There are 9 problems on this exam. Only those problems that say “explain” require explanations. Answers that require explanations will be given at most half credit without the required explanation. Be sure to follow all directions.

1. Becky has the following base ten blocks.

(a) If the flat represents the whole, what number does all of Becky’s base ten blocks represent? Briefly explain. (5 points)

(b) If the flat represents \(\frac{1}{10}\), what number does all of Becky’s base ten blocks represent? Briefly explain. (5 points)

(c) How can Becky represent 1.64 using some of her blocks? Briefly explain. (5 pts)

(d) If Becky adds 3 flats and 5 rods to the blocks she already has, what will be her sum if the flat is the whole? Briefly explain. (5 points)
2. Draw base ten blocks to model $1.57 - 0.38$. Use the flat as your whole. Briefly explain. (8 points)

3. Use the instructional algorithm to calculate $1.6 \times 2.3$. Include all necessary work to explain. (8 points)

4. Model $1.45 \div 0.43$. Use the flat as your whole. Express your answer as a mixed number. Briefly explain. (10 points)
5. Indicate whether the decimal representation of each of the following is terminating, repeating, or neither. Explain without actually finding the decimal representation. (3 points each)

(a) \(\frac{36}{75}\)  
(b) \(\frac{24}{105}\)

6. Convert 2.45 to a rational number in simplest form. Show all necessary steps to explain. (6 points)

7. Convert \(\frac{63}{140}\) to a decimal without using a calculator. Show all necessary steps to explain. (6 points)
8. A jar contains 50 red marbles, 25 blue marbles, and 75 white marbles. Determine the following. Express each ratio in simplest form and express all percentages exactly. (5 points each)

(a) What is the ratio of blue marbles to white marbles in the jar? Explain.

(b) What percent of the marbles in the jar are white? Explain.

(c) What is the ratio of blue marbles to non-blue marbles? Explain.

(d) How many more blue marbles would we have to add to the jar in order for the ratio of blue to white to be 4:5? Explain.

BONUS (e) What is the least number of marbles we can remove from the jar to make the ratio of blue to white 3:4? Explain.

(f) If we add 12 white marbles to the jar what is the percentage change in the number of white marbles? Explain.
9. Use the figure below where lines $AB$ and $CF$ are parallel to determine the following.

(a) Without measuring explain why $\angle DAE$ and $\angle ACF$ have the same measure. (3 pts)

(b) Without measuring explain why $\angle BAC$ and $\angle ACF$ have the same measure. (3 pts)

(c) List all angles in this picture with the same measure as $\angle GCH$. (3 pts)

(d) List all names for the angle $\angle BAD$. (3 points)

(e) List all names for line $\overrightarrow{CA}$. (4 points)