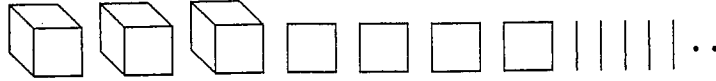


Learning Exercises for Section 4.1

1. Work through the following problems, thinking about each step you perform, and why. If you have used base ten blocks or sketches of base ten blocks, you can use them to help you with these problems. *In each case, specify what you decide to use as your unit.* For example, if the flat is used to represent 1, then 34.52 can be represented as follows:



- a. $56.2 + 34.52$
- b. 4×0.39
- c. $345.6 - 21.21$
- d. $2912 \div 8$ (Think of this as a sharing problem.)

a)

b)

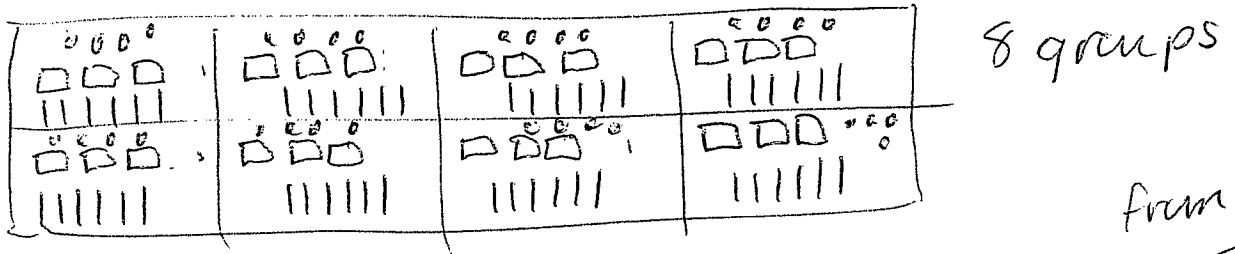
c) $300 +$ \rightarrow trade in for 10

take away (2 flats 1 ten 1 one)

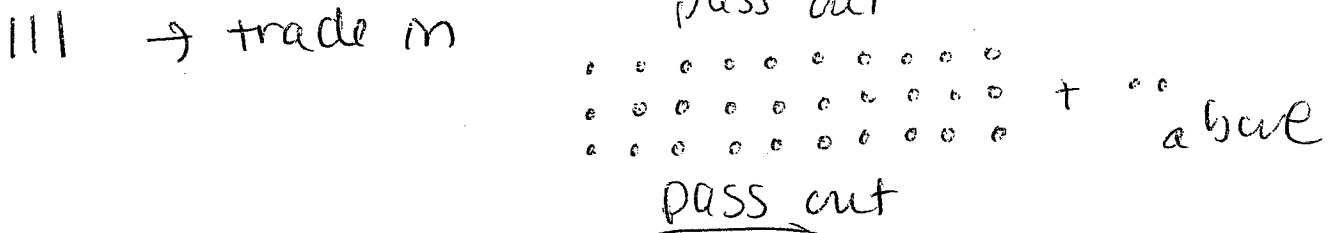
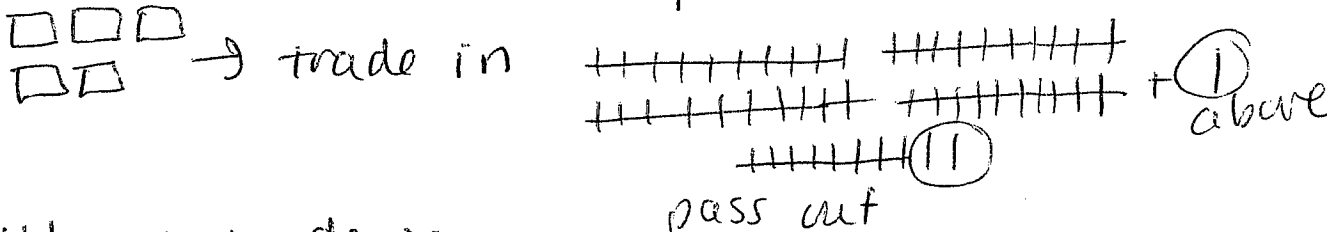
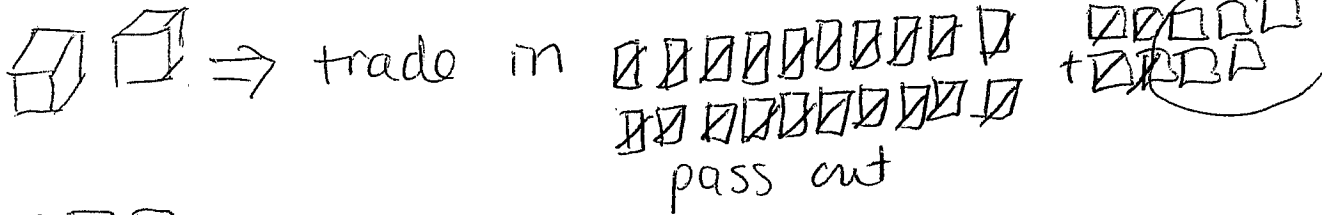
$300 +$

$= 324.39$

d) $2912 \div 8$  1 ..



from above



so each group has 364 in it

2. Work through the following problems in the base indicated. Write down your procedure, and specify what you use as your unit in each case.
- $231 + 342$ in base five
 - $1000 - 555$ in base six
- If you feel at all uncertain about these problems, make up and try some of your own.

a)
$$\begin{array}{r} \overset{1}{2}31 \text{ five} \\ + 342 \text{ five} \\ \hline 1123 \text{ five} \end{array}$$

b)
$$\begin{array}{r} \overset{3}{1}000 \text{ six} \\ - 555 \text{ six} \\ \hline 1 \text{ six} \end{array}$$

4. There have been, in the past, many different algorithms developed for carrying out computation. Here are two such algorithms for computing 36×342 . The first is called the **lattice method** for multiplication, used by the Arabs in the 1600s and carried to Europe. The method depends on knowing the multiplication facts, but not much on place value. The factors are written across the top and right, and the answer, 12,312, is read off going down on the left and around the bottom. Compare this method to showing all partial products.

		3	4	2	
1	0	9	12	6	3
2	18	24	12		6
	3	1	2		

The second is called the **Russian peasant algorithm**. One number is successively halved until 1 is reached (if it is odd, 1 is subtracted before halving) and the other number is doubled the same number of times the first is halved. Numbers in the second column are crossed out when the corresponding number in the first column is even, and the remaining numbers are added. Reread the preceding steps as you study this calculation of 36×342 .

36	342
18	684
9	1368
4	2736
2	5472
1	<u>10944</u>
	12,312

Try these algorithms on 57×623 . They are not magic! Each can be justified mathematically.

a)

		6	2	3	
3	18	12	9		5
5	30	10	15		7
	5	1	1		

= 35,511

b)

57	623
(56)	
28	1246
14	2492
7 ₍₆₎	4984
3 ₍₂₎	9968
1	19936
	<hr/>
	35511

5. Use your understanding of division to complete each equation.

If $4000 \div 16 = 250$, then

- a. $8000 \div 16 =$ _____ b. $16,000 \div 16 =$ _____
c. $2000 \div 16 =$ _____ d. $4000 \div 32 =$ _____
e. $4000 \div 64 =$ _____ f. $4000 \div 8 =$ _____
g. $4000 \div 4 =$ _____ h. $4000 \div 0.4 =$ _____

a) $2(4000 \div 16) = 2(250) = 500$
b) $4(4000 \div 16) = 4(250) = 1000$
c) $\frac{1}{2}(4000 \div 16) = \frac{1}{2}(250) = 125$
d) $(4000 \div 16) \div 2 = (250) \div 2 = 125$
e) $(4000 \div 16) \div 4 = (250) \div 4 = 62.5$
f) $(4000 \div 16) \times 2 = (250) \times 2 = 500$
g) $(4000 \div 16) \times 4 = (250) \times 4 = 1000$
h) $(4000 \div 16) \times 40 = (250) \times 40 = 10,000$