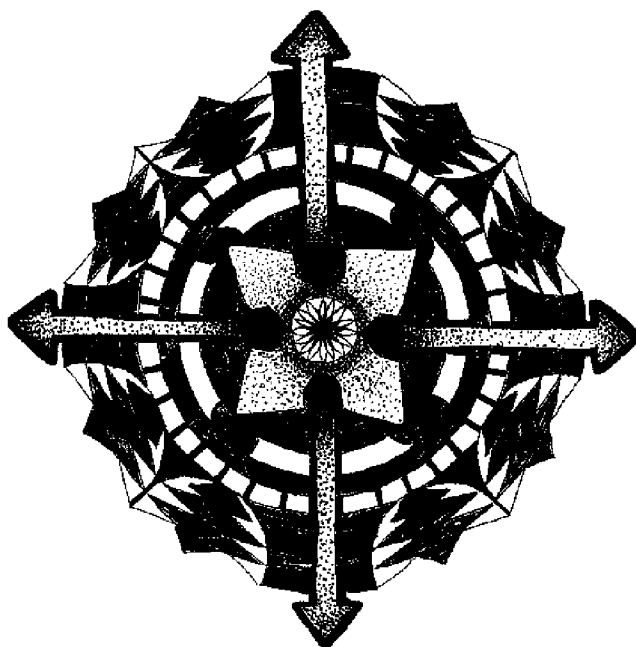

Hour Exams and Final Math 3403 – Spring 2000

Version A

John Wolfe



Mandala by Shannan Hawes

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

File: E00s.tex

MATH 3403 – Geometric Structures – Final Exam – A

May 2000

Name: _____

Honor Code

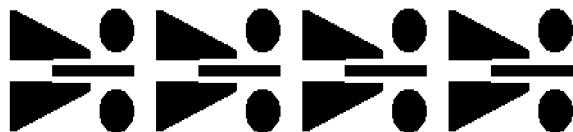
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1. (A12 points) Using the codetable below, identify the symmetry type of these borders.



a)



b)



c)

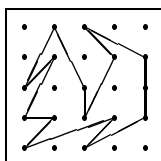


d)

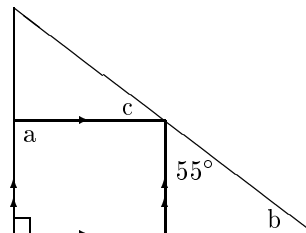
Code for Border Patterns

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. (A6 points) Figure the area of this geoboard shape. Show your work!



3. (A9 points) Some useful information is marked on the figure below.

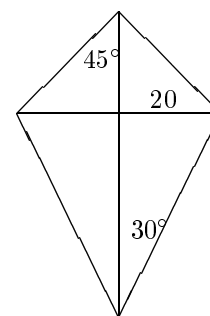


- (a) How many degrees are in angle a ? (Show reasoning.)

- (b) How many degrees are in angle b ? (Show reasoning.)

- (c) How many degrees are in angle c ? (Show reasoning.)

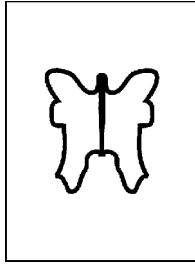
4. (A9 points) Figure out and clearly mark the lengths of all four sides of this kite. *Note: Show your work below.*



5. (A6 points) Pairs of quadrilaterals are named below. For each pair circle the shape which could be considered most general. If one is not more general than the other, then circle *neither*.

- (a) parallelogram, square, (*neither*)
 (b) kite, rhombus, (*neither*)
 (c) rhombus, rectangle, (*neither*)

6. (A7 points) Ms. Jones was teaching second grade. Johnny was having trouble understanding the the idea of reflectionsl symmetry as illustrated with the following card.



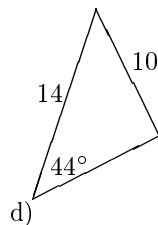
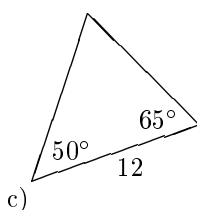
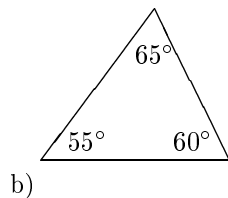
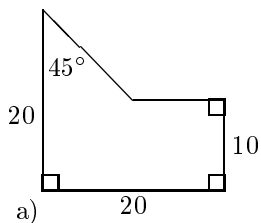
In this course we have used at least three different concrete ways to describe or physically test for reflectional symmetry. Briefly describe these three ways which Ms. Jones could use to show Johnny this idea:

First Way:

Second Way:

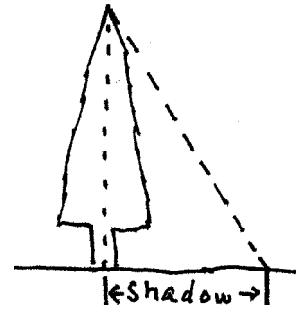
Third Way:

7. (A8 points) For each of the following figures write *CC* if there is enough information to completely determine the shape. Write *not CC* if there is not enough information.



