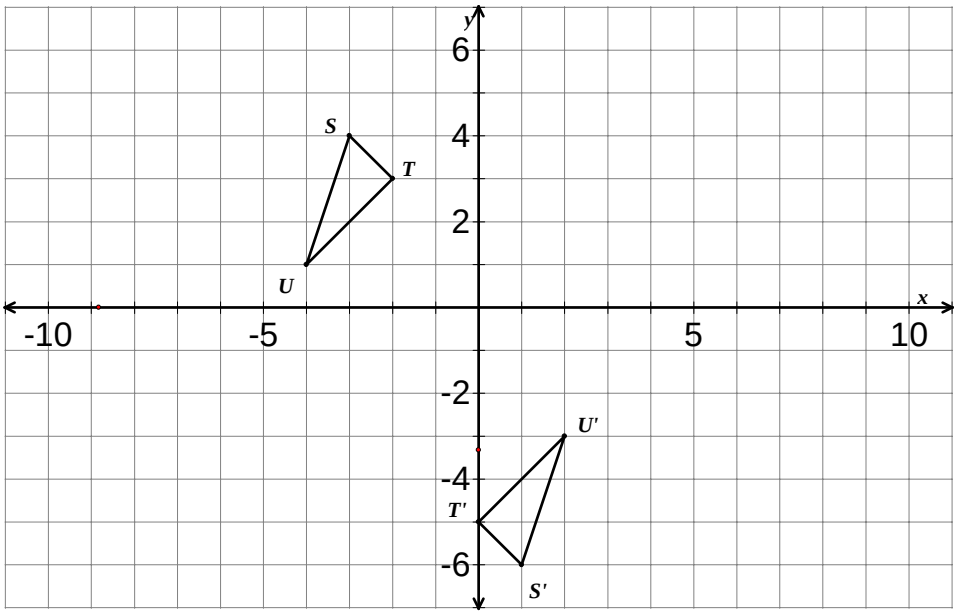
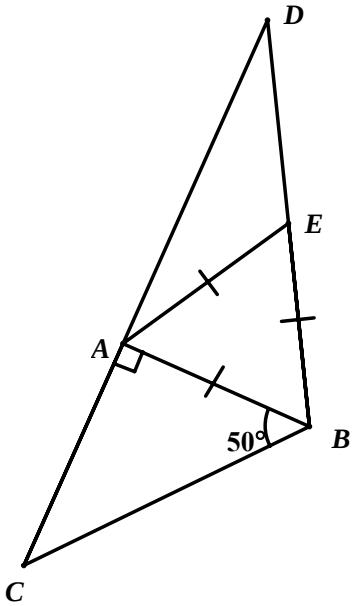
The Texas Education Agency and the Texas Higher Education Coordinating Board
***Geometry Module* Pre-/Post-Test**

1. Triangle STU is rotated 180° clockwise to form image $\Delta S'T'U'$. Determine the center of rotation.



2. In the figure shown below, $m\angle CBA = 50°$ and ΔABE is equilateral. (The figure is not drawn to scale.) Which of the following is NOT a valid conclusion for the given figure? Explain your answer.

I $\overline{AE}$ bisects $\angle DAB$
II $\overline{AE}$ is a median of ΔDAB
III $m\angle D = 30°$
IV $DE = AE$

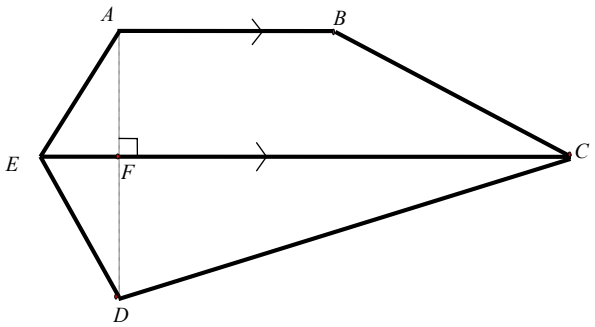


3. The diagonals in a quadrilateral are perpendicular to each other and bisect the vertex angles of the quadrilateral. Circle all of the figures below that always have these properties.

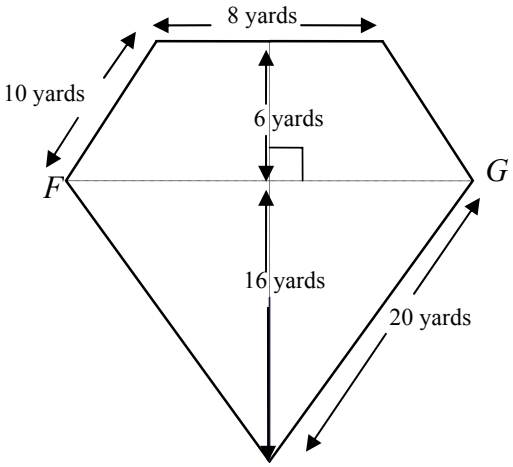
I	Rectangle
II	Square
III	Rhombus
IV	Parallelogram
V	Kite
VI	Isosceles Trapezoid

4. Write a true conditional statement. Write its inverse, converse, and contrapositive. Determine whether each of these statements is true or false. Give a counterexample for each false statement.

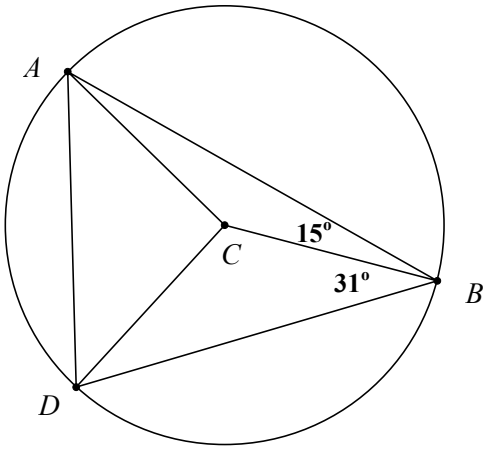
5. In the figure shown, $\overline{AB} \parallel \overline{EC}$, $\overline{AD} \perp \overline{EC}$, $AB = 4$ cm, $EC = 10$ cm, and $AF = DF = 3$ cm (The figure is not drawn to scale.) What is the area, in square centimeters, of pentagon *ABCDE*?



6. The city of Houston is building a fish pond in the middle of a popular park. The figure, not drawn to scale, represents the dimensions of the pond. The figure has one line of symmetry. A bridge will be built from F to G. What will be the length of the bridge?

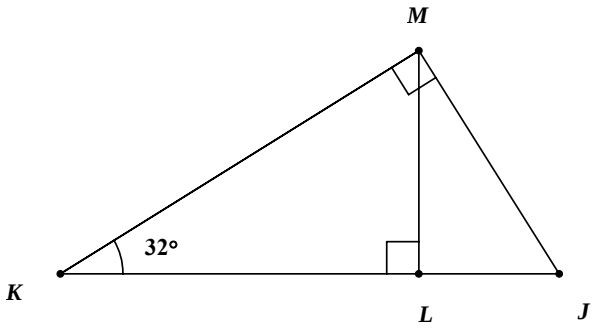


7. Circle C is shown below with inscribed ΔABD, $m\angle ABC = 15^\circ$, and $m\angle CBD = 31^\circ$.



Find the measure of $\angle ACD$.

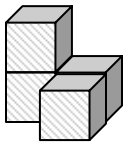
8. In the figure below, ΔJKM is a right triangle with altitude $\overline{ML}$ to the hypotenuse $\overline{KJ}$, $m\angle K = 32^{o}$, and $KM = 6$ cm.

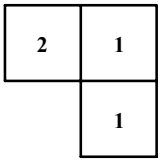


a) Name three pairs of similar triangles in the figure.

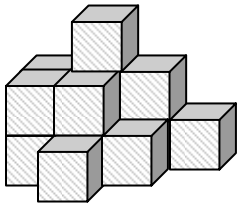
b) Find *ML* and *LJ*. Round your answers to the nearest tenth.

9. The two figures shown below represent the same 3-dimensional figure. The left is a perspective drawing. The right is the top view with numbers indicating how many cubes are on each stack.





Sketch a top view for the figure below, indicating how many cubes are on each stack.



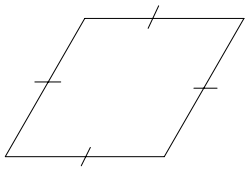
10. Describe the characteristics of a surface of:

    a) zero Gaussian curvature.

    b) positive Gaussian curvature.

    c) negative Gaussian curvature.

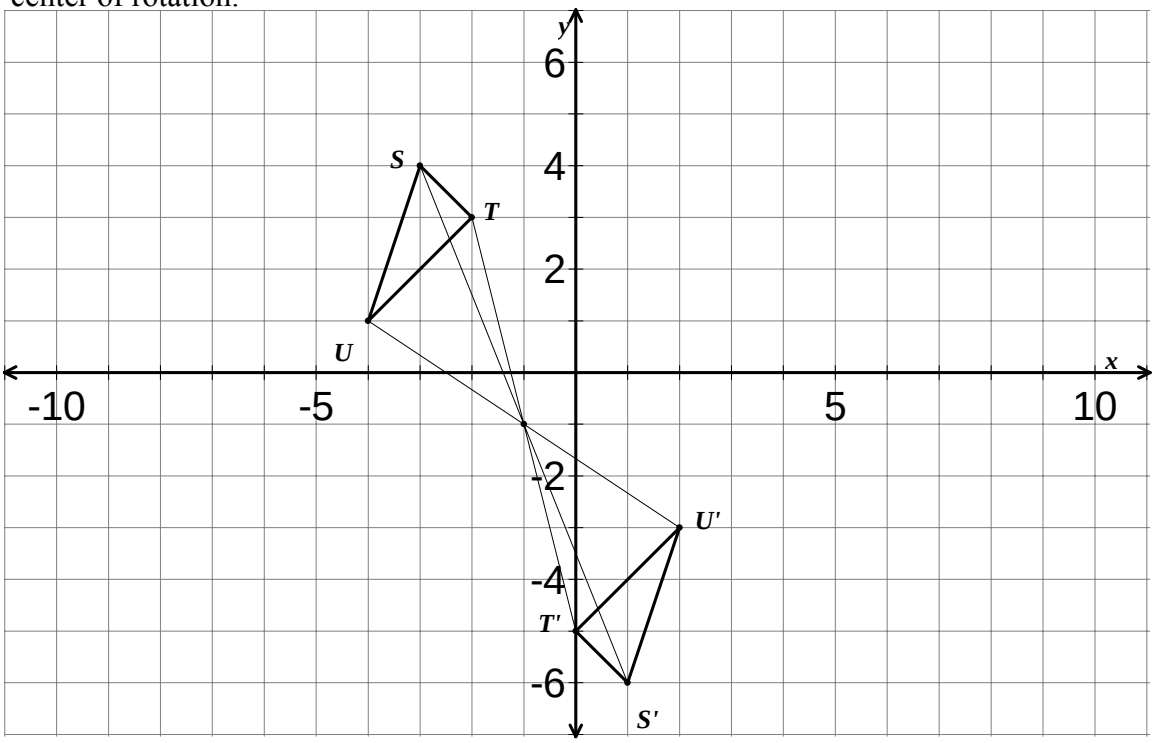
11. A student identifies the figure below as a rhombus but is not able to identify any of its properties. According to the van Hiele model of geometric thought, at what level is the student operating? Explain.



12. What are the advantages of using a dynamic geometry software package to teach geometry?

The Texas Education Agency and the Texas Higher Education Coordinating Board
***Geometry Module* Pre-/Post-Test Solutions**

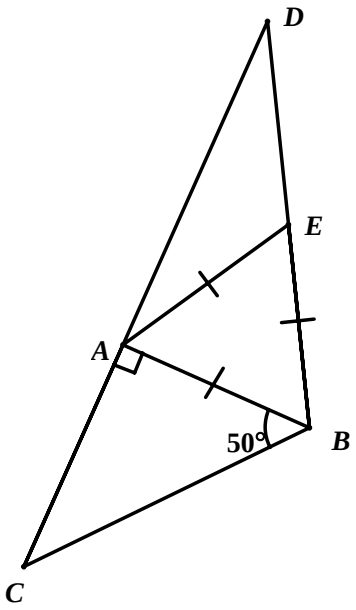
1. Triangle STU is rotated 180° clockwise to form image $\Delta S'T'U'$. Determine the center of rotation.



The point (*−1,−1*) *is the center of rotation. In general, the center of rotation can be found by finding the point of concurrency of the perpendicular bisectors of the segments connecting each pre-image vertex with its corresponding image. In the special case where the rotation is* 180^o (*clockwise or counter-clockwise*) *the segments connecting each vertex's pre-image with its image are concurrent at the midpoint of each segment* (*as shown above*).

2. In the figure shown below, $m\angle CBA = 50°$ and ΔABE is equilateral. (The figure is not drawn to scale.) Which of the following is NOT a valid conclusion for the given figure? Explain your answer.

   I $\overline{AE}$ bisects $\angle DAB$
   II $\overline{AE}$ is a median of ΔDAB
   III $m\angle D = 30°$
   IV $DE = AE$



   Selection I is not a valid conclusion. Since $\angle DAE$, $\angle EAB$, and $\angle BAC$ form a straight line, then $m\angle DAE + m\angle EAB + m\angle BAC = 180^\circ$. Since ΔABE is equilateral, then $m\angle EAB = 60^\circ$. From the drawing, $m\angle BAC = 90^\circ$. Therefore, $m\angle DAE + 60^\circ + 90^\circ = 180^\circ$ and $m\angle DAE = 30^\circ$. Since $m\angle EAB \neq m\angle DAE$, $\overline{AE}$ does not bisect $\angle DAB$.

3. The diagonals in a quadrilateral are perpendicular to each other and bisect the vertex angles of the quadrilateral. Circle all of the figures below that always have these properties.

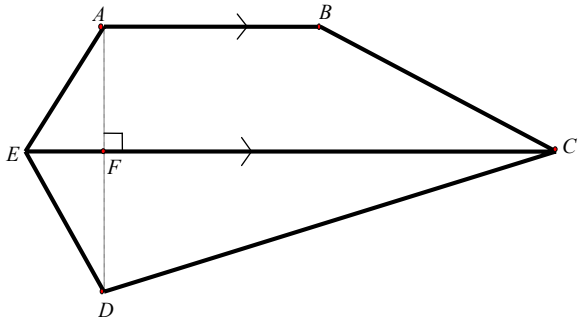
   I Rectangle
   II Square
   III Rhombus
   IV Parallelogram
   V Kite
   VI Isosceles Trapezoid

   Selections II and III always have the properties that the diagonals are perpendicular to each other and bisect the vertex angles. The diagonals of a kite are perpendicular to each other, but they do not bisect the vertex angles. Rectangles and parallelograms do not necessarily have either of these properties. Isosceles trapezoids have neither of the properties.

4. Write a true conditional statement. Write its inverse, converse, and contrapositive. Determine whether each of these statements is true or false. Give a counterexample for each false statement.

   Answers will vary. One example of a true conditional statement is "If I am visiting Rice University then I am in Houston, Texas." The inverse of this statement, "If I am not visiting Rice University then I am not in Houston, Texas" is false. As a counterexample, I can be at Reliant Stadium instead of Rice University and still be in Houston. The converse of the original statement, "If I am in Houston, Texas, then I am visiting Rice University," is also false. "I am in Houston, Texas and visiting Reliant Stadium," is a counterexample. The contrapositive of the statement, "If I am not visiting Houston, Texas then I am not visiting Rice University," is a true statement.

5. In the figure shown, $\overline{AB} \parallel \overline{EC}$, $\overline{AD} \perp \overline{EC}$, $AB = 4$ cm, $EC = 10$ cm, and $AF = DF = 3$ cm (The figure is not drawn to scale.) What is the area, in square centimeters, of pentagon *ABCDE*?



The area of pentagon ABCDE is $36\ cm^2$.
The pentagon is a composite figure consisting of a trapezoid and a triangle.

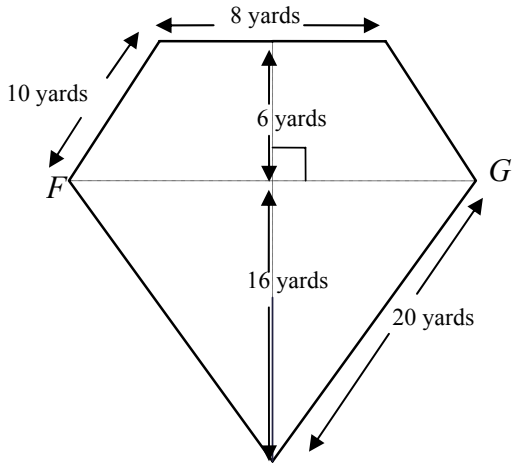
Area of trapezoid ABCE $= \frac{1}{2}h\left(b_1 + b_2\right)$

$= \frac{1}{2} \cdot 3\,cm \cdot \left(4\,cm + 10\,cm\right) = \frac{1}{2} \cdot (3\,cm) \cdot (14\,cm) = 21\,cm^2$

Area of $\Delta EDC = \frac{1}{2} \cdot (10\,cm) \cdot (3\,cm) = 15\,cm^2$

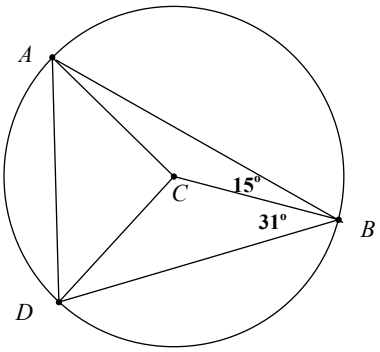
Therefore the area of pentagon $ABCDE = 21\,cm^2 + 15\,cm^2 = 36\,cm^2$.

6. The city of Houston is building a fish pond in the middle of a popular park. The figure, not drawn to scale, represents the dimensions of the pond. The figure has one line of symmetry. A bridge will be built from F to G. What will be the length of the bridge?



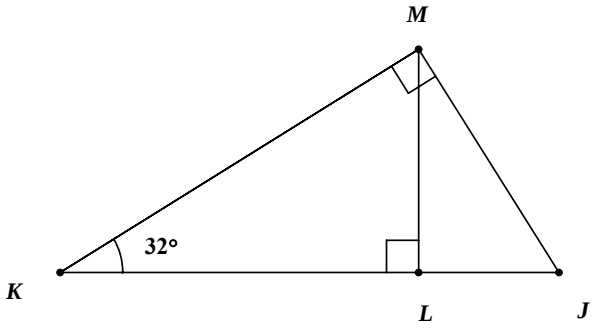
The bridge will be 24 yards long. Let C be the intersection of $\overline{FG}$ and the line of symmetry. By the Pythagorean Theorem $(CG)^2 + 16^2 = 20^2$. Therefore $CG = 12$ yards. Since the pond is symmetrical, then FC = 12 yards. Therefore FG, the length of the bridge, is 24 yards.

7. Circle C is shown below with inscribed ΔABD, $m\angle ABC = 15^\circ$, and $m\angle CBD = 31^\circ$. Find the measure of $\angle ACD$.



$m\angle ACD = 92^\circ$. The measure of an inscribed angle is one-half the measure of its intercepted arc. Therefore $m\angle ABD = \frac{1}{2} \cdot m\overset{\frown}{AD}$; $(15^o + 31^o) = 46^o = \frac{1}{2} \cdot m\overset{\frown}{AD}$ and $m\overset{\frown}{AD} = 92^\circ$. The measure of a central angle is equal to its intercepted arc. Therefore $m\angle ACD = m\overset{\frown}{AD} = 92^\circ$ since $\angle ACD$ is a central angle with intercepted arc $\overset{\frown}{AD}$.

8. In the figure below, ΔJKM is a right triangle with altitude $\overline{ML}$ to the hypotenuse $\overline{KJ}$, $m\angle K = 32^{o}$, and $KM = 6$ cm.



a) Name three pairs of similar triangles in the figure.

$\Delta KMJ \sim \Delta KLM$

$\Delta KMJ \sim \Delta MLJ$

$\Delta KLM \sim \Delta MLJ$

b) Find *ML* and *LJ*. Round your answers to the nearest tenth.

$ML = 3.2\,cm$ *and* $LJ = 2.0\ cm$.

From triangle ΔKLM, $sin32^{o} = \dfrac{ML}{6\,cm}$. *Therefore*

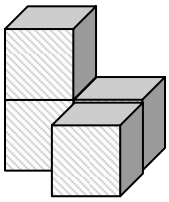
$ML = 6 \cdot sin\,32^{o} = 3.1795\,cm \approx 3.2\,cm$ *(Note: Make sure calculators are in degree mode.)*

Since $\Delta KLM \approx \Delta MLJ$, $m\angle JML = 32^{o}$ *and* $\tan 32^{\circ} = \dfrac{LJ}{ML} = \dfrac{LJ}{3.1795\,cm}$.

Therefore,

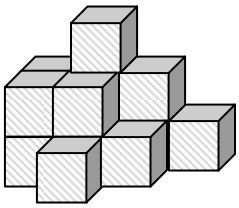
$LJ \approx 2.0\,cm$.

9. The two figures shown below represent the same 3-dimensional figure. The left is a perspective drawing. The right is the top view with numbers indicating how many cubes are on each stack.



2	1
	1

Sketch a top view for the figure below, indicating how many cubes are on each stack.



The following is the answer:

2	*3*	*2*	*1*
2	*2*	*1*	
	1		

10. Describe the characteristics of a surface of:

a) zero Gaussian curvature.

In a surface with zero Gaussian curvature, such as a plane or cylindrical surface, Euclid's first five postulates are true. Specifically the fifth postulate holds: "Through a point not on a line, there exists exactly one line parallel to the line." Theorems whose proofs depend on this postulate are also true. For example, the sum of the measures of the angles in a triangle always equals 180^o. A plane tangent to a surface with zero Gaussian curvature will contain a line that touches the surface at all the points on that line.

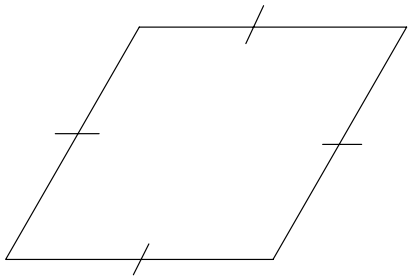
b) positive Gaussian curvature.

In a surface with positive Gaussian curvature, such as a sphere, Euclid's fifth postulate does not hold. Instead, through a point not on a line there exists no line parallel to the line. Because Euclid's fifth postulate is not true for this curvature, theorems that depend on this postulate for their proofs are not valid. As a result, for a surface with positive Gaussian curvature, the sum of the measures of the angles of a triangle is always greater than 180^o *. In addition, a plane tangent to a surface with positive Gaussian curvature will always lie completely to one side of the surface.*

c) negative Gaussian curvature.

In a surface with negative Gaussian curvature, such as a pseudosphere or a hyperbolic paraboloid, Euclid's fifth postulate does not hold. Instead, through a point not on a line there exists an infinite number of lines parallel to the line. Because Euclid's fifth postulate is not true for this curvature, theorems that depend on this postulate for the proofs are not valid. As a result, for a surface with negative Gaussian curvature, the sum of the measures of the angles of a triangle is always less than 180^o *. In addition a plane tangent to a surface with negative Gaussian curvature at a given point will always pass through the surface.*

11. A student identifies the figure below as a rhombus but is not able to identify any of its properties. According to the van Hiele model of geometric thought, at what level is the student operating? Explain.



According to the van Hiele model of geometric thought, the student is operating at the Visual Level for this concept. In the Visual Level students are able to identify the names of geometric objects but are not yet able to specify properties.

12. What are the advantages of using a dynamic geometry software package to teach geometry?

    Answers will vary. The advantages of a dynamic software package such as The Geometer's Sketchpad are many. Primarily, a dynamic geometry software package, if available in a computer laboratory setting, allows students to construct their own knowledge of geometry by allowing them to explore, make inferences, and test hypotheses. As a demonstration tool, it allows a teacher to illustrate examples more quickly and efficiently than can be done at a chalkboard.

Observation #: _____

Date: _____
Start time: _____
End time: _____
Observer: _____

I. Pre-observation interview

Discuss the lesson with the teacher, ask the following questions, and record the responses. You may need to do this interview over the phone with the teacher the night before. You may also plan ahead and send the questions to the teacher via e-mail.

A. What are the instructional goals of the activity you have planned?

B. How will the students be engaged during the lesson?

C. What student success do you expect to see take place during this activity?

D. Do you have any concerns about the activity you have planned? If so, what are they? If not, why not?

E. What should I focus on during the observation?

II. Observation

During the observation, make a written record of teacher and student comments and actions about the topics identified for observation during the pre-observation interview. Focus on the teacher's words and actions. Whenever possible record the teacher's exact words. Abbreviate your notes as necessary (T for teacher, G1, B1, etc. for the students). Note the time every few minutes, or when a shift or transition in the activity takes place.

As soon after the observation as possible, use your notes to write a more polished narrative. The narrative should include an accurate description of the classroom, seating arrangements, displays, etc. Draw a map of the classroom and complete the following checklist in order to provide more detailed information about its layout. The narrative should also include a list of materials used during the observed lesson. Before leaving the classroom, request copies of any worksheets that were used during your observation.

A. Physical Environment: Seating arrangement

	YES	**NO**
Students have assigned seats.		
Desks are arranged in rows and columns.		
Desks are arranged in semi-circles.		
Desks are arranged in clusters.		
Tables are used rather than desks.		

B. Physical Environment: Walls

	YES	**NO**
Rules of behavior are posted.		
Rules of math are posted (formulas, process skills, problem solving styles).		
Illustrations of math concepts are posted.		
Number line is displayed.		
Pictures are displayed.		
Graphs or charts are displayed.		
Motivational posters are displayed.		
Student work is displayed.		
Student math assignments are posted.		

C. Students

Total number of students in the classroom _____

Ethnicity	Number of Male Students	Number of Female Students
White		
African-American		
Hispanic		
Asian		
Other		

D. Materials used during lesson

Textbooks	Yes	No
Worksheets	Yes	No
Manipulatives [List which kind(s).]	Yes	No
Calculators	Yes	No
Computers	Yes	No
Other	Yes	No

E. Teacher's actions during lesson

Teacher uses an exploratory activity to introduce the concept.	Yes	No
Teacher demonstrates without having students participate.	Yes	No
Teacher has student volunteers demonstrate.	Yes	No
Teacher leads whole class as they work with demonstration materials.	Yes	No

	Frequently	Sometimes	Rarely
Teacher raises questions that extend students' thinking.			
Teacher responds to students' questions in a positive and encouraging manner.			
Teacher incorporates manipulatives and technology appropriately.			
Teacher maintains an appropriate pace during the lesson.			
Teacher uses hands-on, interactive activities to develop the concept (not just problems from the textbook).			
Teacher moves around the room to keep everyone engaged and on track.			

F. Students' actions during lesson

	Frequently	Sometimes	Rarely
Students are interacting with each other.			
Students are working independently.			
Students use a variety of materials (aside from worksheets or textbook).			
Students are encouraged to explain the process used to reach a solution.			
The majority of students are engaged in the lesson.			
Students are encouraged to explore several solutions.			
Students ask each other questions.			
The majority of students are engaged in the mathematics activity.			

	Yes	No
Students develop their own products to demonstrate mastery of the concept.		
Students are encouraged to raise original questions about math and discuss these questions.		

G. General Comments

What concept was the teacher discussing? _____

1. How long was the teacher-led portion of the lesson?
   Approximate number of minutes _____

2. Describe the lesson taught.

3. How comfortable did the students appear to be with the teacher?

Not at all comfortable	Sort of comfortable	Very comfortable

4. Comments about teacher (her personality, teaching skills, rapport with students):

5. How much time was spent on student group work?
   Approximate number of minutes _____

6. Describe student group work.

7. How much time was spent on individual student work?
   Approximate number of minutes _____

8. Describe briefly.

9. Comments about students (their behavior, whether they were on task, understanding the lesson):

10. Please rate the quality of the teacher's classroom management.

Poor	Adequate	Excellent

11. Additional comments:

III. Post-observation interview

The post-interview should be done as soon after the observation as possible in order to capture data about the teacher's immediate perceptions.

A. What went particularly well during the lesson?

B. Did it differ from what you expected? If so, how?

C. If you were to teach this lesson again, what would you change?