University of South Carolina
Math 221: Math for Elementary Educators
Instructor: Austin Mohr
Section 001
Spring 2010

Test 1

Help Prime Minister Mittens govern Talking Cat Island by analyzing the following three word problems. For each problem

a. tell what operation is involved ($+$, $-$, $\times$, or $\div$),
b. give the name of an appropriate model for the problem, and
c. draw a picture demonstrating the solution.

1. Talking Cat Island is home to 24 thousand cats. If a district contains 3 thousand cats, how many districts are required? (Hint: Work with the numbers 24 and 3, not 24,000 and 3,000.)

2. Every second, 6 saucers of milk are consumed by the citizens of the island. How many saucers do they drink in 5 seconds?

3. It takes one crew of catstruction workers 14 hours to build a scratching post, while it takes another crew only 11 hours to build the same post. How much longer does the first crew require than the second?

[2] 4. Describe the following sets of numbers.

a. Natural Numbers
b. Whole Numbers
c. Integers
d. Rational Numbers
e. Real Numbers

5a. Convert 342_5 to base 10.
5b. Convert 113_{10} to base 5.

[2] 6. Evaluate each of the following expressions using the specified method.

a. $232_5 + 244_5$ using the partial sums method
b. $231_5 - 133_5$ using the equal addends method
c. $21_5 \times 23_5$ using the partial products method
d. $421_5 \div 3_5$ using the standard algorithm

7. Short Answer

a. Consider the set of even whole numbers $\{0, 2, 4, 6, \cdots\}$. Is this set closed under addition? Is it closed under subtraction? Explain.

b. Why do we say that, for example, $0 \div 1 = 0$ (and so is defined) but $1 \div 0$ is undefined?

c. Prove with a picture that $(x + y)^2 = x^2 + 2xy + y^2$. (Hint: Remember that $(x + y)^2$ is the same as $(x + y)(x + y)$. Now, think about the area model of multiplication to make your picture.)

University of South Carolina
Math 221: Math for Elementary Educators
Instructor: Austin Mohr
Section 001
Spring 2010

Test 1 (take-home)

[2] 8. Evaluate each of the following expressions using any method. Note that the arithmetic is to be carried out in base 7.

a. $453_7 + 265_7$
b. $514_7 - 355_7$
c. $45_7 \times 56_7$
d. $546_7 \div 12_7$