Chapter 1 – Basics of Geometry

1.1 Points, lines and planes
- 1.1.1 Identify and sketch points, lines and planes
- 1.1.2 Describe the relationships between similar objects (coplanar, collinear)
- 1.1.3 Describe the intersections of these objects

1.2 Measuring and constructing segments
- 1.2.1 Ruler postulate (using single-digit "coordinates")
  - 1.2.1.1 Measuring objects with a ruler
- 1.2.2 Constructing congruent line segments (compass and straight-edge)
- 1.2.3 Segment addition postulate (algebraic expressions)

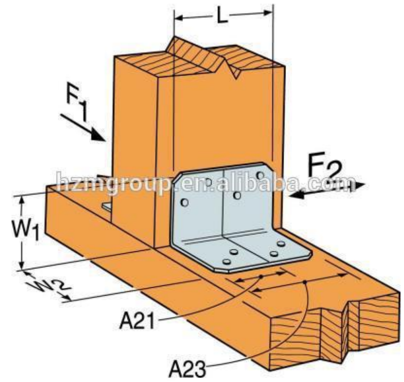
1.3 Midpoint and Distance Formulas
- 1.3.1 Properties of midpoints
- 1.3.2 Midpoint formula
- 1.3.3 The relationship between the distance formula and the Pythagorean Theorem

1.4 Perimeter and Area in the Coordinate Plane
- 1.4.1 Finding perimeter of polygons using distance formula
- 1.4.2 Find the area of triangles and rectangles

1.5 Measuring and constructing angles
- 1.5.1 Naming, measuring and classifying angles (acute, obtuse, right, straight)
- 1.5.2 Copying and bisecting angles (compass and straight-edge)
- 1.5.3 Angle addition postulate (algebraic expressions)

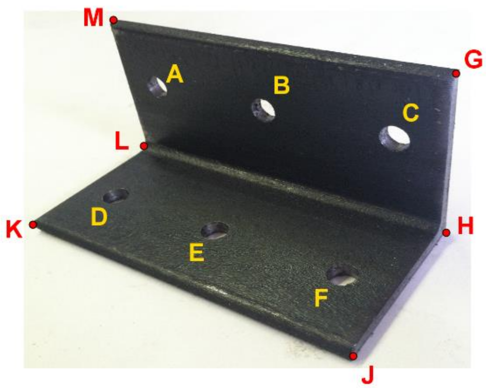
1.6 Describing pairs of angles
- 1.6.1 Identifying and using Complementary, supplementary and adjacent angles
- 1.6.2 Identifying and using linear pairs and vertical angles
- 1.6.3 Solving problems involving pairs of angles (algebraic expressions)

Practice Performance Task – 1.1
Metal Corner Braces



In order to connect two pieces of lumber at a 90-degree angle, a metal corner brace is used. One corner brace is placed on each side of the board as shown in the diagram to the right.

Use the diagram with the labels to answer the following questions. Assume the holes in the brace and the corners can be considered points.



1. For each of the following objects, write out the complete name.
   a. A point A   (example)
   b. $\overrightarrow{AC}$
   c. $\overleftrightarrow{LH}$
   d. $\overline{EF}$

2. Name two lines that intersect. Name the intersection of those two lines.

3. Name three collinear points and three non-collinear points.

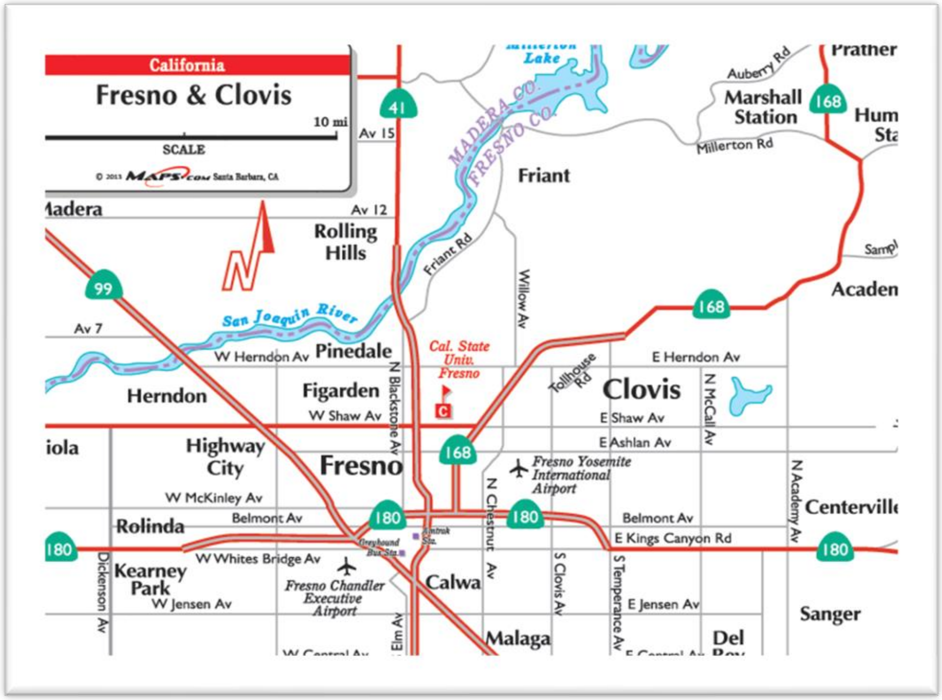
4. Which of the following points is NOT coplanar with the other points: D, H, J, A, E, K?

5. Name the intersection of plane MBG and plane KEF.

6. Why is hard for students to imagine plane MKJ? Explain what this plane looks like and where it is located on the diagram.

I used corner braces when building a climbing wall in my backyard.

Practice Performance Task – 1.2
Fresno & Clovis Map



The map to the right shows a map of Fresno and Clovis. Use your ruler to answer the following questions. Your answer should be to the closest tenth of a unit.

1. Use your ruler to find the distance on the map between Fresno Yosemite International Airport and Fresno Chandler Executive Airport. Write your answer as a mixed number (ex. $4\frac{3}{8}$ in.) and a decimal to the nearest tenth (ex. 4.4 in.)

2. It is 8.6 miles from where the 180 intersects Dickenson to where the 180 and 99 intersect. From the 180 and Dickenson intersection to Clovis and Belmont is 15.0 miles. Approximately how many miles is it from 180 and 99 to Clovis and Belmont? Show you work below.

3. Use your ruler to draw a line segment from Kearney Park to Millerton Lake. Use your compass and straight-edge to copy that segment below, starting at point A and going to the right.

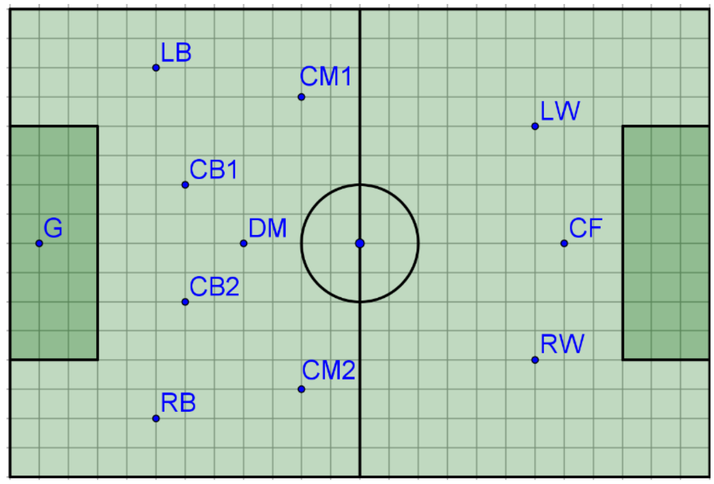
A

4. A triangle can be formed by connecting Cal. State Univ. Fresno, Herndon & 99, and 41 & 180. The following measurements are given:

Fresno State to Herndon & 99	$(3x + 3.5)$ miles
Fresno State to 41 & 180	$(2x + .2)$ miles
41 & 180 to Herndon & 99	$(5x - .6)$ miles
Total	23.3 miles

Find the length in miles of each side of the triangle.

Practice Performance Task – 1.3
Soccer Strategy



The diagram to the right shows a very common formation for soccer teams called a 4-3-3. Each player (point) is labeled with the name of the position.

G – Goalie
CB – Center Back
DM – Defensive Mid
LW – Left Wing
RW – Right Wing
LB – Left Back
RB – Right Back
CM – Center Mid
CF – Center Forward

The diagram is situated on a coordinate grid where each square is 5 yards by 5 yards and the center of the field is (0,0).

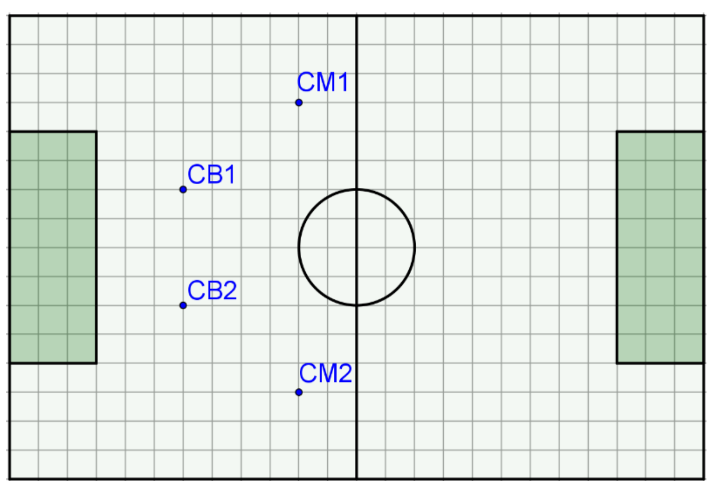
1. Using the current formation, find the coordinates for each of the players on the field. For example: RW (30,-20)

G	LB	CB1	CB2	RB
DM	CM1	CM2	CF	LW

2. How far must the goalie be able to kick the ball in order to directly reach the left winger? Show your work.

3. The coach wants center midfielder #1 to place himself halfway between the goalie and the left winger. Use the midpoint formula to find the coordinates of CM1's new position.

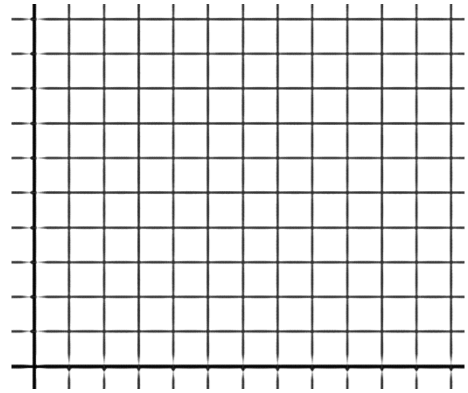
4. Determine the perimeter and area of the quadrilateral formed by both Center Backs and both Center Mids. A new diagram has been provided including only the players in question.



Practice Performance Task – 1.4
Inscribed Figures

When the vertices of one polygon lie on the sides of a larger polygon, the smaller polygon is inscribed within the larger polygon. Use the blank grids provided to investigate the properties of inscribed polygons.

1. Plot and connect the following points to form the larger polygon (a square): $A(2,2)$; $B(2,8)$; $C(8,8)$; $D(8,2)$.

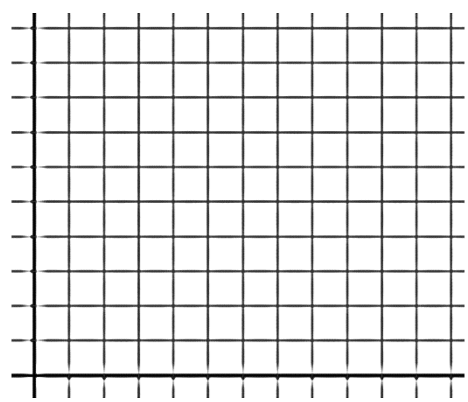


2. Calculate the perimeter and area of ABCD.

3. Plot and connect the midpoints of each side of ABCD to create the smaller inscribed polygon, EFGH. Calculate the perimeter and area of EFGH.

4. Many students assume the perimeter and area of smaller figure formed by connecting the midpoints are half the perimeter and area of the larger figure. Is this true? Explain.

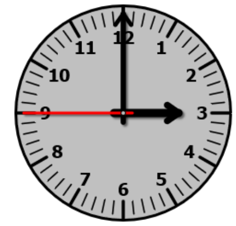
5. Finally, we want to determine if inscribed triangles have similar properties as inscribed squares. Use the grid provided to plot and connect three points to form a right triangle. Create an inscribed triangle by connecting the midpoint for each side. Compare the perimeter and area of the smaller figure to the perimeter and area of the larger figure. Is the relationship the same as inscribed squares? Use complete sentences to summarize the results.



Practice Performance Task – 1.5
Clocks

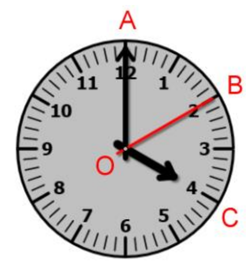
Mathematicians have created several interesting problems involving the angles formed by the hands of an analog clock. These problems can be very tricky because all three hands are in constant motion. To simplify the problem, we will assume the minute hand "clicks" from minute to minute each time the second hand reaches the 12. The hour hand is in continuous motion.

1. The clock to the right shows a time of 3:00:45 (45 seconds past 3:00). The hour, minute and second hands form two 90° angles. A student was asked to list other times that would form 90° angles. They wrote: 9:00:15, 6:00:15, and 3:30,45. Which of those three times would not form two 90° angles? Explain.

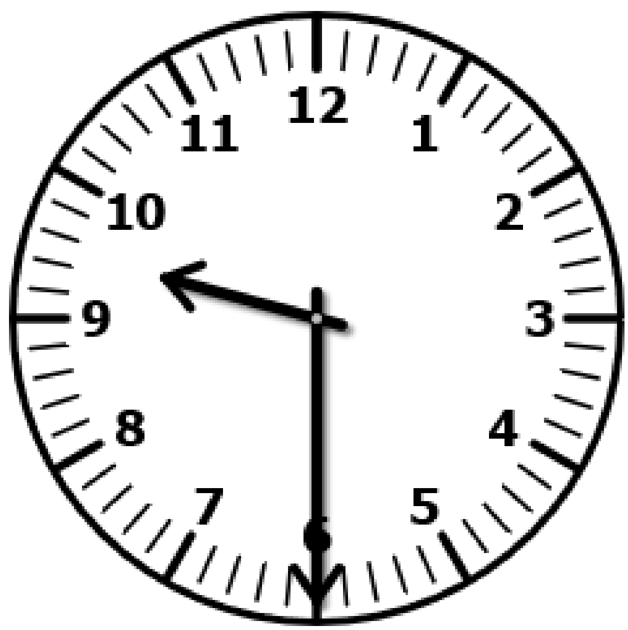


2. The diagram at the right shows the position of each hand when the time is 4:00:10. Find the measure of and classify (acute, obtuse, right, straight) each of the following angles:

   $\angle AOB$ $\angle BOC$ $\angle AOC$



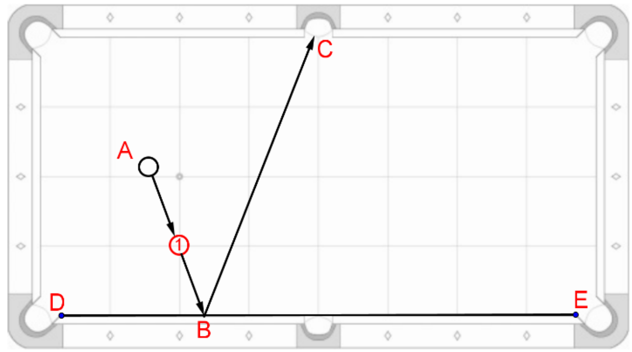
3. At 9:30, the hour hand will be exactly halfway between the 9 and the 10 (as shown in the diagram at the right. Determine the measure of the angle formed by the hour and minute hand (no protractor). Explain how you found your answer.



4. Suppose the second hand bisects the angle formed by the hour and minute hands in the 9:30 diagram. Use your compass and straight edge to construct the second hand. Afterwards, write the time shown on the clock to the nearest second. Explain how you found your answer.

Practice Performance Task 1.6
Billiards

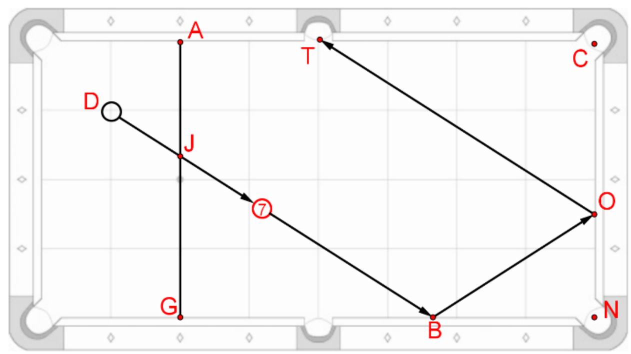
Billiards, or pool, is a common game in which players attempt to strike the balls into pockets around the table using a stick known as a pool cue. Bouncing a ball off one of the sides of the table (called a bank shot) is often necessary to make difficult shots. In the following problem, we will investigate angle relationships present when making pool shots.



1. Pool players know that the pool ball will bounce off the side of the table at the same angle it approached the side. For example, $\angle ABD \cong \angle CBE$. Suppose $m\angle ABD = 68°$, find the measure of each of the following angles:

   $m\angle ABC =$ $m\angle CBE =$

   $m\angle ABE =$ $m\angle DBC =$



2. All pool tables have a line called the "head string". In the diagram to the right, the head string is $\overline{AG}$. The diagram to the right shows a very difficulut pool shot in which the ball will be banked off the rails (edges of the table) two times. Name two pairs of congruent angles and two pairs of supplementary angles. For each pair, explain your reasoning.

The following measurements for the double bank-shot diagram are given: $m\angle DJA = 58°$ and $m\angle JBG = 32°$.

3. If $m\angle JBO = 4x - 7$, then what is the value of x? Show your work.

4. If $m\angle GJB = 2y + 5$, then what is the value of y? Show your work.