Geometry 1A Semester Credit by Exam Information

Plano ISD Now uses the Texas Tech University ISD Credit by Exam Test for Geometry

Format: first semester consists of 21 items or question; open-response items

The recommended time limit for students to take this exam is 3 hours.

A graphing calculator (TI-84 family) and ruler will be provided to you during the exam.

In preparation for the examination, you should review the state standards (TEKS) for geometry. All TEKS are assessed. Since questions are not taken from any one source, you can prepare by reviewing any resources aligned to these TEKS. For your reference, the instructional materials used in TTUISD are listed below.

Bass, LE, et al. (2008). *Prentice Hall Mathematics, Texas Geometry.* Boston, MA: Prentice Hall.
ISBN 0-13-134022-0 **Make sure to order the 2008 edition**
https://www.amazon.com/Prentice-Hall-Mathmatics-Texas-Geometry/dp/0131340220

The practice exam is a model of the types of questions that will be asked on your exam. It is not a duplicate of the exam. It is to illustrate the format of the exam and does not serve as a complete review sheet.

Texas Essential Knowledge and Skills
Geometry 1A, First Semester

§111.41. Geometry, Adopted 2012. (One-Half Credit)

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra I.

(b) Introduction.

(1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on fluency and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.

(2) The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) In Geometry, students will build on the knowledge and skills for mathematics in Kindergarten-Grade 8 and Algebra I to strengthen their mathematical reasoning skills in geometric contexts. Within the course, students will begin to focus on more precise terminology, symbolic representations, and the development of proofs. Students will explore concepts covering coordinate and transformational geometry; logical argument and constructions; proof and congruence; similarity, proof, and trigonometry; two- and three-dimensional figures; circles; and probability. Students will connect previous knowledge from Algebra I to Geometry through the coordinate and transformational geometry strand. In the logical arguments and constructions strand, students are expected to create formal constructions using a straight edge and compass. Though this course is primarily Euclidean geometry, students should complete the course with an understanding that non-Euclidean geometries exist. In proof and congruence, students will use deductive reasoning to justify, prove and apply theorems about geometric figures. Throughout the standards, the term "prove" means a formal proof to be shown in a paragraph, a flow chart, or two-column formats. Proportionality is the unifying component of the similarity, proof, and trigonometry strand. Students will use their proportional reasoning skills to prove and apply theorems and solve problems in this strand. The two- and three-dimensional figure strand focuses on the application of formulas in multi-step situations since students have developed background knowledge in two- and three-dimensional figures. Using patterns to identify geometric properties, students will apply theorems about circles to determine relationships between special segments and angles in circles. Due to the emphasis of probability and statistics in the college and career readiness standards, standards dealing with probability have been added to the geometry curriculum to ensure students have proper exposure to these topics before pursuing their post-secondary education.

(4) These standards are meant to provide clarity and specificity in regards to the content covered in the high school geometry course. These standards are not meant to limit the methodologies used to convey this knowledge to students. Though the standards are written in a particular order, they are not necessarily meant to be taught in the given order. In the standards, the phrase "to solve problems" includes both contextual and non-contextual problems unless specifically stated.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(1) **Mathematical process standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(2) **Coordinate and transformational geometry**. The student uses the process skills to understand the connections between algebra and geometry and uses the one- and two-dimensional coordinate systems to verify geometric conjectures. The student is expected to:

(A) determine the coordinates of a point that is a given fractional distance less than one from one end of a line segment to the other in one- and two-dimensional coordinate systems, including finding the midpoint;

(B) derive and use the distance, slope, and midpoint formulas to verify geometric relationships, including congruence of segments and parallelism or perpendicularity of pairs of lines; and

(C) determine an equation of a line parallel or perpendicular to a given line that passes through a given point.

(3) **Coordinate and transformational geometry**. The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). The student is expected to:

(A) describe and perform transformations of figures in a plane using coordinate notation;

(B) determine the image or pre-image of a given two-dimensional figure under a composition of rigid transformations, a composition of non-rigid transformations, and a composition of both, including dilations where the center can be any point in the plane;

(C) identify the sequence of transformations that will carry a given pre-image onto an image on and off the coordinate plane; and

(D) identify and distinguish between reflectional and rotational symmetry in a plane figure.

(4) **Logical argument and constructions**. The student uses the process skills with deductive reasoning to understand geometric relationships. The student is expected to:

(A) distinguish between undefined terms, definitions, postulates, conjectures, and theorems;

(B) identify and determine the validity of the converse, inverse, and contrapositive of a conditional statement and recognize the connection between a biconditional statement and a true conditional statement with a true converse;

(C) verify that a conjecture is false using a counterexample; and

(D) compare geometric relationships between Euclidean and spherical geometries, including parallel lines and the sum of the angles in a triangle.

(5) **Logical argument and constructions**. The student uses constructions to validate conjectures about geometric figures. The student is expected to:

(A) investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;

(B) construct congruent segments, congruent angles, a segment bisector, an angle bisector, perpendicular lines, the perpendicular bisector of a line segment, and a line parallel to a given line through a point not on a line using a compass and a straightedge;

(C) use the constructions of congruent segments, congruent angles, angle bisectors, and perpendicular bisectors to make conjectures about geometric relationships; and

(D) verify the Triangle Inequality theorem using constructions and apply the theorem to solve problems.

(6) **Proof and congruence**. The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. The student is expected to:

(A) verify theorems about angles formed by the intersection of lines and line segments, including vertical angles, and angles formed by parallel lines cut by a transversal and prove equidistance between the endpoints of a segment and points on its perpendicular bisector and apply these relationships to solve problems;

(B) prove two triangles are congruent by applying the Side-Angle-Side, Angle-Side-Angle, Side-Side-Side, Angle-Angle-Side, and Hypotenuse-Leg congruence conditions;

(C) apply the definition of congruence, in terms of rigid transformations, to identify congruent figures and their corresponding sides and angles;

(D) verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems; and

(E) prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals and apply these relationships to solve problems.

(7) **Similarity, proof, and trigonometry**. The student uses the process skills in applying similarity to solve problems. The student is expected to:

(A) apply the definition of similarity in terms of a dilation to identify similar figures and their proportional sides and the congruent corresponding angles; and

(B) apply the Angle-Angle criterion to verify similar triangles and apply the proportionality of the corresponding sides to solve problems.

(8) **Similarity, proof, and trigonometry**. The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. The student is expected to:

(A) prove theorems about similar triangles, including the Triangle Proportionality theorem, and apply these theorems to solve problems; and

(B) identify and apply the relationships that exist when an altitude is drawn to the hypotenuse of a right triangle, including the geometric mean, to solve problems.

(9) **Similarity, proof, and trigonometry**. The student uses the process skills to understand and apply relationships in right triangles. The student is expected to:

(A) determine the lengths of sides and measures of angles in a right triangle by applying the trigonometric ratios sine, cosine, and tangent to solve problems; and

(B) apply the relationships in special right triangles 30°-60°-90° and 45°-45°-90° and the Pythagorean theorem, including Pythagorean triples, to solve problems.

(10) **Two-dimensional and three-dimensional figures**. The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. The student is expected to:

(A) identify the shapes of two-dimensional cross-sections of prisms, pyramids, cylinders, cones, and spheres and identify three-dimensional objects generated by rotations of two-dimensional shapes; and

(B) determine and describe how changes in the linear dimensions of a shape affect its perimeter, area, surface area, or volume, including proportional and non-proportional dimensional change.

(11) **Two-dimensional and three-dimensional figures**. The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. The student is expected to:

(A) apply the formula for the area of regular polygons to solve problems using appropriate units of measure;

(B) determine the area of composite two-dimensional figures comprised of a combination of triangles, parallelograms, trapezoids, kites, regular polygons, or sectors of circles to solve problems using appropriate units of measure;

(C) apply the formulas for the total and lateral surface area of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure; and

(D) apply the formulas for the volume of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure.

(12) **Circles**. The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. The student is expected to:

(A) apply theorems about circles, including relationships among angles, radii, chords, tangents, and secants, to solve non-contextual problems;

(B) apply the proportional relationship between the measure of an arc length of a circle and the circumference of the circle to solve problems;

(C) apply the proportional relationship between the measure of the area of a sector of a circle and the area of the circle to solve problems;

(D) describe radian measure of an angle as the ratio of the length of an arc intercepted by a central angle and the radius of the circle; and

(E) show that the equation of a circle with center at the origin and radius r is $x^2 + y^2 = r^2$ and determine the equation for the graph of a circle with radius r and center (h, k), $(x - h)^2 + (y - k)^2 = r^2$.

(13) **Probability**. The student uses the process skills to understand probability in real-world situations and how to apply independence and dependence of events. The student is expected to:

(A) develop strategies to use permutations and combinations to solve contextual problems;

(B) determine probabilities based on area to solve contextual problems;

(C) identify whether two events are independent and compute the probability of the two events occurring together with or without replacement;

(D) apply conditional probability in contextual problems; and

(E) apply independence in contextual problems.

Source: The provisions of this §111.41 adopted to be effective September 10, 2012, 37 TexReg 7109.

TTUISD Geometry 1A First Semester Guide and Practice Exam

EXAM OBJECTIVES

Be sure you are able to perform each of the tasks in the following skill areas to prepare yourself for the Geometry 1A CBE. The actual exam will contain the formula chart included with this practice exam. When you take your examination, be sure to show *all* of your work and do not leave any questions blank.

Geometry Basics

- Name points, lines, segments, rays, and planes
- Sketch intersections of lines, planes, rays, and segments
- Use the Ruler and Segment Addition Postulates
- Copy and compare segments for congruence
- Use the distance formula
- Find segment lengths using midpoints and segment bisectors
- Partition a segment on a number line
- Find the midpoint of a segment on the coordinate plane
- Find perimeters of, areas of, and classify polygons in and out of the coordinate plane
- Measure, classify, and name angles
- Identify congruent angles
- Bisect angles, and use the Angle Addition Postulate to find angle measures
- Identify complementary, supplementary, vertical and linear pairs of angles

Reasoning and Proof

- Write conditional and bi-conditional statements
- Make truth tables
- Use inductive and deductive reasoning
- Sketch, interpret, and identify postulates using diagrams
- Use the distributive and equality properties of operations to justify steps in equations and proofs

- Use properties involving segment lengths and angle measures
- Write two–column proofs
- Name and prove properties of congruence
- Write flow–chart, and paragraph proofs to prove geometric relationships

Parallel and Perpendicular Lines

- Identify lines, planes, parallel and perpendicular lines, and pairs of angles cut by a transversal
- Use properties and theorems about parallel lines
- Construct and prove theorems about parallel lines
- Use converses for theorems of parallel lines
- Use transitivity of parallel lines
- Find the distance from a point to a line
- Construct and prove theorems about perpendicular lines
- Find and use slopes of lines to partition directed line segments and to identify parallel and perpendicular lines
- Use slope to find the distance between a point and a line
- Write equations of parallel and perpendicular lines

Transformations

- Perform translations and compositions on the coordinate plane
- Perform reflections and glide reflections on the coordinate plane
- Identify lines of symmetry
- Perform rotations and compositions with rotations
- Identify rotational or point symmetry and angles of rotation
- Identify congruent figures
- Describe and use theorems about congruence transformations

- Identify, use scale factors of, and perform dilations
- Perform and describe similarity transformations

Congruent Triangles

- Classify triangles by their sides and angles
- Find interior and exterior angle measures of triangles
- Use the Third Angles Theorem
- Identify and use corresponding parts of triangles
- Use the SAS, SSS, AAS, ASA, and HL Postulates and Theorems of Congruence
- Use the Base Angles Theorem
- Use properties of and construct isosceles and equilateral triangles
- Use congruent triangles and prove constructions
- Place figures in the coordinate plane
- Write coordinate proofs

Special Segments and Relationships within Triangles

- Use perpendicular and angle bisectors to find measures and distance relationships
- Write equations for perpendicular bisectors
- Use and find the circumference and incenter of a triangle
- Use medians to find centriods of triangles
- Use altitudes to find orthocenters of triangles
- Use mid-segments and the Mid-segment Theorem of Triangles to find distances in the coordinate plane
- Use the Triangle Inequality Theorem, list sides and angles of triangles by size, and write indirect proofs
- Compare measures in triangles

Polygons

- Use the interior and exterior angle measures of polygons
- Use properties to find side lengths and angles of parallelograms in and out of the coordinate plane
- Identify, verify parallelograms, and show that a quadrilateral is a parallelogram in the coordinate plane
- Use properties of and diagonals of special parallelograms
- Use coordinate geometry to identify special types of parallelograms
- Use properties of trapezoids and kites
- Use the Trapezoid Mid-segment Theorem to find distances
- Identify and classify quadrilaterals

TERMS AND VOCABULARY

The following terms and vocabulary words can and may be used in the exam. You should be able to identify and define each:

A

Acute angle

Adjacent angles

Alternate exterior angles

Alternate interior angles

Altitude of a triangle

Angle

Angle bisector

Angle of rotation

Axiom

B

Base angles of a trapezoid

Base angles of an isosceles triangle

Base of an isosceles triangle

Bases of a trapezoid

Between

Biconditional statement

C

Center of dilation

Center of symmetry

Centroid

Center of rotation

Circumcenter

Collinear points

Complementary angles

Component form

Composition of transformations

Conclusion

Concurrent

Conditional statement

Congruence transformation

Congruent angles

Congruent segments

Conjecture

Consecutive interior angles

Construction

Contrapositive

Converse

Coordinate

Coordinate proof

Coplanar points

Corollary to a theorem

Corresponding angles

Corresponding parts

Counterexample

D

Deductive reasoning

Defined terms

Diagonal

Distance

Dilation

Directed line segment

Distance from a point to a line

E

Endpoints

Enlargements

Equiangular polygon

Equidistant

Equilateral polygon

Equivalent statements

Exterior of an angle

F

Flowchart proof

G

Glide reflection

H

Horizontal component

Hypotenuse

Hypothesis

I

Incenter

Indirect proof

Inductive reasoning

Initial point

Interior of an angle

Intersection

Inverse

K

Kite

L

Legs of a right triangle

Legs of a trapezoid

Legs of an isosceles triangle

Line

Line of reflection

Line of symmetry

Line perpendicular to a plane

Line segment

Line symmetry

Linear pair

M

Measure of an angle

Median of a triangle

Midpoint

Midsegment of a trapezoid

Midsegment of a triangle

N

Negation

O

Obtuse angle

Opposite rays

Orthocenter

P

Paragraph proof

Parallel lines

Parallel planes

Parallelogram

Perpendicular bisector

Perpendicular lines

Plane

Point

Point of concurrency

Postulate

Preimage

Proof

R

Ray

Rectangle

Reduction

Reflection

Regular polygon

Rhombus

Right angle

Rigid motion

Rotation

Rotational symmetry

S

Scale factor

Sides of an angle

Segment bisector

Similar figures

Similarity transformation

Skew lines

Slope

Square

Straight angle

Supplementary angles

T

Terminal point

Theorem

Transformation

Translation

Transversal

Trapezoid

Truth table

Truth value

Two–column proof

U

Undefined term

V

Vector

Vertex

Vertex angle

Vertical angles

Vertical component

GEOMETRY 1A Formula Chart

Distance:	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Midpoint:	$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$
Partitioning a Segment:	$\frac{ax_1 + bx_2}{a + b}$; with endpoints at coordinates x_1 and x_2, that partitions the segment in the ratio of b : a.
Point–Slope Form:	$y - y_1 = m(x - x_1)$
Slope:	$m = \frac{y_2 - y_1}{x_2 - x_1}$
Slope–Intercept Form:	$y = mx + b$
Sum of Interior Angles of a Polygon:	$(n - 2)180°$

Congruence Transformations

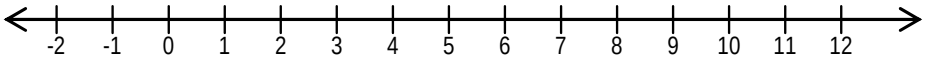
Translation Coordinate Notation:	$(x, y) \rightarrow (x + a, y + b)$
Reflection Coordinate Notation:	
About the x–axis:	$(x, y) \rightarrow (x, -y)$
About the y–axis:	$(x, y) \rightarrow (-x, y)$
About $y = x$:	$(x, y) \rightarrow (y, x)$
About $y = –x$:	$(x, y) \rightarrow (-y, -x)$
Rotation Coordinate Notation About the Origin:	
90–degree counterclockwise:	$(x, y) \rightarrow (-y, x)$
180–degree counterclockwise:	$(x, y) \rightarrow (-x, -y)$
270–degree counterclockwise:	$(x, y) \rightarrow (y, -x)$
Similarity Transformation:	
Dilation coordinate notation about the origin:	$(x, y) \rightarrow (kx, ky)$, where k is the scale factor

GEOMETRY 1A Practice Exam

The following practice exam represents the form and types of questions on the Credit-by-Examination that you will take. Approximately one third of the problems on the GEOM 1A CBE will be in multiple choice format. The other two thirds of the exam will be in short answer or free response format.

Answer the questions below on your own paper.

1. On a number line, the endpoints of $\overline{AB}$ are –2 and 12. Find the coordinate of point *K* that partitions the segment in the ratio 3:1.



A. *K* is at $\frac{3}{2}$

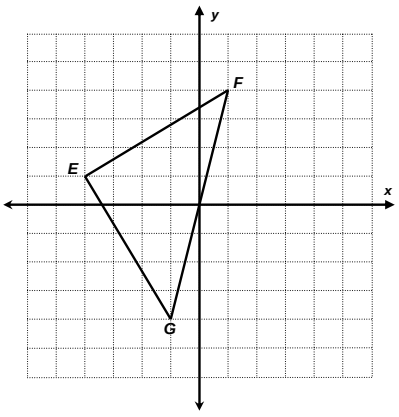
B. *K* is at $\frac{3}{10}$

C. *K* is at $\frac{17}{2}$

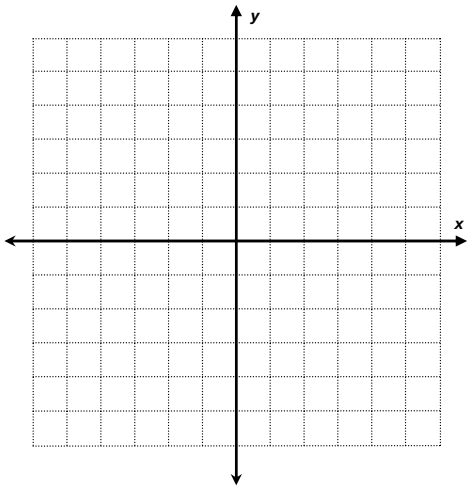
D. *K* is at $\frac{17}{10}$

E. None of the above.

2. Classify Δ*EFG* by its sides using the distance formula. You must show your work. Write distances in simplified radical form. Do not approximate.



3. Write the equation in slope-intercept form, and graph its line passing through the point (2, –1) that is perpendicular to the line $y = \frac{1}{4}x - 2$.



4. Graph ΔXYZ with vertices X (–4, 1), Y (–2, 5) and Z (–1, –3); and its image after a 90° rotation counter-clockwise about origin. State the coordinates of the new vertices.

5. For the given quadrilateral, identify: the number of lines of symmetry, and the angle or angles of rotational symmetry.

   A. Two lines; 90° and 180°
   B. Four lines; 90° and 180°
   C. Two lines; 45°, 90°, 135°, and 180°
   D. Four lines; 45°, 90°, 135°, and 180°
   E. None of the above.

continued →

6. Let p be "It is noon." And let q be "It is 12 o'clock." Write each indicated statement. Then tell whether the statement is true of false.

   A. The conditional statement $p \rightarrow q$ *True* or *False*

   _____

   B. The converse $q \rightarrow p$ *True* or *False*

   _____

   C. The inverse $\sim p \rightarrow \sim q$ *True* or *False*

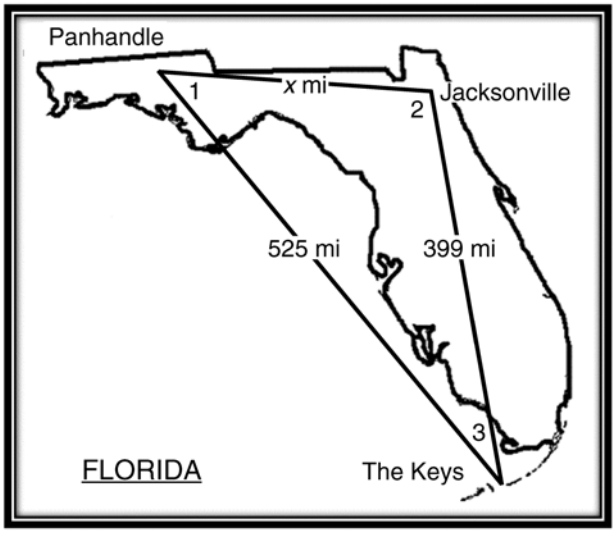
   _____

   D. The contrapositive $\sim q \rightarrow \sim p$ *True* or *False*

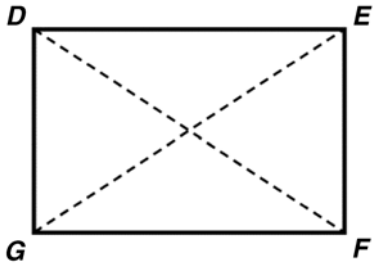
   _____

7. A person which is on a vacation decides to explore the area of Florida. He flies from the Panhandle to the Florida Keys, and from the Florida Keys to the beaches of Jacksonville. Identify two inequalities to represent the two possible distances from the beaches of Jacksonville back to the Panhandle of Florida.

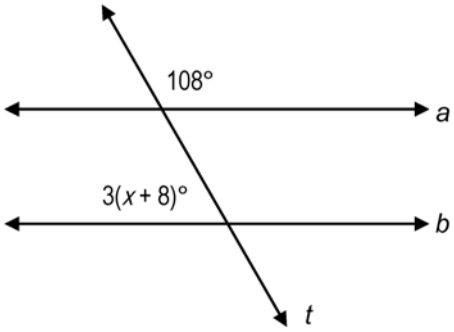
   A. $x < 924$ mi. and $x > -126$ mi.
   B. $x < -126$ mi. and $x > 924$ mi.
   C. $x < 126$ mi. and $x > 924$ mi.
   D. $x < 924$ mi. and $x > 126$ mi.
   E. None of the above.



8. In rectangle *DEFG*, $DF = 4x + 7$ and $EG = 6x - 29$. Find the value of the missing variable and the lengths of both diagonals of *DEFG*.



9. Find the value of x that makes $a \parallel b$. Then state the two postulates that justifies what you found.



10. A. The endpoints of $\overline{RS}$ are R (–8, 3) and S (0, –8). Find the coordinates of the midpoint M.

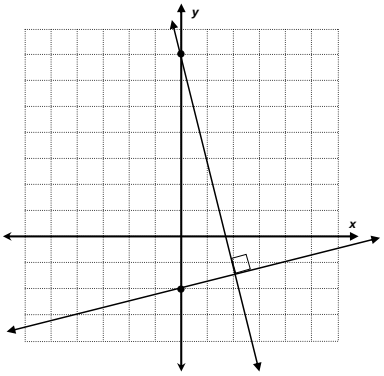
    B. The midpoint of $\overline{CD}$ is M (1, –6). One endpoint is C (5, –2). Find the coordinates of endpoint D.

GEOMETRY 1A Practice Exam Answer Key

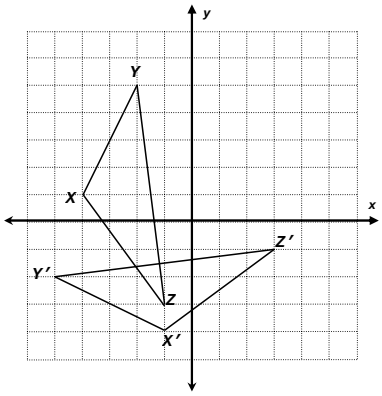
1. A. K is at $\frac{17}{2}$

2. $EF = \sqrt{34}$; $FG = 2\sqrt{17}$; $EG = \sqrt{34}$; isosceles

3. $y = -4x + 7$



4. X' (–1,–4); Y' (–5, –2), Z' (3, –1)



5. B. Four lines; 90° and 180°

6. A. If it is noon, then it is 12 o'clock. *True*
   B. If it is 12 o'clock, then it is noon. *False*
   C. If it is not noon, then it is not 12 o'clock. *False*
   D. If it is not 12 o'clock, then it is not noon. *True*

7. D. $x < 924$ mi. and $x > 126$ mi.

8. $x = 18$; $DF = 79$; $EG = 79$

9. $x = 28$; The Linear Pair Postulate; The Corresponding Angles Postulate

10. A. M $(-4, -\frac{5}{2})$

    B. D (–3, –10)