COOPERATIVE LEARNING LESSON PLAN - Student Teams-Achievement Division (STAD) Model

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Subject(s): Geometry - Essentials of Geometry

Topic or Unit of Study (Title): Find Perimeter, Circumference, and Area

Grade Level: 10th grade

Materials:
Index cards
Teams: Study and Practice, including the Area and Perimeter of Quadrilaterals Worksheet
Homework sheets

Summary (*and Rationale*): Developing and using formulas to determine the perimeter of triangles, parallelograms, trapezoids, and circles; the circumference of circles, and the area of such shapes will help us to develop strategies to apply these concepts to geometric figures we see in the world around us.

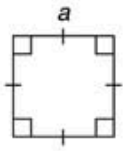
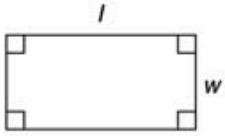
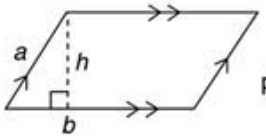
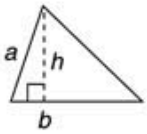
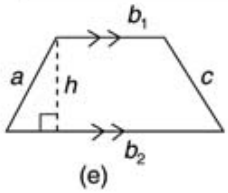
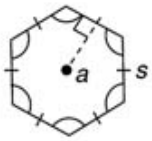
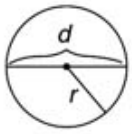
I. Focus and Review (Establish Prior Knowledge): [10 min.]
- Ask students to verbally recall the definitions of **perimeter** (the distance around a figure), **circumference** (the distance around a circle), and **area** (the amount of surface covered by a figure).
- What units of measurement might be used? Measurements of length, such as meters (m) and feet (ft).
- Then how might area be measured? In square units, such as square meters (m^2) and square feet (ft^2).

II. Statement of Instructional Objective(s) *and Assessments*:

Objectives	**Assessments**
1) When given the study guides and worksheets, the students will cooperatively work together as teams to learn the concepts, and to apply the concepts to completing the worksheets with 80% accuracy.	1) Instructor will monitor the teams to make sure that all students are participating in a cooperative manner and the worksheet will be a part of their assessment.
2) When given the team quiz, the students will individually complete the team quizzes for a team score with the goal of being the highest scoring team.	2) Instructor will assess thru the Team Quiz.

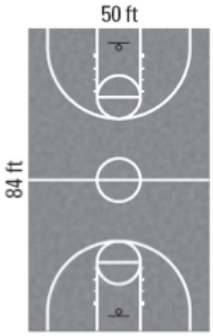
State the objective: [no additional time]
Assessment: [included in lesson time]

III. Teacher Input (Present tasks, information and guidance): [25 min.]
Student Teams-Achievement Division (STAD) Model:
1) Introduce the key concepts using appropriate diagrams. **Have students write the formulas on index cards and include a labeled drawing.**

Figure	Name	Perimeter/ Circumference	Area
 (a)	square	$4a$	a^2
 (b)	rectangle	$2l + 2w$ or $2(l + w)$	lw
 (c)	parallelogram	$2a + 2b$ or $2(a + b)$	bh
 (d)	triangle	$a + b + c$	$1/2bh$
 (e)	trapezoid	$a + b_1 + c + b_2$	$1/2(b_1+b_2)h$
 (f)	regular polygon	ns n = number of sides	$1/2ap$ p = perimeter a = apothem
 (g)	circle	πd or $2\pi r$	πr^2

Example 1:
Find the perimeter and area of the rectangular basketball court shown.
$P = 2\ell + 2w = 2(84) + 2(50) = 268$ ft

$A = \ell w = 84(50) = 4200$ ft^2



Example 2:
You are ordering circular cloth patches for your soccer team's uniforms. Find the circumference and area of the patch shown.

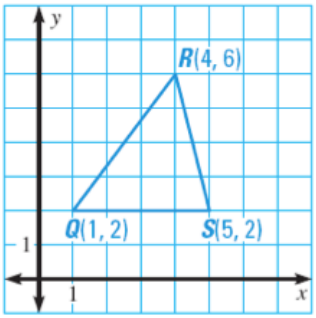
$C = 2\pi r = \pi d = 3.14(9 \text{ cm}) = 28.3$ cm
$A = \pi r^2 = 3.14[1/2(9 \text{ cm})]^2 = 63.6$ cm^2

Example 3:
Triangle *QRS* has vertices *Q*(1,2), *R*(4,6), and *S*(5,2). What is the perimeter of triangle *QRS*?

First draw the triangle in a coordinate plane. Find the side lengths. Use the *Distance Formula* to find *QR* and *RS*.

