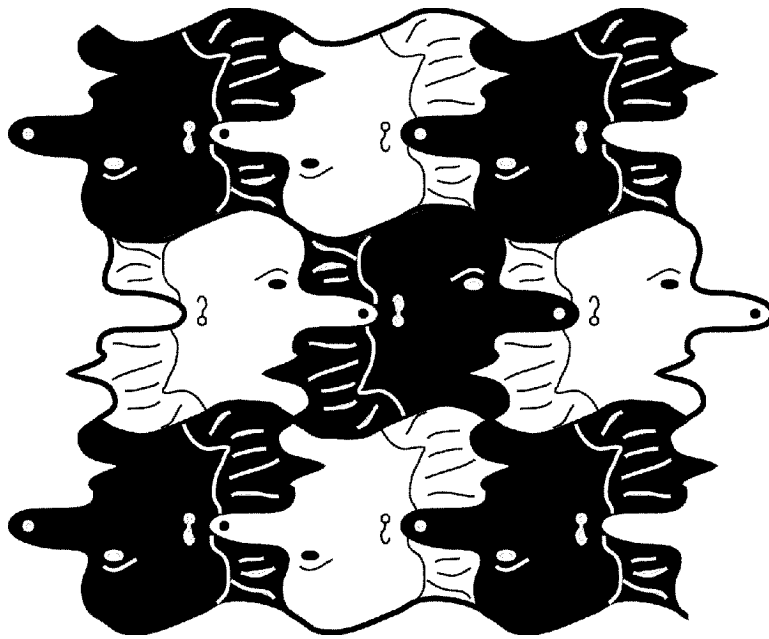

Hour Exams and Final Math 3403 – Spring 2003

John Wolfe



Final	page 2
Exam III	page 10
Exam II	page 14
Exam I	page 18

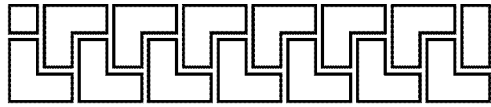
File: e03s.tex

MATH 3403 – Geometric Structures – Final Exam

May 2003

Name: _____

1. (10 points) Using the codetable below, identify the symmetry type of these borders.



(a)



(b)



(c)



(d)

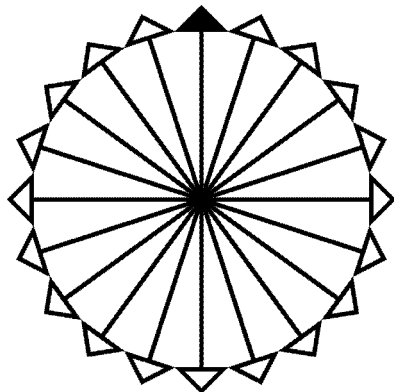


(e)

Code for Border Patterns

First	Second
m crossline sym.	m centerline sym.
1 no crossline sym.	g glide reflectional sym.
	2 half-turn symmetry
	1 no additional sym.

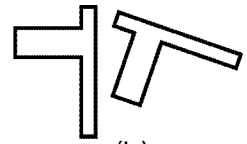
2. (4 points) Since one of the arrowheads is shaded, the following figure is a type D_1 mandala. Shade more arrowheads so that it becomes a D_5 mandala.



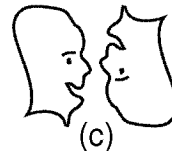
3. (7 points) Four pairs of congruent figures are given below. By each pair write **S** if they have the same orientation or **O** if they have opposite orientations.



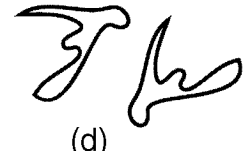
(a)



(b)



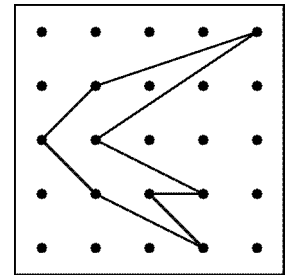
(c)



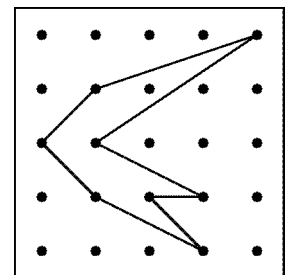
(d)

4. (8 points) The geoboard figure given below has an area of 4 units. Show two different ways to find this area.

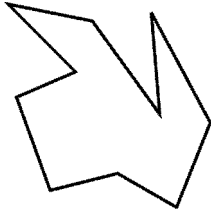
Method 1:



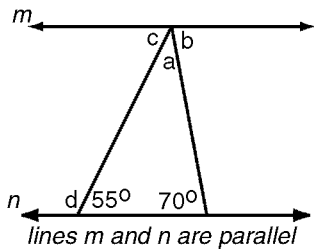
Method 2:



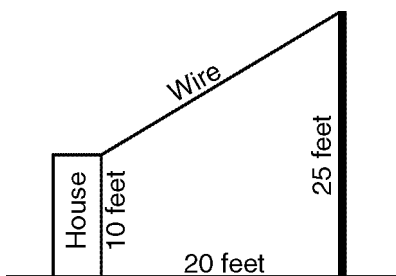
5. (4 points) What is the angle sum for the following polygon? Show your work!



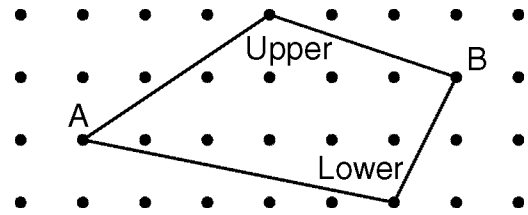
6. (8 points) Find the measure of the angles marked with a letter. (Clearly show your work!)



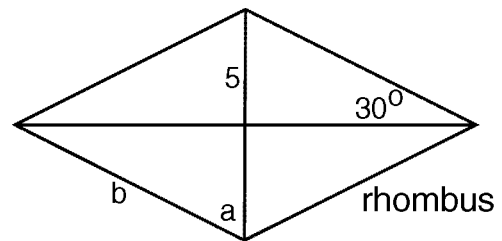
- (a) What is angle a ?
- (b) What is angle b ?
- (c) What is angle c ?
- (d) What is angle d ?
7. (8 points) A wire runs from the top of a pole which is 25 feet tall to the corner of a house which is 10 feet high. Mary measured the distance between the pole and the house as 20 feet. How long is the wire?



8. (8 points) Which is the shortest way to go from A to B, using the upper route or the lower route? Show your work!

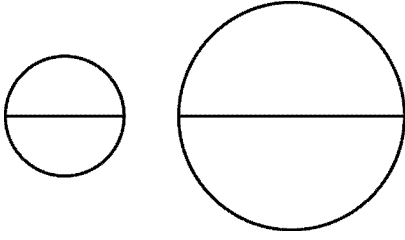


9. (7 points) Some information about a rhombus is given in the figure below. Figure out what angle a and side b are.



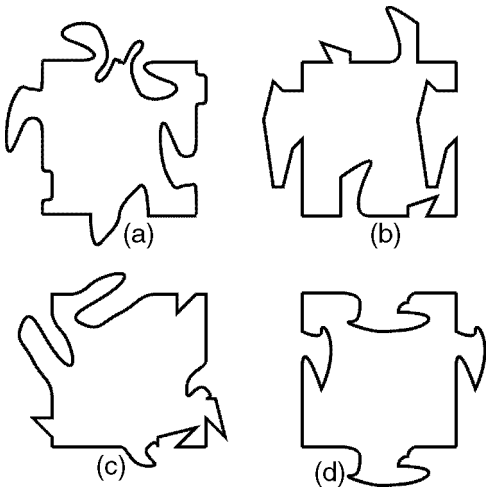
- (a) What is angle a ?
- (b) How long is side b ?
10. (7 points) For this problem you are to name all of the quadrilaterals in which at least one of the diagonals bisects the angles at each end. Then identify the one which is most general.
- Possible names: square, rectangle, rhombus, parallelogram, kite, trapezoid, and isosceles trapezoid.
- (a) Names:
- (b) Which is most general?

11. (6 points) The area of the second circle below is 3 times larger than the area of the first. If the first diameter is 7 inches, how long would the second diameter be?

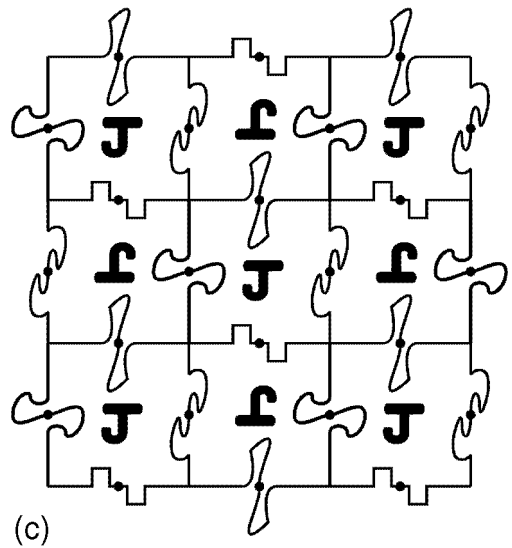
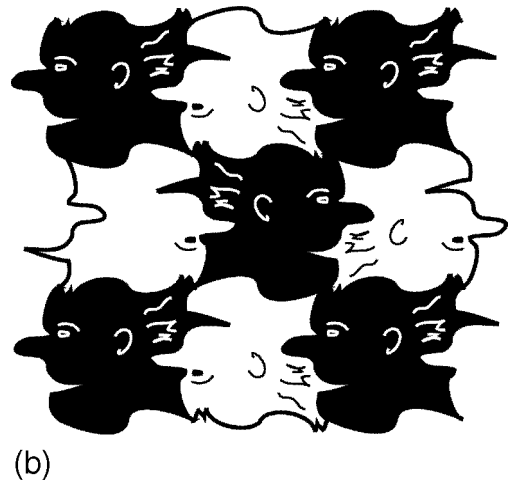
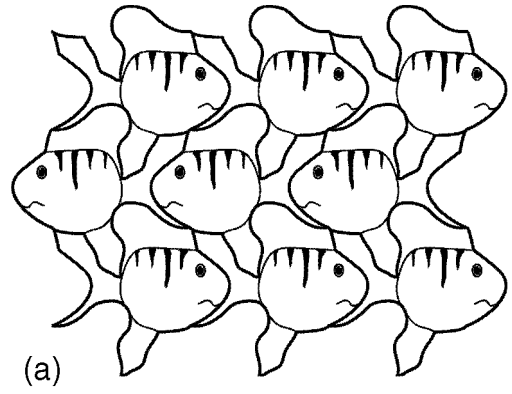


12. (6 points) Hannah is doubling the dimensions of her flower garden. If it took 3 bags of mulch to cover her smaller flower garden last spring, how many bags will be needed to cover her enlarged garden?

13. (8 points) For each of the tessellation prototiles given below, identify the Heesch Type.



14. (9 points) Analyze each of the Escher style tessellations given below. For each design, indicate the Heesch type.



Definitions to Properties – Four Step Model

Name: _____

15. (10 points)

Official Definition: A kite is a quadrilateral in which one diagonal bisects the angles at both ends.

Property: For an official kite, there is one pair of congruent opposite angles. (ASA).

Step 1

Step 2

Step 3

Step 4

Four Step Model

Step 1: Mark given information on figure: official definition, constructions, related definitions, earlier results.

Step 2: Draw and identify apparently congruent triangles.

Step 3: Cite and fully apply CC to triangles.

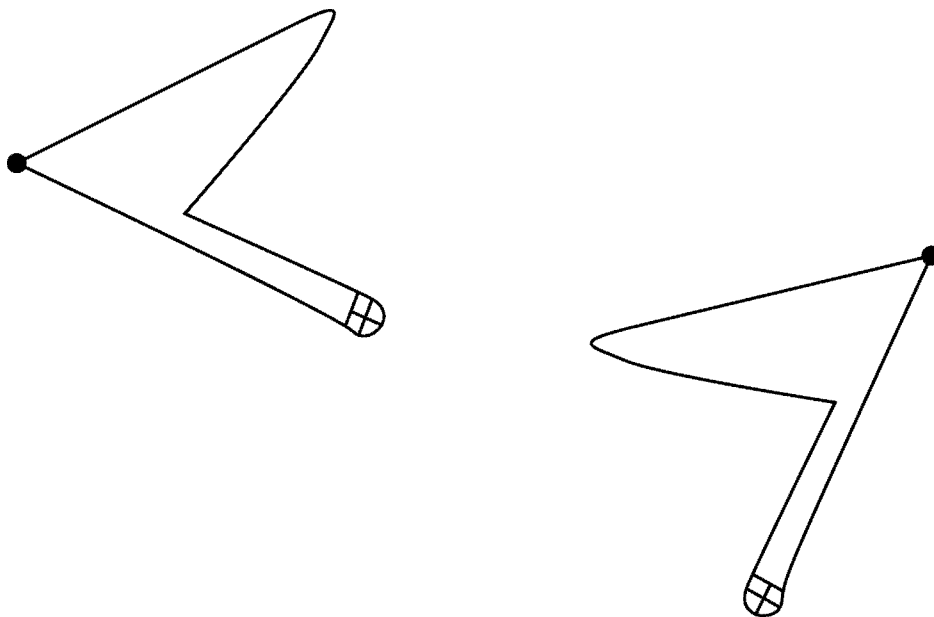
Step 4: Apply CPCT for results needed for the property.

CD Problem – Mira

Name: _____

16. (10 points) The two figures below are related by a glide reflection. Using a mira, construct the glide reflection line.

Note: Do the construction and then clearly describe the process that you used.



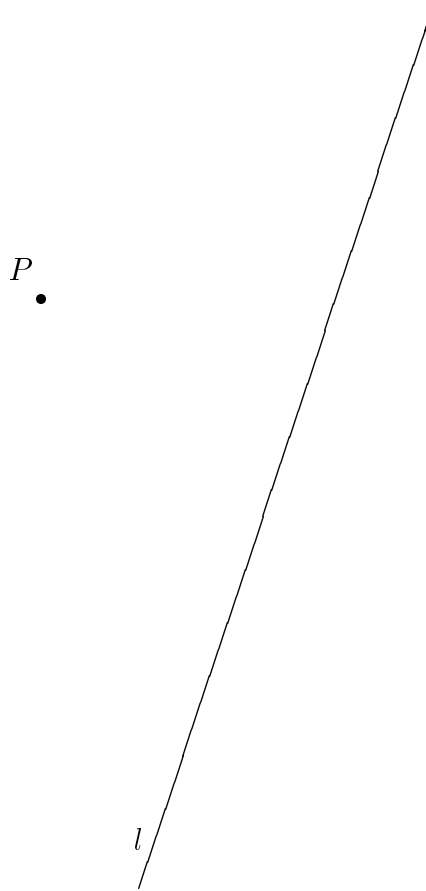
Describe:

CD Problem – Straight Edge and Compass

Name: _____

17. (10 points) Using a straight edge and compass, construct the reflection of the point marked P through the line marked l .

First do the construction and then describe your steps.



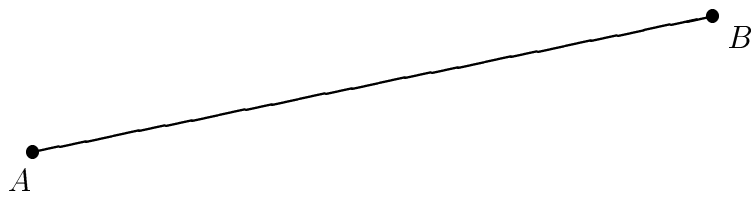
CD Problem – Mira

Name: _____

18. (10 points) Using a mira, locate a point C so that the triangle ABC is equilateral.

Note: Do the construction and then clearly describe the process that you used.

Describe:



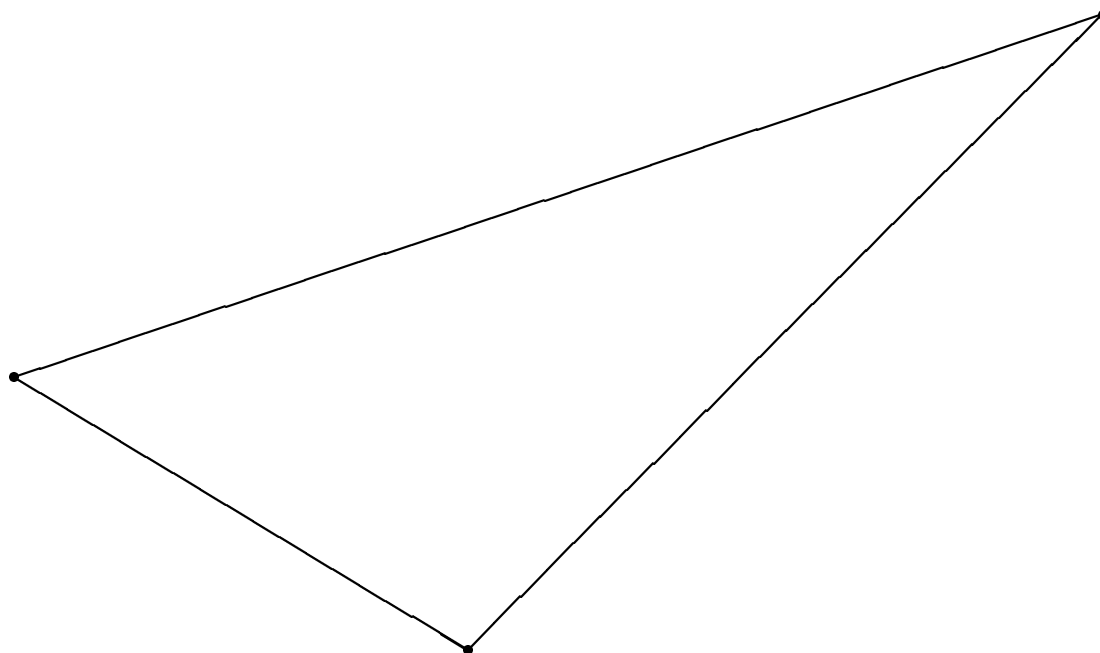
CD Problem – Paper Folding

Name: _____

19. (10 points) On the triangle below, use paper folding to find the center of the inscribed circle. Use a compass to draw this circle.

Describe the process that you used to find the inscribed circle.

Describe:

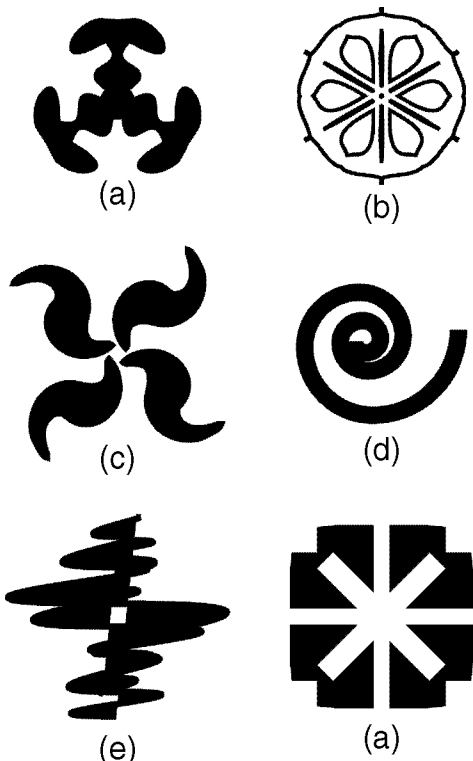


MATH 3403 – Geometric Structures – Exam III

April 2003

Name: _____

1. (17 points) Using the code table below, identify the symmetry type of the following mandalas.



Code for Mandalas

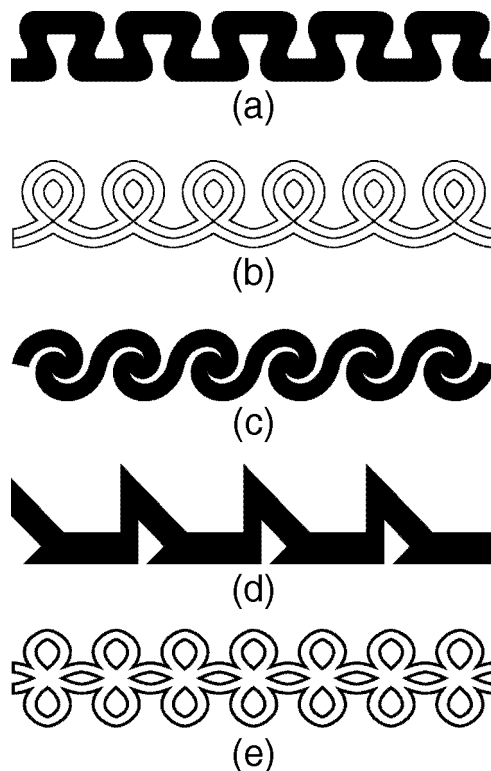
C_n	n-fold rotational symmetry (no reflectional symmetry)
D_n	reflectional symmetry and n-fold rotational symmetry
D or D_1	Bilateral symmetry only
N or C_1	No symmetry

2. (4 points) Which of the seven types of quadrilaterals (square, rhombus, rectangle, parallelogram, kite, trapezoid and isosceles trapezoid) have half-turn symmetry?

3. (4 points) A border of type mg is given below. Which of the four types of symmetries (translation, rotation, reflection and glide reflection) does this border have? List all that apply.



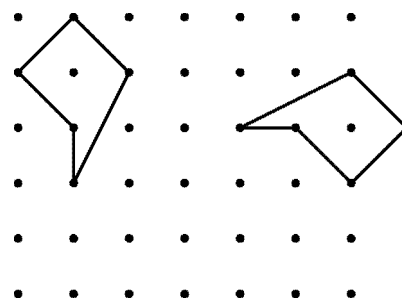
4. (15 points) Using the codetable below, identify the symmetry type of these borders.



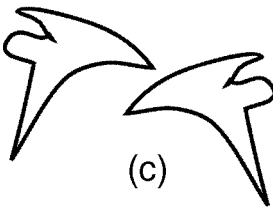
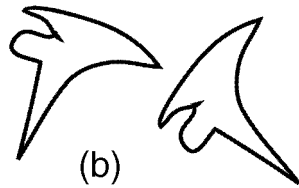
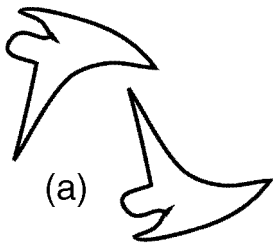
Code for Border Patterns

First	Second
m crossline sym.	m centerline sym.
1 no crossline sym.	g glide reflectional sym.
	2 half-turn symmetry
	1 no additional sym.

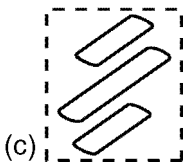
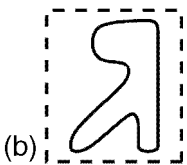
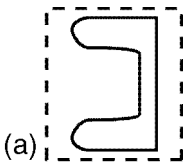
5. (4 points) The two figures below are related by a glide reflection. Draw the glide reflection line which carries the one figure to the other.



6. (8 points) Pairs of congruent figures are given below. For each pair, indicate by which of the four types of transformations the two copies are related (translation, reflection, rotation or glide reflection).



7. (9 points) Three generating rectangles for borders are given below. Imagine that each is repeated many times on each side, left and right, so that three different borders are generated. By each of the generating rectangles, indicate what type of border will be generated. The border code table is given below for your information.



Code for Border Patterns

First	Second
m crossline sym.	m centerline sym.
1 no crossline sym.	g glide reflectional sym.
	2 half-turn symmetry
	1 no additional sym.

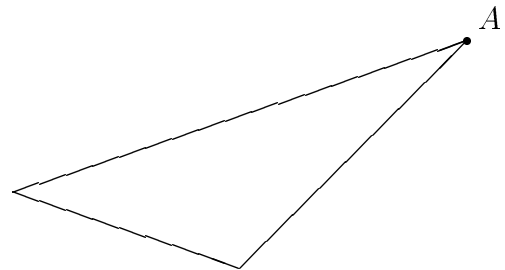
8. (9 points) **Possible?** For each of the following statements, decide if it is possible or not.
- If it is possible, write POSSIBLE and draw a picture.
 - If it is not possible, write NOT and give a reason.

(a) **Possible?** A fold and cut figure which makes a mandala of type C_3 .

(b) **Possible?** A triangle which has three lines of symmetry.

(c) **Possible?** A border of type mm which does not have half-turn symmetry.

9. (8 points) **Mini-CD Problem:** Using a mira, construct the altitude through the vertex A for the triangle given below. Describe the process that you used.



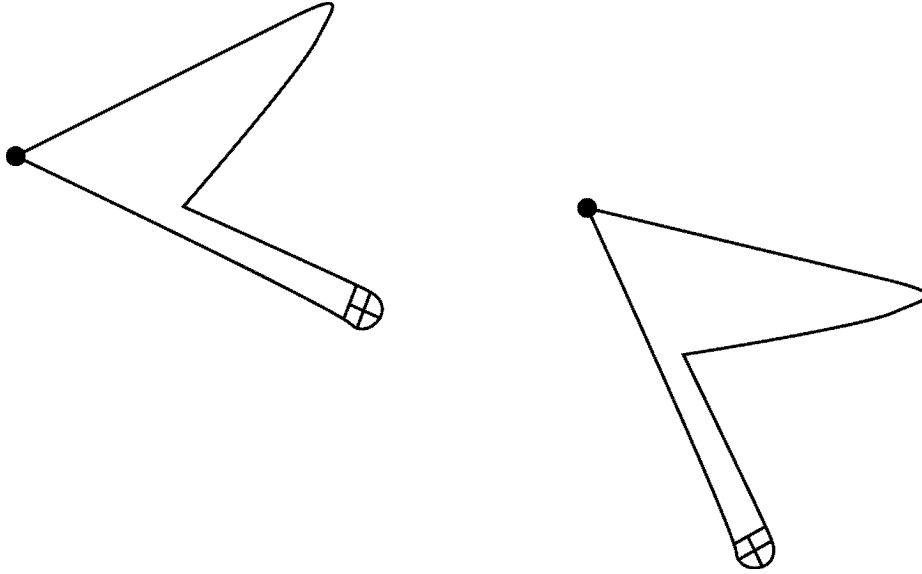
Describe:

CD Problem – Mira

Name: _____

10. (11 points) The two figures given below are related by a rotation. Using a mira, construct the center of this rotation.

Note: Do the construction and then clearly describe the process that you used.



Describe:

CD Problem – Mira or Reflecta

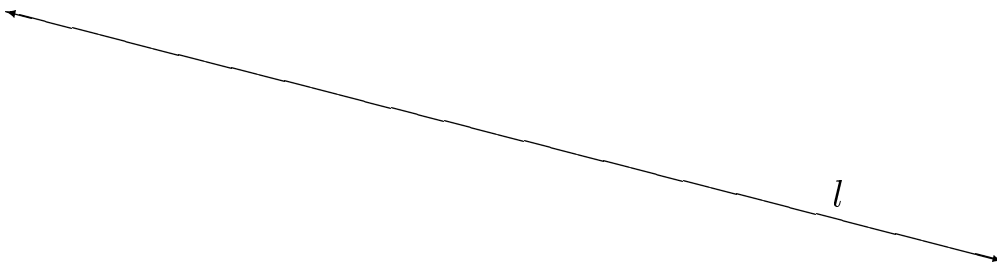
Name: _____

11. (11 points) Using a mira, find the line which is parallel to the line l and passes through the point P .

Note: Do the construction and then clearly describe the process that you used.

Describe:

P •

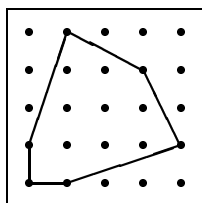


MATH 3403 – Geometric Structures – Exam II

March 2003

Name: _____

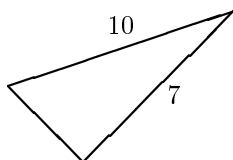
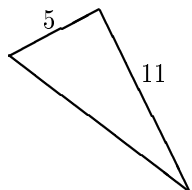
1. (10 points) Figure out the perimeter of the following figure. Write your answer two ways: (a) as a sum of square roots and (b) as a decimal.



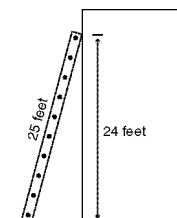
(a) As a sum of square roots:

(b) As a decimal:

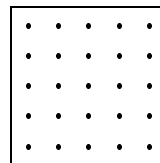
2. (12 points) Find the lengths of the unmarked sides of these two right triangles.



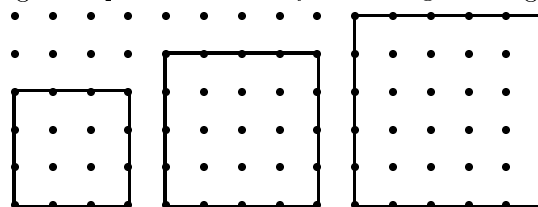
3. (8 points) A 25-foot ladder reaches 24 feet up the side of a building. How far out is the bottom of the ladder from the base of the building?



4. (4 points) Make a line joining two points of this geoboard which has a length of $\sqrt{13}$.



5. (7 points) If you put these squares together to form a triangle of squares would they form a right triangle?

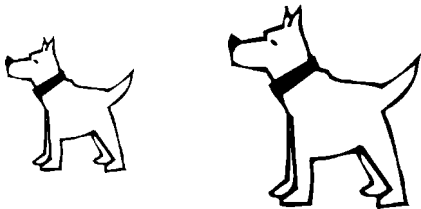


Answer (yes or no):

Reason:

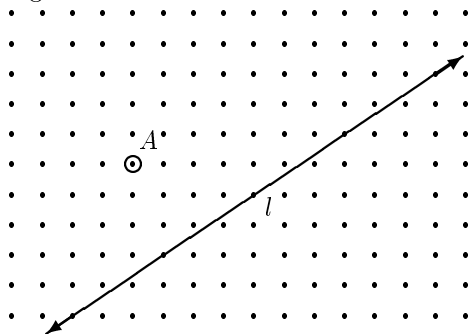
6. (7 points) Hannah is doubling the dimensions of her flower garden. If it took 3 bags of mulch to cover her smaller flower garden last spring, how many bags will be needed to cover her enlarged garden?

7. (7 points) The area of the second dog drawn below is 3 times as large as the area of the first.



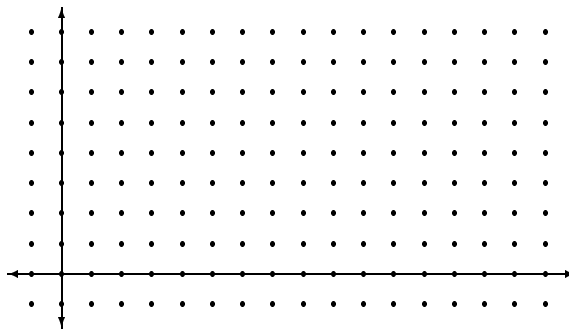
If the small dog's tail is 2 cm long, how long is the tail of the second dog?

8. (8 points) A line l and a point A off the line are given in the figure below.



- (a) Draw a line which is parallel to line l and goes through the point A . (Clearly show other dots which this line goes through.)
- (b) Draw a line which is perpendicular to line l and goes through the point A . (Clearly show other dots which this line goes through.)

9. (5 points) On the dot paper given below, imagine a line segment going from $(1,1)$ to $(16,6)$. How many dots, including endpoints, does this line segment go through?



10. (6 points) What would be a congruence condition for a parallelogram? In other words, what information is needed to determine a parallelogram?

Four Step Problem

Name: _____

11. (14 points)

Official Definition: A kite is a quadrilateral with two distinct pairs of adjacent sides which are equal.

Property: For an official kite, one pair of opposite angles are congruent.

Step 1

Step 2

Step 3

Step 4

Four Step Model

Step 1: Mark given information on figure: official definition, constructions, related definitions, earlier results.

Step 2: Draw and identify apparently congruent triangles.

Step 3: Cite and fully apply CC to triangles.

Step 4: Apply CPCT for results needed for the property.

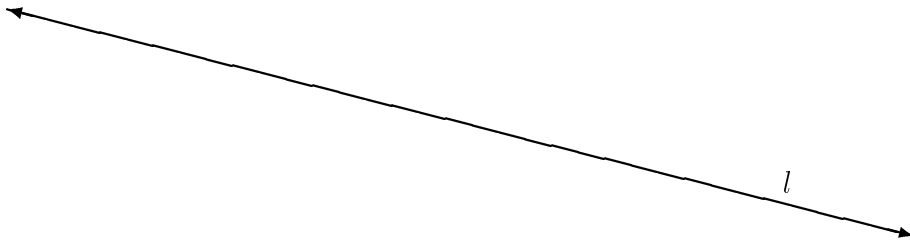
CD Problem – Straight Edge and Compass

Name: _____

12. (12 points) Three lengths or sides are given below. Using a straight edge and compass, make a triangle out of the given information. Begin by copying segment AB onto line l below.

First carry out your construction. Then write out a step by step description of the process that you use.

A _____ B



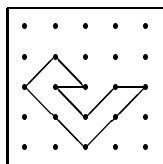
MATH 3403 – Geometric Structures – Exam I

February 2003

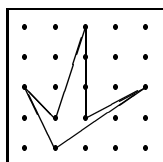
Name: _____

1. (16 points) Four different geoboard figures are given below. You are to work out the area of each figure using a different method on each figure. Fully describe the method you use for each figure. *Note: Be sure to illustrate 4 different methods.*

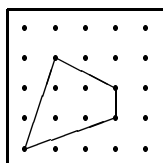
(a) Method 1:



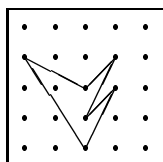
(b) Method 2:



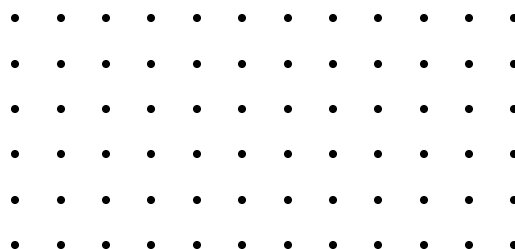
(c) Method 3:



(d) Method 4:

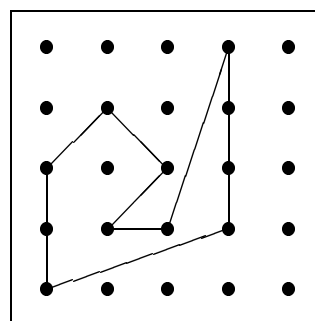


2. (6 points) In the dotpaper below draw two figures where the area is two more than the number of internal dots.

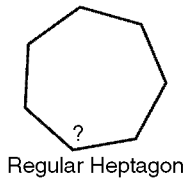
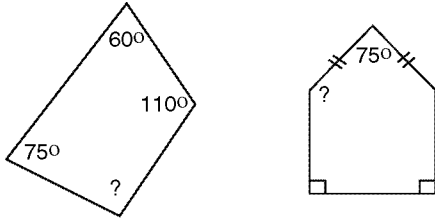


Two Examples

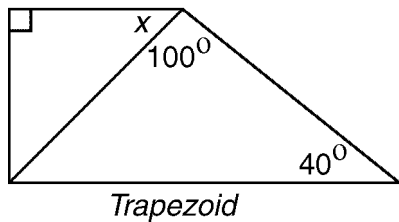
3. (5 points) Use Julie's Way (also called the triangle method) to find out the area of this figure. (*Show your work!*)



4. (13 points) What are the angles marked with a question mark? (Write in the degree measure, showing calculations.)



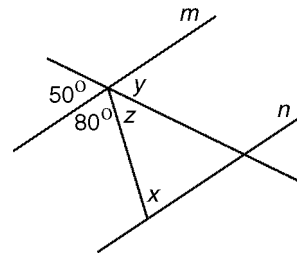
5. (4 points) Figure out the angle marked with an x in the following figure. *Show your work!*



6. (8 points) In the figure below, lines m and n are parallel. For each of the angles marked with a letter, (a) give the value of the angle and (b) give a reason.

Acceptable reasons include:

“alternate interior angle to something”,
 “corresponding angle to something”,
 “vertical angle to something” or
 “supplementary angle to something.”



- (a) The value of x is:

The reason is:

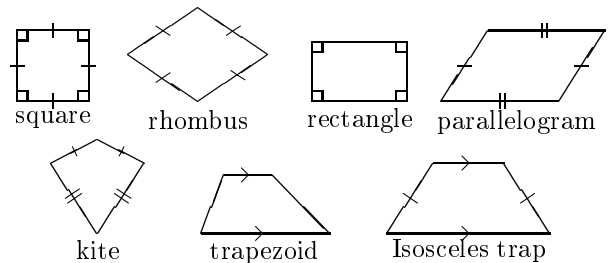
- (b) The value of y is:

The reason is:

- (c) The value of z is:

The reason is:

7. (6 points) The seven types of quadrilaterals we have been working with are drawn here.



For each of the following descriptions, write down all of the names of the quadrilaterals which satisfy the description. *Note: Multiple answers are possible.*

- (a) A quadrilateral in which there are two pairs of opposite parallel sides.
- (b) A quadrilateral in which there is one or more pairs of equal adjacent angles.
- (c) A quadrilateral in which the diagonals are perpendicular bisectors of each other.

8. (5 points)

(a) State a property of a kite which is not a definition of a kite.

(b) Draw a figure which shows that the above property is not a definition of a kite.

9. (8 points) We have been working with seven types of quadrilaterals: squares, rectangles, rhombuses, parallelograms, kites, trapezoids, and isosceles trapezoids. Possible definitions are given below for some of these kinds of quadrilaterals. For each definition identify the type of quadrilateral defined.

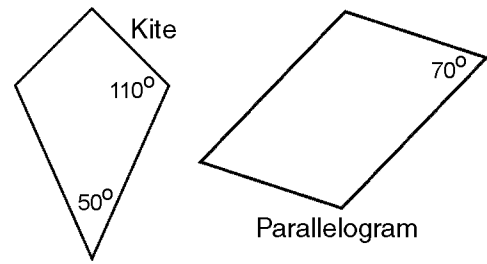
(a) A quadrilateral whose opposite angles are congruent.

(b) A quadrilateral where a diagonal is a line of symmetry.

(c) A quadrilateral where there are two distinct pairs of adjacent supplementary angles.

(d) A quadrilateral where whose diagonals are perpendicular bisectors of each other.

10. (6 points) Write in the values of all of the angles of these two quadrilaterals.



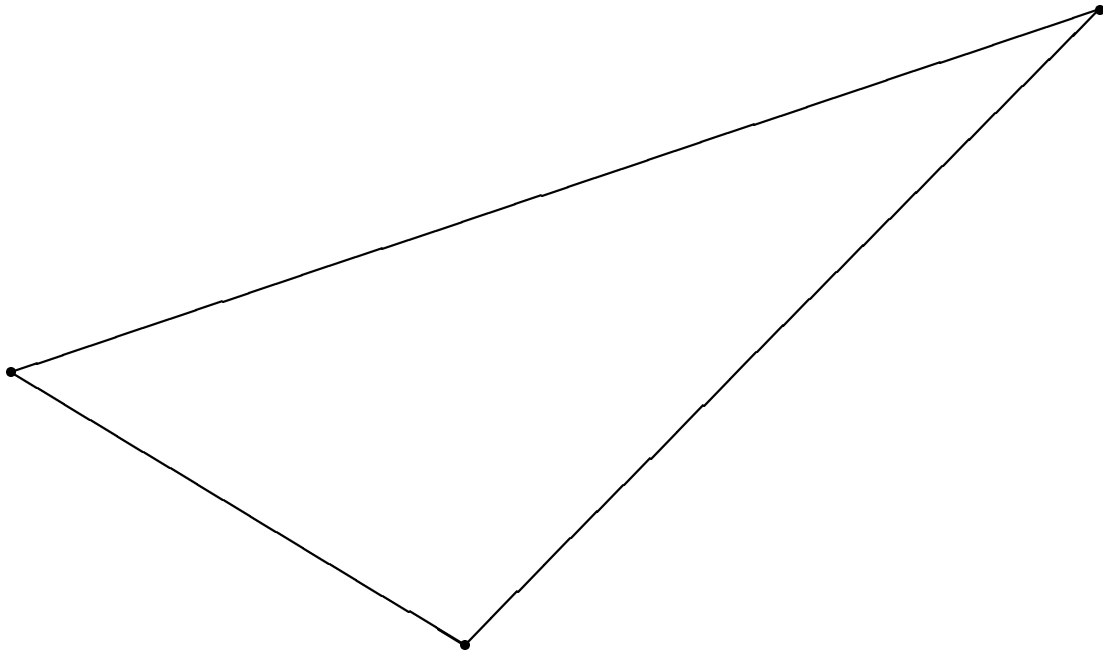
CD Problem – Paper Folding

Name: _____

11. (12 points) On the triangle below, use paper folding to find the center of the inscribed circle. Use a compass to draw this circle.

Describe the process that you used to find the inscribed circle.

Describe:



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12. (12 points) Using paper folding, construct an isosceles right triangle so that the segment \overline{AB} is one of the legs.

Note: Do the construction and then clearly describe the process that you used.

Describe:

