

LSU Dual Enrollment Program for Math

Geometry COURSE PROFILE with LMS 3-22-2017

ETEXT: *Geometry in MyLab Math*, Elayn Martin-Gay

HIGH SCHOOL COURSE CODE: 160323

CHAPTERS

- 1 – The Beginning of Geometry
- 2 – Introduction to Reasoning and Proofs
- 3 – Parallel and Perpendicular Lines
- 4 – Triangles and Congruence
- 5 – Special Properties of Triangles
- 6 – Quadrilaterals
- 7 – Similarity
- 8 – Transformations
- 9 – Right Triangles and Trigonometry
- 10 – Area
- 11 – Surface Area and Volume
- 12 – Circles and Other Conic Sections
- 13 – Probability

The number in parentheses indicates the number of homework exercises on that topic in MyLab Math.

Chapter 1: The Beginning of Geometry

Section 1.2 Geometry – A Mathematical System (32)

LMS: None

Understand how a mathematical system, like geometry, is formed

Section 1.3 Points, Lines, and Planes (49)

LMS: G-CO.A.1

Learn the basic terms and postulates of geometry

Section 1.4 Segments and Their Measures (35)

LMS: G-CO.A.1

Determine where a point is on a line

Understand the measure of segments

Determine whether segments are congruent

Use segment postulates and algebra to find segment lengths

Section 1.5 Angles and Their Measures (35)

LMS: G-CO.A.1

Understand the measure of angles

Use algebra and the Angle Addition Postulate to solve applications

Section 1.6 Angle Pairs and Their Relationships (52)

LMS: G-CO.A.1, 7.G.B.5

- Learn special relationships between pairs of angles
- Use algebra to find angle measures

Section 1.7 Midpoint and Distance Formulas (39)

LMS: G-GPE.B.6, 8.G.B.8

- Find the midpoint of a segment
- Find the endpoint of a segment
- Find the distance between two points on the coordinate plane
- Find the midpoint and distance of two points

Section 1.8 Basic Geometry Constructions (25)

LMS: G-CO.D.12

- Make basic constructions using a straight edge and a compass

Chapter 2: Introduction to Reasoning and Proofs

Section 2.1 Perimeter, Circumference, and Area (44)

LMS: G-GPE.B.7

- Find the perimeter of circumference of basic shapes
- Find the area of basic shapes
- Determine whether a situation is discussing area or perimeter
- Determine the perimeter and area
- Understand the concepts of perimeter and area

Section 2.6 Properties of Equality and Two-Column Proofs (41)

LMS: G-CO.C.9

- Use properties of equality to justify reasons for steps
- Write a two-column proof

Section 2.7 Proving Theorems About Angles (37)

LMS: G-CO.C.9

- Prove and use theorems about angles

Chapter 3: Parallel and Perpendicular Lines

Section 3.1 Lines and Angles (61)

LMS: G-CO.A.1, 8.G.A.5

- Identify relationships between lines and planes
- Learn the names of angles formed by lines and a transversal

Section 3.2 Proving Lines are Parallel (57)

LMS: G-CO.C.9, 8.G.A.5

- Use theorems to prove that two lines are parallel
- Use algebra to find the measures of angles needed so that lines are parallel.
- Understand the concepts of proofs

Section 3.3 Parallel Lines and Angles Formed by Transversals (45)

LMS: G-CO.C.9

Prove and use theorems about parallel lines cut by a transversal

Use algebra to find measures of angles formed by parallel lines

Section 3.4 Proving Theorems: Parallel and Perpendicular Lines (30)

LMS: G-CO.C.9, G-MG.A.1

Use and prove theorems about parallel and perpendicular lines

Use algebra to find measures of angles related to perpendicular lines

Section 3.5 Constructing Parallel and Perpendicular Lines (28)

LMS: G-CO.D.12, 7.G.A.2

Construct parallel and perpendicular lines

Construct geometric shapes

Section 3.6 Coordinate Geometry – The Slope of a Line (30)