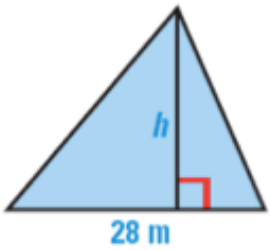
$QS = |5-1| = 4$ units
$QR = \text{sqrt.}[(4 - 1)^2 + (6 - 2)^2] = \text{sqrt.}[25] = 5$ units
$RS = \text{sqrt.}[(5 - 4)^2 + (2 - 6)^2] = \text{sqrt.}[17] = 4.1$ units

Then find the perimeter.
P = *QS* + *QR* + *RS* = 4 + 5 + 4.1 = 13.1 units



<u>Example 4</u>:
The base of a triangle is 28 meters. Its area is 308 square meters. Find the height of the triangle.

$A = \frac{1}{2}bh$
$308 = \frac{1}{2}(28\text{m})\,h$
$h = 22$ m



2) <u>Form teams for study and practice</u>. Place students in teams with one member form the high achievement, high average achievement, low average achievement, and low achievement groups.
Use: "TEAMS: Study and Practice", including the "Area and Perimeter of Quadrilaterals Worksheet"
3) <u>Test students on newly learned materials</u>. "Team Quiz"
4) <u>Recognize winning teams</u>. Winning teams will be given an extra day to turn in their project.

IV. Guided Practice (Elicit performance): [35 min.]
"Teams: Study and Practice", including the "Area and Perimeter of Quadrilaterals Worksheet"

***V.* Closure (Plan for maintenance):** [20 min.]
"Team Quiz"
Remind students that their completed unit project - Modeling Geometric Shapes - is due on Monday.

***VI.* Independent Practice:** [if there is time at the end]
Homework sheets

STANDARDS:
G.CO.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

G.C.1 Prove that all circles are similar. Using the fact that the ratio of diameter to circumference is the same for circles, prove that all circles are similar.

G.GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

G.GMD.1 Explain the formulas for the circumference of a circle and the area of a circle by determining the meaning of each term or factor.

G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

Plans for Individual Differences: This model naturally provides differentiation opportunities by placing students into teams with one member form the high achievement, high average achievement, low average achievement, and low achievement groups. This type of grouping helps students learn from the different degrees of prior knowledge brought to the group, and the groups can build on strengths and shore up weaknesses. This environment will also encourage participation of reluctant students. Tiered Assignments and Products - can be used in the final step of the STAD model for low achieving students by allowing for demonstrating correct use of the formulas and their variables, without focusing on exact computations.

References (APA style):

Larson, R., Boswell, L., Kanold, T. D., & Stiff, L. (2007). *Essentials of Geometry*. Geometry (Teacher's Edition, p. 1-69). Evanston, Ill.: McDougal Littell.

Maths Chick. (2008, January 16). *Area and Circumference of Circles*. Maths Teaching. Retrieved April 26, 2014, from WordPress.com

Area and Perimeter of Quadrilaterals Worksheets. (n.d.). *Dynamically Created Math Worksheets*. Retrieved April 26, 2014, from Math-Aids.com

Trask, A. (n.d.). Unit Test - Perimeter, Circumference, and Area. *Office of Mathematics, Science, and Technology Education*. Retrieved April 26, 2014, from the University of Illinois

Perimeter and Area of Geometric Figures on the Coordinate Plane. (2012, January 1). *Davis School District / Overview*. Retrieved April 27, 2014, from Carnegie Learning

Formulas: Perimeter, Circumference, Area. (2013, January 1). *CliffsNotes*. Retrieved April 27, 2014, from Houghton Mifflin Harcourt

TEAMS: Study and Practice

Study - Use your index cards of formulas created in class.
Practice - Complete the problems below.

Circles Complete this table - answers to 1 d.p.

Radius (cm)	Diameter (cm)	Circumference (cm)	Area (cm^2)
6.5			
	9		
		58	
			140
			290
		72	

Area and Perimeter of Quadrilaterals Worksheet - Teams complete first 6 problems for practice:

(Note: Worksheet and answer sheet in link below. Instructor will have printed worksheets for students to complete.)

http://www.math-aids.com/cgi/pdf_viewer_4.cgi?script_name=perimeter_quadrilaterals.pl&square=1&rectangle=1&parallelogram=1&rhombus=1&trapezoid=1&inch=1&feet=1&yard=1&centi=1&milli=1&language=0&memo=&answer=1&x=158&y=14

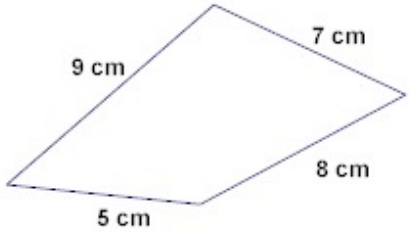
Answers for Team study and practice Circle table:

Radius (cm)	Diameter (cm)	Circumference (cm)	Area (cm^2)
6.5	13	40.8	132.7
4.5	9	28.3	63.6
9.2	18.5	58	267.7
6.7	13.4	41.9	140
9.6	19.2	60.4	290
11.5	22.9	72	412.5

Team Quiz

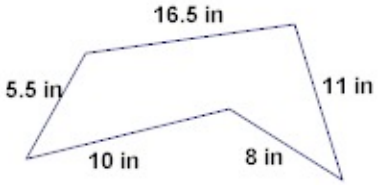
Find the perimeter of each polygon. Show all work.

1.



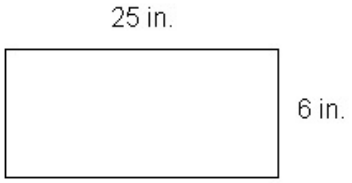
P =

2.



P =

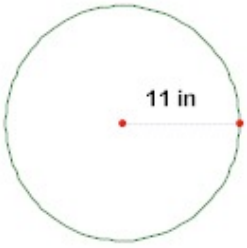
3.



P =

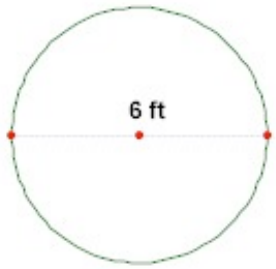
Find the circumference and area of each circle. Show all work.

4.



C =
A =

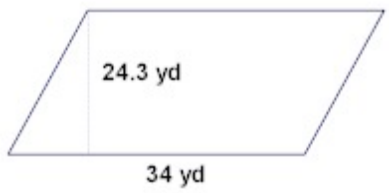
5.



C =
A =

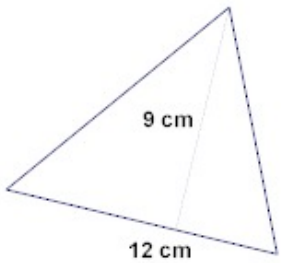
Find the area of each figure. Show all work.

1.



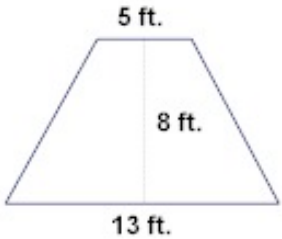
A=

2.



A=

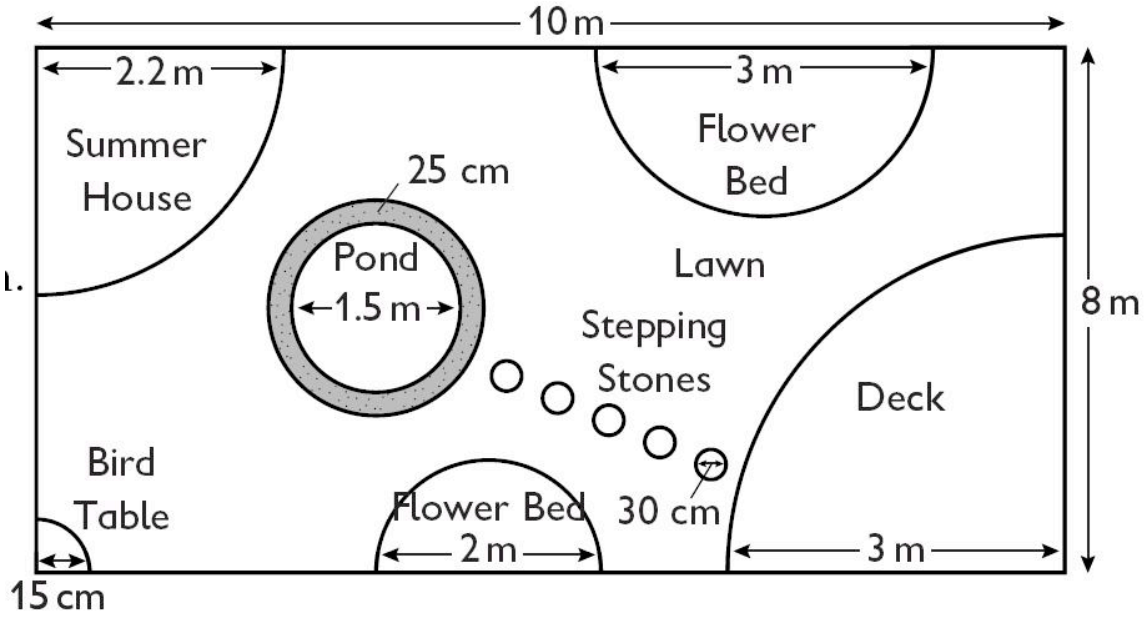
3.



