MTH 202 – Spring 2008
Exam 1 Form A – February 2008 – 100 points

Name ___________________________ Answer Key ___________________________
Number of Points/100

Directions: Answer all questions on the test paper. If you need more space, please use the back of one of the test pages. There are 10 questions on 5 pages.

1. (5 points) Draw a net for a tetrahedron, i.e., a 2-dimensional pattern that can be folded to make a pyramid with faces that are equilateral triangles.

2. (5 points) Refer to the cube pictured below. Draw a plane that shows how to slice the cube so that the cross-section is a triangle. Use dotted lines to indicate the location of the triangle determined.

3. (9 points) Fill in the chart below for each polyhedron named.

<table>
<thead>
<tr>
<th>Figure</th>
<th>Number of edges (E)</th>
<th>Number of faces (F)</th>
<th>Number of Vertices (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentagonal <em>prism</em></td>
<td>15</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Hexagonal <em>pyramid</em></td>
<td>12</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Pyramid with an n-gon base</td>
<td>2n</td>
<td>n + 1</td>
<td>n + 1</td>
</tr>
</tbody>
</table>
4. (a) (5 points) Complete the following definition: A rhombus is a quadrilateral with all sides congruent.

(b) (5 points) Draw a counterexample to show that the following statement is false: The diagonals of a rhombus are the same length.

5. (12 points) Indicate by circling whether the following properties are true or false for every parallelogram.

(a) T/F The diagonals are the same length. $ABCD$ above is a parallelogram.

(b) T/F The diagonals are perpendicular. Only true in a rhombus.

(c) T/F The diagonals bisect each other (cut each other in half).

(d) T/F The diagonals bisect the angles of the parallelogram. Only true in a rhombus.

6. (10 points) Use the space below to draw a Venn Diagram to indicate the relations between the following sets of figures:
kites, quadrilaterals, rectangles, squares
7. Explain why the sum of the angles in a triangle is $180^\circ$ by the following methods:

(a) (6 points) Tearing off or folding over the corners of a paper triangle

If you tear off the three corners you can put them together forming a straight line, which has $180^\circ$.

(b) (6 points) Using the parallel postulate

Draw line $l$ parallel to the base of the triangle. Extend the sides.

$a = a'$, Vertical Angle Thm
$b = b'$, Parallel Postulate
$c = c'$, ""

$a' + b' + c' = 180^\circ$ b/c they form a straight line.

So also $a + b + c = 180^\circ$. 
8. (8 points) In the figure below, the arrows indicate parallel lines. However, the angles are not drawn to scale. Without using a protractor, determine the measure of the angle $a$. Show your work.

Many ways to solve this. Here's one example:

$a^\circ = 85^\circ$

9. (10 points) A new Superstore is being planned somewhere in the vicinity of two towns, Alpha and Beta, whose business centers are 10 miles apart. The developers have announced that they are considering locations that are less than 7 miles from Alpha and more than 5 miles from Beta.

(a) Use a compass and straightedge and the lengths given below to create a scale drawing of this situation.

(b) Label all places on your drawing where the new Superstore could be located.

<table>
<thead>
<tr>
<th>5 miles</th>
<th>7 miles</th>
<th>10 miles</th>
</tr>
</thead>
</table>

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10. (9 points) The tetrahedron and cube are both Platonic Solids.

(a) Name one other Platonic Solid. octahedron  dodecahedron  icosahedron

(b) How many faces does it have? 8  12  20

(c) What shape are the faces? equilateral triangles  regular pentagons  equilateral triangles

11. (a) (5 points) Use a compass and straightedge to construct the perpendicular bisector of segment AB. Leave all the marks showing your construction.

(b) (5 points) Explain how your construction also creates a rhombus.

ABCD is a rhombus.

AC = AD \( \because \) they are radii of the same circle centered at A.

BC = BD \( \because \) they are radii of the same circle centered at B.

They are all equal \( \because \) my compass was opened the same amount for both circles. So

\[ AC = AD = BC = BD, \]

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