LMS: G-GPE.B.5, 8.EE.B.6

Find the slope of a line

Interpret the slope-intercept form in an application

Compare the slopes of parallel and perpendicular lines

Section 3.7 Coordinate Geometry – Equations of Lines (21)

LMS: G-GPE.B.5

Use the slope-intercept form

Use the point-slope form

Write the equations of vertical and horizontal lines

Find the equations of parallel and perpendicular lines

Understand the concepts of parallel and perpendicular lines

Find the equation of the perpendicular bisector of a line segment

Chapter 4: Triangles and Congruence

Section 4.1 Types of Triangles (63)

LMS: G-CO.C.10, 8.G.A.5

Learn the vocabulary of triangles

Classify triangles by angles and sides

Find angle measures of triangles

Section 4.2 Congruent Figures (40)

LMS: G-SRT.B.5

Identify corresponding parts in congruent figures

Prove triangles are congruent

Section 4.3 Congruent Triangles by SSS and SAS (35)

LMS: G-SRT.B.5

Determine parts of a triangle using a drawing

Prove two triangles are congruent using the SSS and SAS postulates

Use the distance formula to determine if two triangles are congruent

Understand the meaning of the SSS and SAS postulates

Section 4.4 Congruent Triangles by ASA and AAS (47)

LMS: G-SRT.B.5

Prove two triangles are congruent using ASA postulates and the AAS theorem
Identify when to use SSS, SAS, ASA, or AAS to prove triangles congruent
Use postulates and theorems of congruence to find missing values in a triangle

Section 4.5 Proofs Using Congruent Triangles (45)

LMS: G-SRT.B.5, G-MG.A.1

Identify common parts of overlapping triangles
Use triangle congruence and corresponding parts of congruent triangles
Prove two triangles are congruent using other congruent triangles
Determine the measure of missing angles and sides of congruent triangles

Section 4.6 Isosceles, Equilateral, and Right Triangles (71)

LMS: G-CO.C.10, G-SRT.B.5, G-MG.A.1

Determine if triangles are congruent
Use properties of isosceles and equilateral triangles
Use properties of right triangles
Use multiple properties of triangles to solve
Construct triangles

Chapter 5: Special Properties of Triangles

Section 5.1 Perpendicular and Angle Bisectors (42)

LMS: G-CO.C.9, G-CO.D.12, G-SRT.B.5

Use perpendicular bisectors to solve problems
Use angle bisectors to solve problems

Section 5.2 Bisectors of a Triangle (44)

LMS: G-C.A.3, G-MG.A.1

Identify the differences between the circumcenter and the incenter of a triangle
Use properties of perpendicular bisectors of sides of a triangle
Use properties of angle bisectors of the angles of a triangle
Use properties of both perpendicular bisectors and angle bisectors

Section 5.3 Medians and Altitudes of a Triangle (42)

LMS: G-CO.C.10, G-GPE.B.4

Identify differences between medians and altitudes of triangles
Use properties of the medians of a triangle
Use properties of the altitudes of a triangle

Section 5.4 Midsegments of Triangles (35)

LMS: G-CO.C.10, G-CO.D.12, G-GPE.B.4, G-MG.A.1

Use properties of midsegments of triangles
Use coordinate geometry with midsegments
Solve applications of midsegments

Section 5.5 Indirect Proofs and Inequalities in One Triangle (47)

LMS: G-CO.C.10

Use indirect reasoning to write proofs
Learn the triangle relationship between length of a side and size of its opposite angle
Use the triangle inequality theorem

Section 5.6 Inequalities in Two Triangles (26)

LMS: G-CO.C.10, G-MG.A.1

Use the Hinge Theorem and its converse to compare measures of sides and angles

Chapter 6: Quadrilaterals

Section 6.2 Parallelograms (51)

LMS: G-CO.C.11, G-MG.A.1

Use relationships among sides and angles of parallelograms

Use relationships among consecutive angles and diagonals of parallelograms

Section 6.3 Proving that a Quadrilateral is a Parallelogram (24)

LMS: G-CO.C.11, G-GPE.B.4, G-MG.A.1

Determine whether quadrilaterals are parallelograms

Use coordinate geometry with parallelograms

Section 6.4 Rhombuses, Rectangles, and Squares (39)

LMS: G-CO.C.11

Define and classify special types of parallelograms

Use properties of diagonals of rhombuses, rectangles, and squares

Use properties of diagonals to form rhombuses, rectangles, and squares

Section 6.5 Trapezoids and Kites (36)

LMS: G-SRT.B.5

Use properties of trapezoids

Use properties of kites

Chapter 7: Similarity

Section 7.3 Similar Polygons (51)

LMS: G-SRT.B.5

Identify similar polygons

Use similar polygons to solve applications

Understand the concepts of similar polygons

Make scaled drawings

Section 7.4 Proving Triangles are Similar (48)

LMS: G-SRT.B.4, G-SRT.B.5

Use the AA Similarity Postulate and the SAS Similarity and SSS Similarity Theorems

Use similarity to find indirect measurements

Find the measurements of similar figures

Section 7.5 Geometric Mean and Similarity in Right Triangles (43)

LMS: G-SRT.B.4, G-SRT.B.5

Use altitudes of right triangles to prove similarity

Find the geometric mean of the lengths of segments in a right triangle

Solve applications involving right triangles

Understand the concepts of right triangles

Section 7.6 Additional Proportions in Triangles (45)

LMS: G-SRT.B.4, G-SRT.B.5

Use the Side-Splitter Theorem

Use the Triangle-Angle-Bisector Theorem

Understand the properties of parallelograms

Chapter 8: Transformations

Section 8.1 Rigid Transformations (18)

LMS: G-SRT.A.2

Identify rigid transformations of isometries

Name images and corresponding parts

Use isometries to determine values of variables

Section 8.2 Translations (20)

LMS: G-CO.A.2, G-CO.B.6

Find translation images of figures

Write ordered-pair translation rules

Solve application problems involving translations

Solve conceptual problems involving translations

Section 8.3 Reflections (26)

LMS: G-CO.A.2, G-CO.A.5, G-CO.B.6

Find reflection images of figures

Identify and use line symmetry

Solve application problems involving reflections

Solve conceptual problems involving reflections

Section 8.4 Rotations (27)

LMS: G-CO.A.2, G-CO.B.6

Draw and identify rotation images of figures

Find angles of rotation

Identify symmetries

Section 8.5 Dilations (22)

LMS: G-SRT.A.1, G-CO.A.2

Understand dilation images of figures

Section 8.6 Compositions of Reflections (21)

LMS: G-CO.A.2, G-CO.A.4, G-CO.A.5, G-CO.B.6

Find compositions of reflections, including glide reflections

Classify isometries

Work with kaleidoscope images

Prove properties of transformations

Chapter 9: Right Triangles and Trigonometry

Section 9.1 Pythagorean Theorem and its Converse (36)

LMS: G-SRT.C.8, G-CO.C.10

Use the Pythagorean Theorem
Use the converse of the Pythagorean Theorem
Solve application problems

Section 9.2 Special Right Triangles (27)

LMS: G-SRT.C.6, G-SRT.C.8, G-CO.C.10, G-MG.A.1

Use the properties of 45° - 45° - 90° triangles
Use the properties of 30° - 60° - 90° triangles
Use the properties of special triangles to find the missing parts of figures
Solve application problems

Section 9.3 Trigonometric Ratios (47)

LMS: G-SRT.C.6, G-SRT.C.7, G-SRT.C.8, G-MG.A.1

Write the ratios for sine, cosine, and tangent given a right triangle
Approximate values for the sine, cosine, and tangent of an angle
Use sine, cosine, and tangent ratios to determine side lengths in right triangles
Approximate angle measures given the sine, cosine, or tangent value
Use the sine, cosine, and tangent ratios to determine angle measure in right triangles
Write the ratios for secant, cosecant, and cotangent given a right triangle
Solve application problems

Section 9.4 Solving Right Triangles (29)

LMS: G-SRT.C.8
Solve right triangles
Use angle of elevation and depression to solve problems
Solve application problems

Chapter 10: Area

Section 10.1 Angles: Polygons & Regular Polygon Tessellations (38)

LMS: None

Find and use the measures of interior angles of polygons
Find and use the measures of exterior angles of polygons
Solve problems related to the measures of interior and exterior angles of polygons
Determine whether a tessellation of regular polygons is formed
Prove theorems related to the measures of interior and exterior angles of polygons

Section 10.2 Areas of Triangles and Quadrilaterals (47)

LMS: G-GPE.B.7, G-MG.A.1

Find the areas of squares, rectangles, parallelograms, and triangles
Find the areas of trapezoids, rhombuses, and kites
Find the areas of irregular figures

Section 10.3 Areas of Regular Polygons (36)

LMS: G-CO.D.13

Find the measures of angles formed between radii and the apothem in regular polygons
Find areas of regular polygons
Find areas of regular polygons using trigonometric ratios
Solve problems involving geometric constructions or proofs

Understand the relationships among radii, apothems, side lengths, and areas of regular polygons

Section 10.4 Perimeters and Areas of Similar Figures (33)

LMS: G-SRT.B.5

Find scale factors and ratios of perimeters and areas of similar figures

Find side lengths, perimeters, and areas of similar figures

Solve application problems

Solve problems involving geometric constructions

Complete statements about similar figures

Section 10.5 Arc Measure, Circumference, and Arc Lengths of Circles (40)

LMS: G-CO.A.1, G-C.A.2

Identify and name semicircles, major arcs, and minor arcs

Find measures of central angles and arcs

Find circumferences and arc lengths

Section 10.6 Areas of Circles and Sectors (33)

LMS: G-C.B.5, G-MG.A.1

Find areas of circles, sectors, and segments of circles

Find radii of circles

Solve problems relating regular polygons and circles

Section 10.7 Geometric Probability (33)

LMS: S-CP.A.1

Use segment models to find the probabilities of events

Use area models to find the probabilities of events

Chapter 11: Surface Area and Volume

Section 11.1 Solids and Cross Sections (35)

LMS: G-GMD.B.4, G-MG.A.1

Recognize polyhedra and their parts

Visualize cross sections of solids

Visualize solids formed by revolving a region about a line

Section 11.4 Volume of Prisms and Cylinders (32)

LMS: G-GMD.A.3, G-MG.A.1

Find the volume of a prism

Find the volume of a cylinder

Find the volume of a composite solids

Section 11.5 Volume of Pyramids and Cones (20)

LMS: G-GMD.A.3, G-MG.A.1

Find the volume of a pyramid

Find the volume of a cone

Section 11.6 Volume of Spheres (16)

LMS: G-GMD.A.3, G-MG.A.1

Find the volume of a sphere

Chapter 12: Circles and Other Conic Sections

Section 12.1 Circle Review and Tangent Lines (33)

LMS: G-C.A.2

Review circles and arcs

Use properties of a tangent line to a circle

Solve problems involving geometric proofs or constructions

Section 12.2 Chords and Arcs (18)

LMS: G-C.A.2

Use congruent chords, arcs, and central angles

Use perpendicular bisectors to chords

Solve problems involving geometric proofs or constructions

Section 12.3 Inscribed Angles (18)

LMS: G-C.A.2, G-C.A.3, G-C.A.4

Find measures of inscribed angles and/or intercepted arcs

Find measures of angles and/or arcs formed by tangent and chords

Solve problems involving geometric proofs or constructions

Section 12.4 Additional Angle Measure and Segment Lengths (17)

LMS: G-C.A.2

Find measures of angles formed by chords, secants, and tangents

Find the lengths of segments associated with circles

Solve application problems

Solve problems involving geometric proofs

Section 12.5 Circles in the Coordinate Plane (19)

LMS: G-GPE.A.1

Write an equation of a circle

Find the center and radius of a circle written in standard form

Complete the square to find the center and radius of a circle

Find quantities related to circles

Chapter 13: Probability

Section 13.1 Fundamentals of Probability (18)

LMS: S-CP.A.1, S-CP.A.4

Compute theoretical probability

Compute empirical probability

Section 13.2 Events Involving “Not” and “Or” (16)

LMS: S-CP.A.1, S-CP.A.4

Find the probability that an event will not occur

Find the probability of one event or a second event occurring

Section 13.3 Events Involving “And”; Conditional Probability (19)

LMS: S-CP.A.2, S-CP.A.3

Find the probability of one event and a second event occurring

Compute conditional probabilities

LMS for Geometry that are not reflected in *MyLab Math* course exercises:

LMS#	Standard Description
G-CO.A.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
G-CO.B.7	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
G-CO.B.8	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
G-SRT.A.3	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
G-C.A.1	Prove that all circles are similar.
G-GMD.A.1	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.
G-GMD.B.4	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
G-MG.A.2	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
G-MG.A.3	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
S-CP.A.5	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.
S-CP.B.6	Find the conditional probability of A given B as the fraction of B 's outcomes that also belong to A , and interpret the answer in terms of the model.
S-CP.B.7	Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and interpret the answer in terms of the model.

LSU Dual Enrollment Program for Math

Geometry Supplemental Activities

Standard # and Description	G-CO.A.3 Given a rectangle, parallelogram, trapezoid, or regular polygons, describe the rotations and reflections that carry it onto itself.
Source	Illustrative Mathematics https://www.illustrativemathematics.org/HSG-CO.A.3

Symmetries of a Quadrilateral I

Suppose $ABCD$ is a quadrilateral for which there is exactly one rotation, through an angle larger than 0 degrees and less than 360 degrees, which maps to itself. Further, no reflections map $ABCD$ to itself. What shape is $ABCD$?

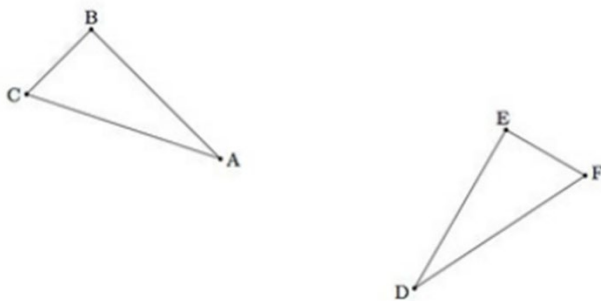
Symmetries of a Quadrilateral II

There is exactly one reflection and no rotation that sends the convex quadrilateral $ABCD$ onto itself. What shape(s) could quadrilateral $ABCD$ be? Explain.

Standard # and Description	G-CO.B.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
Source	Illustrative Mathematics https://www.illustrativemathematics.org/content-standards/tasks/1637

Properties of Congruent Triangles

Below is a picture of two triangles:

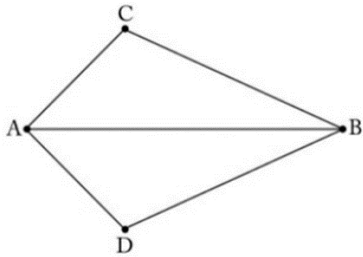


- Suppose there is a sequence of rigid motions which maps $\triangle ABC$ to $\triangle DEF$. Explain why corresponding sides and angles of these triangles are congruent.
- Suppose instead that corresponding sides and angles of $\triangle ABC$ and $\triangle DEF$ are congruent. Show that there is a sequence of rigid motions which maps $\triangle ABC$ to $\triangle DEF$.

