AB, the distance from C to A is the same as the distance from C to B.	 $AB \perp CM$, $\overline{AM} \cong \overline{BM}$, so $\overline{AC} \cong \overline{BC}$
U2, L9 theorem	**Side-Side-Side Triangle Congruence Theorem:** In two triangles, if all three pairs of corresponding sides are congruent, then the triangles must be congruent.	 $\overline{HU} \cong \overline{HJ}$, $\overline{UG} \cong \overline{JG}$, $\overline{HG} \cong \overline{HG}$, so $\triangle HUG \cong \triangle HJG$
U2, L9 theorem	In a parallelogram, opposite angles are congruent.	 $ABCD$ is a parallelogram, so $\angle A \cong \angle C$, $\angle D \cong \angle B$
U2, L12 definition	A **rectangle** is a quadrilateral with four right angles.	

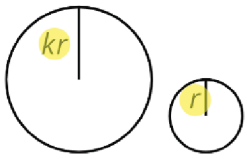
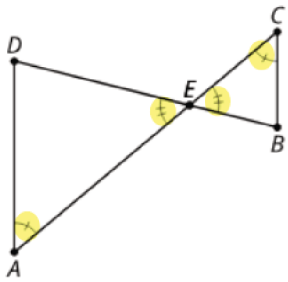
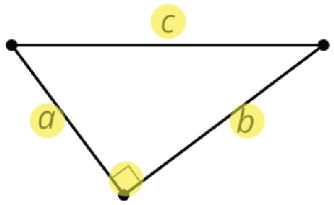
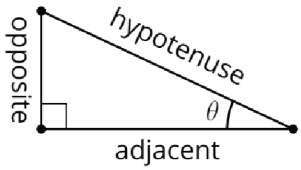
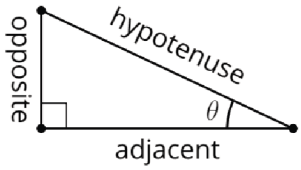
CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U2, L12 definition	A **rhombus** is a quadrilateral with four congruent sides.	
U2, L12 theorem	If a parallelogram has (at least) one right angle, then it is a rectangle.	 *KLMN* has a right angle so it is a rectangle
U3, L1 definition	**Scale factor** is the factor by which every length in an original figure is multiplied when you make a scaled copy.	 Scale factor is 2 or ½
U3, L1 definition	A **dilation** with center *P* and positive scale factor *k* takes a point *A* along the ray *PA* to another point whose distance is *k* times further away from *P* than *A* is. Dilate _(object)_ using center _(point)_ and a scale factor of _(number)_.	 $PA' = k \bullet PA$
U3, L3 assertion	The dilation of a line segment is longer or shorter according to the same ratio given by the scale factor.	 $PC{:}PC' = 3{:}1$, $BC{:}B'C' = 2{:}\frac{2}{3}$

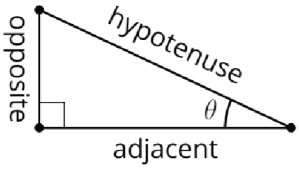
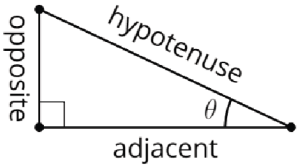
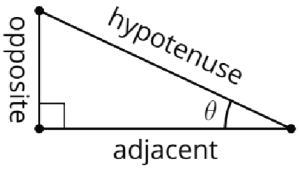
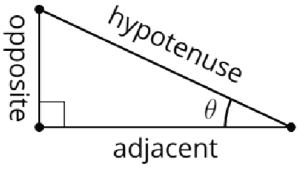
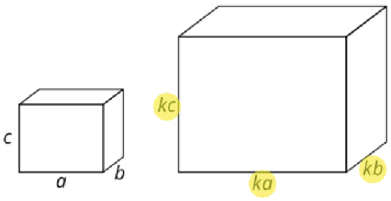
CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U3, L4 assertion	If a figure is dilated, then corresponding angles are congruent.	 $\triangle A'B'C'$ is a dilation of $\triangle ABC$ so $\angle B \cong \angle B'$
U3, L4 theorem	A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.	 Dilate using center C. $DE \parallel D'E'$
U3, L5 theorem	If a line divides two sides of a triangle proportionally, the line must be parallel to the third side of the triangle.	 $\frac{1}{2} = \frac{1.2}{2.4}$ so $AC \parallel GF$
U3, L6 definition	One figure is **similar** to another if there is a sequence of rigid motions and dilations that takes the first figure so that it fits exactly over the second.	 Translation and dilation takes $\triangle ABC$ onto $\triangle FDE$ so $\triangle ABC \sim \triangle FDE$
U3, L7 theorem	If two triangles have all pairs of corresponding angles congruent and all pairs of corresponding side lengths in the same proportion, then the two triangles are similar.	 $\angle A \cong \angle C$, $\angle D \cong \angle B$, $\angle DEA \cong \angle BEC$, $\frac{AD}{CB} = \frac{DE}{BE} = \frac{EA}{EC}$ so $\triangle DEA \sim \triangle BEC$

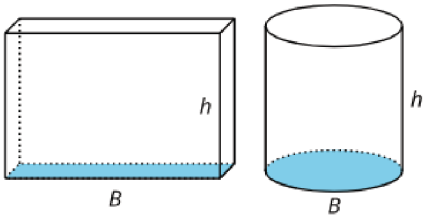
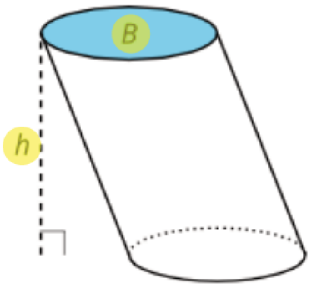
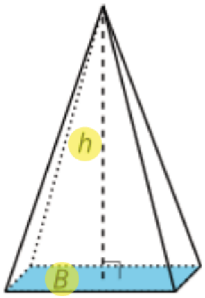
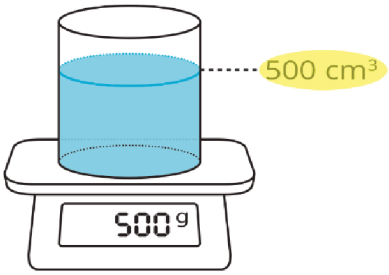
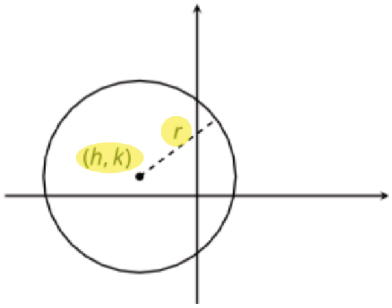
CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U3, L8 theorem	All circles are similar.	
U3, L9 theorem	**Angle-Angle Triangle Similarity Theorem:** In two triangles, if two pairs of corresponding angles are congruent, then the triangles must be similar.	 $\angle A \cong \angle C$, $\angle DEA \cong \angle BEC$, so $\triangle DEA \sim \triangle BEC$
U3, L14 theorem	**Pythagorean Theorem:** If a right triangle has legs with lengths a and b and hypotenuse with length c, then $a^2 + b^2 = c^2$.	 $a^2 + b^2 = c^2$
U4, L6 definition	The **cosine** of an acute angle in a right triangle is the ratio (quotient) of the length of the adjacent leg to the length of the hypotenuse.	 $\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$
U4, L6 definition	The **sine** of an acute angle in a right triangle is the ratio (quotient) of the length of the opposite leg to the length of the hypotenuse.	 $\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$

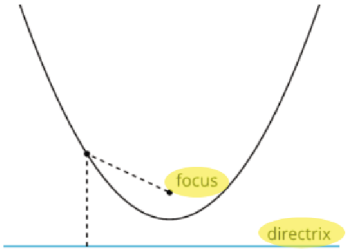
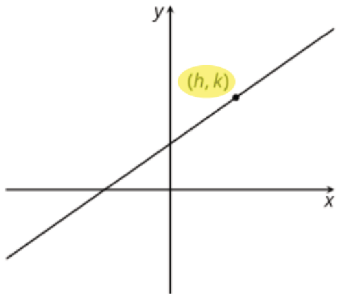
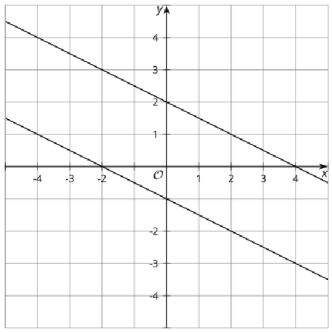
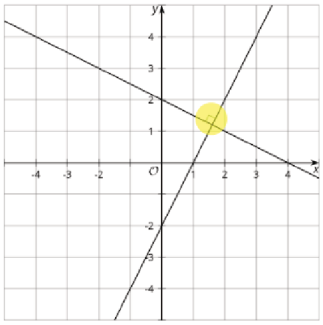
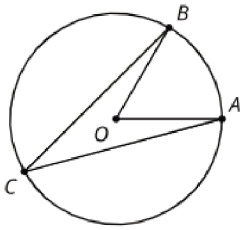
CC BY NC 2024 Illustrative Mathematics®

