incorrect words

borrowing
carrying
column shifting

correct words

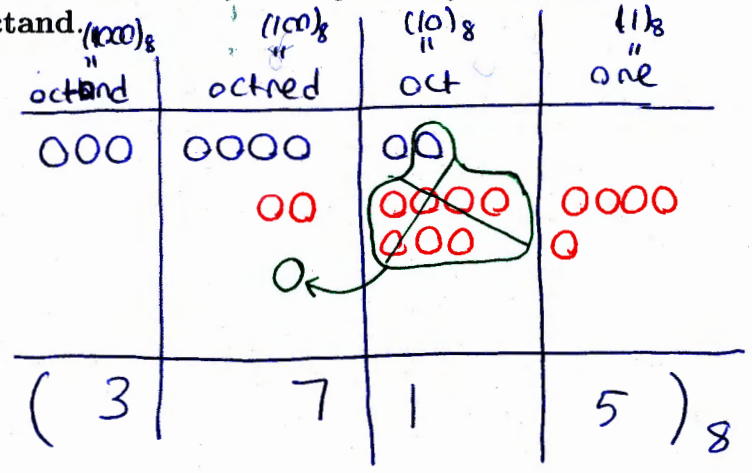
rebundling/unbundling
composing/decomposing
regrouping/ungraping

Algorithms
Activity 3
Math-T101 Spring 2014

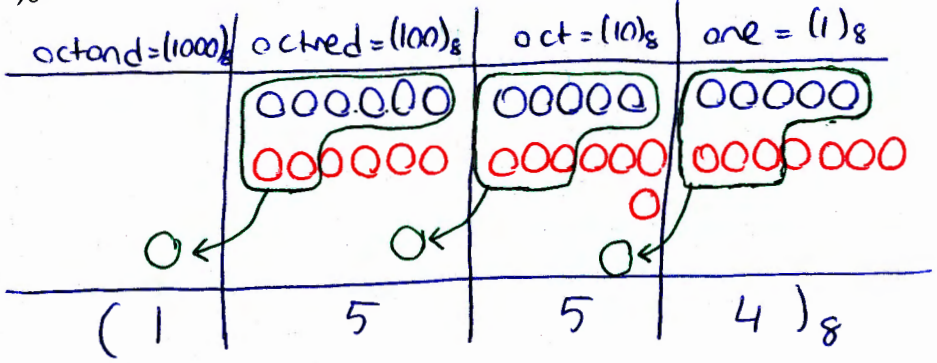
Name: Serife Sevis

Problem 1. *Use chip model to solve the following base eight arithmetic problems. Remember that* $(1000)_8$ *is called* **octand**.

