

## Math 246 Test 2 practice problems:

### Scaffolding and expanded algorithms.

1. Show how to do each of these using the appropriate expanded algorithm:

a.  $478 + 394$    b.  $723 - 186$    c.  $246 \times 87$

$$\begin{array}{r} 478 \\ + 394 \\ \hline 12 \\ 160 \\ 700 \\ \hline 872 \end{array}$$

$$\begin{array}{r} 723 \rightarrow 600 + 110 + 13 \\ - 186 \rightarrow 700 + 20 + 3 \\ \hline 500 + 30 + 7 \\ \hline 537 \end{array}$$

$$\begin{array}{r} 246 \\ \times 87 \\ \hline 1602 \\ 1968 \\ \hline 21402 \end{array} \quad \text{OR}$$

$$\begin{array}{r} 7 \times 6 = 42 \\ 7 \times 40 = 280 \\ 7 \times 200 = 1400 \\ 80 \times 6 = 480 \\ 80 \times 40 = 3200 \\ 80 \times 200 = 16000 \\ \hline 21402 \end{array}$$

2. On next page

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

	$\begin{array}{r} 648 \\ - 283 \\ \hline \end{array}$	Lay out materials to show the minuend: 6 hundreds, 4 tens and 8
	$\begin{array}{r} 648 \\ - 283 \\ \hline 5 \end{array}$	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
	$\begin{array}{r} 5 \\ \cancel{6} 148 \\ - 283 \\ \hline 5 \end{array}$	I don't have enough tens to take away 8 tens, so I trade 1 hundred for 10 tens. I change the 6 hundred to 5 hundred in my numbers. 4 tens and 10 more tens is 14 tens, so I change the tens place number to 14 tens.
	$\begin{array}{r} 5 \\ \cancel{6} 148 \\ - 283 \\ \hline 65 \end{array}$	Separate out 8 tens from the 14 tens, and put them with the 3 ones. There are 6 tens left. Write 6 in the tens place of the answer
	$\begin{array}{r} 5 \\ \cancel{6} 148 \\ - 283 \\ \hline 365 \end{array}$	Take away 2 hundreds from 5 hundreds. There are 3 hundreds left, so write 4 in the hundreds place.

2.

$$\begin{array}{r}
 368 \text{ R}9 \\
 13 \overline{)4793} \\
 \underline{3900} \quad 300 \\
 893 \\
 \underline{390} \quad 30 \\
 503 \\
 \underline{390} \quad 30 \\
 113 \\
 \underline{13} \quad 1 \\
 100 \\
 \underline{39} \quad 3 \\
 61 \\
 \underline{39} \quad 3 \\
 22 \\
 \underline{13} \quad 1 \\
 9 \quad \underline{368}
 \end{array}$$

4.

$$\begin{array}{r}
 3076 \text{ R}1 \\
 8 \overline{)24609} \\
 \underline{24} \quad \downarrow \downarrow \\
 60 \\
 \underline{56} \\
 49 \\
 \underline{48} \\
 1
 \end{array}$$

5. a.

$$\begin{array}{r}
 24 \\
 \times 2 \\
 \hline
 247 \\
 \times 63 \\
 \hline
 741 \\
 14820 \\
 \hline
 15,561
 \end{array}$$

5b. I write a 0 because when I do  $6 \times 7$ , the 6 isn't really a 6, its 60 or 6 tens, so when I multiply, I get  $60 \times 7 = 420$  or 42 tens. I get 0 ones so I put 0 in the ones place, and I'll move over to the tens place before writing the product of  $6 \times 7$

c. When you computed  $6 \times 7 = 42$  as part of the problem, in what place value did you write the 2? Why is that the correct place? 2 is in the tens place of the answer. That's the right place for it because  $60 \times 7 = 420$ , so the 2 is 2 tens.

d. When you computed  $6 \times 7 = 42$  as part of the problem, in what place value did you write the 4 (above which number and which place value)? Why is that the correct place?

