Name: Section 002 Answer Key Score: ____________

MA 202 EXAM 1: February 6, 2018

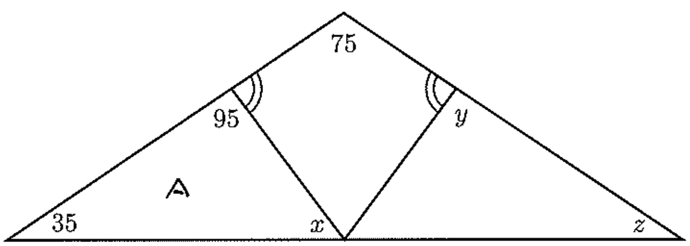
Instructions: The following exam has 100 possible points. The point value of each question is stated explicitly. No books or notes may be used on this exam. Please write legibly and keep your paper as organized as possible. You **may not** use a calculator on this exam. **Show all your work!** Answers without explanation will not receive full credit. Use complete sentences where appropriate. If you have any questions, be sure to ask. Good luck!

Question	Points	Score
1	10	
2	8	
3	8	
4	10	
5	6	
6	6	
7	12	
8	10	
9	10	
10	8	
11	12	
Total:	100	

1. (10 points) Place check marks to indicate the sets of numbers to which each number belongs.

	Natural	Integer	Rational	Irrational	Real	
-5		✓	✓		✓	+2
$\sqrt{4}$	✓	✓	✓		✓	+2
$2.\overline{32}$			✓		✓	+2
$\sqrt{13}$				✓	✓	+2
-2.9			✓		✓	+2

2. (8 points) Determine the missing angles in the diagram below. The diagram may not be drawn to scale.



In $\triangle A$: $35° + 95° + x = 180°$, so $\boxed{x = 50°}$ +2

For y: $\angle)) + y = 180°$ and $\angle)) + 95 = 180°$ so $\boxed{y = 95°}$ +2

In the large $\triangle$: $35° + 75° + z = 180°$, so $\boxed{z = 70°}$ +2

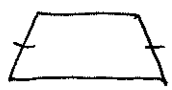
+2 for using $\triangle$s at some point

3. (8 points) Draw an example of each of the following figures, making sure to label angles and sides appropriately:

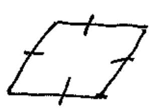
+2 per part

(a) Acute triangle.

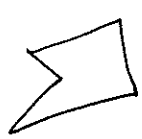
(b) Isosceles trapezoid.



(c) Rhombus.



(d) Concave pentagon.



4. (10 points) For each part, give an answer with a justification written in complete sentences.

(a) Which rational number is its own multiplicative inverse? (4 points)

1 is its own multiplicative inverse because $1 \cdot 1 = 1$.
(+2) (+2)

(b) Is $-\sqrt{2}$ an irrational number? (2 points)

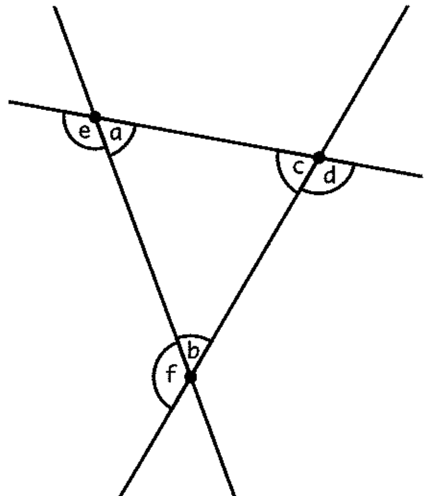
Yes, because $\sqrt{2}$ is irrational and multiplying by -1 does not change that.
(+1) (+1)

(c) Show that the set of irrational numbers is not closed under addition, giving an example and explanation. (4 points)

$\sqrt{2} + -\sqrt{2} = 0$ (+2)

Both $\sqrt{2}$ and $-\sqrt{2}$ are irrational, but their sum 0 is rational, so the set of irrational numbers is not closed under addition. (+2)

5. (6 points) In the figure below, what is the sum of the measures of angles d, e, and f? (Hint: How do d, e, and f relate to a, b, and c?)



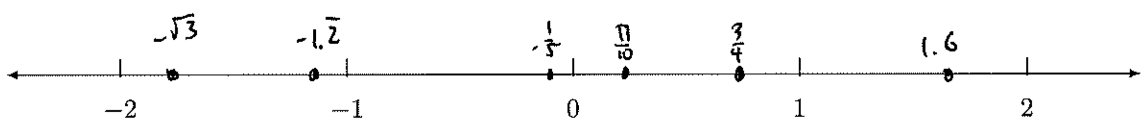
(+2) (+2)

Each pair (a,e), (c,d), (b,f) sums to $180°$ and $a+b+c=180°$, so

$$d+e+f = a+b+c+d+e+f-(a+b+c) = 180+180+180-180$$
$$= \boxed{360°}$$ (+2)

6. (6 points) Graph the following on the given real number line: (Recall that $\pi \approx 3.14$).

$$\frac{3}{4}, -1.\overline{2}, -\frac{1}{5}, \frac{\pi}{10}, -\sqrt{3}, 1.6$$



7. (12 points) (a) Determine whether or not $y = 3$ is a solution to the equation

$$\frac{1}{6}y + 7 = \frac{11}{2}.$$

Be sure to show your work. (4 points)

Check: $\frac{1}{6}(3)+7 = \frac{1}{2}+7 = \frac{1}{2}+\frac{14}{2} = \frac{15}{2} \neq \frac{11}{2}$.

So $y=3$ is not a solution.

(b) Solve the equation for z. (4 points)

$$\frac{4}{3}z - \frac{5}{4} = 2.$$

Clear denominators by multiplying by 12.

$16z - 15 = 24$

$\cancel{16z = 9}$ $\quad 16z = 39$

$\cancel{z = \frac{9}{16}}$ $\quad \boxed{z = \frac{39}{16}}$

(c) Set up an equation that models the following scenario, indicating clearly what your variable represents. You do NOT need to solve the equation.

A fair charges an entrance fee of \$25 and \$1.25 per ride. If a student spends \$53.75, how many rides will the student go on? (4 points)

Let x = # of rides the student goes on.

Then $1.25x + 25 = 53.75$

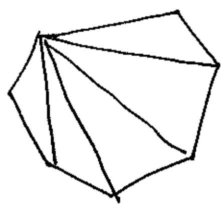
8. (10 points) (a) State the formula for the sum of the interior angles of an n-gon.

$(n-2)\cdot 180$

(b) Use the formula from part (a) to find the sum of the interior angles of a heptagon.

$n=7: \quad (7-2)\cdot 180 = 900^\circ$

(c) Use a *different* method to determine the interior angles of a heptagon. Include a diagram in your description and explain your reasoning using **complete sentences**.



We can split up a heptagon into 5 triangles whose angles sum to the original angles of the heptagon. Each triangle's angles sum to 180°, so in total the sum is [illegible] 900°

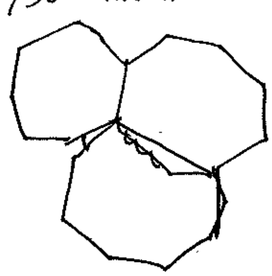
(d) Determine the measure of one interior angle of a *regular* heptagon. Your answer should be exact (i.e. either a complex fraction or a mixed number).

Each of the 7 angles is equal, and the sum is ~~800~~ 900°

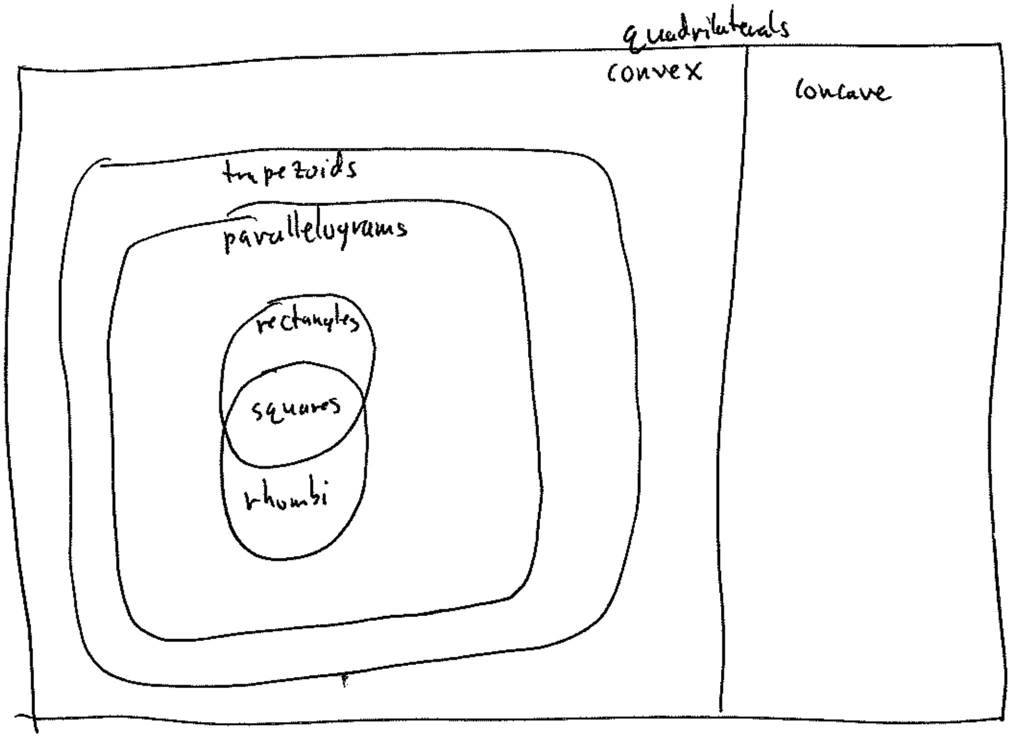
so each angle measures $\frac{\cancel{800^\circ}\ 900^\circ}{7} = \cancel{114\frac{2}{7}}\ 128\frac{4}{7}^\circ$.

(e) Is it possible to arrange three *regular* heptagons so that all three share a vertex and each pair of heptagons shares exactly one side? In other words, is it possible to tessellate the plane using regular heptagons? Explain your reasoning.

No. $3\cdot 114\frac{2}{7}^\circ \neq 360^\circ$, so there will be a small gap



9. (10 points) Create an Euler (Venn) diagram that demonstrates the relationship between: squares, parallelograms, rectangles, quadrilaterals, and trapezoids. **Bonus:** (3 points) Include rhombi, concave and convex figures in your diagram. +2 each +1 each



10. (8 points) Use algebra tiles to model and solve the equation $2x + 1 = -7$. Make sure to give the final answer.

Setup: $\boxed{x}\ \boxed{x}\ \oplus = \ominus\ominus\ominus\ominus\ominus\ominus\ominus$

Add one $\ominus$ to each side:

$\boxed{x}\ \boxed{x}\ \underbrace{\cancel{\oplus\ \ominus}}_{=0} = \ominus\ominus\ominus\ominus\ominus\ominus\ominus\ominus$

Group into two groups:

$\boxed{x} = \ominus\ominus\ominus\ominus \qquad \boxed{x} = \ominus\ominus\ominus\ominus$

So $\boxed{x = -4}$

11. (12 points) Determine whether the following statements are *always, sometimes,* or *never* true. **Explain your reasoning.**

(a) Two lines that are parallel intersect at exactly one point.

Never. Parallel lines do not intersect.

(b) Two acute angles are supplementary.

Never. Summing two angles $< 90°$ will be $< 180°$.

(c) Opposite angles of a quadrilateral are congruent.

Sometimes. This is true for parallelograms, but not all trapezoids

(d) Two sides of a right triangle are congruent.

Sometimes. If the right triangle is a $45°$-$45°$-$90°$ right triangle it is true, but not for any other right triangle.

(e) A rectangle is a right trapezoid.

Always. Rectangles have at least 1 pair of parallel sides, and a pair of adjacent right angles.

(f) A pentagon with all angles congruent is a regular pentagon.

~~False~~

Sometimes. See example from HW 5, for a nonexample.