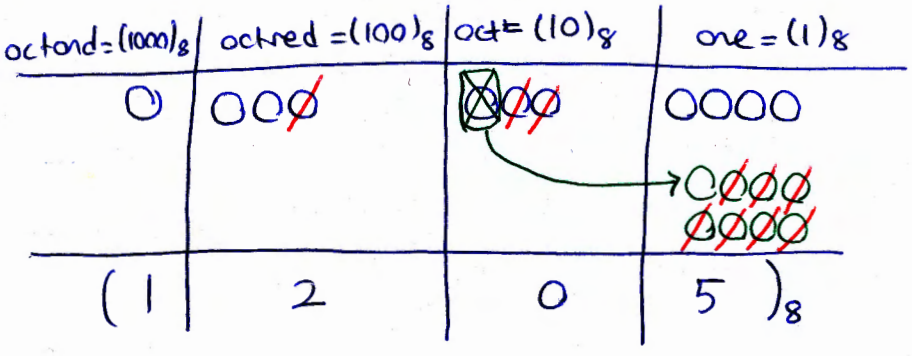
(a) $(3420)_8 + (275)_8$



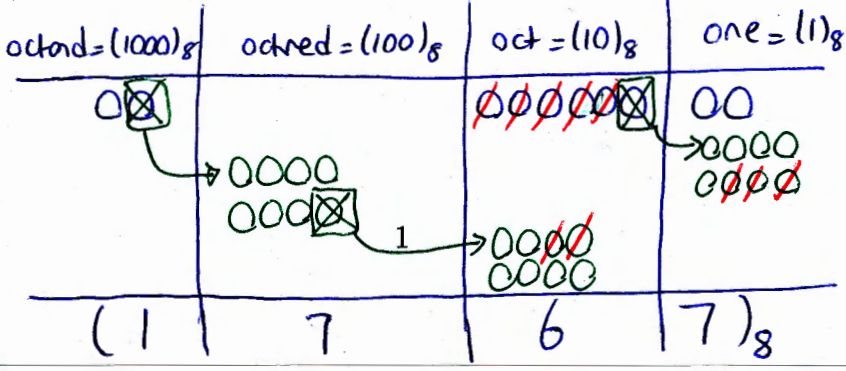
(b) $(654)_8 + (677)_8$



(c) $(1334)_8 - (127)_8$

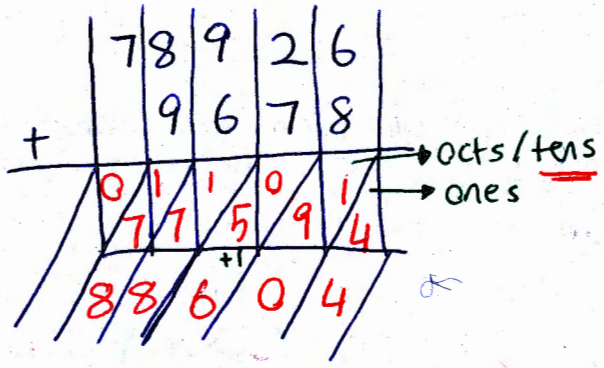


(d) $(2062)_8 - (73)_8$

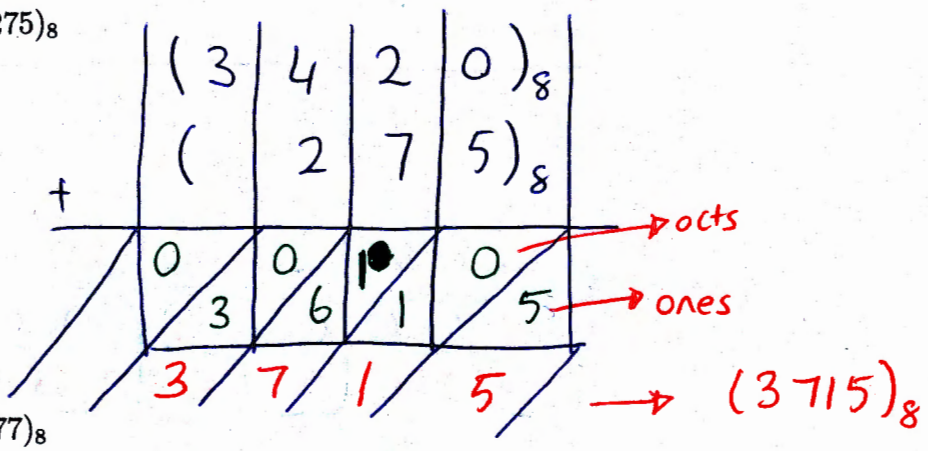


Problem 2. *Use lattice addition algorithm to find the answer to the following arithmetic problems.*