A=

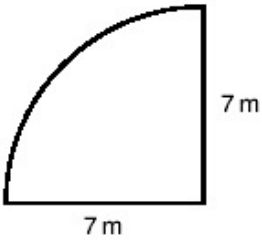
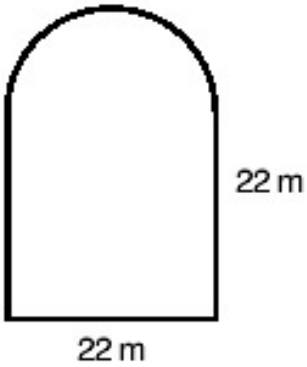
Homework:

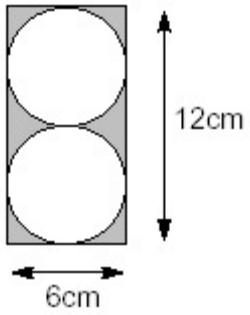
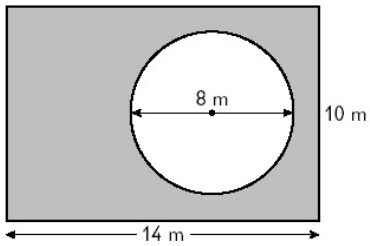
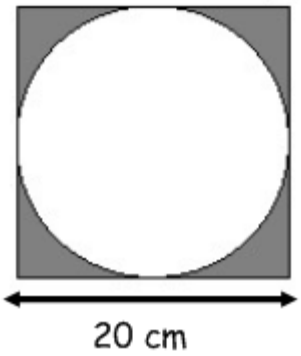
Using the garden diagram, complete the table below.



Object in Garden	Area in m^2
Summer house	
Bird table	
Large flower bed	
Small flower bed	
Deck	
Pond	
Gravel around the pond	
A stepping stone	
LAWN	

Homework con't… :

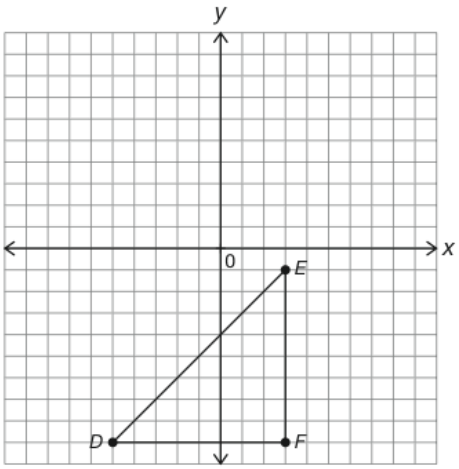
 Find the area Find the circumference	 Find the area Find the circumference	 Find the area Find the circumference

Find the shaded area	Find the shaded area	Find the shaded area
		

Homework con't… :

Students must also complete problems # 7 - 9 of Area and Perimeter of Quadrilaterals Worksheet used in team practice.

Find the area and perimeter of triangle DEF.



Answers:

"Team Quiz" -

1. 29 cm
2. 51 in.
3. 62 in.
4. C = 69.08 in., A = 379.94 in.^{2}
5. C = 18.84 ft., A = 28.26 ft.^{2}

1. 826.2 yd.^{2}
2. 54 cm^2
3. 72 ft.^{2}

"Homework" -

Summer house, A = 3.80 m^2
Bird table, A = .02 m^2
Large flower bed, A = 3.53 m^2
Small Flower bed, A = 1.57 m^2
Deck, A = 7.07 m^2
Pond, A = 1.77 m^2
Gravel around the pond, A = 1.37 m^2
A stepping stone, A = .08 m^2
Lawn, A = 80 m^2

Shape 1 - A = 56.52 cm^2 , C = 30.84 cm
Shape 2 - A = 38.47 m^2, C = 24.99 m
Shape 3 - A = 673.97 m^2, C = 100.54 m
Shape 4 - A = 15.48 cm^2
Shape 5 - A = 89.76 m^2
Shape 6 - A = 86 cm^2

Note: An answer sheet is included in the link to the Area and Perimeter of Quadrilaterals Worksheet

Triangle DEF - A = 32 units^2 , P = 11.3 units