Standard # and Description	G-CO.B.8 Explain how the criteria for triangle congruence (Angle-Side-Angle, Side-Angle-Side, and Side-Side-Side) follow from the definition of congruence in terms of rigid motions.
Source	Illustrative Mathematics https://www.illustrativemathematics.org/HSG-CO.B.8

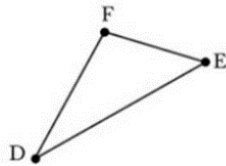
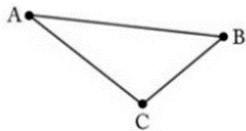
Why Does ASA Work?

In $\triangle ABC$ and $\triangle ABD$ below, we are given that $\angle BAC$ is congruent to $\angle BAD$ and $\angle ABC$ is congruent to $\angle ABD$. Show that the reflection of the plane about $\overline{AB}$ maps $\triangle ABD$ to $\triangle ABC$.



Why Does SAS Work?

In the two triangles below, angle A is congruent to angle D , side $\overline{AC}$ is congruent to side $\overline{DF}$, and side $\overline{AB}$ is congruent to side $\overline{DE}$.



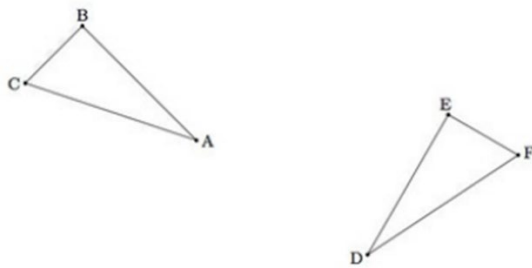
Sally reasons as follows: "If angle A is congruent to angle D , then I can move point A to point D so that side $\overline{AB}$ lies on top of side $\overline{DE}$ and side $\overline{AC}$ lies on top of side $\overline{DF}$. Since $\overline{AB}$ and $\overline{DE}$ are congruent as are $\overline{AC}$ and $\overline{DF}$, the two triangles match up exactly so they are congruent."

Explain Sally's reasoning for why $\triangle ABC$ is congruent to $\triangle DEF$ using the language of reflections:

- Construct a reflection which maps point A to point D . Call B' and C' the images of B and C respectively under this reflection.
- Construct a reflection which does not move D but which sends B' to E . Call C'' the image of C' under this reflection.
- Construct a reflection which does not move D or E but which sends C'' to F .

Why Does SSS Work?

In the two triangles below, side $\overline{AB}$ is congruent to side $\overline{DE}$, side $\overline{AC}$ is congruent to side $\overline{DF}$, and side $\overline{BC}$ is congruent to side $\overline{EF}$.



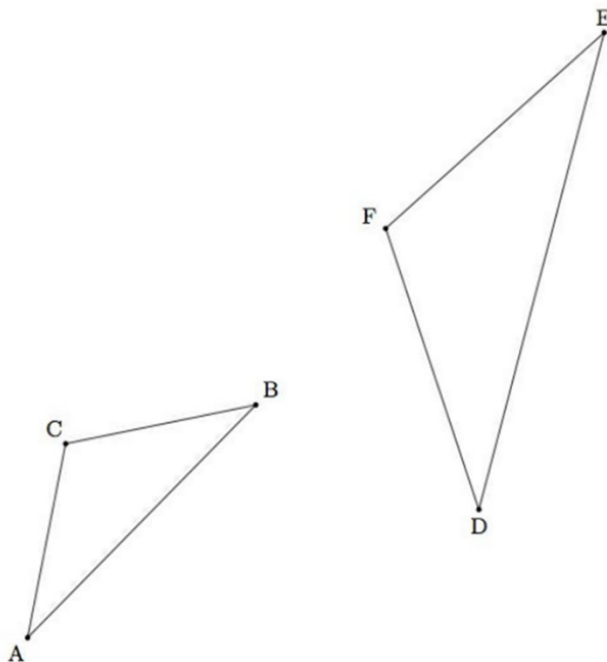
Show that the two triangles $\triangle ABC$ and $\triangle DEF$ are congruent via the following steps, which produce a rigid transformation of the plane sending $\triangle ABC$ to $\triangle DEF$.