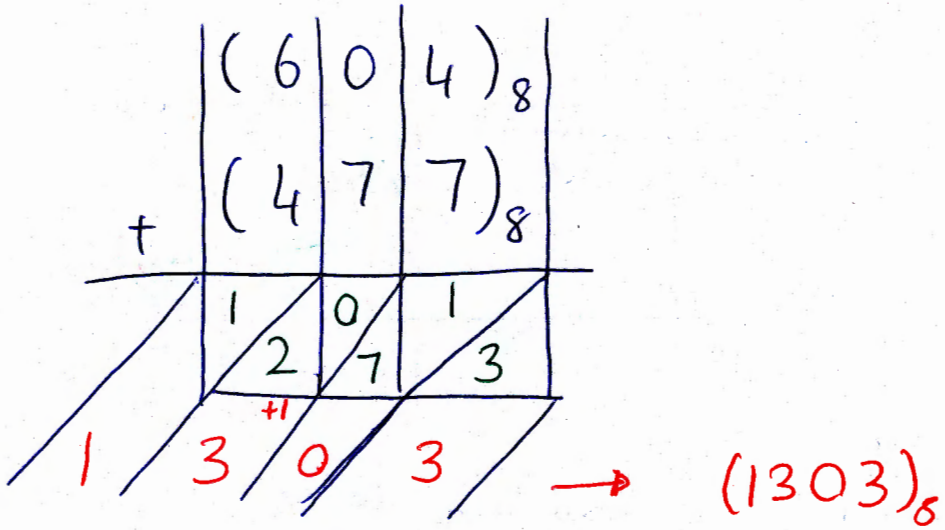
(a) $78926 + 9678$



(b) $(3420)_8 + (275)_8$

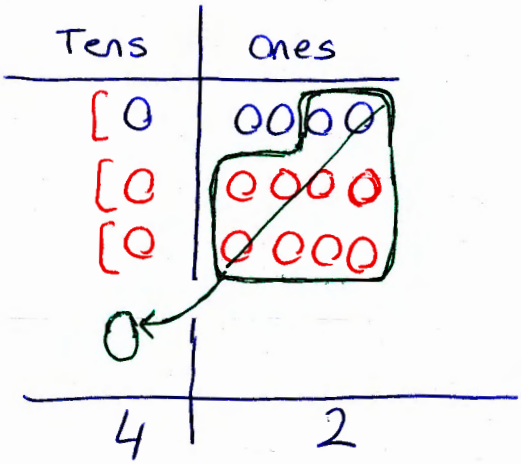


(c) $(604)_8 + (477)_8$

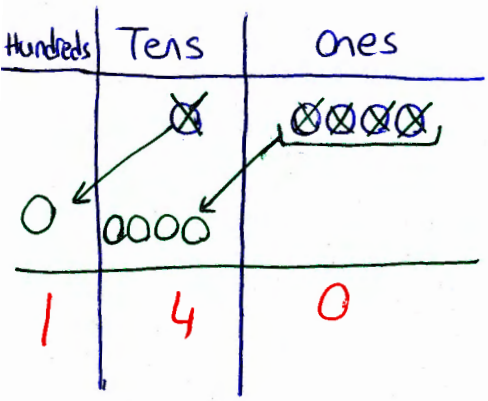


Problem 3. *Use chip model to find the answer to the following arithmetic problems.*

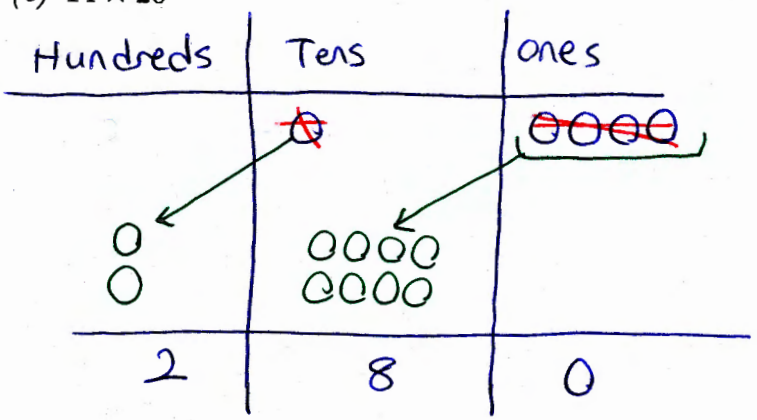
(a) 14×3



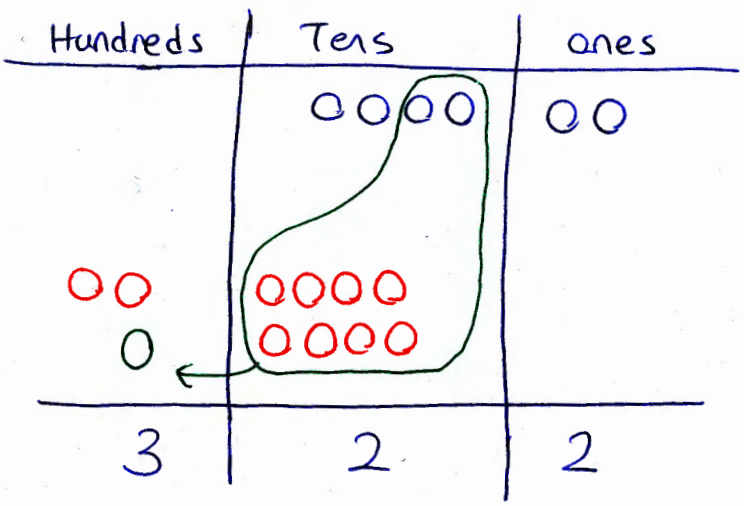
(b) 14×10



(c) 14×20

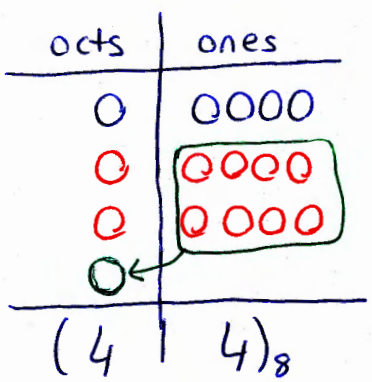


(d) 14×23

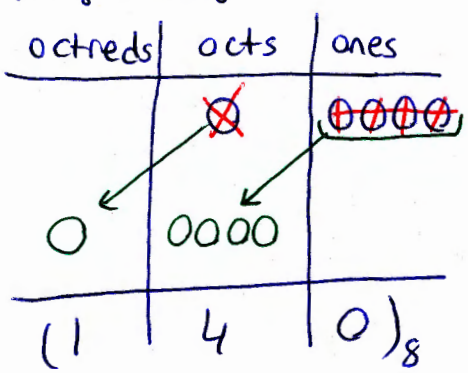


Problem 4. *Use chip model and the step-by-step method in the previous problem, to find* $(14)_8 \times (23)_8$