8. (A8 points)

A tree casts a shadow of 11 feet on the ground. The distance from the tip of the tree to the end of the shadow measures 37 feet.



How tall is the tree?

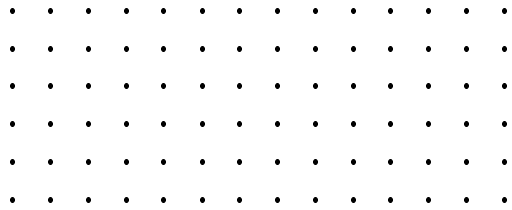
Express your answer two ways: as a square root and as a decimal.

9. (A8 points) Jenny has a square pen in her backyard which is just the right size for holding 12 rabbits without crowding. To make room for her new dog pen, Jenny needs to reduce the size of the rabbit pen so that the length of each side is one-half the present length. How many rabbits will the reduced pen hold without crowding?

10. (A7 points) It is not possible to draw a line with length $\sqrt{11}$ which goes from dot to dot on a geoboard.

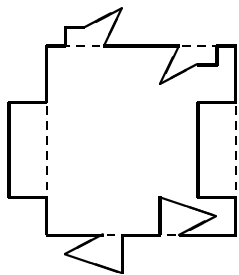
Why is this not possible? Clearly express the best idea you can come up with.

Here is some dot paper for you to experiment with.

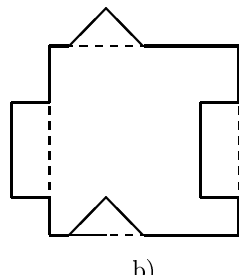


Your explanation:

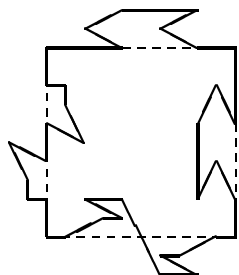
11. (A12 points) For each of the Escher style prototiles given below, identify the Heesch type.



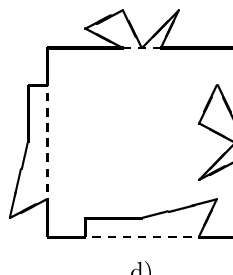
a)



b)

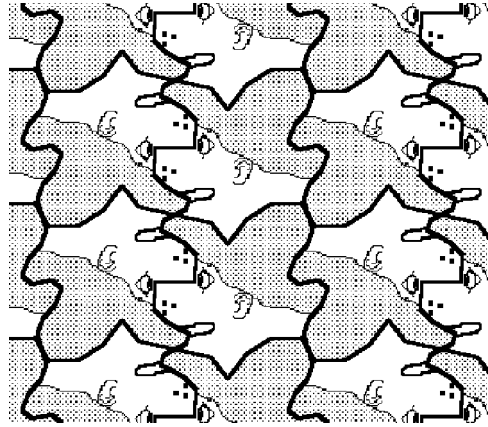


c)

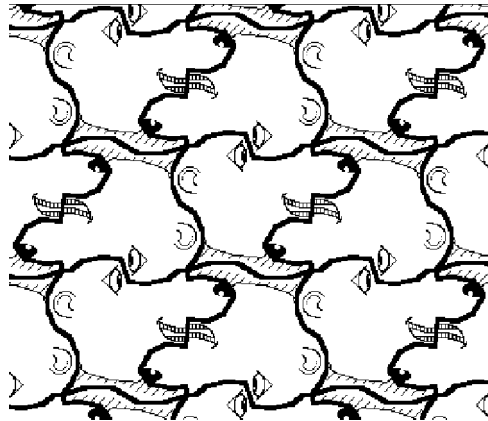


d)

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



a)



b)

Four Step Problem

Name: _____

13. (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 – Straight Edge and Compass

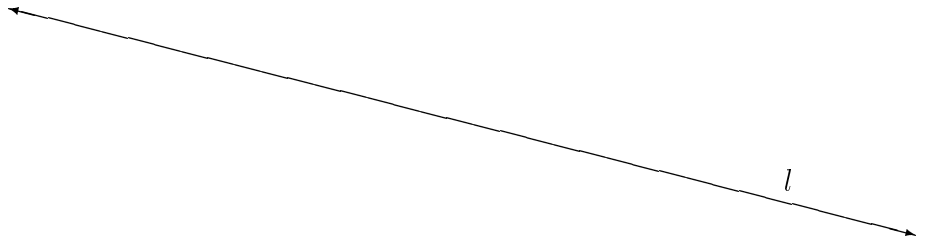
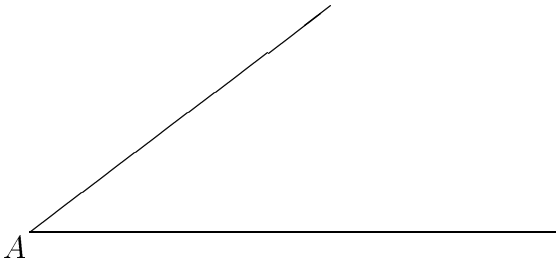
Name: _____