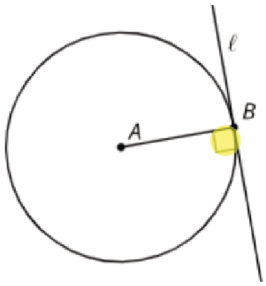
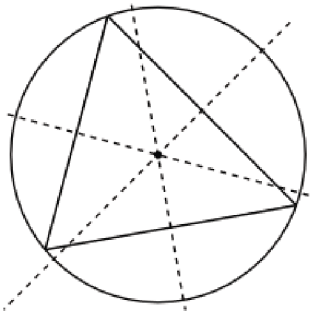
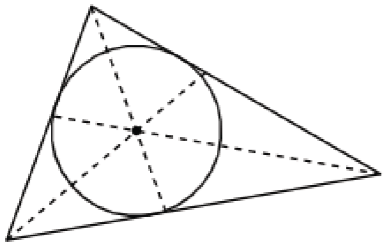
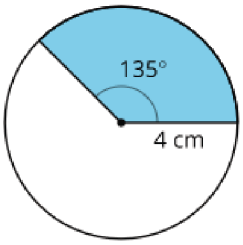
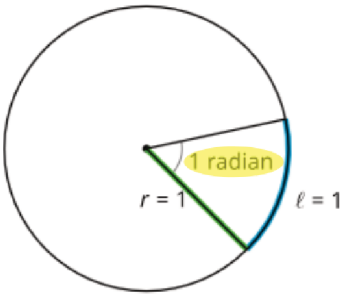
lesson, type	statement	diagram
U4, L6 definition	The **tangent** of an acute angle in a right triangle is the ratio (quotient) of the length of the opposite leg to the length of the adjacent leg.	 $\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$
U4, L10 definition	The **arccosine** of a number between 0 and 1 is the measure of an acute angle whose cosine is that number.	 $\arccos\left(\frac{\text{adjacent}}{\text{hypotenuse}}\right) = \theta$
U4, L10 definition	The **arcsine** of a number between 0 and 1 is the measure of an acute angle whose sine is that number.	 $\arcsin\left(\frac{\text{opposite}}{\text{hypotenuse}}\right) = \theta$
U4, L10 definition	The **arctangent** of a positive number is the measure of an acute angle whose tangent is that number.	 $\arctan\left(\frac{\text{opposite}}{\text{adjacent}}\right) = \theta$
U5, L6 theorem	When any solid is dilated using a scale factor of k, all lengths are multiplied by k, all areas are multiplied by k^2, and all volumes are multiplied by k^3.	

CC BY NC 2024 Illustrative Mathematics®

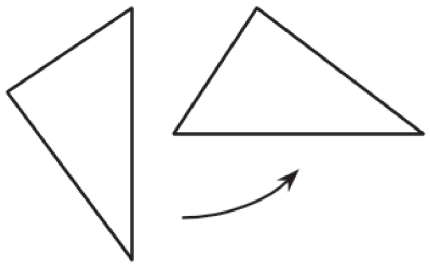
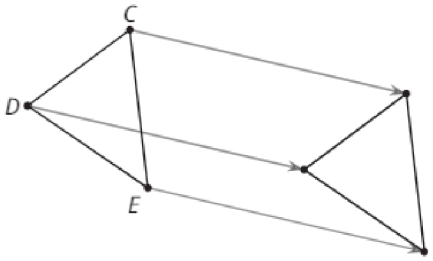
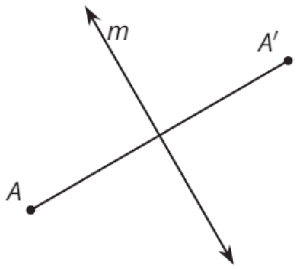
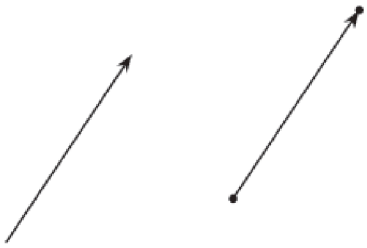
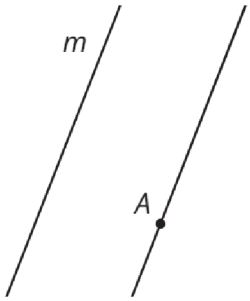
lesson, type	statement	diagram
U5, L10 theorem	**Cavalieri's Principle**: If two solids are cut into cross sections by parallel planes, and the corresponding cross sections on each plane always have equal areas, then the two solids have the same volume.	
U5, L10 theorem	A prism or cylinder whose base has an area of B square units and whose height is h units has volume of Bh cubic units, regardless of the shape of the base or whether the solid is oblique.	
U5, L13 theorem	A pyramid or cone whose base has an area of B square units and whose height is h units has volume of $\frac{1}{3}Bh$ cubic units, regardless of the shape of the base or whether the solid is oblique.	
U5, L17 definition	The **density** of a substance is the mass of the substance per unit volume. That is, $\text{density} = \frac{\text{mass}}{\text{volume}}$.	 density = 1 g per cm³
U6, L4 theorem	A circle with center (h, k) and radius r has equation $(x - h)^2 + (y - k)^2 = r^2$.	

CC BY NC 2024 Illustrative Mathematics®

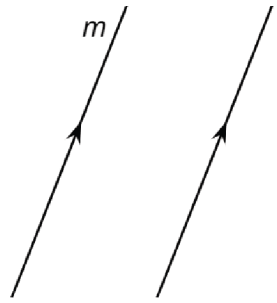
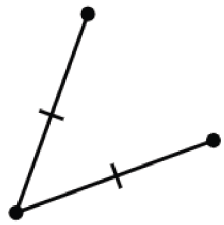
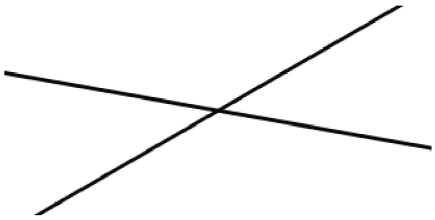
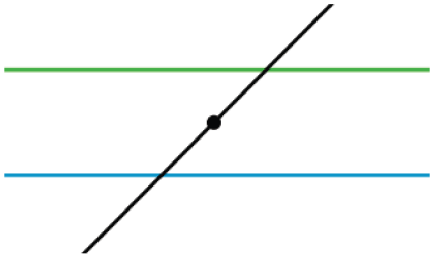
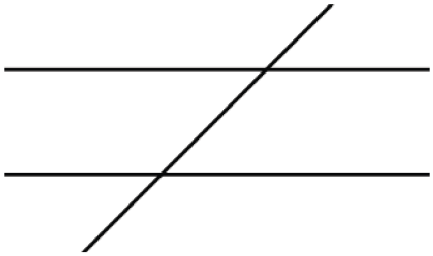
lesson, type	statement	diagram
U6, L7 definition	A **parabola** is the set of points that are equidistant from a given point, called the **focus**, and a given line, called the **directrix**.	
U6, L9 definition	The **point-slope form** of the equation of a line is $y - k = m(x - h)$ where (h, k) is a particular point on the line and m is the slope of the line.	
U6, L10 theorem	Lines are parallel if and only if they have equal slopes.	
U6, L11 theorem	Lines are perpendicular if and only if their slopes are opposite reciprocals.	
U7, L2 assertion	**Inscribed Angle Theorem:** The measure of an inscribed angle is half the measure of the central angle that defines the same arc.	 $m\angle BCA = \frac{1}{2} m\angle BOA$

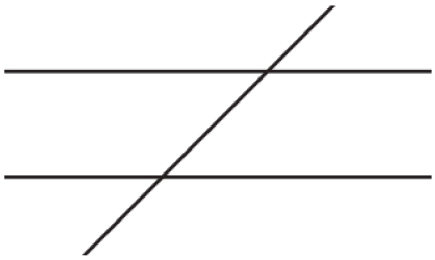
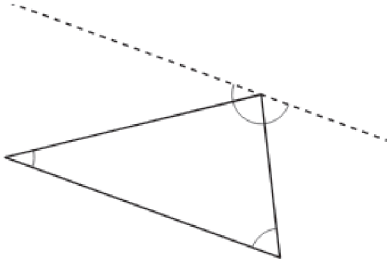
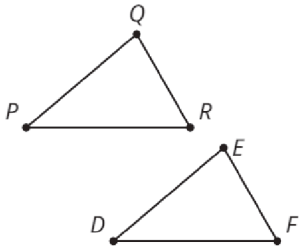
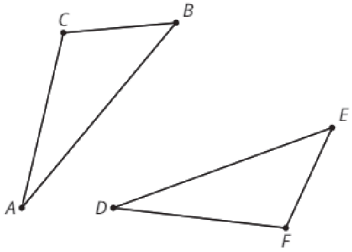
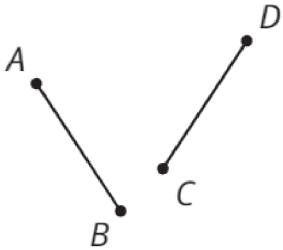
lesson, type	statement	diagram
U7, L3 theorem	A line is tangent to a circle if and only if it is perpendicular to the radius drawn to the point of tangency.	 $\overline{AB} \perp \ell$
U7, L5 theorem	The three perpendicular bisectors of the sides of a triangle meet at a single point, called the triangle's **circumcenter**. This point is the center of the triangle's circumscribed circle.	
U7, L7 theorem	The three angle bisectors of a triangle meet at a single point, called the triangle's **incenter**. This point is the center of the triangle's inscribed circle.	
U7, L8 theorem	To calculate the area of a sector or the length of an arc, first find the fraction of the circle represented by the central angle of the arc or sector. Multiply this fraction by the circle's area or circumference.	 arc length: 3π cm sector area: 6π cm^2
U7, L11 definition	For any angle, imagine drawing a circle with the angle's vertex at its center. Then, the "**radian** measure of the angle" is the ratio of the length of the arc defined by the angle to the circle's radius. That is, $\theta = \frac{arc\ length}{radius}$.	

CC BY NC 2024 Illustrative Mathematics®

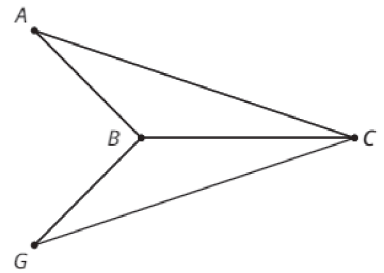
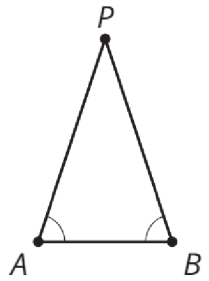
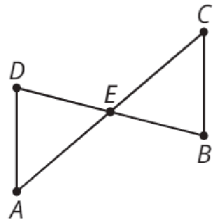
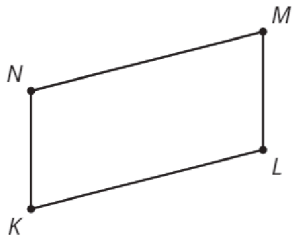
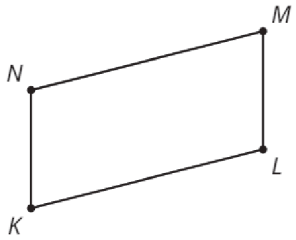
date, type	statement	diagram
assertion	A _____ is a _____, _____, _____, or any sequence of the three. Rigid transformations take lines to _____, angles to _____ of the same measure, and segments to _____ of the same length.	
definition	Two figures are _____ if there is a sequence of _____, _____, and _____ that takes the one figure _____ onto the other. The second figure is called the _____ of the rigid transformation.	
definition	_____ is a rigid transformation that takes a point to another point that is the same _____ from the given line, that is on the other side of the given line, and so that the segment from the original point to the image is _____ to the given line. Reflect _(object)_ across line _(name)_.	 Reflect *A* across line *m*.
definition	_____ is a rigid transformation that takes a point to another point so that the directed _____ from the original point to the image is _____ to the given line segment and has the same _____ and _____. Translate _(object)_ by the directed line segment _(name or from [point] to [point])_.	 Translate *A* by the directed line segment *v*.
assertion	**Parallel Postulate:** Given a _____ *m* and a _____ *A* that is not on _____, there is exactly _____ that goes through *A* that is _____ to *m*.	

CC BY NC 2024 Illustrative Mathematics®

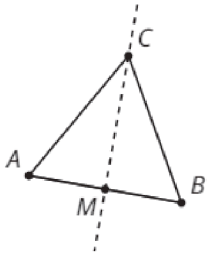
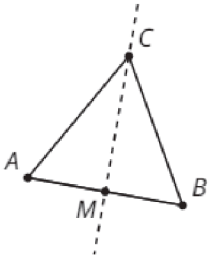
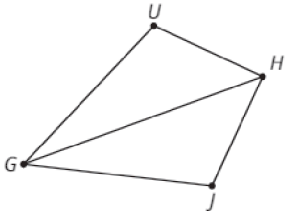
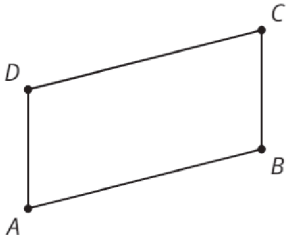
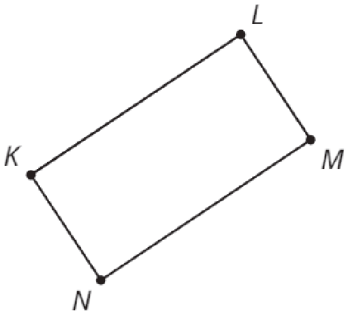
date, type	statement	diagram
theorem	_____ take lines to _____ or to _____.	
definition	_____ is a _____ transformation that takes a point to another point on the circle through the original point with the given _____. The two radii, the one from the center to the original point and the one from the center to the image, make the given _____. Rotate _(object)_ (clockwise or counterclockwise) by _(angle or angle measure)_ using center _(point)_.	 Rotate *P* counterclockwise by *a*° using center *C*.
theorem	_____ angles are _____.	
assertion	_____ by _____ takes lines to _____ lines or to _____.	
theorem	_____ **Angle Theorem:** If two _____ lines are cut by a _____, then alternate interior angles are _____. Conversely, if two lines are cut by a _____ and alternate interior angles are _____, then the lines have to be _____.	

date, type	statement	diagram
theorem	_____ **Angle Theorem:** If two _____ lines are cut by a _____, then corresponding angles are _____. Conversely, if two _____ are cut by a _____ and corresponding angles are congruent, then the lines have to be _____.	
theorem	**Triangle** _____ **Theorem:** The three _____ measures of any _____ always sum to _____ degrees.	
theorem	If two figures are _____, then _____ parts of those figures must be _____.	 $\triangle DEF \cong \triangle PQR$ so $\overline{PQ} \cong \overline{DE}$, $\overline{PR} \cong \overline{DF}$, $\overline{QR} \cong \overline{EF}$, $\angle P \cong \angle D$, $\angle Q \cong \angle E$, $\angle R \cong \angle F$
theorem	If all pairs of corresponding _____ and all pairs of corresponding _____ are congruent, then the _____ must be _____.	 $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, $\overline{AC} \cong \overline{DF}$, $\angle A \cong \angle D$, $\angle B \cong \angle E$, $\angle C \cong \angle F$ so
theorem	If two _____ have the same _____, then they are _____.	

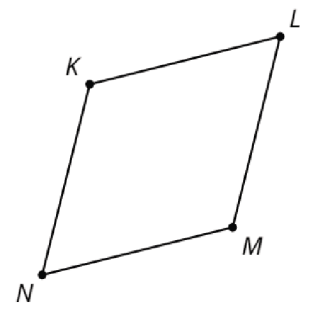
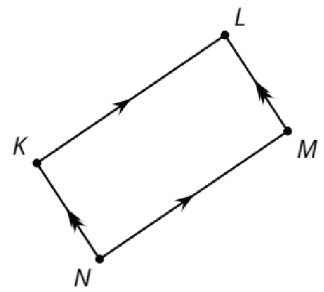
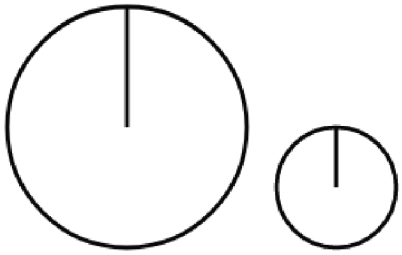
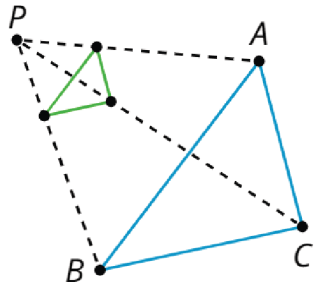
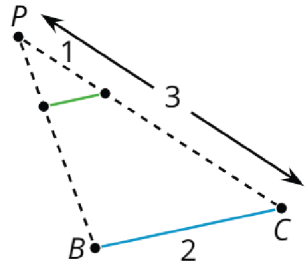
CC BY NC 2024 Illustrative Mathematics®

date, type	statement	diagram
theorem	_____ **Triangle Congruence Theorem:** In two triangles, if two pairs of congruent _____ and the pair of corresponding _____ between the sides are _____, then the two triangles are _____.	 $\overline{AB} \cong \overline{GB}$, $\overline{BC} \cong \overline{BC}$, $\angle ABC \cong \angle GBC$ so
theorem	_____ **Triangle Theorem:** In an _____ triangle, the _____ are _____.	
theorem	_____ **Triangle Congruence Theorem:** In two triangles, if two pairs of corresponding _____ are _____ and the pair of corresponding _____ between the _____ is _____, then the triangles must be _____.	 $\angle A \cong \angle C$, $\overline{AE} \cong \overline{EC}$, $\angle DEA \cong \angle BEC$, so
definition	A _____ is a quadrilateral with two pairs of _____ sides _____.	 $NM \parallel KL$, $NK \parallel ML$, so
theorem	In a _____, pairs of _____ sides are _____.	 *MNKL* is a parallelogram, so

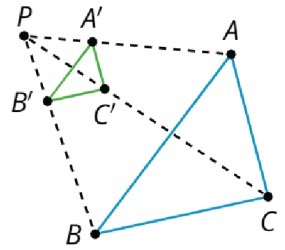
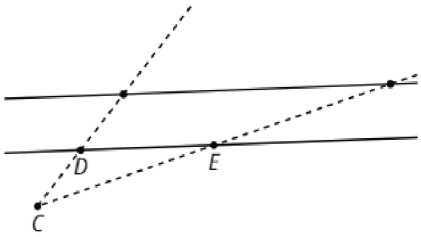
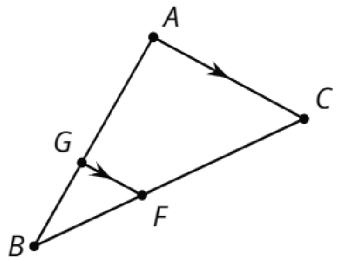
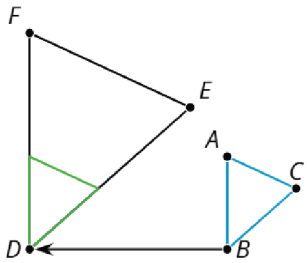
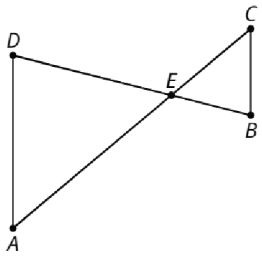
CC BY NC 2024 Illustrative Mathematics®

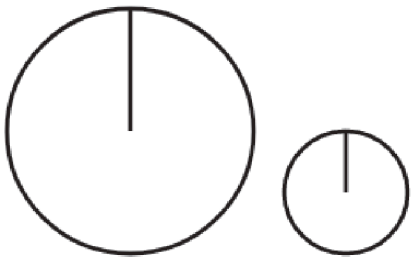
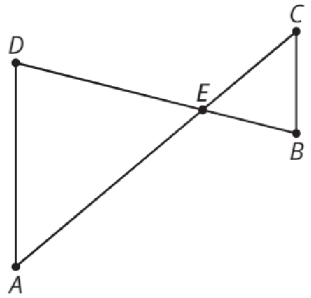
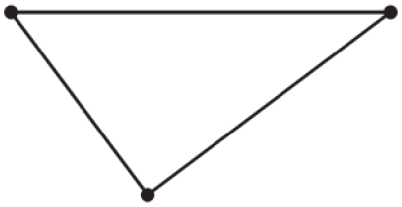
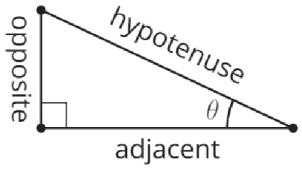
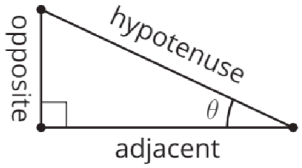
date, type	statement	diagram
theorem	If a _____ *C* is the same _____ from _____ as it is from _____, then *C* must be on the _____ of *AB*.	 $\overline{AC} \cong \overline{BC}$, so
theorem	If *C* is a point on the _____ of *AB*, the distance from _____ to _____ is the same as the _____ from _____ to _____.	 $AB \perp CM$, $\overline{AM} \cong \overline{BM}$, so
theorem	_____ **Triangle Congruence Theorem:** In two triangles, if _____ of corresponding _____ are congruent, then the triangles must be _____.	 $\overline{HU} \cong \overline{HJ}$, $\overline{UG} \cong \overline{JG}$, $\overline{HG} \cong \overline{HG}$, so
theorem	In a _____, _____ angles are _____.	 *ABCD* is a parallelogram, so
definition	A _____ is a quadrilateral with four _____.	

CC BY NC 2024 Illustrative Mathematics®

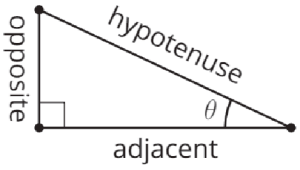
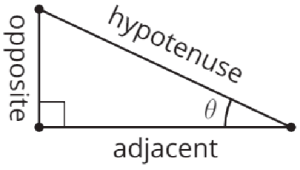
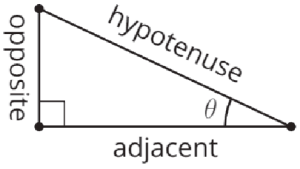
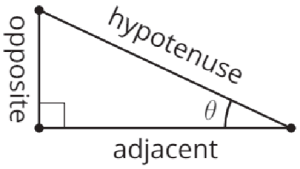
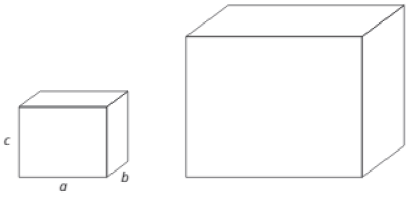
date, type	statement	diagram
definition	A _____ is a quadrilateral with four _____ sides.	
theorem	If a _____ has (at least) one _____, then it is a _____.	
definition	_____ is the factor by which every _____ in an original figure is _____ when you make a _____ copy.	
definition	A _____ with center *P* and positive _____ *k* takes a point *A* along the _____ *PA* to another point whose _____ is *k* times further away from *P* than _____ is. Dilate _(object)_ using center _(point)_ and a scale factor of _(number)_.	
assertion	The _____ of a line segment is _____ or shorter according to the same _____ given by the _____.	

CC BY NC 2024 Illustrative Mathematics®

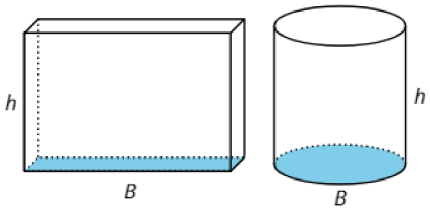
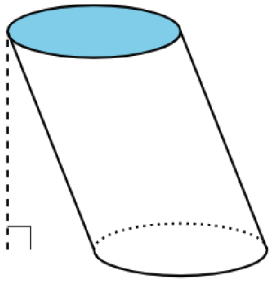
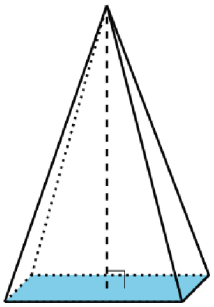
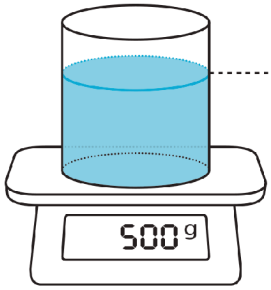
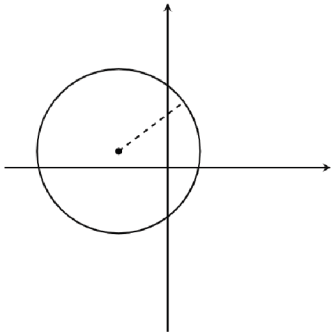
date, type	statement	diagram
assertion	If a figure is _____, then corresponding _____ are _____.	
theorem	A _____ takes a line not passing through the _____ of the dilation to a _____ line, and leaves a line passing through the _____ unchanged.	
theorem	If a line divides two _____ of a triangle proportionally, the _____ must be _____ to the _____ of the triangle.	
definition	One figure is _____ to another if there is a sequence of _____ and _____ that takes the first figure so that it fits _____ over the second.	
theorem	If two _____ have all pairs of corresponding _____ congruent, and all pairs of corresponding _____ in the same proportion, then the two triangles are _____.	 $\angle A \cong \angle C$, $\angle D \cong \angle B$, $\angle DEA \cong \angle BEC$, $\frac{AD}{CB} = \frac{DE}{BE} = \frac{EA}{EC}$ so

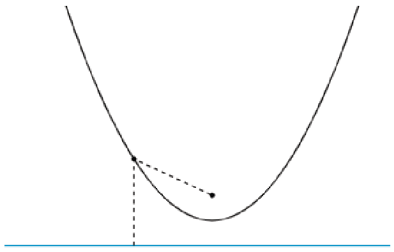
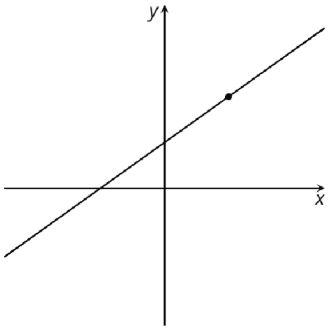
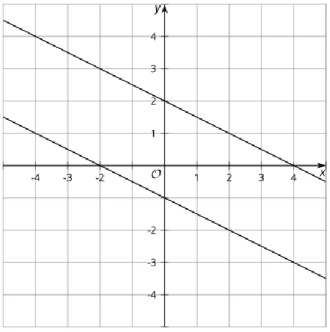
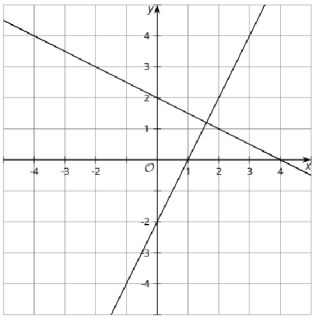
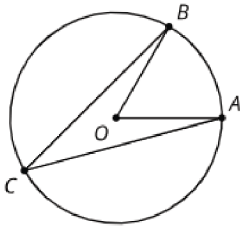
date, type	statement	diagram
theorem	All _____.	
theorem	_____ **Triangle Similarity Theorem:** In two _____, if _____ pairs of corresponding _____ are congruent, then the triangles must be _____.	
theorem	_____ **Theorem:** If a _____ triangle has _____ with lengths _____ and _____ and hypotenuse with length *c*, then _____.	
definition	The _____ of an acute angle in a _____ triangle is the ratio (quotient) of the length of the _____ leg to the length of the _____.	
definition	The _____ of an acute angle in a _____ triangle is the ratio (quotient) of the length of the _____ leg to the length of the _____.	

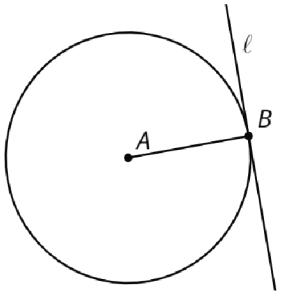
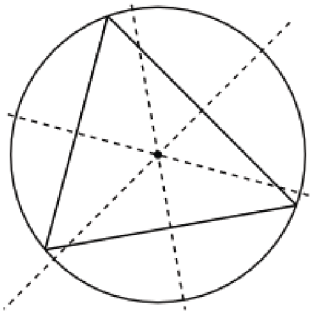
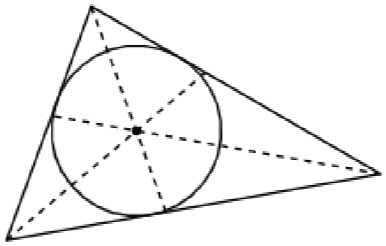
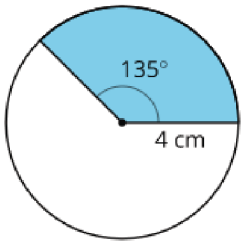
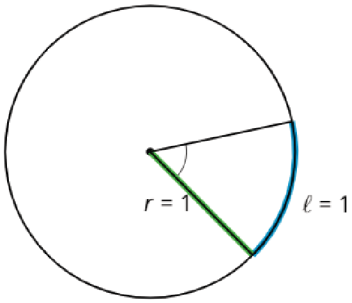
CC BY NC 2024 Illustrative Mathematics®

date, type	statement	diagram
definition	The _____ of an acute angle in a _____ triangle is the ratio (quotient) of the length of the _____ leg to the length of the _____ leg.	
definition	The _____ of a number between _____ and _____ is the measure of an acute _____ whose _____ is that number.	
definition	The _____ of a number between _____ and _____ is the measure of an acute _____ whose _____ is that number.	
definition	The _____ of a positive number is the measure of an acute _____ whose _____ is that number.	
theorem	When any solid is _____ using a _____ of *k*, all lengths are multiplied by _____, all areas are multiplied by _____, and all volumes are multiplied by _____.	

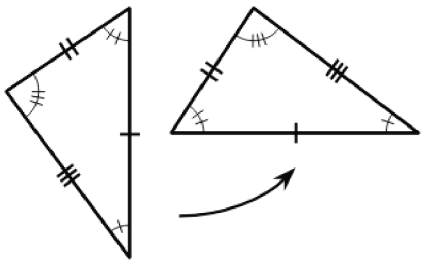
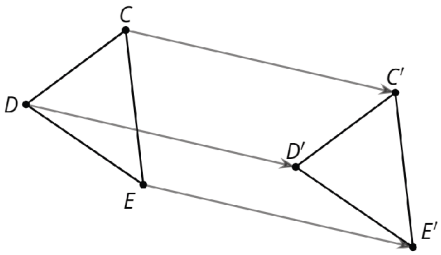
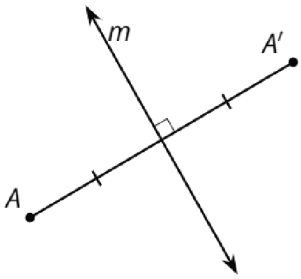
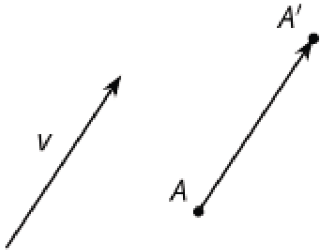
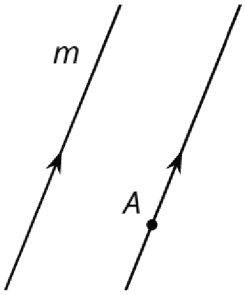
CC BY NC 2024 Illustrative Mathematics®

date, type	statement	diagram
theorem	**Cavalieri's Principle**: If two solids are cut into cross sections by _____ planes, and the corresponding _____ on each plane always have _____ areas, then the two solids have the same _____.	
theorem	A _____ or _____ whose base has an area of ____ square units and whose _____ is *h* units has volume of _____ cubic units, regardless of the shape of the base or whether the solid is oblique.	
theorem	A _____ or _____ whose base has an area of ____ square units and whose _____ is *h* units has volume _____ cubic units, regardless of the shape of the base or whether the solid is oblique.	
definition	The _____ of a substance is the _____ of the substance per unit _____ . That is, density = _____	 density =
theorem	A _____ with _____ (*h*, *k*) and _____ *r* has equation _____.	

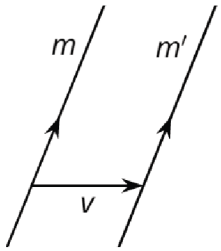
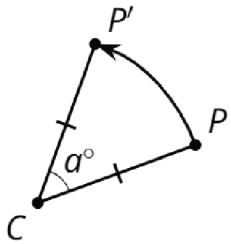
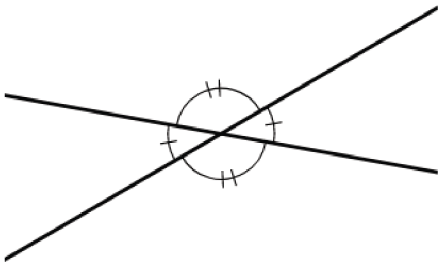
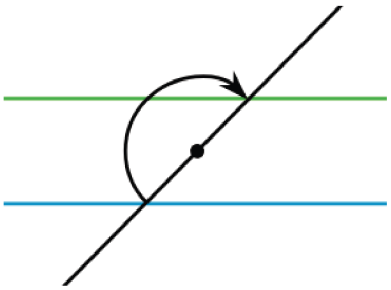
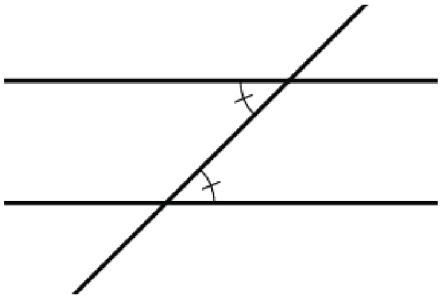
date, type	statement	diagram
definition	A _____ is the set of _____ that are equidistant from a given point, called the _____, and a given line, called the _____.	
definition	The _____ form of the equation of a line is _____ where (h, k) is a particular _____ on the line and m is the _____ of the line.	
theorem	Lines are _____ if and only if they have _____.	
theorem	Lines are _____ if and only if their _____ are _____.	
assertion	_____ **Angle Theorem**: The measure of an _____ angle is _____ the measure of the _____ angle that defines the same arc.	

date, type	statement	diagram
theorem	A _____ is _____ to a _____ if and only if it is _____ to the radius drawn to the point of _____.	
theorem	The three _____ of the sides of a triangle meet at a single _____, called the triangle's _____. This point is the _____ of the triangle's _____.	
theorem	The three _____ of a triangle meet at a single _____, called the triangle's _____. This point is the _____ of the triangle's _____.	
theorem	To calculate the _____ of a _____ or the _____ of an _____, first find the fraction of the circle represented by the central angle of the arc or sector. Multiply this _____ by the circle's _____ or _____.	
definition	For any _____, imagine drawing a _____ with the angle's vertex at its _____. Then, the "_____ measure of the angle" is the ratio of the length of the arc defined by the angle to the circle's radius. That is, _____	

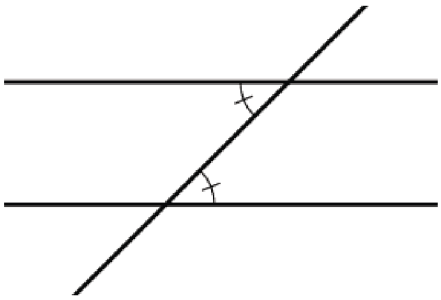
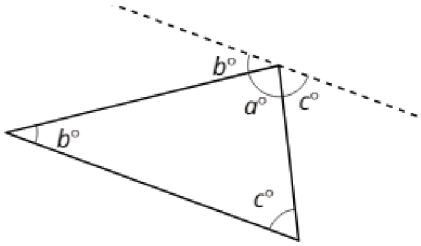
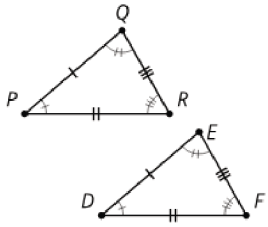
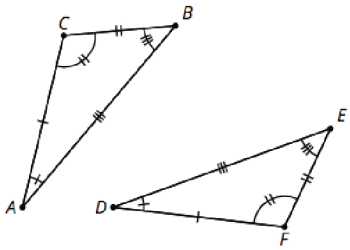
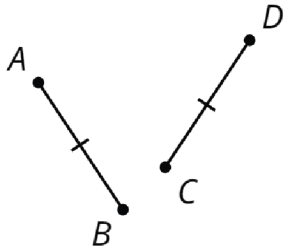
CC BY NC 2024 Illustrative Mathematics®

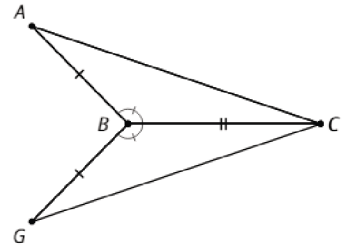
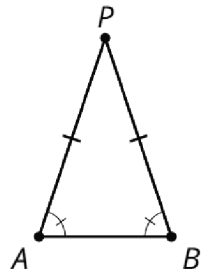
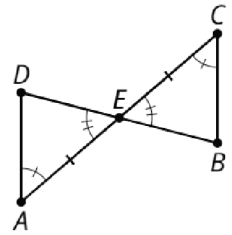
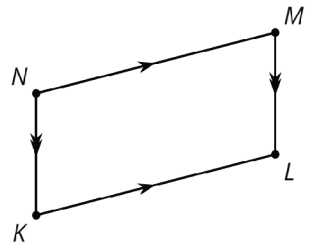
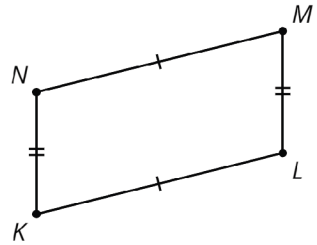
lesson, type	statement	diagram
U1, L10 (students write the date) assertion	A **rigid transformation** is a translation, reflection, rotation, or any sequence of the three. Rigid transformations take lines to lines, angles to angles of the same measure, and segments to segments of the same length.	
U1, L10 definition	Two figures are **congruent** if there is a sequence of translations, rotations, and reflections that takes one figure exactly onto the other. The second figure is called the image of the rigid transformation.	 $\triangle EDC \cong \triangle E'D'C'$
U1, L11 definition	**Reflection** is a rigid transformation that takes a point to another point that is the same distance from the given line, that 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, L12 assertion	**Parallel Postulate:** Given a line *m* and a point *A* that is not on *m*, there is exactly one line that goes through *A* that is parallel to *m*.	

CC BY NC 2024 Illustrative Mathematics®

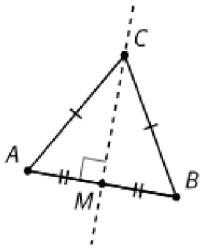
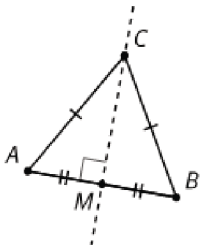
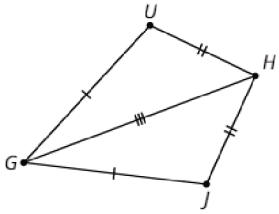
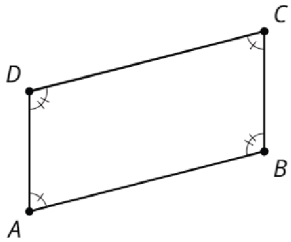
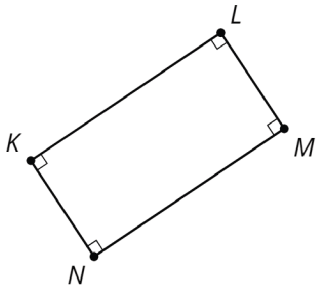
lesson, type	statement	diagram
U1, L12 theorem	Translations take lines to parallel lines or to themselves.	 $m \parallel m'$
U1, L14 definition	**Rotation** is a rigid transformation that takes a point to another point on the circle through the original point with the given center. The two radii, the one from the center to the original point and the one from the center to the image, make the given angle. "Rotate <u>(object)</u> (clockwise or counterclockwise) by <u>(angle or angle measure)</u> using center <u>(point)</u>."	 Rotate P counterclockwise by $a°$ using center C.
U1, L19 theorem	Vertical angles are congruent.	
U1, L20 assertion	Rotation by 180 degrees takes lines to parallel lines or to themselves.	
U1, L20 theorem	**Alternate Interior Angle Theorem:** If two parallel lines are cut by a transversal, then alternate interior angles are congruent. Conversely, if two lines are cut by a transversal and alternate interior angles are congruent, then the lines have to be parallel.	

CC BY NC 2024 Illustrative Mathematics®

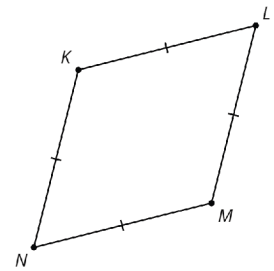
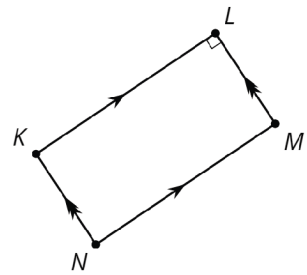
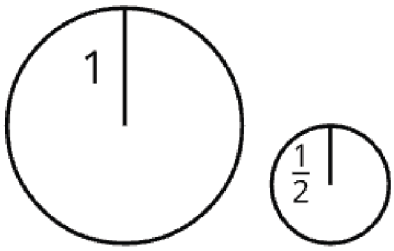
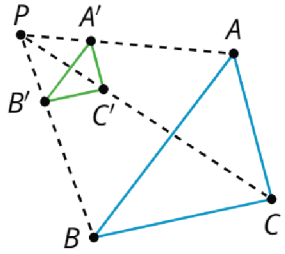
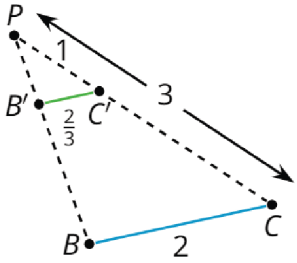
lesson, type	statement	diagram
U1, L20 theorem	**Corresponding Angle Theorem:** If two parallel lines are cut by a transversal, then corresponding angles are congruent. Conversely, if two lines are cut by a transversal and corresponding angles are congruent, then the lines have to be parallel.	
U1, L21 theorem	**Triangle Angle Sum Theorem:** The three angle measures of any triangle always sum to 180 degrees.	 $a + b + c = 180$
U2, L1 theorem	If two figures are congruent, then **corresponding** parts of those figures must be congruent	 $\triangle DEF \cong \triangle PQR$ so $\overline{PQ} \cong \overline{DE}$, $\overline{PR} \cong \overline{DF}$, $\overline{QR} \cong \overline{EF}$, $\angle P \cong \angle D$, $\angle Q \cong \angle E$, $\angle R \cong \angle F$
U2, L3 theorem	If all pairs of corresponding sides and all pairs of corresponding angles are congruent, then the triangles must be congruent.	 $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, $\overline{AC} \cong \overline{DF}$, $\angle A \cong \angle D$, $\angle B \cong \angle E$, $\angle C \cong \angle F$, so $\triangle ABC \cong \triangle DEF$
U2, L5 theorem	If two segments have the same length, then they are congruent.	 $AB = CD$, so $\overline{AB} \cong \overline{CD}$

lesson, type	statement	diagram
U2, L6 theorem	**Side-Angle-Side Triangle Congruence Theorem:** In two triangles, if two pairs of congruent corresponding sides and the pair of corresponding angles between the sides are congruent, then the two triangles are congruent.	 $\overline{AB} \cong \overline{GB}$, $\overline{BC} \cong \overline{BC}$, $\angle ABC \cong \angle GBC$, so $\triangle ABC \cong \triangle GBC$
U2, L6 theorem	**Isosceles Triangle Theorem:** In an isosceles triangle, the base angles are congruent.	 $\overline{AP} \cong \overline{PB}$, so $\angle A \cong \angle B$
U2, L7 theorem	**Angle-Side-Angle Triangle Congruence Theorem:** In two triangles, if two pairs of corresponding angles are congruent and the pair of corresponding sides between the angles is congruent, then the triangles must be congruent.	 $\angle A \cong \angle C$, $\overline{AE} \cong \overline{EC}$, $\angle DEA \cong \angle BEC$, so $\triangle DEA \cong \triangle BEC$
U2, L7 definition	A **parallelogram** is a quadrilateral with two pairs of opposite sides parallel.	 $NM \parallel KL$, $NK \parallel ML$, so $MNKL$ is a parallelogram
U2, L7 theorem	In a parallelogram, pairs of opposite sides are congruent.	 $MNKL$ is a parallelogram, so $\overline{NM} \cong \overline{KL}$, $\overline{NK} \cong \overline{ML}$

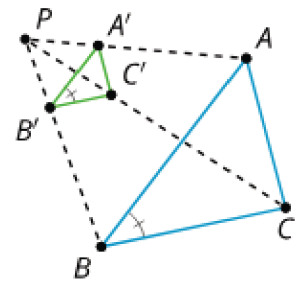
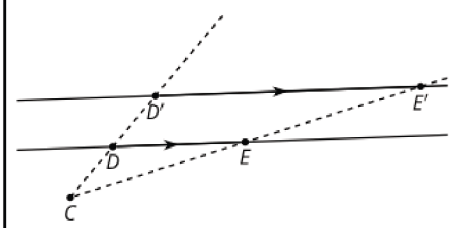
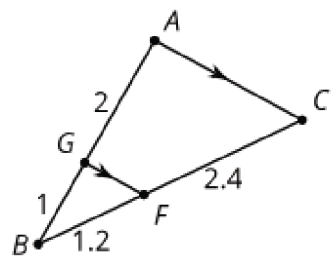
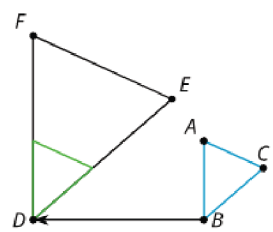
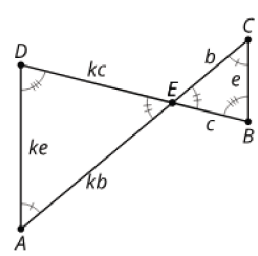
CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U2, L8 theorem	If a point *C* is the same distance from *A* as it is from *B*, then *C* must be on the perpendicular bisector of *AB*.	 $\overline{AC} \cong \overline{BC}$, so *C* is on the line through midpoint *M* perpendicular to $\overline{AB}$.
U2, L8 theorem	If *C* is a point on the perpendicular bisector of *AB*, the distance from *C* to *A* is the same as the distance from *C* to *B*.	 $AB \perp CM$, $\overline{AM} \cong \overline{BM}$, so $\overline{AC} \cong \overline{BC}$
U2, L9 theorem	**Side-Side-Side Triangle Congruence Theorem:** In two triangles, if all three pairs of corresponding sides are congruent, then the triangles must be congruent.	 $\overline{HU} \cong \overline{HJ}$, $\overline{UG} \cong \overline{JG}$, $\overline{HG} \cong \overline{HG}$, so $\triangle HUG \cong \triangle HJG$
U2, L9 theorem	In a parallelogram, opposite angles are congruent.	 *ABCD* is a parallelogram, so $\angle A \cong \angle C$, $\angle D \cong \angle B$
U2, L12 definition	A **rectangle** is a quadrilateral with four right angles.	

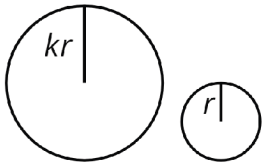
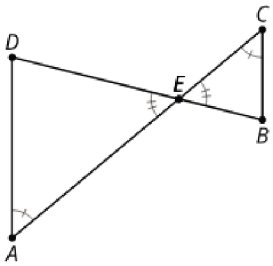
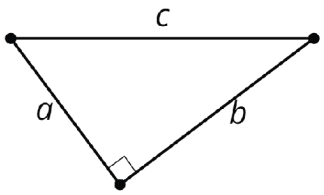
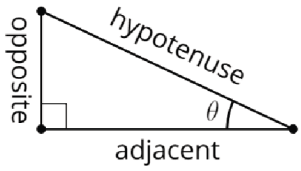
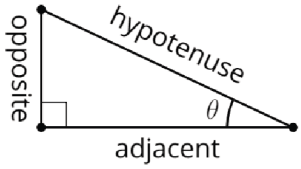
CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U2, L12 definition	A **rhombus** is a quadrilateral with four congruent sides.	
U2, L12 theorem	If a parallelogram has (at least) one right angle, then it is a rectangle.	 *KLMN* has a right angle, so it is a rectangle
U3, L1 definition	**Scale factor** is the factor by which every length in an original figure is multiplied when you make a scaled copy.	 Scale factor is 2 or ½
U3, L1 definition	A **dilation** with center *P* and positive scale factor *k* takes a point *A* along the ray *PA* to another point whose distance is *k* times farther away from *P* than *A* is. Dilate _(object)_ using center _(point)_ and a scale factor of _(number)_.	 $PA' = k \bullet PA$
U3, L3 assertion	The dilation of a line segment is longer or shorter according to the same ratio given by the scale factor.	 $PC{:}PC' = 3{:}1$, $BC{:}B'C' = 2{:}\frac{2}{3}$

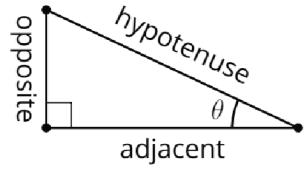
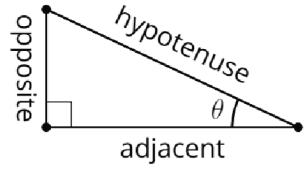
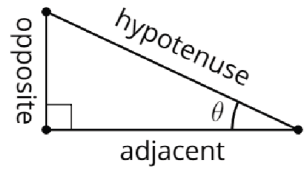
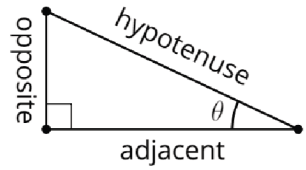
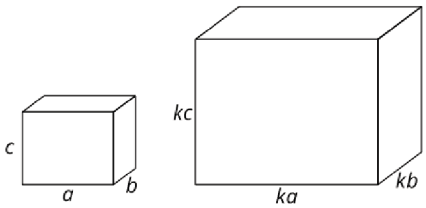
CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U3, L4 assertion	If a figure is dilated, then corresponding angles are congruent.	 $\triangle A'B'C'$ is a dilation of $\triangle ABC$, so $\angle B \cong \angle B'$
U3, L4 theorem	A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.	 Dilate using center C. $DE \parallel D'E'$
U3, L5 theorem	If a line divides two sides of a triangle proportionally, the line must be parallel to the third side of the triangle.	 $\frac{1}{2} = \frac{1.2}{2.4}$, so $AC \parallel GF$
U3, L6 definition	One figure is **similar** to another if there is a sequence of rigid motions and dilations that takes the first figure so that it fits exactly over the second.	 Translation and dilation takes $\triangle ABC$ onto $\triangle FDE$, so $\triangle ABC \sim \triangle FDE$
U3, L7 theorem	If two triangles have all pairs of corresponding angles congruent and all pairs of corresponding side lengths in the same proportion, then the two triangles are similar.	 $\angle A \cong \angle C$, $\angle D \cong \angle B$, $\angle DEA \cong \angle BEC$, $\frac{AD}{CB} = \frac{DE}{BE} = \frac{EA}{EC}$, so $\triangle DEA \sim \triangle BEC$

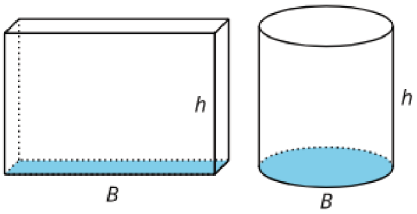
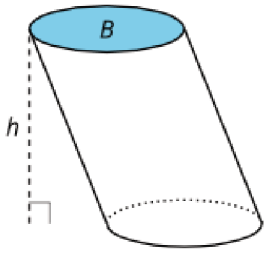
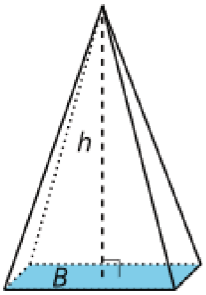
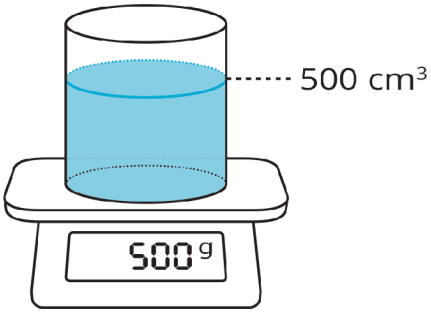
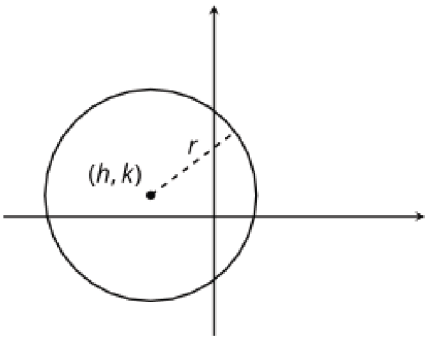
CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U3, L8 theorem	All circles are similar.	
U3, L9 theorem	**Angle-Angle Triangle Similarity Theorem:** In two triangles, if two pairs of corresponding angles are congruent, then the triangles must be similar.	 $\angle A \cong \angle C$, $\angle DEA \cong \angle BEC$, so $\triangle DEA \sim \triangle BEC$
U3, L14 theorem	**Pythagorean Theorem:** If a right triangle has legs with lengths a and b and hypotenuse with length c, then $a^2 + b^2 = c^2$.	 $a^2 + b^2 = c^2$
U4, L6 definition	The **cosine** of an acute angle in a right triangle is the ratio (quotient) of the length of the adjacent leg to the length of the hypotenuse.	 $\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$
U4, L6 definition	The **sine** of an acute angle in a right triangle is the ratio (quotient) of the length of the opposite leg to the length of the hypotenuse.	 $\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$

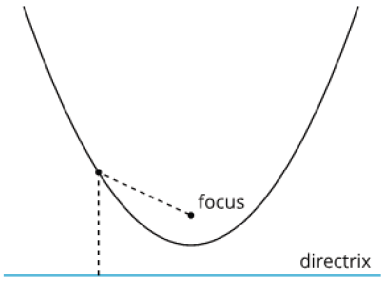
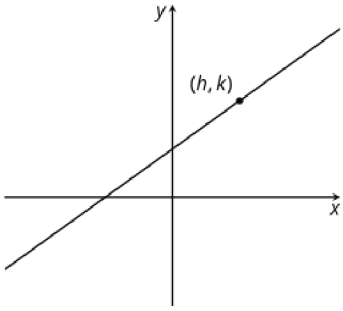
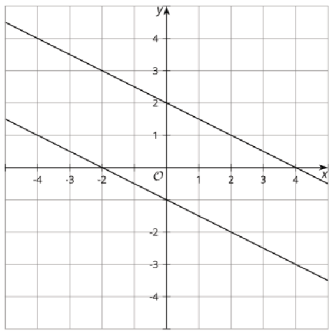
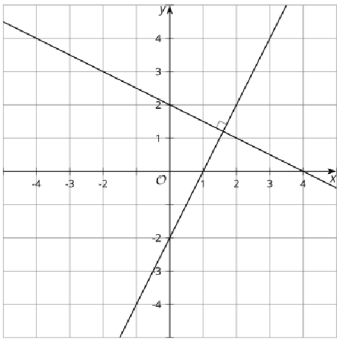
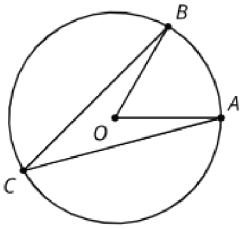
CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U4, L6 definition	The **tangent** of an acute angle in a right triangle is the ratio (quotient) of the length of the opposite leg to the length of the adjacent leg.	 $\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$
U4, L10 definition	The **arccosine** of a number between 0 and 1 is the measure of an acute angle whose cosine is that number.	 $\arccos\left(\frac{\text{adjacent}}{\text{hypotenuse}}\right) = \theta$
U4, L10 definition	The **arcsine** of a number between 0 and 1 is the measure of an acute angle whose sine is that number.	 $\arcsin\left(\frac{\text{opposite}}{\text{hypotenuse}}\right) = \theta$
U4, L10 definition	The **arctangent** of a positive number is the measure of an acute angle whose tangent is that number.	 $\arctan\left(\frac{\text{opposite}}{\text{adjacent}}\right) = \theta$
U5, L6 theorem	When any solid is dilated using a scale factor of k, all lengths are multiplied by k, all areas are multiplied by k^2, and all volumes are multiplied by k^3.	

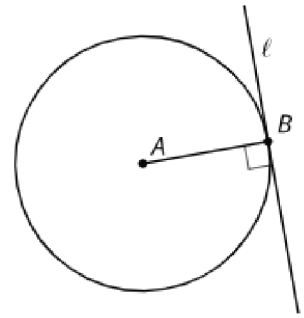
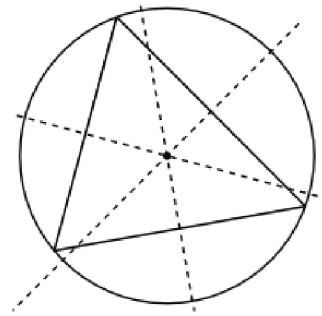
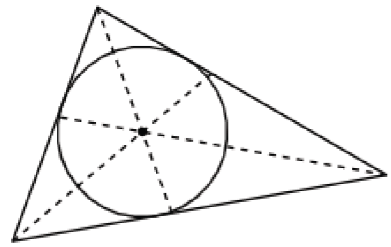
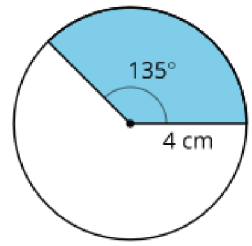
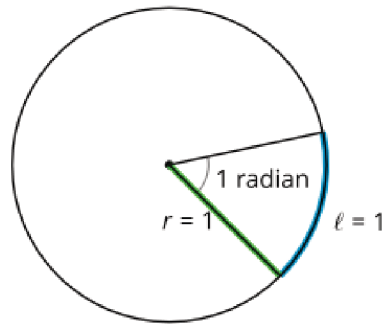
CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U5, L10 theorem	**Cavalieri's Principle**: If two solids are cut into cross sections by parallel planes, and the corresponding cross sections on each plane always have equal areas, then the two solids have the same volume.	
U5, L10 theorem	A prism or cylinder whose base has an area of B square units and whose height is h units has volume of Bh cubic units, regardless of the shape of the base or whether the solid is oblique.	
U5, L13 theorem	A pyramid or cone whose base has an area of B square units and whose height is h units has volume $\frac{1}{3}Bh$ cubic units, regardless of the shape of the base or whether the solid is oblique.	
U5, L17 definition	The **density** of a substance is the mass of the substance per unit volume. That is, $\text{density} = \frac{\text{mass}}{\text{volume}}$.	 density = 1 g per cm³
U6, L4 theorem	A circle with center (h, k) and radius r has equation $(x - h)^2 + (y - k)^2 = r^2$.	

CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U6, L7 definition	A **parabola** is the set of points that are equidistant from a given point, called the **focus**, and a given line, called the **directrix**.	
U6, L9 definition	The **point-slope form** of the equation of a line is $y - k = m(x - h)$ where (h, k) is a particular point on the line and m is the slope of the line.	
U6, L10 theorem	Lines are parallel if and only if they have equal slopes.	
U6, L11 theorem	Lines are perpendicular if and only if their slopes are opposite reciprocals.	
U7, L2 assertion	**Inscribed Angle Theorem:** The measure of an inscribed angle is half the measure of the central angle that defines the same arc.	 $m\angle BCA = \frac{1}{2} m\angle BOA$

CC BY NC 2024 Illustrative Mathematics®

lesson, type	statement	diagram
U7, L3 theorem	A line is tangent to a circle if and only if it is perpendicular to the radius drawn to the point of tangency.	 $\overline{AB} \perp \ell$
U7, L5 theorem	The three perpendicular bisectors of the sides of a triangle meet at a single point, called the triangle's **circumcenter**. This point is the center of the triangle's circumscribed circle.	
U7, L7 theorem	The three angle bisectors of a triangle meet at a single point, called the triangle's **incenter**. This point is the center of the triangle's inscribed circle.	
U7, L8 theorem	To calculate the area of a sector or the length of an arc, first find the fraction of the circle represented by the central angle of the arc or sector. Multiply this fraction by the circle's area or circumference.	 arc length: 3π cm sector area: 6π cm^2
U7, L11 definition	For any angle, imagine drawing a circle with the angle's vertex at its center. Then, the "**radian** measure of the angle" is the ratio of the length of the arc defined by the angle to the circle's radius. That is, $\theta = \frac{arc\ length}{radius}$.	

CC BY NC 2024 Illustrative Mathematics®