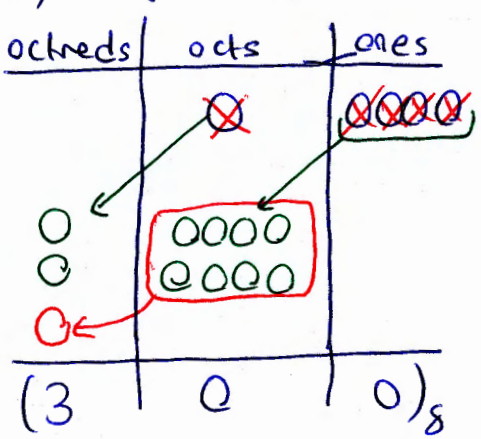
(a) $(14)_8 \times (3)_8$



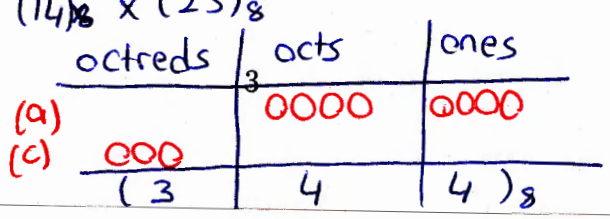
b) $(14)_8 \times (10)_8$



c) $(14)_8 \times (20)_8$

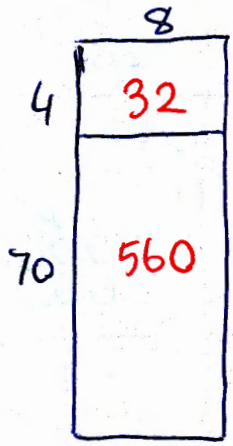


d) $(14)_8 \times (23)_8$



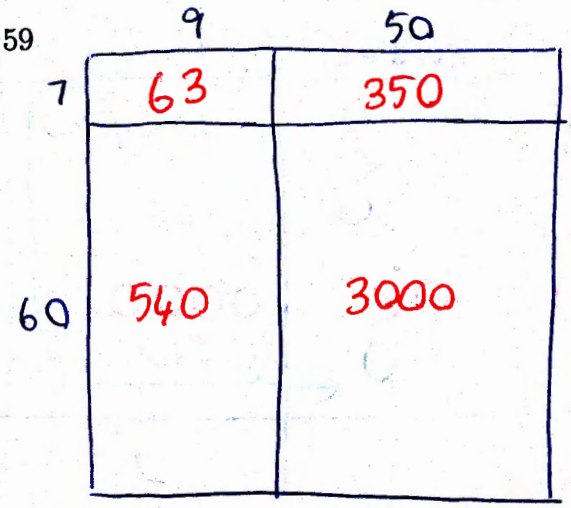
Problem 5. *Use the array model to find the answer to the following arithmetic problems and display the parallel to the SCA for multiplication.*

(a) 74×8



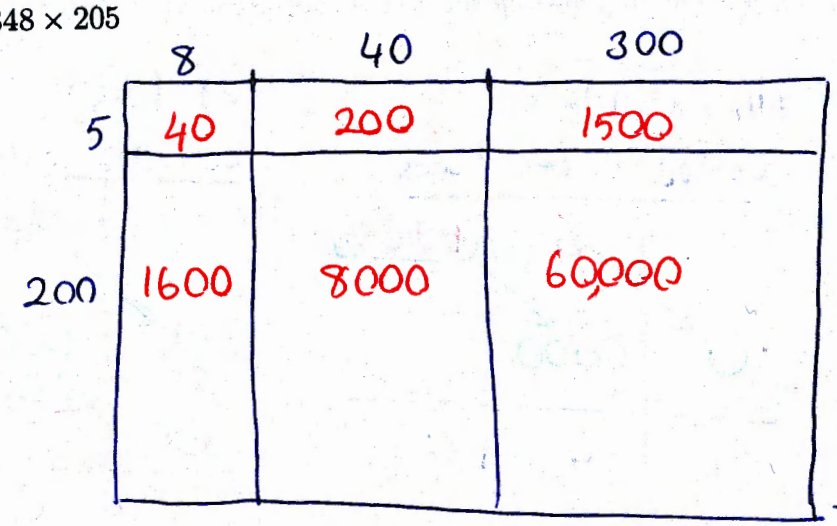
$$\begin{array}{r} 74 \\ \times\ 8 \\ \hline 32 \\ +\ 560 \\ \hline 592 \end{array}$$

(b) 67×59



$$\begin{array}{r} 64 \\ \times\ 59 \\ \hline 63 \\ 540 \\ 350 \\ +\ 3000 \\ \hline 3953 \end{array}$$

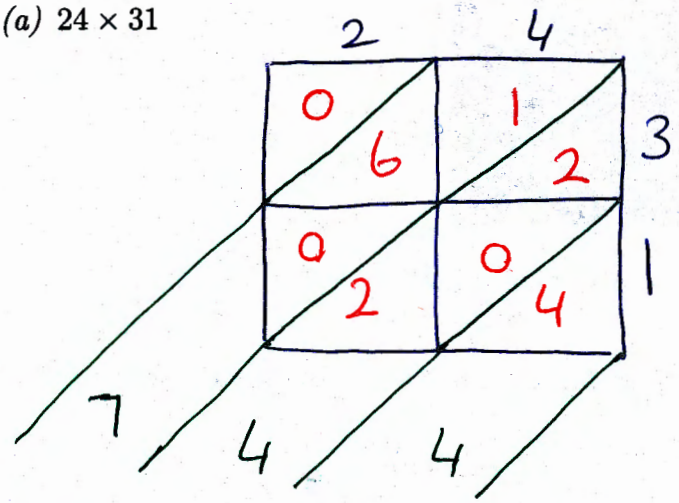
(c) 348×205



$$\begin{array}{r} 348 \\ \times\ 205 \\ \hline 40 \\ 200 \\ 1500 \\ 1600 \\ 8000 \\ +\ 60000 \\ \hline 71340 \end{array}$$

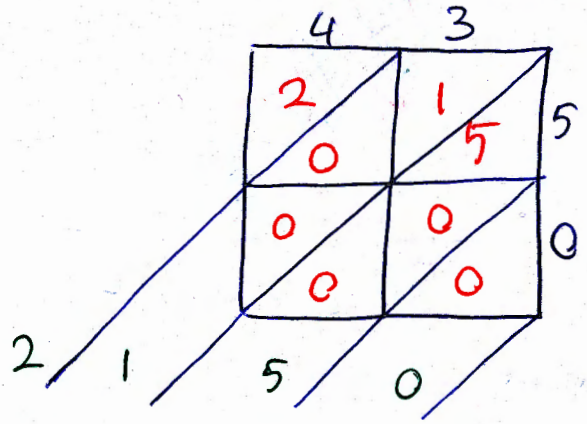
Problem 6. *Use the lattice algorithm to find the answer to the following arithmetic problems.*

(a) 24×31



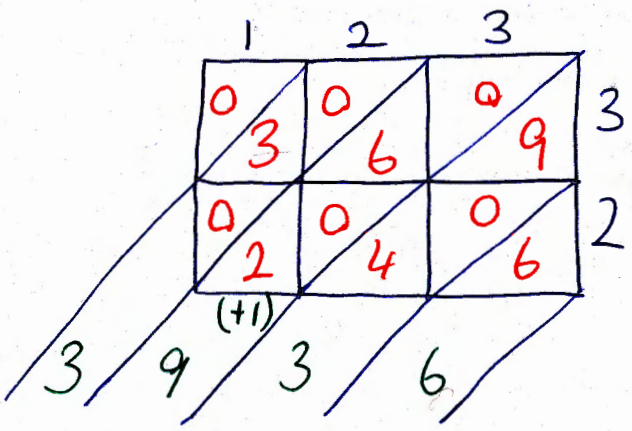
$$\begin{array}{r} 24 \\ \times\ 31 \\ \hline 4 \\ 20 \\ 120 \\ +\ 600 \\ \hline 744 \end{array}$$

(b) 43×50



$$\begin{array}{r} 43 \\ \times\ 50 \\ \hline 150 \\ +2000 \\ \hline 2150 \end{array}$$

(c) 123×32



$$\begin{array}{r} 123 \\ \times\ 32 \\ \hline 6 \\ 40 \\ 200 \\ 90 \\ 600 \\ +\ 3000 \\ \hline 3936 \end{array}$$

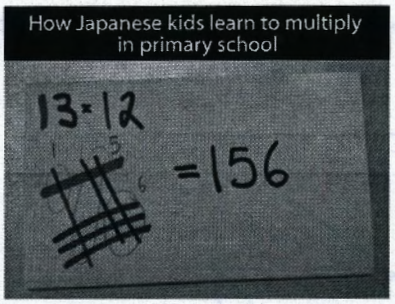
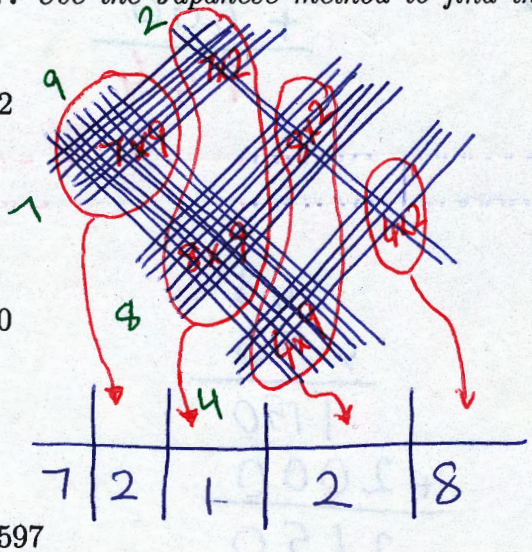


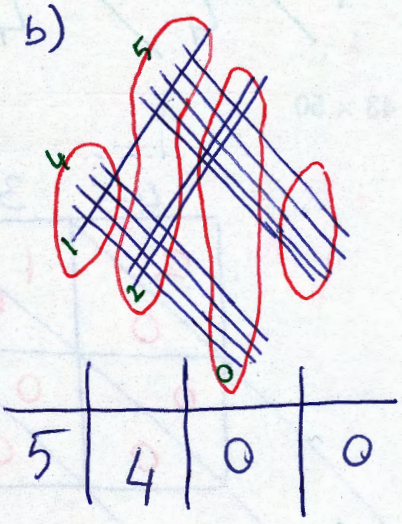
Figure 1: Japanese Multiplication

Problem 7. *Use the Japanese method to find the answer to the following multiplication problems.*

(a) 784×92

(b) 45×120





(c) 6335×597

I will leave this one for students to try.
It is really long and cumbersome

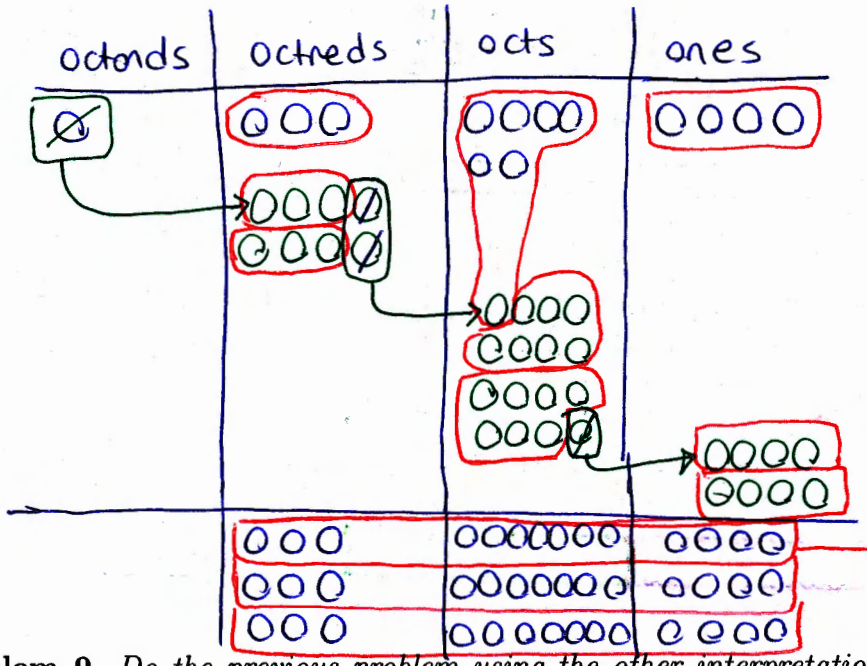
(d) What are the advantages and limitations of using the above method for multiplication?

- a visual representation of multiplication
- alternative method for the ones who don't remember SCA

- easy to make mistake
- cumbersome
- complicated

Problem 8. *Use the chip model to evaluate* $(1364)_8 \div (3)_8$. *What interpretation of division did you use? (measurement or partitive)*

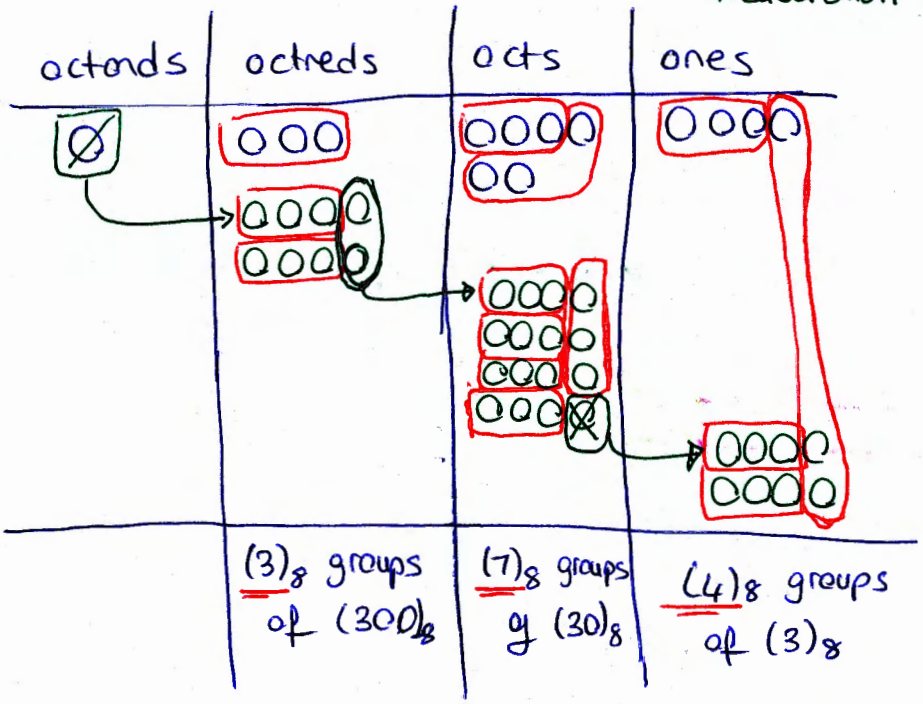
partitive { sharing equally among 3 people



Each person will get $(374)_8$

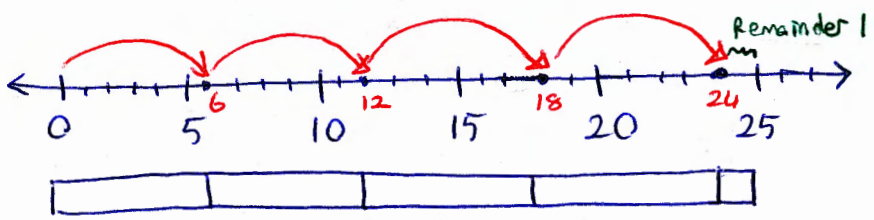
Problem 9. *Do the previous problem using the other interpretation that you did not use there.*

measurement { repeatedly subtract group of 3



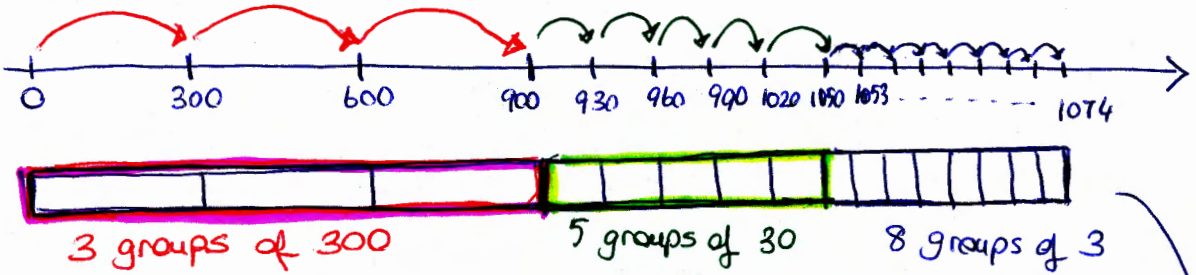
$\rightarrow (374)_8$

Problem 10. *Use the number line and the measurement interpretation to calculate* $25 \div 6$.

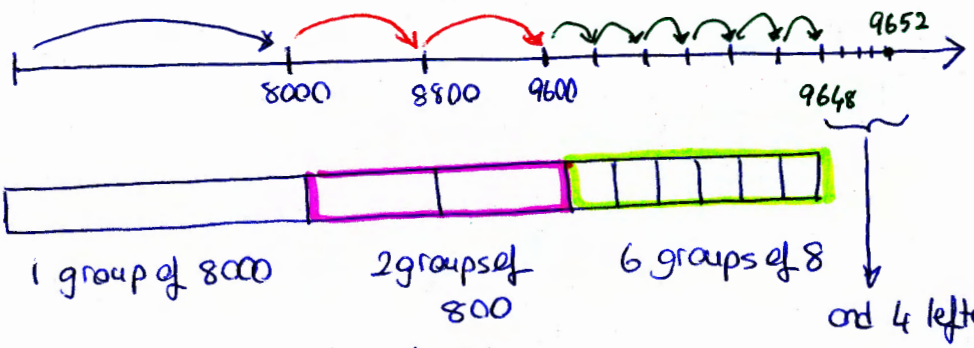


$$\begin{array}{r} 4\ \text{R}1 \\ 6\overline{)25} \\ -24 \\ \hline 1 \end{array}$$

Problem 11. *Use measurement division to find* $1074 \div 3$, *laying out segments of lengths 3, 30, and 300 along the number line (you do not have to draw it to scale here). Draw the connection between this method and the SCA for long division.*



Problem 12. *Use measurement division to find* $9652 \div 8$, *laying out segments of lengths 8, 80, and 800, etc. along the number line (you do not have to draw it to scale here). Draw the connection between this method and the SCA for long division.*



$$\begin{array}{r} 1206\ \text{R}4 \\ 8\overline{)9652} \\ -8000 \\ \hline 1652 \\ -1600 \\ \hline 52 \\ -48 \\ \hline 04 \end{array}$$

- -8000 → 1 group of length 8000
- -1600 → 2 groups of length 800
- -48 → 6 groups of 8
- 04 → 4 leftover

$$\begin{array}{r} 358 \\ 3\overline{)1074} \\ -900 \\ \hline 174 \\ -150 \\ \hline 24 \\ -24 \\ \hline 0 \end{array}$$

- -900 → 3 groups of length 300
- 174 → 174 leftover
- -150 → 5 groups of length 30
- 24 → 24 leftover
- -24 → 8 groups of length 3
- 0 → no leftover

estimation < actual answer

Problem 13. *Underestimate* $(1647)_8 - (376)_8$ *by rounding the minuend and the subtrahend to multiples of octred. (See p. 19 for the definitions of these terms.) Which number would you round up? Which number would you round down? Is your estimate correct to the nearest octred?*

actual answer

$$(1647)_8 - (376)_8 = (1251)_8$$

minuend subtrahend

$$(1600)_8 - (400)_8 = (1200)_8$$

OR

$$(1640)_8 - (400)_8 = (1240)_8 \rightarrow \text{better estimate}$$

Problem 14. *How would you overestimate,* $1345 \div 72$*? (Would you round 72 up or down? How about 1345?)*

estimation > actual result

up

$1400 \div 70 = 20$

actual result

$$\begin{array}{r} 18\ R49 \\ 72\overline{)1345} \\ -72 \\ \hline 625 \\ -576 \\ \hline 049 \end{array}$$

Problem 15. *Use long division to find* $1455 \div 15$*.*

$$\begin{array}{r} 97 \\ 15\overline{)1455} \\ -135 \\ \hline 105 \\ -105 \\ \hline 00 \end{array}$$

$15 \times 10 = 150$

$-\ 15$

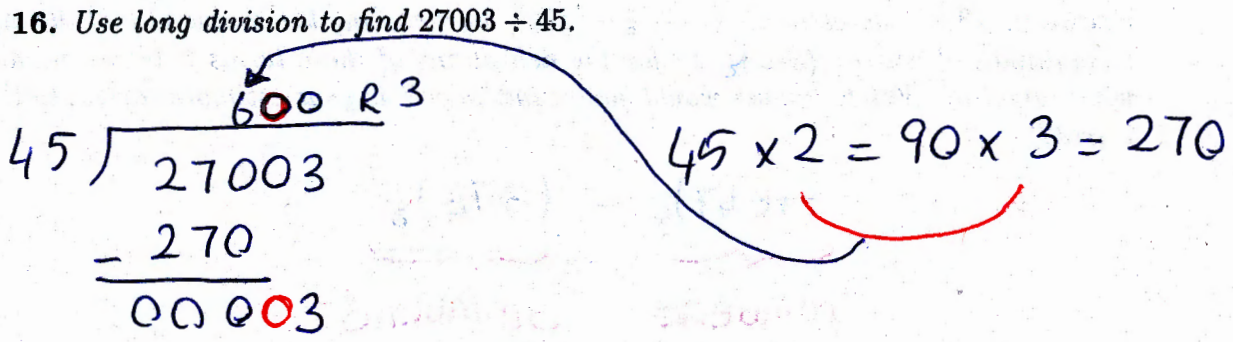
135

$15 \times 6 = 90$

$+\ 15$

105

Problem 16. *Use long division to find* $27003 \div 45$.



Problem 17. *Use long division to find* $14985 \div 37$.