- Show that there is a translation of the plane which maps A to D. Call B' and C' the images of B and C under this transformation.
- Show that there is a rotation of the plane which does not move D and which maps B' to E. Call C'' the image of C' under this transformation.
- Show that there is a reflection of the plane which does not move D or E and which maps C'' to F.

Standard # and Description	G-SRT.A.3 Use the properties of similarity transformations to establish the Angle-Angle criterion for two triangles to be similar.
Source	Illustrative Mathematics https://www.illustrativemathematics.org/content-standards/HSG/SRT/A/3/tasks/1422

Similar triangles

In the two triangles below, $m(\angle A) = m(\angle D)$ and $m(\angle B) = m(\angle E)$.



Use a sequence of translations, rotations, reflections, and/or dilations show that $\triangle ABC$ is similar to $\triangle DEF$.

Standard # and Description	G-C.A.1 Prove that all circles are similar.
Source	Louisiana Student Standards: Companion Document for Teachers (Geometry) https://www.louisianabelieves.com/resources/library/k-12-math-year-long-planning

Show that the two circles are similar by stating the necessary transformations from C to D.

C: center at (2,3) with a radius of 5

D: center at (−1,4) with a radius of 10

Standard # and Description	G-GMD.A.1 Give an informal argument, e.g., dissection arguments, Cavalieri's principle, or informal limit arguments, for the formulas for the circumference of a circle; area of a circle; volume of a cylinder, pyramid, and cone.
Source	Illustrative Mathematics https://www.illustrativemathematics.org/content-standards/HSG/GMD/A/1/tasks/1567

Area of a Circle

The goal is to explain why the area enclosed by a circle C of radius r is πr^2 . Recall that π is the ratio of the circumference of a circle to its diameter and that this ratio is independent of the size of the circle.

- Draw a picture of a regular octagon O inscribed in C. Find a formula for the area of the octagon in terms of its perimeter.
- Reasoning as in part (a), find a formula for the area of a regular n sided polygon, for $n \geq 3$, inscribed in C. The formula should give the area of the polygon in terms of its perimeter.
- Using your formula from part (b), explain why the area of C is πr^2 .

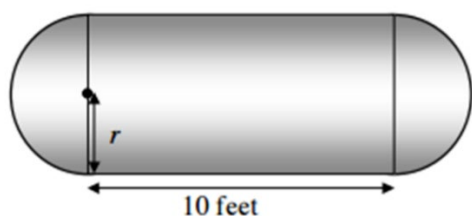
Circumference of a Circle

Suppose we define π to be the circumference of a circle whose diameter is 1. Explain why the circumference of a circle with radius $r > 0$ is $2\pi r$.

standard # and Description	G-GMD.B.4 Identify the shapes of two-dimensional cross sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
Source	Mathematics Assessment Project http://map.mathshell.org/tasks.php?unit=HE16&collection=9&redir=1

Propane Tanks

People who live in isolated or rural areas have their own tanks of natural gas to run appliances like stoves, washers, and water heaters. These tanks are made in the shape of a cylinder with hemispheres on the ends.



The Insane Propane Tank Company makes tanks with this shape in different sizes. The cylinder part of every tank is exactly 10 feet long, but the radius of the hemispheres, r , will be different depending on the size of the tank. The company wants to double the capacity of their standard tank which is 6 feet in diameter. What should the radius of the new tank be? Explain your thinking and show your calculations.

Standard # and Description	G-MG.A.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
Source	Louisiana Student Standards: Companion Document for Teachers (Geometry) https://www.louisianabelieves.com/resources/library/k-12-math-year-long-planning

1. An antique waterbed has the following dimensions 72 inches x 84 inches x 9.5 inches. It takes 240.7 gallons of water to fill it, which would weigh 2071 pounds. What is the weight of a cubic foot of water?
2. Wichita, Kansas has 344,234 people within 165.9 square miles. What is Wichita's population density?

Standard # and Description	G-MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Source	Louisiana Student Standards: Companion Document for Teachers (Geometry) https://www.louisianabelieves.com/resources/library/k-12-math-year-long-planning

1. You are the manager of a packing company responsible for manufacturing identical rectangular boxes from rectangular sheet of cardboard, each sheet having the same dimensions (18 inches X 24 inches). To save money, you want to manufacture boxes that will have the maximum possible volume. Determine the maximum volume possible.
2. The Bolero Chocolate Company makes square prisms to package their famous chocolate almond balls. The package holds 5 of the chocolate almond balls that are 1.5 inches in diameter. They are considering changing packaging to a triangular prism. What would be the difference in material cost if the cardboard used is currently purchased at \$1.25 per square foot? (Consider both the top and bottom of the box.)

Standard # and Description	S-CP.A.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. <i>For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.</i> S-CP.B.6 Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A and interpret the answer in terms of the model.
Source	Illustrative Mathematics https://www.illustrativemathematics.org/HSS-CP

The Titanic 1

On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2,204 passengers and crew surviving. Data on survival of passengers are summarized in the table below. (Data source: www.encyclopedia-titanica.org)

Passenger Type	Survived	Did not survive	Total
First Class	201	123	324
Second Class	118	166	284
Third Class	181	528	709
Total	500	817	1317

- a. Calculate the following probabilities. Round your answers to three decimal places.
 - i. If one of the passengers is randomly selected, what is the probability that this passenger was in first class?
 - ii. If one of the passengers is randomly selected, what is the probability that this passenger survived?
 - iii. If one of the passengers is randomly selected, what is the probability that this passenger was in first class and survived?
 - iv. If one of the passengers is randomly selected from the first-class passengers, what is the probability that this passenger survived? (That is, what is the probability that the passenger survived, given that this passenger was in first class?)
 - v. If one of the passengers who survived is randomly selected, what is the probability that this passenger was in first class?
 - vi. If one of the passengers who survived is randomly selected, what is the probability that this passenger was in third class?
- b. Why is the answer to part (a. iv) larger than the answer to part (a. iii)?
- c. Why is the answer to part (a. v) larger than the answer to part (a. vi)?
- d. What other questions can you ask and answer using information in the given table? List at least three.

The Titanic 2

On April 15, 1912, the Titanic struck an iceberg and rapidly sank with only 710 of her 2,204 passengers and crew surviving. Some believe that the rescue procedures favored the wealthier first-class passengers. Data on survival of passengers is summarized in the table below. We will use this data to investigate the validity of such claims. (Data source: www.encyclopedia-titanica.org)

Passenger Type	Survived	Did not survive	Total
First Class	201	123	324
Second Class	118	166	284
Third Class	181	528	709
Total	500	817	1317

- Are the events “passenger survived” and “passenger was in first class” independent events? Support your answer using appropriate probability calculations.
- Are the events “passenger survived” and “passenger was in third class” independent events? Support your answer using appropriate probability calculations.
- Did all passengers aboard the Titanic have the same probability of surviving? Support your answer using appropriate probability calculations.

Standard # and Description	S-CP.B.7 Apply the Addition Rule $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ and interpret the answer in terms of the model.
Source	Illustrative Mathematics https://www.illustrativemathematics.org/content-standards/HSS/CP/B/7/tasks/1112

Rain and Lightning

- Today there is a 55% chance of rain, a 20% chance of lightning, and a 15% chance of lightning and rain together. Are the two events “rain today” and “lightning today” independent events? Justify your answer.
- Now suppose that today there is a 60% chance of rain, a 15% chance of lightning and a 20% chance of lightning if it is raining. What is the chance of both rain and lightning today?
- Now suppose that today there is a 55% chance of rain, a 20% chance of lightning, and a 15% chance of lightning and rain. What is the chance that we will have rain or lightning today?
- Now suppose that today there is a 50% chance of rain, a 60% chance of rain or lightning, and a 15% chance of rain and lightning. What is the chance that we will have lightning today?