## 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.

$$a.36 + 29$$

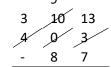
$$b.92 - 38$$

### 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:







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

3. For each step, ill in the missing manipulative picture, number work or explanatory sentence:				
	6 4	8		
=	2 8	3		
			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	
	<sup>5</sup> 14	8		
_	2 8	3		
		5		
	<sup>5</sup> 14	8		
	2 8	3		
	6	5		
			Take away 2 hundreds from 5 hundreds. There are 3 hundreds left, so write 3 in the hundreds place.	
			manareas iere, so write s in the nanareas 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)51,856
- 6. Solve by scaffolding, drawing out the groups: 6)2780

7. Draw what the manipulatives would look at this point in the long division algorithm.	2 4	Explain what each of the numbers represents in the manipulatives and the problem:
this point in the long division digorithm.	6) 1489 -12	a. What is 6?
	28 -24	b. What is 24?
	49	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  $4 \times 6 = 6 \times 4$ .

What is the name of this property?

9. Explain with words and a diagram why it works and makes sense that  $6 \times (5+2) = (6 \times 5) + (6 \times 2)$ .

What is the name of this property?

- - b. Before computing  $3 \times 8$  in the standard algorithm we write a 0 in the partial product. Explain why we write a 0 there.
  - c. When we computer  $3 \times 8 = 24$  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.