I wrote the 4 over the tens place in the first factor. I wrote it there because when I multiply the numbers in the top factor by 60, I'm going to get a product that is one place value larger, so when I multiply  $60 \times$  the tens digit, I'll get hundreds. The 4 from  $60 \times 7 = 420$ , so I want to add it with the other hundreds I'm going to get from doing  $60 \times$  tens digit.

6.

a.

$400 + 30 + 6$			
$20,000$ A	$1500$ B	$300$ C	50
$3200$ D	$240$ E	$48$ F	
+			8

$$\begin{array}{r}
 48F \\
 240E \\
 3200D \\
 300C \\
 1500B \\
 20000A \\
 \hline
 25,288
 \end{array}$$

b.

$$\begin{array}{r}
 436 \\
 \times 58 \\
 \hline
 48F \\
 240E \\
 3200D \\
 300C \\
 1500B \\
 20000A \\
 \hline
 25,288
 \end{array}$$

c.

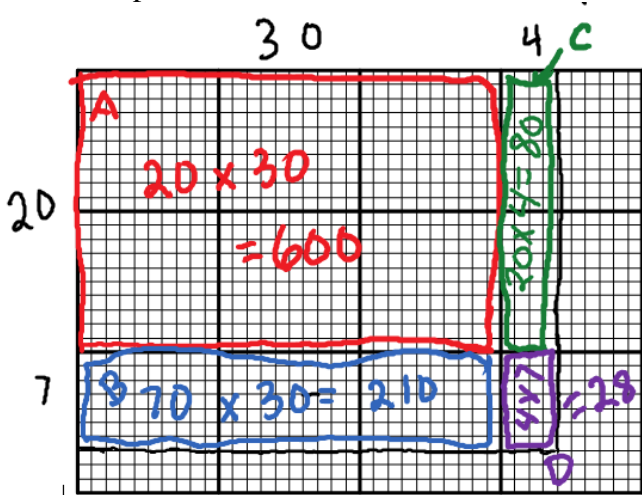
$$\begin{array}{r}
 \overset{1}{2} \overset{3}{4} \\
 436 \\
 \times 58 \\
 \hline
 3488 \text{ D+E+F} \\
 21800 \text{ A+B+C} \\
 \hline
 25,288
 \end{array}$$

d.

	4	3	6	
2	2 A	1 B	3 C	5
5	3 D	2 E	4 F	
	2	8	8	

$$25,288$$

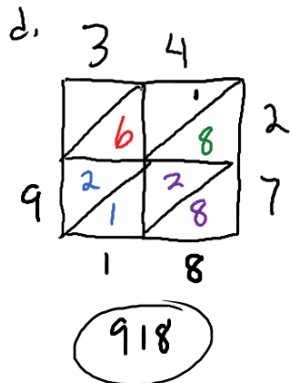
7. For the product  $27 \times 34$ .



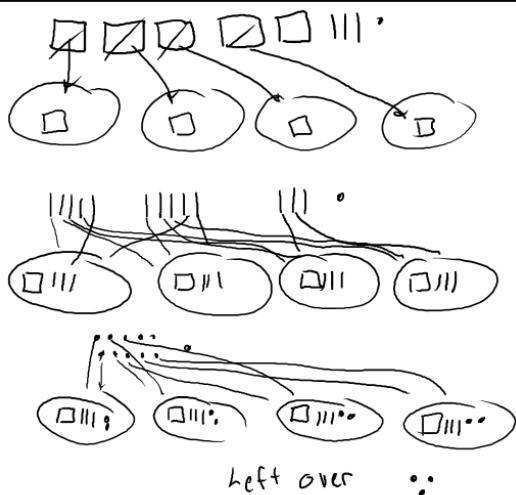
$$\begin{array}{r} 600 \text{ A} \\ 80 \text{ C} \\ 210 \text{ B} \\ + 28 \text{ D} \\ \hline 918 \end{array}$$

$$\begin{array}{r} 34 \\ \times 27 \\ \hline 210 \text{ B} \\ 290 \text{ D} \\ \hline 918 \end{array}$$

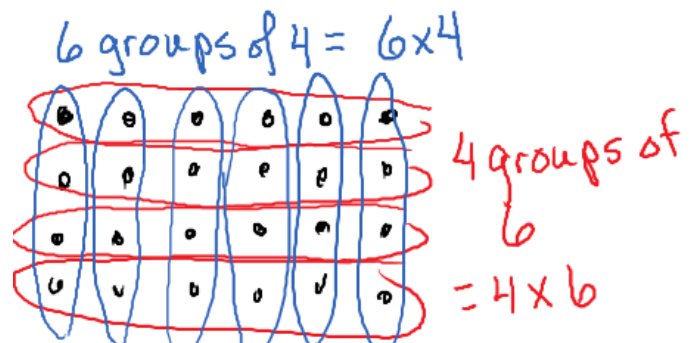
$$\begin{array}{r} 34 \\ \times 27 \\ \hline 238 \text{ D+B} \\ 680 \text{ C+A} \\ \hline 918 \end{array}$$



8. Draw out what the division problem  $531 \div 4$  would look like when solved with manipulatives in 3 steps (one for each place value step).

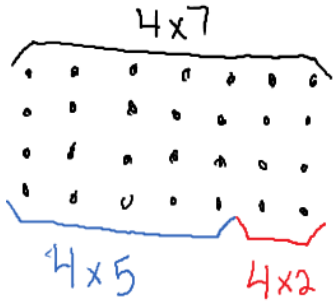


9. Explain with words and a diagram why it works and makes sense that  $4 \times 6 = 6 \times 4$ . What is the name of this property?



I can group the dots into 4 sets of 6 or 6 sets of 4, so both  $4 \times 6$  and  $6 \times 4$  must tell me the same amount (this many dots)  
This is the commutative property

10. Explain with words and a diagram why it works and makes sense that  $4 \times 7 = (4 \times 5) + (4 \times 2)$   
What is the name of this property?

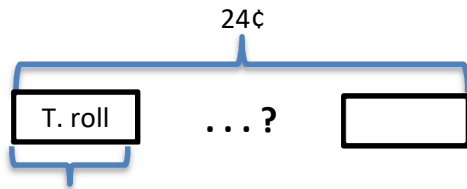


I can break a group of  $4 \times 7$  dots into two parts, by splitting each 7 into 5 and 2. If I add the dots in the left part:  $4 \times 5$ , and the dots in the right part:  $4 \times 2$  I get all of the dots, which is  $4 \times 7$

12. a. Solve  $4 \times 8$  using the strategy for 4's:  $2 \times 8 = 16$ , and  $2 \times 16 = 32$ , so  $4 \times 8 = 32$ .  
b. Solve  $6 \times 8$  using the strategy for 6's:  $5 \times 8 = 40$  and one more 8 is  $40+8=48$   
c. Solve  $6 \times 3$  using the strategy for 3's  $6 \times 2 = 12$  and one more 6 is  $12 + 6 = 18$   
d. Explain the fives pattern that helps you solve  $5 \times 8$  quickly 8 is even, so you can take half of 8 (that's 4) and do that many tens: 40.  
e. Show how to solve  $4 \times 9$  using the strategy for 9's.  $4 \times 9$  is  $4 \times 10 = 40$ , and take away 4.  
 $40 - 4 = 30 + (10 - 4) = 36$

13. a. Write a multiplication problem for  $14 \times 26$  A bag of marbles has 26 marbles. Kyle has 14 bags of marbles. How many marbles does he have?  
b. Write a partitive division problem for  $84 \div 12$  Sam has 84 stickers. If he puts the same number of stickers on each of 12 pages, how many stickers will be on each page?  
c. Write a measurement division problem for  $84 \div 12$ . I have 84 cents. A pencil costs 12 cents. How many pencils can I buy?

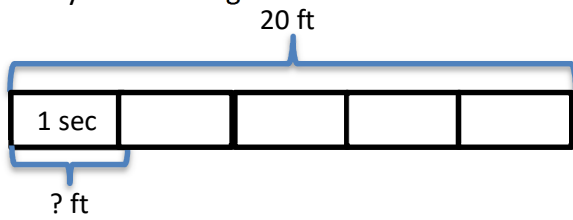
14a. A tootsie roll costs 4¢. Ross has 24¢. How many tootsie rolls can he buy?



$$24 \div 4 = ? \quad 4\text{¢}$$

$$4 \times ? = 24 \text{ Measurement division}$$

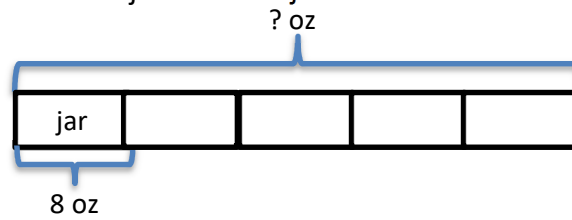
b. A toy train can go 20 feet in 5 seconds. How many feet can it go in one second?



$$20 \div 5 = ?$$

$$5 \times ? = 20 \text{ Partitive division}$$

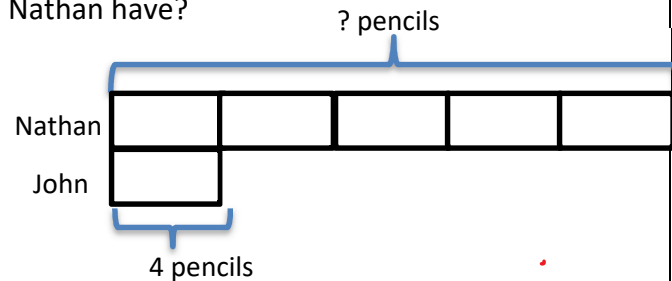
c. A Jar of jam has 8 ounces of jam in it. How many ounces of jam are in 5 jars?



$$8 \times 5 = ?$$

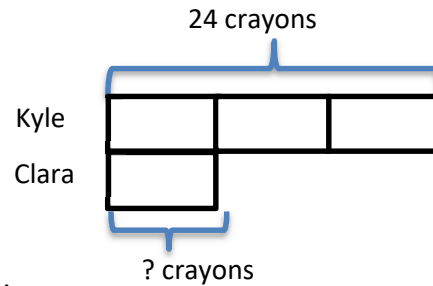
$$\text{multiplication}$$

d. John has 4 pencils. Nathan has 5 times as many pencils as John. How many pencils does Nathan have?



$$4 \times 5 = ? \text{ multiplication}$$

e. Kyle has 24 crayons. He has 3 times as many crayons as Clara. How many crayons does Clara have?



$$24 \div 3 = ?$$

$$3 \times ? = 24$$

$$\text{Partitive division}$$

15. For each of these word problems, tell whether they are multiplication, partitive division or measurement division. Describe how each might be solved by direct modeling.

a. Ms. Johnson baked 24 cookies. She wants to make plates of cookies that have 4 cookies on each plate. How many plates can she fill? Measurement division:

Take out 24 counters.

Make groups of 4 counters until you have used all of the counters

Count the number of groups.

b. Kara has 5 boxes of dolls. Each box has 4 dolls in it. How many dolls does she have?

Multiplication

Make a 5 groups with 4 counters in each group. Count all of the counters

c. Four friends are sharing a bag of 24 marbles. How many marbles should each friend get?

Partitive division.

Take 24 counters

Deal out counters one at a time into 4 groups

Count the counters in 1 group.