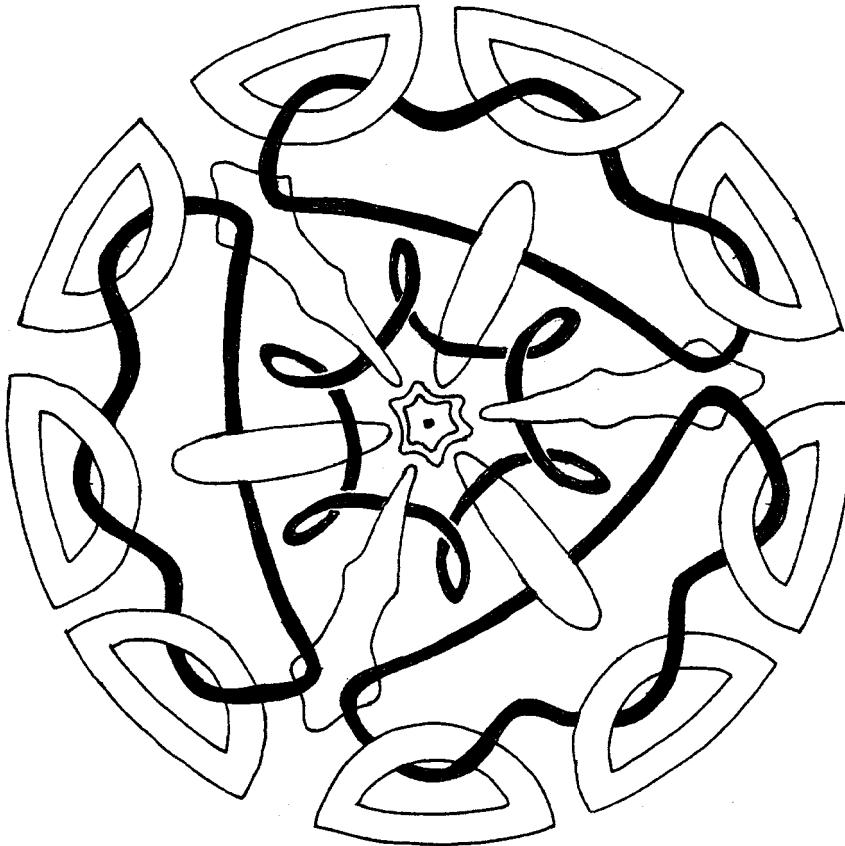

Hour Exams and Final
Math 3403 – Spring 2001

Version A

John Wolfe



Final page 2
Exam III page 10
Exam II page 15
Exam I page 19

File: e01s.tex

MATH 3403 – Geometric Structures – Final Exam – A

May 2001

Name: _____

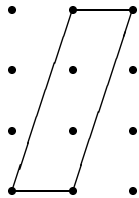
Honor Code

IMPORTANT: There are multiple sections of this course. Although different versions of the exams are given in each section, there are enough similarities that sharing information about the exam could influence a student's grade.

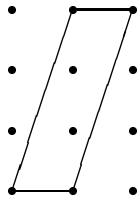
You are on your honor to not discuss this exam with students in other sections until after all sections have taken the test.

1. (A12 points) The parallelogram given below has area 3. Give four different methods to calculate this area. Completely show your work for each method.

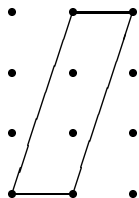
Method 1:



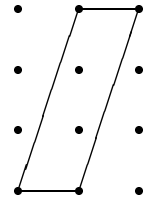
Method 2:



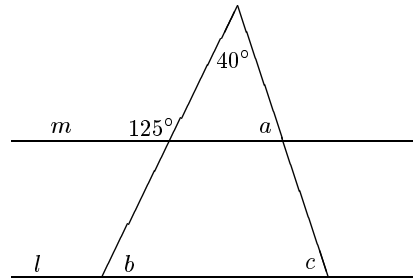
Method 3:



Method 4:



2. (A8 points) Find the measure of angles a , b and c . Assume that lines l and m are parallel. (*Show your work!*)



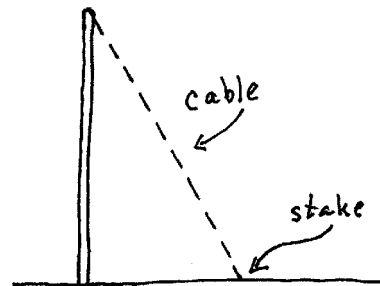
What is angle a ?

What is angle b ?

What is angle c ?

3. (A7 points)

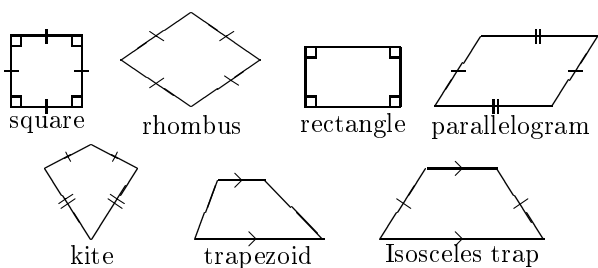
Carla wants to attach a 12 foot length of cable to the top of a pole which is 8 feet tall. She will stretch out the cable and attach it to a stake in the ground as shown.



