LSU Dual Enrollment Program for Math

 COURSE PROFILE with LMS

Content Revised 3-22-2017

**COURSE NAME: Geometry**

**HIGH SCHOOL COURSE CODE: 160323**

**PRIMARY ONLINE CONTENT SOURCE: *Geometry in MyMathLab****,* **Elayn Martin-Gay**

**COURSE/UNIT CREDIT: 1 Carnegie Unit for full year**

**GRADE(S): 8, 9, or 10**

**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**

| **SECTION NAMES (NUMBER OF EXERCISES) AND LEARNING OBJECTIVES**  | **LMS #** |
| --- | --- |
| **CHAPTER 1: The Beginning of Geometry**  | no data |
| **1.2 Geometry – A Mathematical System (32)**Understand how a mathematical system, like geometry, is formed. |  |
| **1.3 Points, Lines, and Planes (49)**Learn the basic terms and postulates of geometry | G-CO.A.1 |
| **1.4 Segments and Their Measures (35)**Determine where a point is on a lineUnderstand the measure of segmentsDetermine whether segments are congruentUse segment postulates and algebra to find segment lengths | G-CO.A.1 |
| **1.5 Angles and Their Measures (35)**Understand the measure of anglesUse algebra and the Angle Addition Postulate to solve applications | G-CO.A.1 |
| **1.6 Angle Pairs and Their Relationships (52)**Learn special relationships between pairs of anglesUse algebra to find angle measures |  G-CO.A.17.G.B.5 |
| **1.7 Midpoint and Distance Formulas (39)**Find the midpoint of a segmentFind the endpoint of a segmentFind the distance between two points on the coordinate planeFind the midpoint and distance of two points | G-GPE.B.68.G.B.8 |
| **1.8 Basic Geometry Constructions (25)**Make basic constructions using a straight edge and a compass | G-CO.D.12 |
| **CHAPTER 2: Introduction to Reasoning and Proofs** | no data |
| **2.1 Perimeter, Circumference, and Area (44)**Find the perimeter of circumference of basic shapesFind the area of basic shapesDetermine whether a situation is discussing area or perimeterDetermine the perimeter and areaUnderstand the concepts of perimeter and area |  G-GPE.B.7 |
| **2.6 Properties of Equality and Two-Column Proofs (41)**Use properties of equality to justify reasons for stepsWrite a two-column proof | G-CO.C.9 |
| **2.7 Proving Theorems About Angles (37)**Prove and uses theorems about angles | G-CO.C.9 |
| **CHAPTER 3: Parallel and Perpendicular Lines** | no data |
| **3.1 Lines and Angles (61)**Identify relationships between lines and planesLearn the names of angles formed by lines and a transversal | G-CO.A.18.G.A.5  |
| **3.2 Proving Lines are Parallel (57)**Use theorems to prove that two lines are parallelUse algebra to find the measures of angles needed so that lines are parallel.Understand the concepts of proofs | G-CO.C.98.G.A.5 |
| **3.3 Parallel Lines and Angles Formed by Transversals (45)**Prove and use theorems about parallel lines cut by a transversalUse algebra to find measures of angles formed by parallel lines | G-CO.C.9 |
| **3.4 Proving Theorems: Parallel and Perpendicular Lines (30)**Use and prove theorems about parallel and perpendicular linesUse algebra to find measures of angles related to perpendicular lines | G-CO.C.9G-MG.A.1 |
| **3.5 Constructing Parallel an Perpendicular Lines (28)**Construct parallel and perpendicular linesConstruct geometric shapes |  G-CO.D.127.G.A.2  |
| **3.6 Coordinate Geometry – The Slope of a Line (30)**Find the slope of a lineInterpret the slope-intercept form in an applicationCompare the slopes of parallel and perpendicular lines | G-GPE.B.58.EE.B.6 |
| **3.7 Coordinate Geometry – Equations of Lines (21)**Use the slope-intercept formUse the point-slope formWrite the equations of vertical and horizontal linesFind the equations of parallel and perpendicular linesUnderstand the concepts of parallel and perpendicular linesFind the equation of the perpendicular bisector of a line segment | G-GPE.B.5 |
| **CHAPTER 4: Triangles and Congruence** | no data |
| **4.1 Types of Triangles (63)**Learn the vocabulary of trianglesClassify triangles by angles and sidesFind angle measures of triangles | G-CO.C.108.G.A.5 |
| **4.2 Congruent Figures (40)**Identify corresponding parts in congruent figuresProve triangles are congruent | G-SRT.B.5 |
| **4.3 Congruent Triangles by SSS and SAS (35)**Determine parts of a triangle using a drawingProve two triangles are congruent using the SSS and SAS postulatesUse the distance formula to determine if two triangles are congruentUnderstand the meaning of the SSS and SAS postulates | G-SRT.B.5 |
| **4.4 Congruent Triangles by ASA and AAS (47)**Prove two triangles are congruent using ASA postulates and the AAS theoremIdentify when to use SSS, SAS, ASA, or AAS to prove triangles congruentUse postulates and theorems of congruence to find missing values in a triangle | G-SRT.B.5 |
| **4.5 Proofs Using Congruent Triangles (45)**Identify common parts of overlapping trianglesUse triangle congruence and corresponding parts of congruent trianglesProve two triangles are congruent using other congruent trianglesDetermine the measure of missing angles and sides of congruent triangles | G-SRT.B.5G-MG.A.1 |
| **4.6 Isosceles, Equilateral, and Right Triangles (71)**Determine if triangles are congruentUse properties of isosceles and equilateral trianglesUse properties of right trianglesUse multiple properties of triangles to solveConstruct triangles | G-CO.C.10G-SRT.B.5G-MG.A.1 |
| **CHAPTER 5: Special Properties of Triangles** | no data |
| **5.1 Perpendicular and Angle Bisectors (42)**Use perpendicular bisectors to solve problemsUse angle bisectors to solve problems | G-CO.C.9G-CO.D.12G-SRT.B.5 |
| **5.2 Bisectors of a Triangle (44)**Identify the differences between the circumcenter and the incenter of a triangleUse properties of perpendicular bisectors of sides of a triangleUse properties of angle bisectors of the angles of a triangleUse properties of both perpendicular bisectors and angle bisectors | G-C.A.3G-MG.A.1 |
| **5.3 Medians and Altitudes of a Triangle (42)**Identify differences between medians and altitudes of trianglesUse properties of the medians of a triangleUse properties of the altitudes of a triangle | G-CO.C.10G-GPE.B.4 |
| **5.4 Midsegments of Triangles (35)**Use properties of midsegments of trianglesUse coordinate geometry with midsegmentsSolve applications of midsegments | G-CO.C.10G-CO.D.12G-GPE.B.4G-MG.A.1  |
| **5.5 Indirect Proofs and Inequalities in One Triangle (47)**Use indirect reasoning to write proofsLearn the triangle relationship between length of a side and size of its opposite angleUse the triangle inequality theorem | G-CO.C.10 |
| **5.6 Inequalities in Two Triangles (26)**Use the Hinge Theorem and its converse to compare measures of sides and angles | G-CO.C.10G-MG.A.1 |
| **CHAPTER 6: Quadrilaterals** | no data |
| **6.2 Parallelograms (51)**Use relationships among sides and angles of parallelogramsUse relationships among consecutive angles and diagonals of parallelograms | G-CO.C.11G-MG.A.1 |
| **6.3 Proving that a Quadrilateral is a Parallelogram (24)**Determine whether quadrilaterals are parallelogramsUse coordinate geometry with parallelograms | G-CO.C.11G-GPE.B.4G-MG.A.1  |
| **6.4 Rhombuses, Rectangles, and Squares (39)**Define and classify special types of parallelogramsUse properties of diagonals of rhombuses, rectangles, and squaresUse properties of diagonals to form rhombuses, rectangles, and squares | G-CO.C.11  |
| **6.5 Trapezoids and Kites (36)**Use properties of trapezoidsUse properties of kites | G-SRT.B.5 |
| **CHAPTER 7: Similarity** | no data |
| **7.3 Similar Polygons (51)**Identify similar polygonsUse similar polygons to solve applicationsUnderstand the concepts of similar polygonsMake scaled drawings | G-SRT.B.5 |
| **7.4 Proving Triangles are Similar (48)**Use the AA~ Postulate and the SAS~ and SSS~ TheoremUse similarity to find indirect measurementsFind the measurements of similar figures | G-SRT.B.4G-SRT.B.5 |
| **7.5 Geometric Mean and Similarity in Right Triangles (43)**Use altitudes of right triangles to prove similarityFind the geometric mean of the lengths of segments in a right triangleSolve applications involving right trianglesUnderstand the concepts of right triangles | G-SRT.B.4 G-SRT.B.5 |
| **7.6 Additional Proportions in Triangles (45)**Use the Side-Splitter TheoremUse the Triangle-Angle-Bisector TheoremUnderstand the properties of parallelograms | G-SRT.B.4G-SRT.B.5 |
| **CHAPTER 8: Transformations** | no data |
| **8.1 Rigid Transformations (18)**Identify rigid transformations of isometriesName images and corresponding partsUse isometries to determine values of variables | G-SRT.A.2  |
| **8.2 Translations (20)**Find translation images of figuresWrite ordered-pair translation rulesSolve application problems involving translationsSolve conceptual problems involving translations | G-CO.A.2G-CO.B.6 |
| **8.3 Reflections (26)**Find reflection images of figuresIdentify and use line symmetrySolve application problems involving reflectionsSolve conceptual problems involving reflections | G-CO.A.2G-CO.A.5G-CO.B.6 |
| **8.4 Rotations (27)**Draw and identify rotation images of figuresFind angles of rotationIdentify symmetries | G-CO.A.2G-CO.B.6 |
| **8.5 Dilations (22)**Understand dilation images of figures | G-SRT.A.1G-CO.A.2 |
| **8.6 Compositions of Reflections (21)**Find compositions of reflections, including glide reflectionsClassify isometriesWork with kaleidoscope imagesProve properties of transformations | G-CO.A.2G-CO.A.4G-CO.A.5G-CO.B.6 |
| **CHAPTER 9: Right Triangles and Trigonometry** | no data |
| **9.1 Pythagorean Theorem and its Converse (36)**Use the Pythagorean TheoremUse the converse of the Pythagorean TheoremSolve application problems | G-SRT.C.8G-CO.C.10 |
| **9.2 Special Right Triangles (27)**Use the properties of 45°-45°-90° trianglesUse the properties of 30°-60°-90° trianglesUse the properties of special triangles to find the missing parts of figuresSolve application problems | G-SRT.C.6G-SRT.C.8G-CO.C.10G-MG.A.1 |
| **9.3 Trigonometric Ratios (47)**Write the ratios for sine, cosine, and tangent given a right triangleApproximate values for the sine, cosine, and tangent of an angleUse sine, cosine, and tangent ratios to determine side lengths in right trianglesApproximate angle measures given the sine, cosine, or tangent valueUse the sine, cosine, and tangent ratios to determine angle measure in right trianglesWrite the ratios for secant, cosecant, and cotangent given a right triangleSolve application problems | G-SRT.C.6G-SRT.C.7G-SRT.C.8G-MG.A.1 |
| **9.4 Solving Right Triangles (29)**Solve right trianglesUse angle of elevation and depression to solve problemsSolve application problems | G-SRT.C.8 |
| **CHAPTER 10: Area** | no data |
| **10.1 Angles: Polygons & Regular Polygon Tessellations (38)**Find and use the measures of interior angles of polygonsFind and use the measures of exterior angles of polygonsSolve problems related to the measures of interior and exterior angles of polygonsDetermine whether a tessellation of regular polygons is formedProve theorems related to the measures of interior and exterior angles of polygons | No LMS correlation |
| **10.2 Areas of Triangles and Quadrilaterals (47)**Find the areas of squares, rectangles, parallelograms, and trianglesFind the areas of trapezoids, rhombuses, and kitesFind the areas of irregular figures | G-GPE.B.7G-MG.A.1 |
| **10.3 Areas of Regular Polygons (36)**Find the measures of angles formed between radii and the apothem in regular polygonsFind areas of regular polygonsFind areas of regular polygons using trigonometric ratiosSolve problems involving geometric constructions or proofsUnderstand the relationships among radii, apothems, side lengths, and areas of regular polygons | G-CO.D.13 |
| **10.4 Perimeters and Areas of Similar Figures (33)**Find scale factors and ratios of perimeters and areas of similar figuresFind side lengths, perimeters, and areas of similar figuresSolve application problemsSolve problems involving geometric constructionsComplete statements about similar figures | G-SRT.B.5 |
| **10.5 Arc Measure, Circumference, and Arc Lengths of Circles (40)**Identify and name semicircles, major arcs, and minor arcsFind measures of central angles and arcsFind circumferences and arc lengths | G-CO.A.1G-C.A.2  |
| **10.6 Areas of Circles and Sectors (33)**Find areas of circles, sectors, and segments of circlesFind radii of circlesSolve problems relating regular polygons and circles | G-C.B.5G-MG.A.1 |
| **10.7 Geometric Probability (33)**Use segment models to find the probabilities of eventsUse are models to find the probabilities of events | S-CP.A.1 |
| **CHAPTER 11: Surface Area and Volume** | no data |
| **11.1 Solids and Cross Sections (35)**Recognize polyhedra and their partsVisualize cross sections of solidsVisualize solids formed by revolving a region about a line | G-GMD.B.4G-MG.A.1 |
| **11.4 Volume of Prisms and Cylinders (32)**Find the volume of a prismFind the volume of a cylinderFind the volume of a composite solids | G-GMD.A.3G-MG.A.1 |
| **11.5 Volume of Pyramids and Cones (20)**Find the volume of a pyramidFind the volume of a cone | G-GMD.A.3G-MG.A.1 |
| **11.6 Volume of Spheres (16)**Find the volume of a sphere | G-GMD.A.3G-MG.A.1 |
| **CHAPTER 12: Circles and Other Conic Sections** | no data |
| **12.1 Circle Review and Tangent Lines (33)**Review circles and arcsUse properties of a tangent line to a circleSolve problems involving geometric proofs or constructions | G-C.A.2 |
| **12.2 Chords and Arcs (18)**Use congruent chords, arcs, and central anglesUse perpendicular bisectors to chordsSolve problems involving geometric proofs or constructions | G-C.A.2 |
| **12.3 Inscribed Angles (18)**Find measures of inscribed angles and/or intercepted arcsFind measures of angles and/or arcs formed by tangent and chordsSolve problems involving geometric proofs or constructions | G-C.A.2G-C.A.3G-C.A.4 |
| **12.4 Additional Angle Measure and Segment Lengths (17)**Find measures of angles formed by chords, secants, and tangentsFind the lengths of segments associated with circlesSolve application problemsSolve problems involving geometric proofs | G-C.A.2 |
| **12.5 Circles in the Coordinate Plane (19)**Write an equation of a circleFind the center and radius of a circle written in standard formComplete the square to find the center and radius of a circleFind quantities related to circles | G-GPE.A.1 |
| **CHAPTER 13: Probability** | no data |
| **13.1 Fundamentals of Probability (18)**Compute theoretical probabilityCompute empirical probability | S-CP.A.1S-CP.A.4 |
| **13.2 Events Involving “Not” and “Or” (16)**Find the probability that an event will not occurFind the probability of one event or a second event occurring | S-CP.A.1S-CP.A.4 |
| **13.3. Events Involving “And”; Conditional Probability (19)**Find the probability of one event and a second event occurringCompute conditional probabilities | S-CP.A.2S-CP.A.3 |

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

| **LMS#** | **Standard Description** |
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| 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, , and interpret the answer in terms of the model. |

LSU College Readiness Program for Math

MML Geometry Supplemental Activities

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| **Standard # and Description** | G-CO.A.3Given 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.

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| **Standard # and Description** | G-CO.B.7Use 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:



1. Suppose there is a sequence of rigid motions which maps ΔABC to ΔDEF. Explain why corresponding sides and angles of these triangles are congruent.
2. Suppose instead that corresponding sides and angles of ΔABC and ΔDEF are congruent. Show that there is a sequence of rigid motions which maps ΔABC to ΔDEF.

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| **Standard # and Description** | G-CO.B.8Explain how the criteria for triangle congruence (ASA, SAS, and SSS) 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 triangles *ABC* and *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 line *AB* maps triangle *ABD* to triangle *ABC*.



**Why Does SAS Work?**

In the two triangles below, angle *A* is congruent to angle *D*, side *AC* is congruent to side *DF*,and side *AB* is congruent to side *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 *AB* lies on top of side *DE* and side *AC* lies on top of side *DF*. Since *AB* and *DE* are congruent as are *AC* and *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:

1. Construct a reflection which maps point *A* to point *D*. Call *B’* and *C’* the images of *B* and *C* respectively under this reflection.
2. Construct a reflection which does not move *D* but which sends *B’* to *E*. Call *C”* the image of *C’* under this reflection.
3. 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, segment *AB* is congruent to segment *DE*, segment *AC* is congruent to segment *DF*,and segment *BC* is congruent to side *EF*.



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

1. 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.
2. 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.
3. Show that there is a reflection of the pane which does not move D or E and which maps C” to F.

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

**Similar triangles**

In the two triangles below,  and .



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

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| **Standard # and Description** | G-C.A.1Prove 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

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| **Standard # and Description** | G-GMD.A.1Give 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 Mathematicshttps://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 . 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.

1. 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.
2. Reasoning as in part (a), find a formula for the area of a regular n sided polygon, for , inscribed in C. The formula should give the area of the polygon in terms of its perimeter.
3. Using your formula from part (b), explain why the area of C is .

**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  is .

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| **Standard # and Description** | G-GMD.B.4Identify 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 Projecthttp://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.

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| **Standard # and Description** | G-MG.A.2Apply 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 in. x 84 in. x 9.5in. 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?

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| **Standard # and Description** | G-MG.A.3Apply 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” X 24”). 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” 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.)

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| **Standard # and Description** | S-CP.A.5Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *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.*S-CP.B.6Find 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](http://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 |

1. Calculate the following probabilities. Round your answers to three decimal places.
2. If one of the passengers is randomly selected, what is the probability that this passenger was in first class?
3. If one of the passengers is randomly selected, what is the probability that this passenger survived?
4. If one of the passengers is randomly selected, what is the probability that this passenger was in first class and survived?
5. 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?)
6. If one of the passengers who survived is randomly selected, what is the probability that this passenger was in first class?
7. If one of the passengers who survived is randomly selected, what is the probability that this passenger was in third class?
8. Why is the answer to part (a.iv) larger than the answer to part (a.iii)?
9. Why is the answer to part (a.v) larger than the answer to part (a.vi)?
10. 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 are summarized in the table below. We will use this data to investigate the validity of such claims. (Data source: [www.encyclopedia-titanica.org](http://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 |

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

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| **Standard # and Description** | S-CP.B.7Apply the Addition Rule, *P*(*A* or *B*) = *P*(*A*) + *P*(*B*) – *P*(*A* 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**

1. 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.
2. 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?
3. 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?
4. 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?