Math 246 review for test 2: Number and operations

Addition and subtraction invented algorithms:

- know how to add on an open number line
- know how to subtract by adding up on an open number line (using numbers that end in 0)
- know how to by adding in place values and combining
- know how to subtract using the negative numbers algorithm
- be able to explain the steps in a student algorithm (see homework sheet last problem)

1. Show **two ways** of doing each calculation that are **different from the standard algorithm.** Know how to show at least one strategy for each on an open number line.

a.36 + 29 b. 92 – 38

Addition and subtraction standard algorithm

- Explain in words, without using "carry" or "borrow" particular steps in an addition or subtraction problem
- Show with manipulative pictures and numbers how to do part of an addition or subtraction problem.

2. Fill in the missing step, and explain both steps:

$$\begin{array}{r} 4\ 0\ 3 \\ -\ 8\ 7 \\ \hline \end{array} \quad \Rightarrow \quad \ldots \quad \Rightarrow \quad \begin{array}{r} 9 \\ 3\ \ 10\ \ 13 \\ \cancel{4}\ \ \cancel{0}\ \ \cancel{3} \\ -\ 8\ \ 7 \\ \hline \end{array}$$

3. For each step, fill in the missing manipulative picture, number work or explanatory sentence:

	$\begin{array}{r} 6\ 4\ 8 \\ -\ 2\ 8\ 3 \\ \hline \end{array}$	
		I can separate out 3 ones from the 8 ones. There are 5 ones left when I am done, so I write 5 in the ones place of the answer
	$\begin{array}{r} \overset{5}{\cancel{6}}\ 14\ 8 \\ -\ 2\ 8\ 3 \\ \hline 5 \end{array}$	
	$\begin{array}{r} \overset{5}{\cancel{6}}\ 14\ 8 \\ -\ 2\ 8\ 3 \\ \hline 6\ 5 \end{array}$	
		Take away 2 hundreds from 5 hundreds. There are 3 hundreds left, so write 3 in the hundreds place.

Solve and explain solutions to division problems using manipulatives, long division and scaffolding division.

4. Solve by long division $4793 \div 13$

5. Solve by scaffolding division, using easy mental math multiplications: $14\overline{)51{,}856}$

6. Solve by scaffolding, drawing out the groups: $6\overline{)2780}$

7. Draw what the manipulatives would look at this point in the long division algorithm.	$$\begin{array}{r} 24 \\ 6\overline{)\,1489} \\ -12 \\ \hline 28 \\ -24 \\ \hline 49 \end{array}$$	Explain what each of the numbers represents in the manipulatives and the problem: a. What is 6? b. What is 24? c. What is 49?

Multiplication

- draw a diagram and write an explanation for the commutative law
- draw a diagram and write an explanation for the distributive law
- draw a base 10 blocks diagram for a 2 digit by 2 digit multiplication problem, compute the product using both the expanded and the standard algorithm, and label or color code it to show how the algorithms correspond.
- multiply using the standard algorithm and the expanded algorithm

8. Explain with words and a diagram why it works and makes sense that 4 × 6 = 6 × 4.
What is the name of this property?

9. Explain with words and a diagram why it works and makes sense that 6 × (5+2) = (6 × 5) + (6 × 2).
What is the name of this property?

10. a. Show how to compute $\begin{array}{r} 548 \\ \times\ 37 \\ \hline \end{array}$ using the standard algorithm.

b. Before computing 3 × 8 in the standard algorithm we write a 0 in the partial product. Explain why we write a 0 there.

c. When we computer 3 × 8 =24 on the standard algorithm, we write 4 in the tens place, and we write 2 above the tens place. Why does 4 go in the tens place, and why does 2 go above the tens place?

11. a. Sketch an array diagram for: 57 × 82

b. Write out the product using the expanded algorithm

c. Write out the product using the standard algorithm

d. Color code or label to show how the solutions in a, b, c show where the place value products are in each method.

12. Write a word problem for 32 × 14

Use equals signs correctly:

13. Fix the equals signs while keeping the thinking the same

a. $86-2=84\div 4=21$ rewrite this one with shorter 1-step equations

b. $\frac{1}{2}\times 3\times 4=\frac{1}{2}\times 12=6\times 4=24+16=40$ rewrite this one into a single complex equation. Show the steps in calculating the answer from the complex equation.

14. Write down this numerical calculation (for 4x7) using correct equations:

Two 7's are 14, and another 7 is 21 and another 7 makes 28.