14. (A10 points) Two sides and the included angle 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

A _____ C



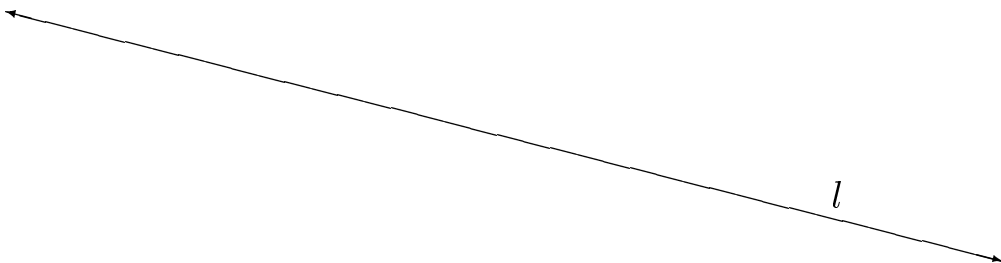
CD Problem – Mira or Reflecta

Name: _____

15. (A10 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 •



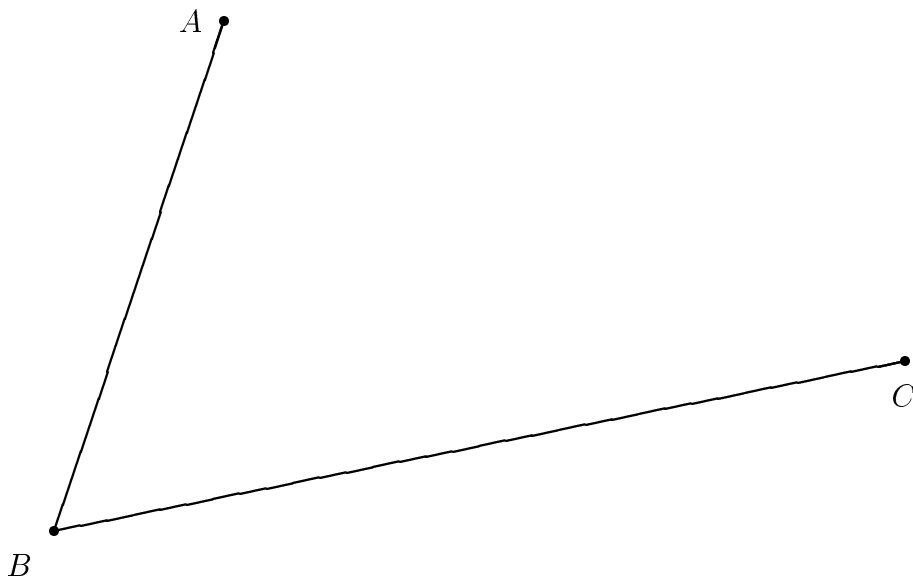
CD Problem – Straight Edge and Compass

Name: _____

16. (A10 points) **Complete the Parallelogram:** Using a straightedge and compass, find the point D so that $ABCD$ forms a parallelogram.

Describe the process that you used.

Describe:



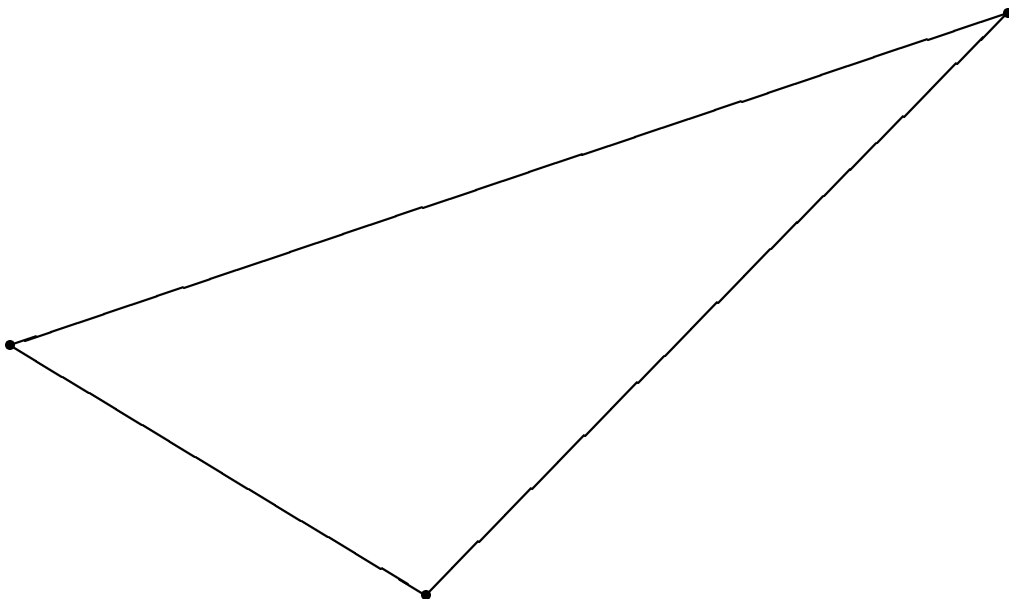
CD Problem – Paper Folding

Name: _____

17. (A10 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–A

April 2000

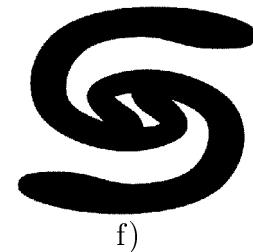
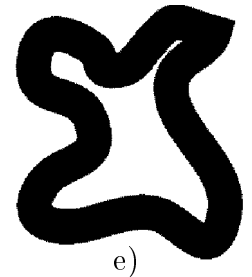
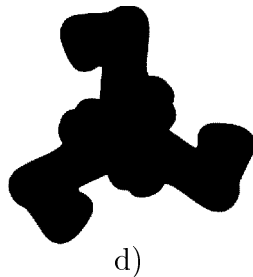
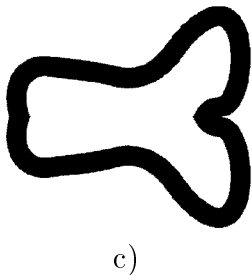
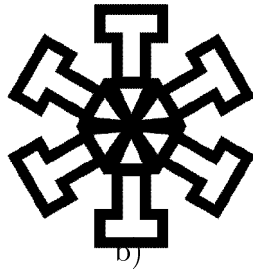
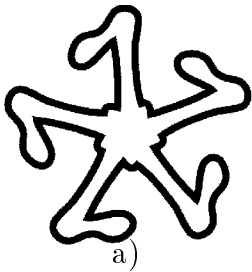
Name: _____

Honor Code

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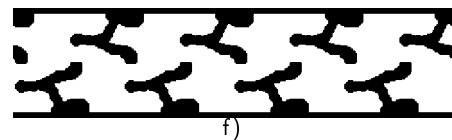
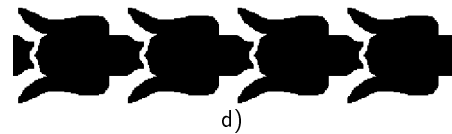
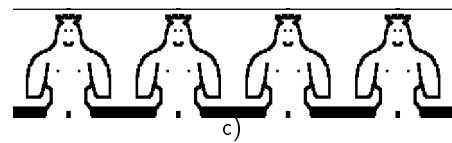
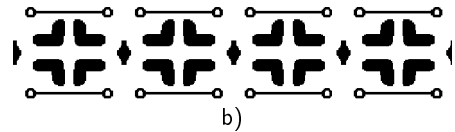
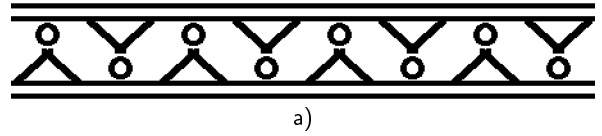
1. (A18 points) Using the code table below, identify the symmetry type of the following mandalas.



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. (A18 points) Using the codetable below, identify the symmetry type of these borders.



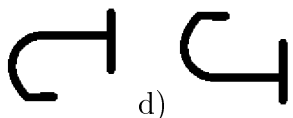
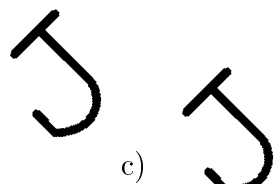
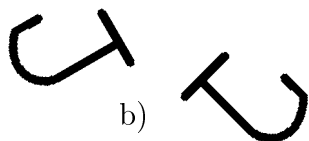
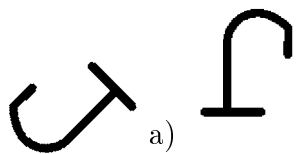
Code for Border Patterns

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

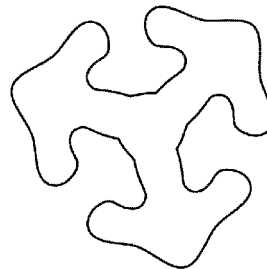
3. (A8 points) Write a 1 or a 2 beside each of the following figures to indicate if they are 1-sided or 2-sided.



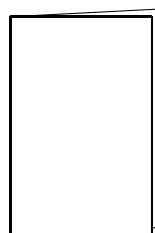
4. (A8 points) For each of the following pairs of congruent figures indicate if they are related by translation, rotation, reflection or glide reflection.



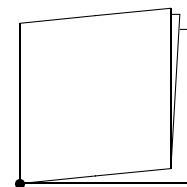
5. (A5 points) Consider the following figure which can be created by folding and cutting a sheet of paper.



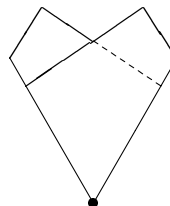
The four figures below represent a sheet of paper folded in various ways. Choose the way which would be correctly folded to get the above figure. On this correctly folded sheet of paper, draw the outline along which you need to cut to get the figure.



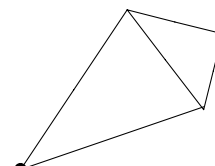
single fold



double fold

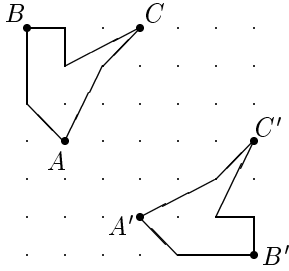


triple fold



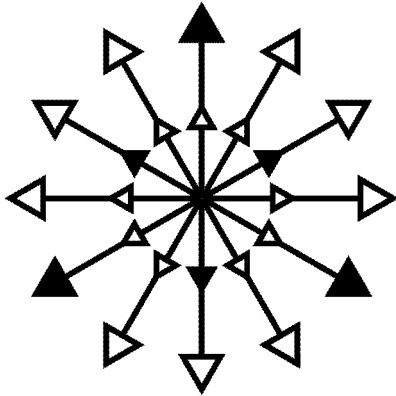
five fold

6. (A6 points) Two congruent shapes are pictured below. Carefully draw the point image segments AA' , BB' and CC' .



- (a) Describe how the three point image segments are related.
- (b) Draw in the reflection line between the two figures. Describe the relationship between each of the point image segments and the reflection line.

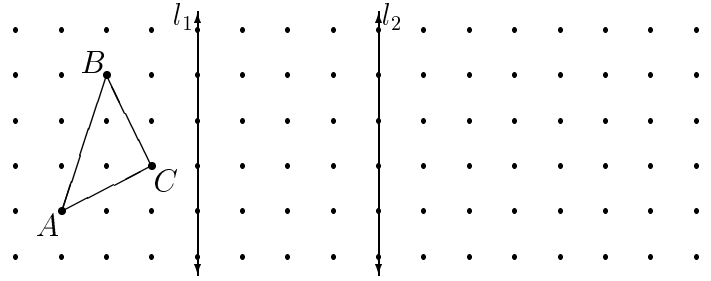
7. (A5 points) Charlie made the template design shown here.



He claimed that it was a mandala of type D_{12} . But one of his classmates disagreed. What do you think the type of this mandala is? Why do you think that there is this disagreement?

Explain:

8. (A8 points) A triangle ABC is shown on the dotpaper below.



- (a) Carry out the following construction:
- Reflect ABC across line l_1 . Label the reflection as $A'B'C'$ where A' is the reflection of A , B' the reflection of B , etc.
 - Reflect the new triangle $A'B'C'$ over line l_2 . Label this third triangle as $A''B''C''$.
- (b) How are ABC and $A''B''C''$ related? (Reflection, glide reflection, rotation or translation.)

- (c) Draw the point images segments AA'' , BB'' and CC'' . How long are these segments?

- (d) How far apart are lines l_1 and l_2 ?

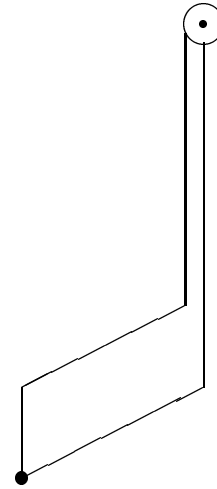
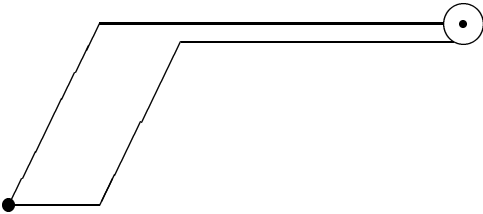
- (e) What is the relationship between the answers you found in part c and the answer you found in part d. Describe this relationship.

CD Problem – Mira

Name: _____

9. (A12 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. (A12 points) Using a mira, locate the center of the circle passing through **J**, **K** and **L**. Use a compass to draw this circle.

Describe the process that you used.

J •

• **L**

•
K

Description:

MATH 3403 – Geometric Structures – Exam II – A

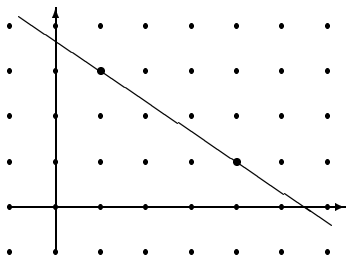
March 2000

Honor Code

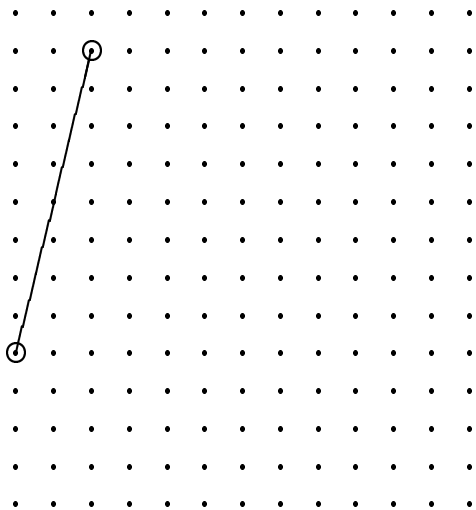
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1. (A6 points) What is the slope of this line?



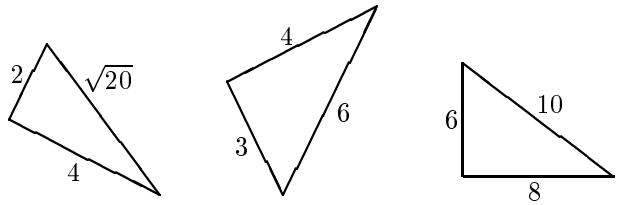
2. (A7 points) One side of a square is shown on the dotpaper below. Circle two more corner dots so that a square is formed by the four circled dots.



Briefly describe how you can be sure the two dots that you circled are correct.

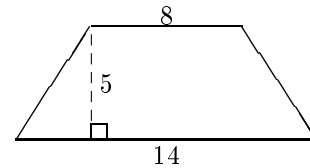
Name: _____

3. (A9 points) Indicate if the following triangles are right triangles by writing *yes* or *no* inside each one. Be sure to show your work!



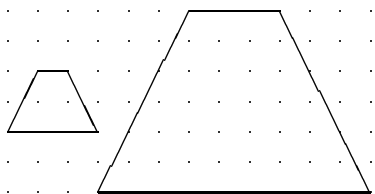
How did you decide if the triangles are right or not? Describe:

4. (A8 points) Find the perimeter of this isosceles trapezoid. Give your answer two ways: as a square root and as a decimal.



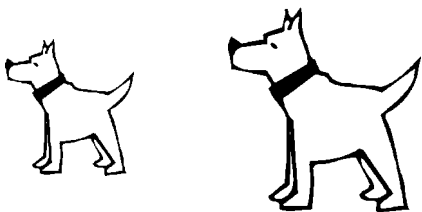
5. (A8 points) Bill stands a ladder up against a wall. The ladder touches the wall 6 feet up from the floor and touches the floor 2 feet out from the wall. How long is the ladder?

6. (A11 points) The two figures drawn below are similar. Inside of each figure write the area.



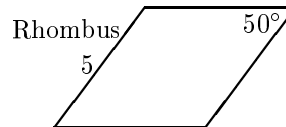
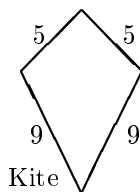
- (a) What is the *scale factor* going from the smaller figure to the larger?
- (b) What is the *area factor* going from the smaller figure to the larger?
- (c) Describe how the area factor and the scale factor are related. Your description:

7. (A7 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?

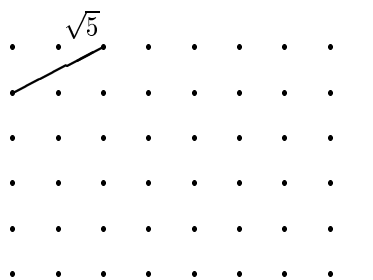
8. (A8 points) Beside each of the figures given below write *CC* or *not CC* to indicate if enough information is given to completely determine the figure.



9. (A10 points) After each of the three numbers given below, circle *possible* or *impossible* to indicate if there is a line segment going dot to dot on a geoboard whose length is the given number. If the number is possible, draw and label the line segment on the dotpaper below.

- (a) $\sqrt{13}$ *possible* *not possible*
- (b) $\sqrt{11}$ *possible* *not possible*
- (d) $\sqrt{10}$ *possible* *not possible*

Note: You can see in the figure below that, for example, $\sqrt{5}$ is possible.



Four Step Problem

Name: _____

10. (A14 points)

Official Definition: A parallelogram is a quadrilateral in which opposite sides are equal.

Property: For official parallelograms, opposite angles are congruent.

Note: You only need to show that one pair of opposite angles are congruent since the same argument will apply to the other pair.

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.

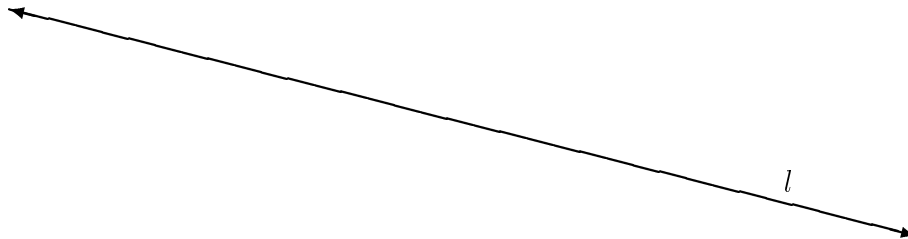
CD Problem – Straight Edge and Compass

Name: _____

11. (A12 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 – A

February 2000

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.

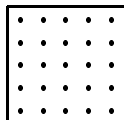
1. (A18 points) We have developed several methods to figure areas on the geoboard, including

- Internal dots plus 1
- Pick's formula
- Internal dots plus 2
- Edge dots divided by 2 and then subtract 1, that is $\frac{E}{2} - 1$
- *base* \times *height*

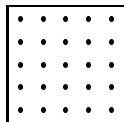
Choose two of these methods to discuss in parts a) and b) below.

(a) Name the first method chosen: _____

i. Make up a figure and illustrate the method below:



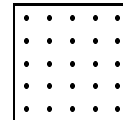
ii. Make up an example that illustrates a situation where the method does not work:



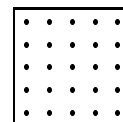
iii. For what kind of figures does the method work? Describe:

(b) Name the second method chosen: _____

i. Make up a figure and illustrate the method below:



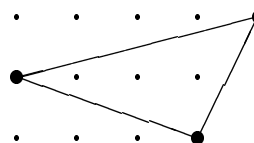
ii. Make up an example that illustrates a situation where the method does not work:



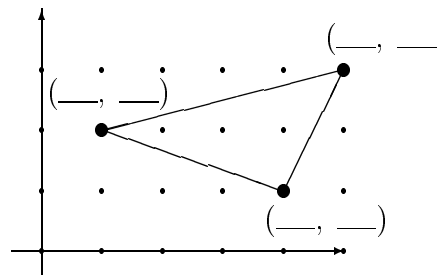
iii. For what kind of figures does the method work? Describe:

2. (A6 points)

(a) What is the area of this triangle?

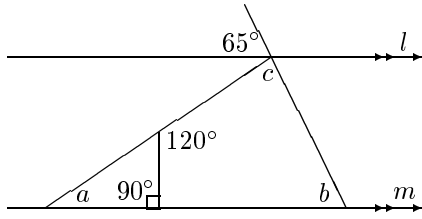


(b) In the figure below, write the coordinates by each point using the space provided.



(c) Using the “coordinate method,” use the coordinate values found above to figure the area of the figure.

3. (A10 points) In the figure below lines l and m are parallel.

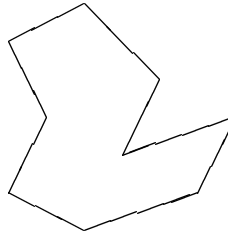


(a) What is angle a ? (Show your reasoning.)

(b) What is angle b ? (Show your reasoning.)

(c) What is angle c ? (Show your reasoning.)

4. (A6 points) What is the angle sum for the following figure? *Note: Show your reasoning.*



5. (A6 points) For this problem you are to name all of the quadrilaterals in which the diagonals bisect each other. Then identify one which is most general.

Possible names: rectangle, rhombus, parallelogram, square, kite, trapezoid and isosceles trapezoid.

(a) Names:

(b) Which is most general?

6. (A6 points) List the following four terms in order, from most general to most specific.

rhombus square
quadrilateral parallelogram

1. _____ (most general)

2. _____

3. _____

4. _____ (most specific)

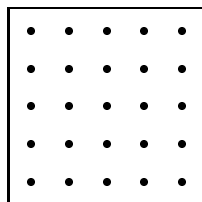
7. (A10 points) Each of the following types of figures may be possible or not possible. If possible, draw an example which shows how it is possible. If not possible state this and explain why.

(a) A regular octagon with one angle of 100° . (*Explain why not possible or show picture.*)

(b) A quadrilateral with no right angles that has perpendicular diagonals. (*Explain why not possible or show picture.*)

(c) A triangle whose balance point is on one of the sides. (*Explain why not possible or show picture.*)

8. (A7 points) A geoZAG has area $6\frac{1}{2}$. How many edge pegs does it have? Draw one.



9. (A7 points) A lively discussion is going on in geometry class. Nobody could find a geoZAG whose perimeter is $1 + 3d$.

Jamie: "I can't make this one. Maybe it is because the number of diagonals d is odd."

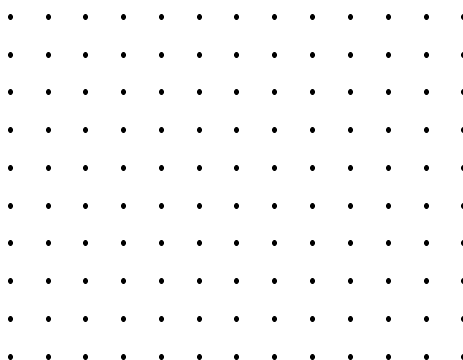
Amy: "I do not think the number of diagonal lengths d matters. It is possible to make one except when the number of whole lengths is odd, like the 1 in this example."

Diana: "I think that it is possible to make the geoZAG except when there are an odd number of whole lengths and an odd number of diagonal lengths d ."

Do you agree with Jamie, Amy or Diana? Be sure to include reasoning or evidence to support your conclusion.

Your conclusion:

Your reasoning and evidence:



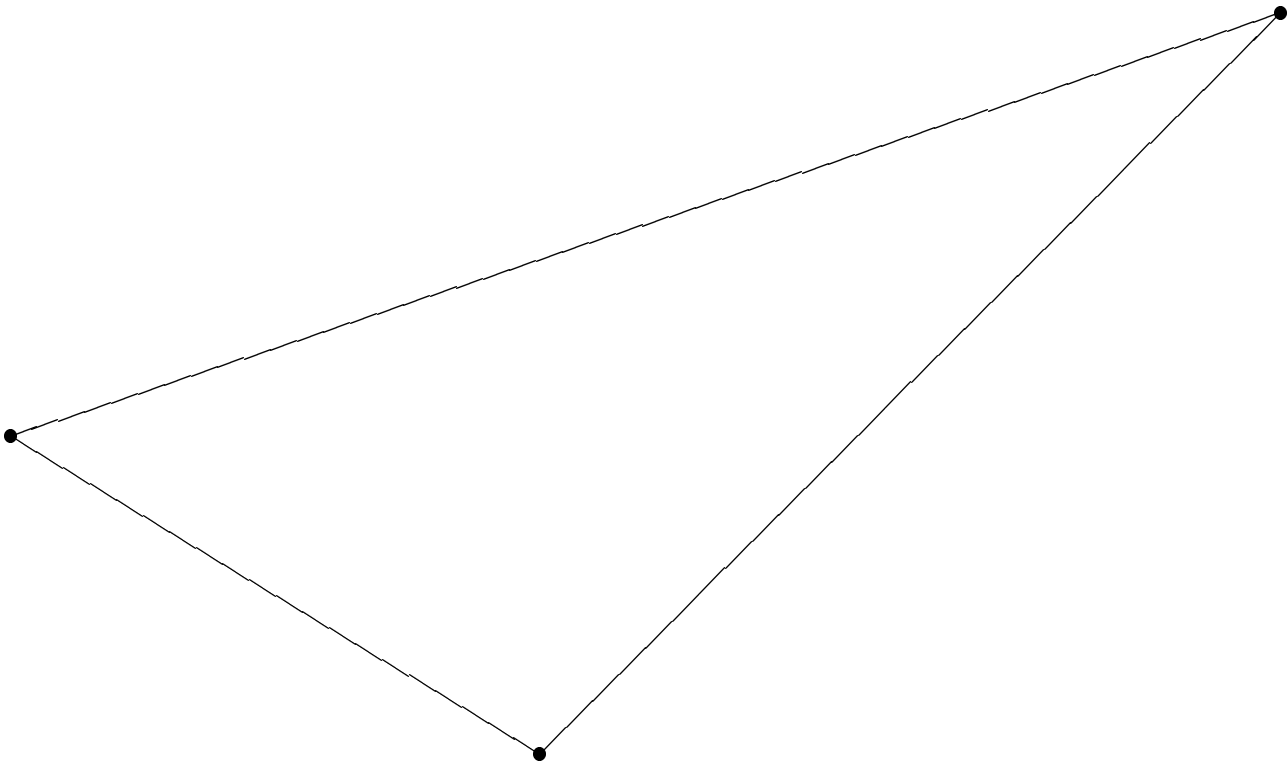
CD Problem – Paper Folding

Name: _____

9. (A12 points) On the triangle below, use paper folding to find the balance point or center of gravity.

Describe the process that you used to find the balance point.

Describe:



CD Problem – Paper Folding

Name: _____

10. (A12 points) Using paper folding, 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:

