

UNIVERSITY OF MANITOBA

DATE: February 24, 2009

MIDTERM

TITLE PAGE

COURSE: MATH 1020

TIME: 70 minutes

EXAMINATION: Math in Art

EXAMINER: M. Davidson

FAMILY NAME: (Print in ink) _____

GIVEN NAME(S): (Print in ink) _____

STUDENT NUMBER: _____

SIGNATURE: (in ink) _____
(I understand that cheating is a serious offense)

INSTRUCTIONS TO STUDENTS:

This is a 70 minute exam. **Please show your work clearly.**

A compass and straight edge (ruler) are required for this exam.

No texts, notes, or other similar aids are permitted. There are no calculators, cellphones or electronic translators permitted.

This exam has a title page and 5 pages of questions. Please check that you have all the pages.

The value of each question is indicated in the lefthand margin beside the statement of the question. The total value of all questions is 50 points.

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
Total:	50	

Answer all questions on the exam paper in the space provided beneath the question. If you need more room, you may continue your work on the reverse side of the page, but **CLEARLY INDICATE** that your work is continued.

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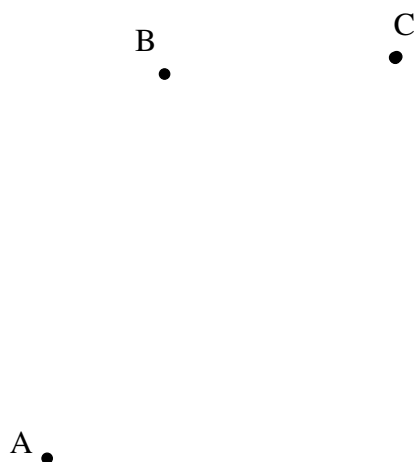
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Important: “Construct” means “construct using an unmarked ruler and compass.” The phrase “unmarked ruler” stands for any ruler that may be used only as a straight edge to draw straight line segments. When you use a compass, show the (intermediate) circular arcs you draw in your constructions (do not erase them). Use words to describe **BRIEFLY** what you have done.

- [5] 1. (a) Find (construct) the center of the circle containing the points A, B and C. Construct the circle.



- [5] (b) Construct the division of the following line segment into three equal segments.
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- [7] 2. (a) Construct a golden rectangle that has the given line as its (shorter) side.



- [3] (b) On the following line (which is the same length as the one given above) construct a regular pentagon. In it, clearly identify 3 golden triangles.



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[3] 3. (a) What are the Fibonacci numbers? (Give a definition)

[3] (b) List the first 10 Fibonacci numbers.

[4] (c) Given that $f_{28} = 317811$ and $f_{30} = 832040$, what is f_{29} ?

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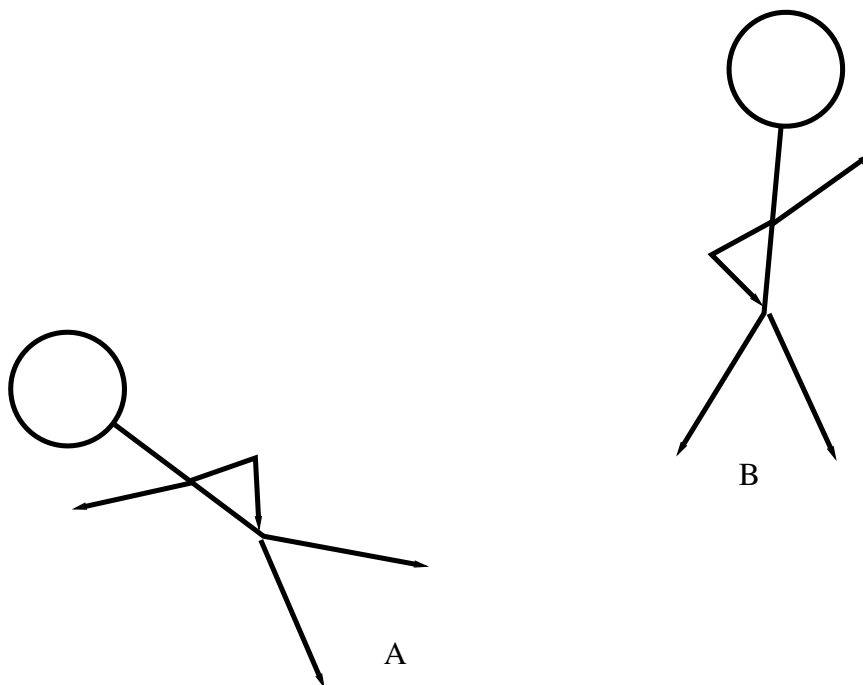
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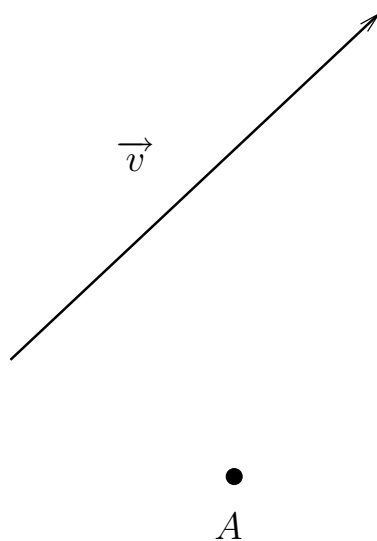
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- [5] 4. (a) Item B is the image of Item A under a reflection. Construct ℓ , the line of reflection.



- [5] (b) Find $f(A)$, the image of the point A under the symmetry $f = \text{tran}(\vec{v})$.



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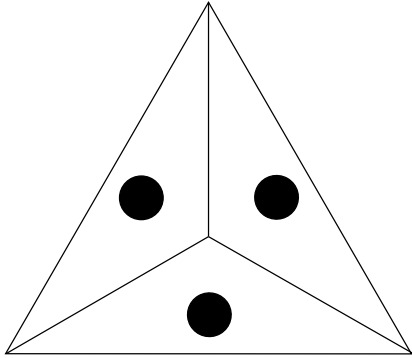
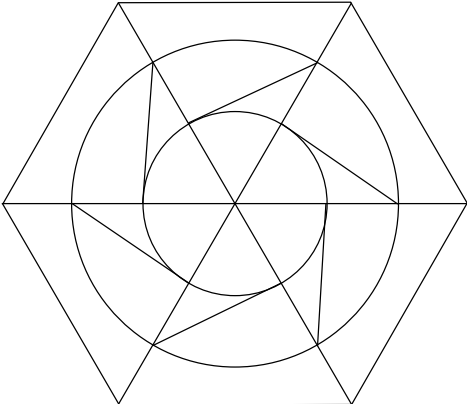

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- [10] 5. Find the group of symmetries for each of the three objects shown below. Be sure to indicate in the object any centers of rotation, lines of reflection or vectors of translation. If you are indicating a rotation, be sure to include the angle of rotation.

OBJECT	SYMMETRIES
	
	
 <p style="text-align: center; margin-top: 10px;">This is a Frieze pattern. It continues infinitely in both directions.</p>	