How far will it be from the base of the pole to the stake?

Express your answer two ways: as a square root and as a decimal.

4. (A8 points) The seven types of quadrilaterals we have been working with are drawn here.



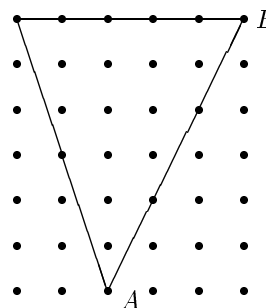
For each of the following descriptions, write down all of the names of the quadrilaterals which satisfy the description. *Note: Multiple answers are possible.*

- (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.
5. (A8 points) Find both the area and the perimeter of the quadrilateral given below. Express the perimeter in terms of square roots and as a decimal. Show your calculations!
-
- (a) Area:
- (b) Perimeter in terms of square roots:
- (c) Perimeter as a decimal:
6. (A8 points) John's rectangular rabbit pen is just the right size for 20 rabbits. He wants to decrease the size of the pen so that it is just right for 10 rabbits. By how much does he need to decrease the sides of the pen?

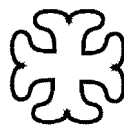
7. (A8 points) Imagine that the triangle pictured below is stood up on the table with the side marked AB on the table. How high will it stand?

Express your answer in two ways,

- (a) using square roots:
 (b) as a decimal:



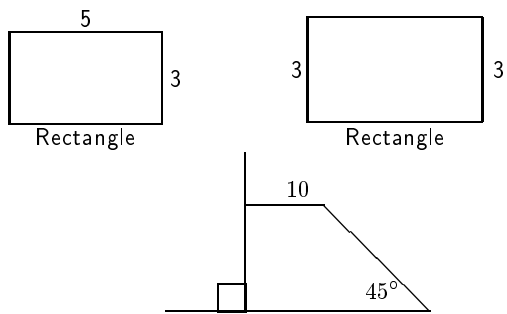
8. (A8 points) Write a 1 or a 2 beside each of the following figures to indicate if it is 1-sided or 2-sided.



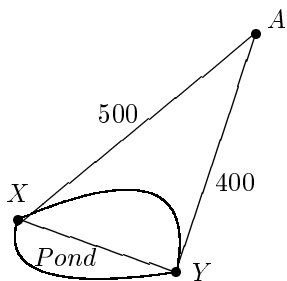
9. (A5 points) Is it possible to use fold and cut to make a mandala of type C_4 ? Explain why or why not?

Your Explanation:

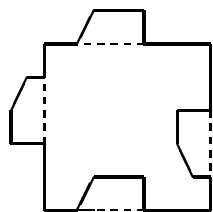
10. (A6 points) Write **CC** for congruence condition by the figures below where enough information is given to determine the figure. If not enough information is given, write **NOT CC**.



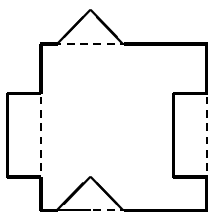
11. (A8 points) Flags have been placed at points X and Y on opposite sides of a small pond. Another flag was placed at point A so that a right angle is formed at point Y (where lines YX and YA meet). The lengths of the “overland” distances AX and AY were measured and are marked on the map below. How far is it across the pond from flag X to flag Y ?



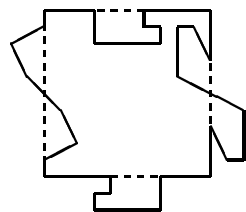
12. (A8 points) For each of the Escher style prototiles given below, identify the Heesch type.



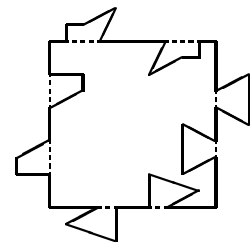
a)



b)

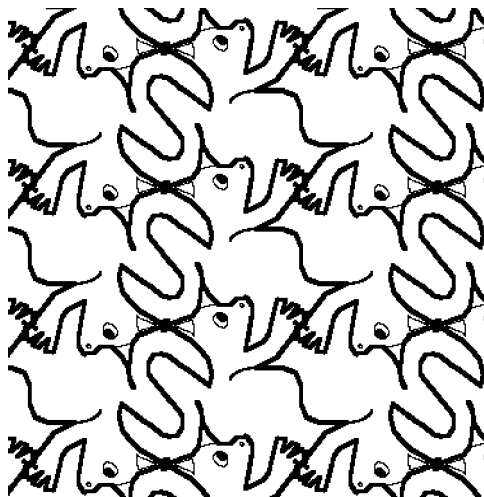


c)

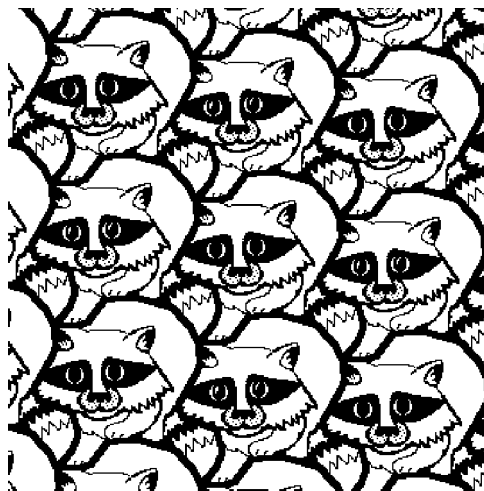


d)

13. (A6 points) Analyze each of the Escher style tessellations given below. For each design, indicate the Heesch type.



a)



b)

Four Step Problem

Name: _____

14. (A10 points)

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

Property: For an official kite, one diagonal bisects the angles at each end.

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.

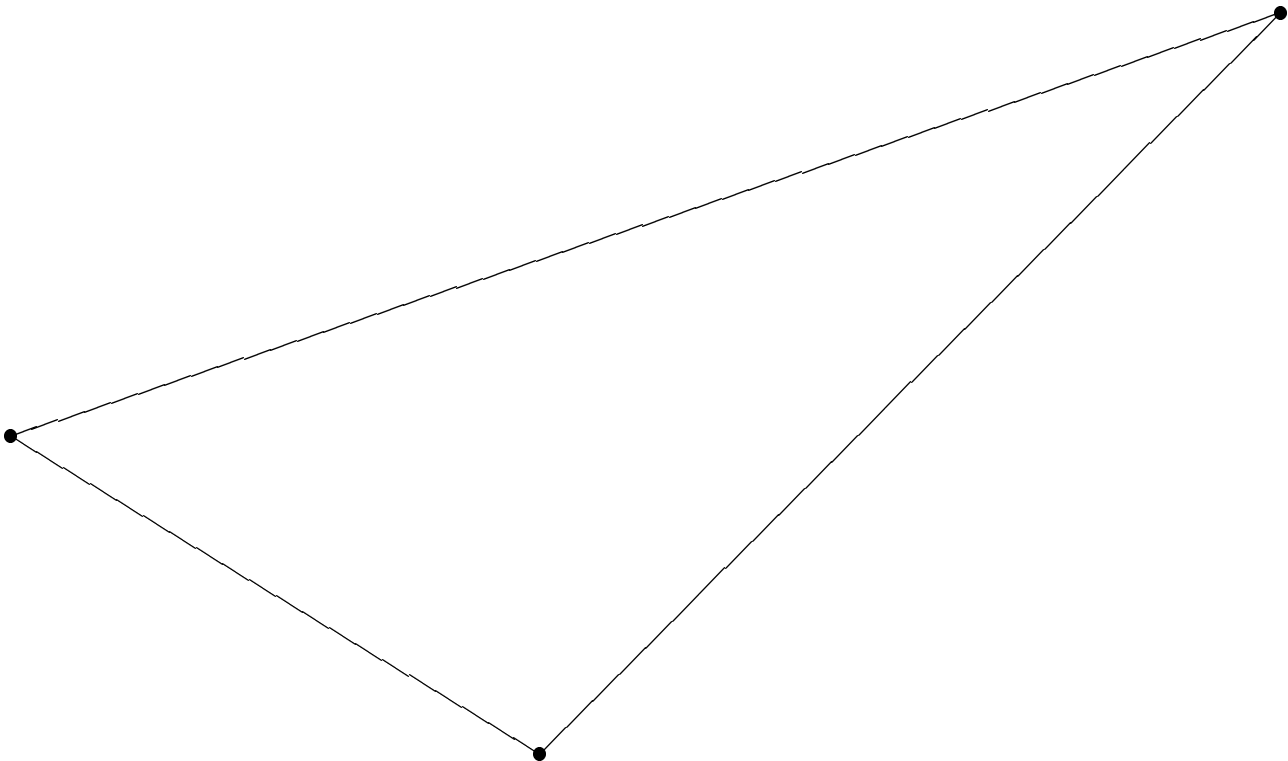
CD Problem – Mira

Name: _____

15. (A10 points) On the triangle below, use a mira 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.

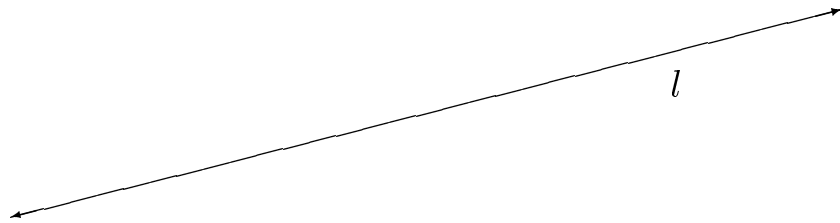
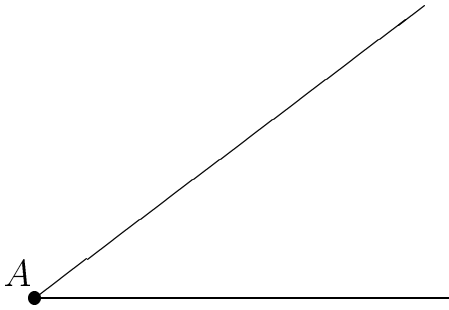
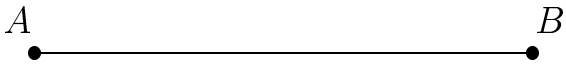
Describe:



CD Problem – Straight Edge and Compass

Name: _____

16. (A10 points) Use a straight edge and compass to construct a rhombus with sides of length \overline{AB} and one angle as shown. Put one side on the line l .



Describe the process that you used in this problem.

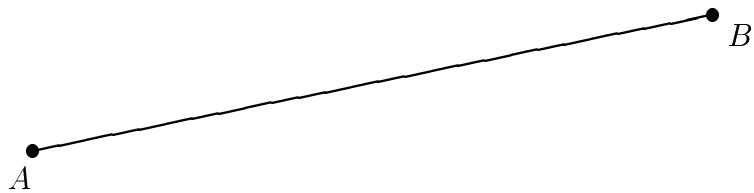
CD Problem – Paper Folding

Name: _____

17. (A10 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:



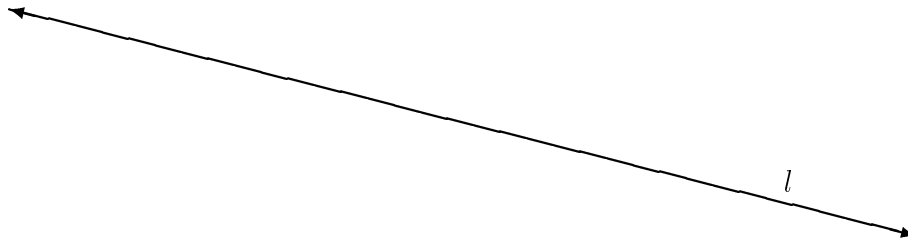
CD Problem – Straight Edge and Compass

Name: _____

18. (A10 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 III–A

April 2001

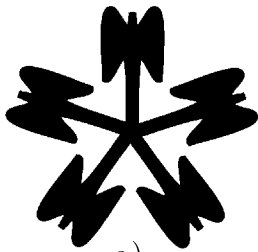
Name: _____

Honor Code

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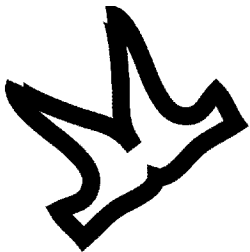
1. (A18 points) Using the code table below, identify the symmetry type of the following mandalas.



a)



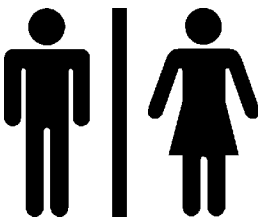
b)



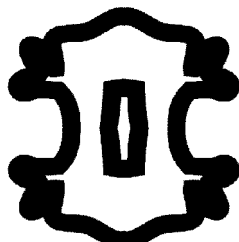
c)



d)



e)



f)

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

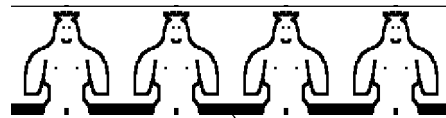
2. (A15 points) Using the codetable below, identify the symmetry type of these borders.



a)



b)



c)



d)

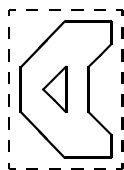


e)

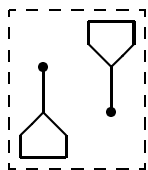
Code for Border Patterns

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

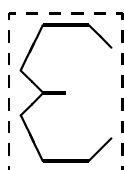
3. (A9 points) Three generating rectangles for borders are given below. Imagine that each is repeated many times on each side, left and right, so that three different borders are generated. By each of the generating rectangles, indicate what type of border will be generated. The border code table is given below for your information.



a)



b)



c)

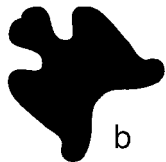
Code for Border Patterns

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

4. (A10 points) Several figures are given below.



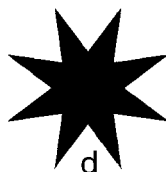
a



b



c



d



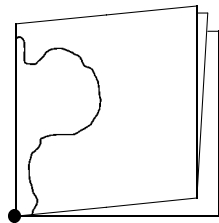
e



f

- Which figures are symmetric?(list letters)
- Which figures have bilateral symmetry?
- Which figures are fold and cut?
- Which figures are double fold and cut?

5. (A4 points) A diagram is drawn below showing a folded sheet of paper along with a line showing where the paper will be cut. After being cut and unfolded a cutout mandala shape will result. Write beside the diagram your prediction of what the symmetry type of the resulting mandala will be. The table for mandala types is given below for your information.

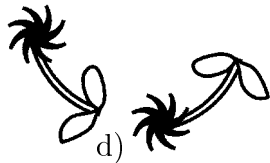
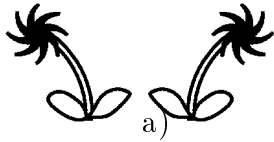


double fold

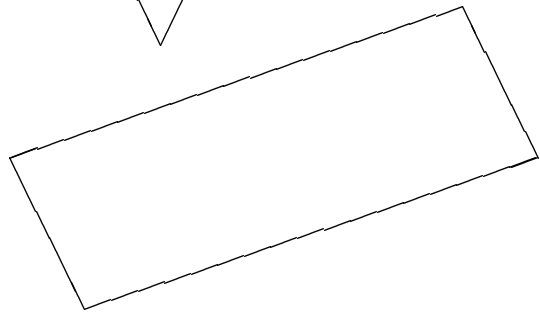
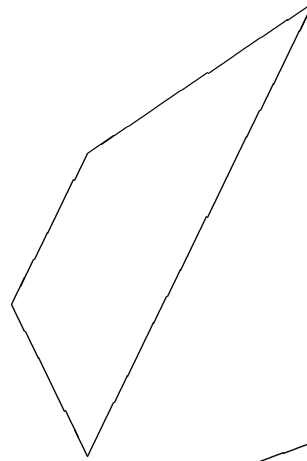
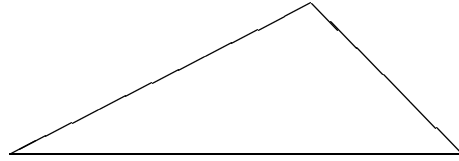
Code for Mandalas

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

6. (A8 points) For each of the following pairs of congruent figures indicate if they are related by translation, rotation, reflection or glide reflection.



7. (A10 points) Draw all possible altitudes (1, 2 or 3) for each figure below.



8. (A6 points) Describe, in terms of using tracing paper, how to decide if a figure is one-sided or two-sided.

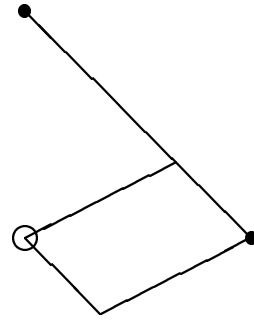
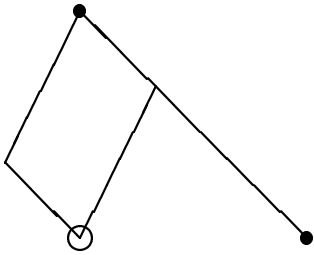
Your Description:

CD Problem – Mira

Name: _____

9. (A10 points) Notice that the two figures given below have opposite orientations. Therefore they must be related by a glide reflection (since plane reflection does not seem to work). Using a mira, find the glide reflection line which takes one of the figures to the other.

Describe the process that you used in this problem.

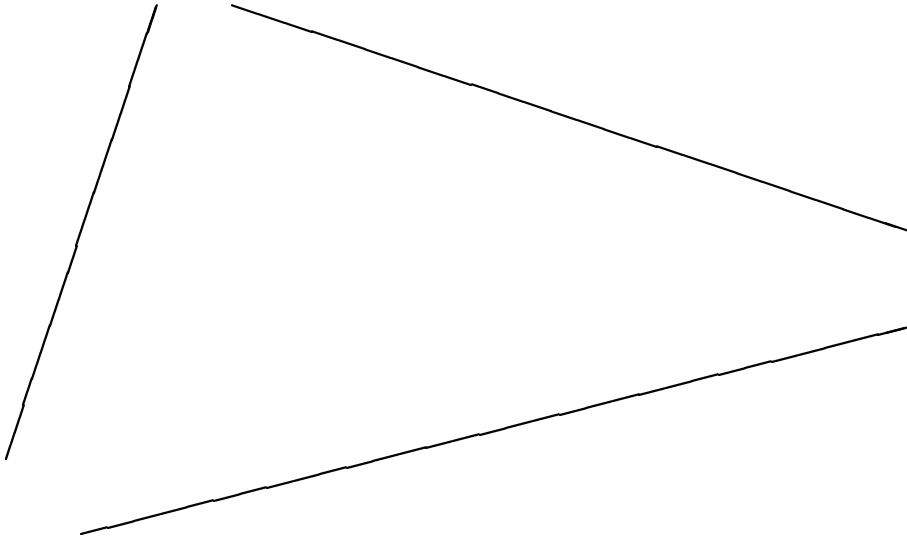


CD Problem – Mira

Name: _____

10. (A10 points) Using a mira, locate the center of the circle which is tangent to each of these three lines.

Describe the process that you used.



Description:

MATH 3403 – Geometric Structures – Exam II – A

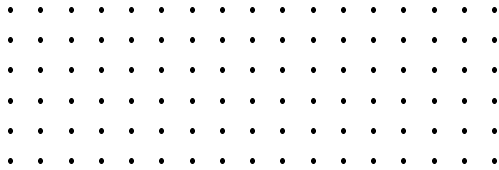
March 2001

Honor Code

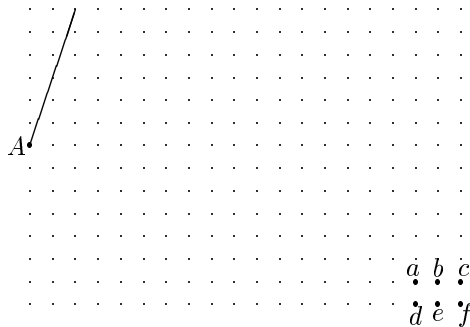
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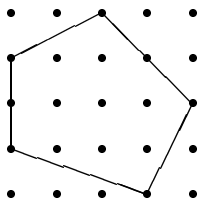
1. (A8 points) Using the dotpaper below, draw and label
- a segment with slope $\frac{3}{5}$.
 - a segment with slope 20%.
 - a segment with slope -4 .



2. (A3 points) A line is drawn below. Will the line which is perpendicular to this line and passes through the point A also pass through point a, b, c, d, e, or f? Circle your choice.



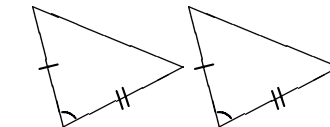
3. (A10 points) Figure the perimeter of this figure. Express your answer with square roots and as a decimal.



- Answer using square roots:
- Answer as a decimal:

Name: _____

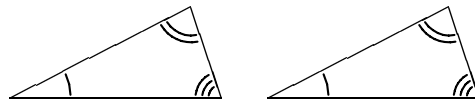
4. (A8 points) Pairs of triangles, which appear to be congruent, are given in parts a and b below. Additional information about the pair of triangles is indicated using the standard markings.



a)

Circle one:

- CC because of _____
- Not CC

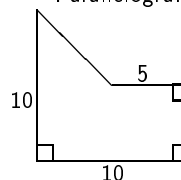
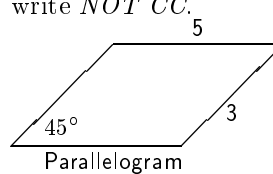


b)

Circle one:

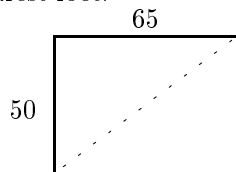
- CC because of _____
- Not CC

5. (A6 points) Write **CC** for congruence condition by the figures below where enough information is given to determine the figure. If not enough information is given, write **NOT CC**.

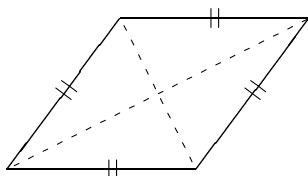


6. (A9 points)

A faucet is located at one corner of a yard that measures 50 ft by 65 ft. How long must a garden hose be in order to be able to water plants in any part of the yard? Round your answer to the nearest foot.



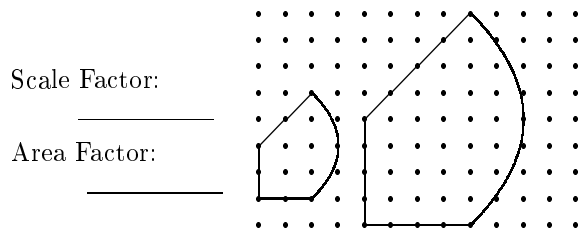
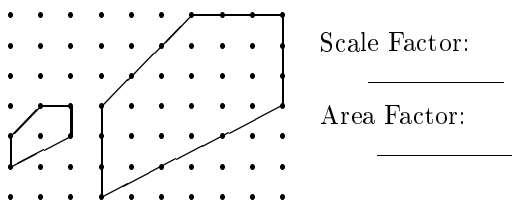
7. (A10 points) For the rhombus drawn below, the short diagonal has length 6 and the long diagonal has length 12. What is the area and perimeter of the figure. *Show your reasoning.*



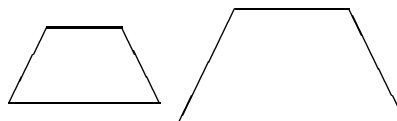
(a) The area:

(b) The perimeter:

8. (A9 points) Two sets of similar figures are given below. In the blanks provided beside each set, indicate the scale factor and the area factor going from the figure on the left to the larger figure on the right?



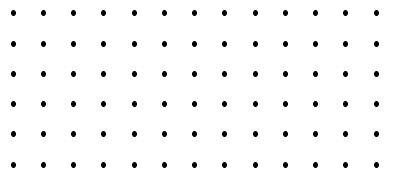
9. (A6 points) Two similar trapezoids are drawn below. The area of the second trapezoid is 2 times larger than the first. If the height of the first is 5 inches, what is the height of the second? *Show your reasoning and work!*



10. (A6 points)

Statement: On a geoboard, any two rectangles with area 12 must have the same perimeter.

If this is true, write *TRUE* below. If it is false write *FALSE* below and give examples on the dotpaper to show it is false.



Four Step Problem

Name: _____

11. (A13 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

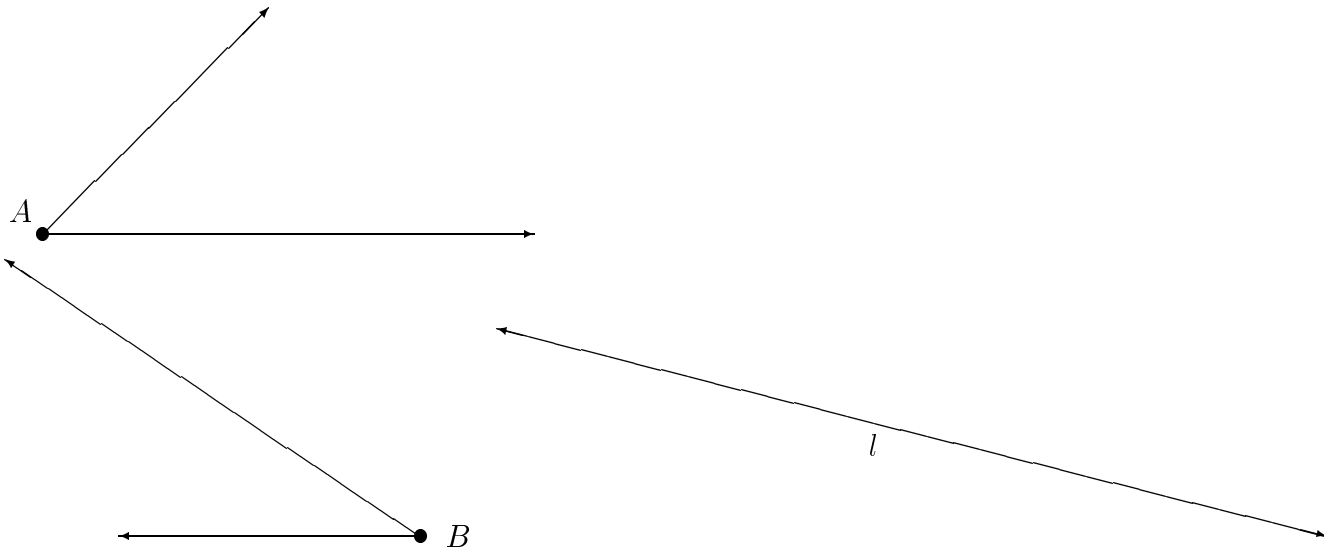
Step 1: Mark given information on figure: official definition, constructions, related definitions, earlier results.
Step 2: Draw and identify apparently congruent triangles.
Step 3: Cite and fully apply CC to triangles.
Step 4: Apply CPCT for results needed for the property.

CD Problem – Straight Edge and Compass

Name: _____

12. (A12 points) Two angles and the included side 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.



MATH 3403 – Geometric Structures – Exam I – A

February 2001

Name: _____

Honor Code

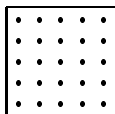
IMPORTANT: There are multiple sections of this course. Although different versions of the exams are given in each section, there are enough similarities that sharing information about the exam could influence a student's grade.

You are on your honor to not discuss this exam with students in other sections until after all sections have taken the test.

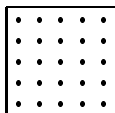
1. (A9 points) One of the methods we have used for finding areas is:

METHOD: internal dots plus 1.

- (a) Make up a figure and illustrate this method below:

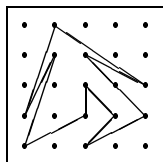


- (b) Make up a figure where this method does not work.

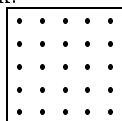


- (c) For what kind of figures does this method work? Describe:

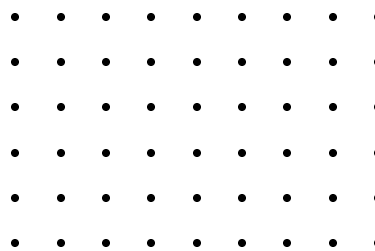
2. (A8 points) Use Pick's formula to figure out the area of this figure. (*Show your calculations!*)



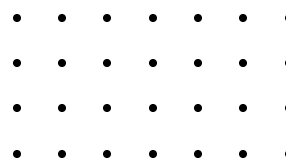
On the geoboard below draw a figure for which Pick's formula does not work:



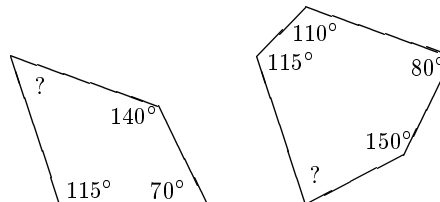
3. (A8 points) Give three different examples of geoZAGs with area 2:



Give an example of a figure with area 2 which is not a geoZAG.



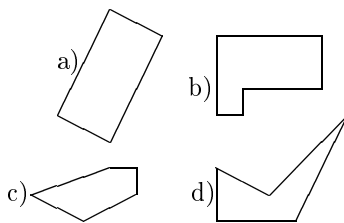
4. (A6 points) Find the measure of the angles marked with a question mark. (*Show work!*)



5. (A6 points) The Greedy Triangle visited the ShapeShifter (who adds a side) 4 times and then he visited the ShapeShredder (who shreds into triangles along diagonals).

- (a) What shape was the Greedy Triangle just before he was shredded?
- (b) What was his angle sum before he was shredded?
- (c) In the end, how many brothers and sisters are there all together (including Greedy)?

6. (A6 points) Identify each as convex or concave:



7. (A6 points)

(a) If the diagonals of a parallelogram are perpendicular but not congruent, then the figure is a (circle one):

- a) trapezoid b) rectangle
c) rhombus d) square

(b) If a rhombus has a pair of equal adjacent angles then the figure is a (circle one):

- a) trapezoid b) rectangle
c) rhombus d) square

8. (A9 points) In each of the following, a pair of quadrilaterals is given. You are either to name the most general or to indicate that neither is most general. More specifically,

- if there is a common way for defining the terms so that one is more general than the other then name the most general,

OR

- if neither is more general, then circle *neither*.

(a) Pair of quadrilaterals:

rhombus kite

Most general: _____ OR *neither*

(b) Pair of quadrilaterals:

rectangle rhombus

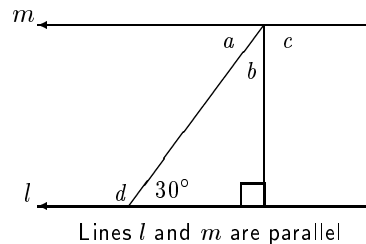
Most general: _____ OR *neither*

(c) Pair of quadrilaterals:

isosceles trapezoid rectangle

Most general: _____ OR *neither*

9. (A9 points) Find the measure of the four angles marked with letters. (Clearly show your work and identify your answers.)



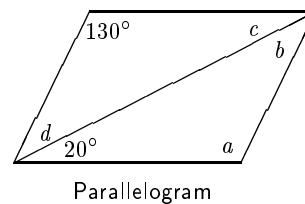
What is angle b ?

What is angle a ?

What is angle c ?

What is angle d ?

10. (A9 points) Find the measure of the four angles marked with a letter. (Show your work and identify your answers.)



What is angle a ?

What is angle b ?

What is angle c ?

What is angle d ?

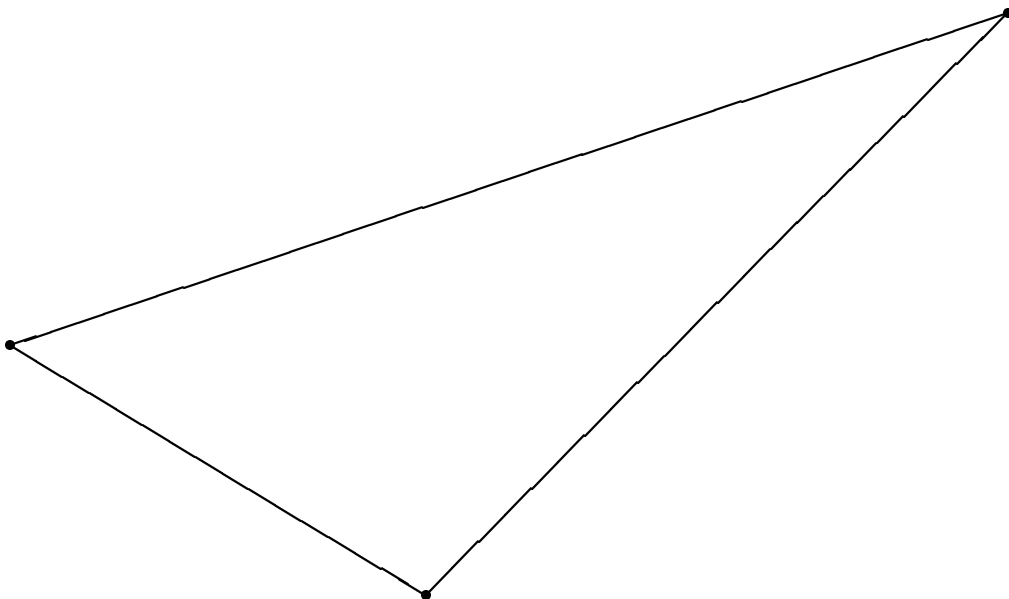
CD Problem – Paper Folding

Name: _____

11. (A12 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:



CD Problem – Paper Folding

Name: _____

12. (A12 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:

