3.1 numeration system / Whole numbers

• Starts off with early numeration system then going into base 5 peices.

Key Ideas
1. positional number systems
2. place value
3. minimal collection
4. Rounding whole numbers
5. base - five numeration

positional numeration system: a number is selected for a base and basic symbols are adopted for 0, 1, 2, up to one less than the base. Whole numbers are represented in positional numeration system

ex - 7<u>0</u>24
- the value zero is in the hundreds place.

place value: Babylonians used their basic skills and concept of place value. Place value is a power of a base.

example, $135 = 2(60) + 15(1)$, so represented 2×60 and 15×1.

• first position from right to left represented the number of units, second position the number of 60s, the third position number of 60^2s etc.

$22(60^2) + 3(60) + 30(1) = 79,410$

minimal collection: make exchanges until'l you have an equivalent collection with the least number of base 5 peices.

ex-

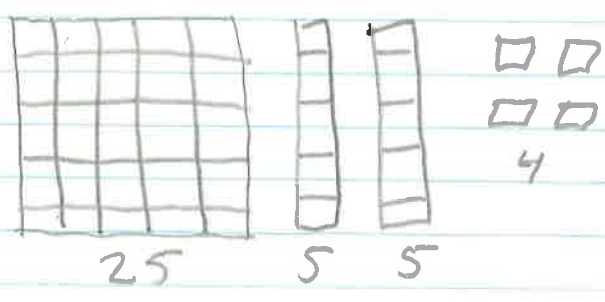
minimal collection is: 0 0 4 4 base 5

Rounding numbers: you can round to the nearest million is to write the nearest million greater than the number and the nearest million less than the number then choose the cloest number.

ex- 131,257,328 rounding = 131,000,000

base-five numeration: models for powers of 5, 5 units form a long and 5 longs form a flat, then 5 flats is a long-flat.

ex- collection with 1 flat, 2 longs and 4 units.



Section 3.2

Adding and Subtracting w/Multibase pieces

addition	vs	Subtraction
- bundle of sticks		missing addend
- partial products		take away
- left to right		comparison

Bundle of sticks

| = one

ł = 10

ⱡ = 100

ǂ = 1,000

Partial Products

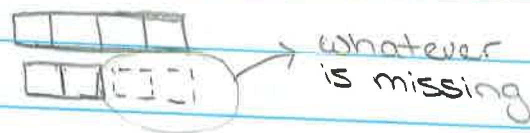
```
  627
+ 854
-----
   11  ←  7+4          = (1481)
   70  ←  20 + 50
+1400  ←  600 + 800
-----
 1481
```

Left to Right "Scratch"

```
   6 6 7
 + 8 5 4
 -------
  14 (1)1 (1)1
   +     +
  15   1
  15   2  1  =  (1521)
```

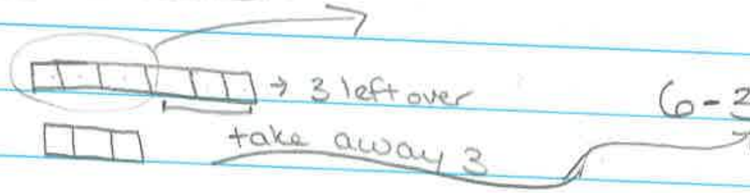
Subtraction Methods

Missing Addend



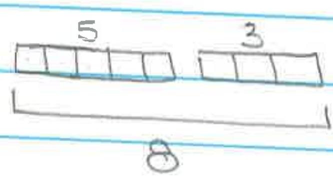
$$\begin{array}{r} 4 \\ -2 \\ \hline 2 \end{array}$$

Take Away



$6 - 3 = 3$

Comparison



$8 - 5 = 3$

You need 3 left to complete the 8.

Exam 2 review

Key Ideas 3.3

- Multiplication of whole numbers
- Base 10 pieces
- Sketch
- Four Partial Product Algorithm
- Two Partial Product Algorithm
- Area Model
- Tree diagram
- Number line
- Number properties: associative, distributive, commutative, identity, closure

Examples

Four partial Product:

$$\begin{array}{r} 23 \\ \times 12 \\ \hline 6 \\ 40 \\ 30 \\ 200 \\ \hline 276 \end{array}$$

Key Ideas with examples 3.4

Dividing base-ten pieces

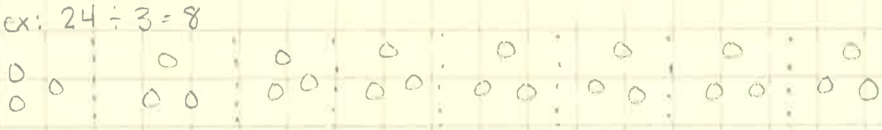
- Sharing Concept:
  - Seperating (partitioning) into equivalent sets.

ex: 24 ÷ 3 = 8

3 groups of 8 when added together you get 24.

- Measurement Concept:
  - Determining by subtracting or measuring off as many sets as possible.

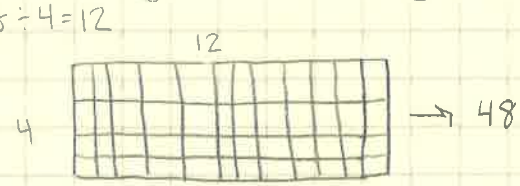
ex: 24 ÷ 3 = 8



8 groups of 3 when added together you get 24

- Array Model:
  - representing division using rows and columbs.

ex 48 ÷ 4 = 12



When you add them all up you get 48

3.4 Division & Exponents

- long division →
- sharing concept
- Measurement concept
- Number lines

71
5)355
-35
05
-5
0

Exponentation $b^n = \underbrace{b \times b \times b \times b \ldots \times b}_{\text{b occurs n times}}$

Law of exponents $a^n \times a^m = a^{n+m}$

$a^n \div a^m = a^{n-m}$ for $a \neq 0$

Order of opperations

P : ( )

E : a^n ←

M/D : × ÷

A/S : + / −

4.2 Key Ideas

Greatest Common Factor & Least Common Multiple

- Factor Trees — Find the prime factors of a number by obtaining any two factors
  - (→ For Finding Prime Factorizations)

  ex. 30
  - 30 → (3), 10
  - 10 → (2), (5)

  factors of 30: $30 = 2 \times 3 \times 5$

- List of all factors of each number.
  - → This can be obtained by starting with 1 and continuing with whole numbers (ex. 2, 3, 4,)

  ex. 20 = 1, 2, 4, 5, 10, 20

- Greatest Common Factor: Between two numbers they will have a largest common factor.

  ex. 24 = 1, 2, 3, 4, 6, 8, (12), 24
  36 = 1, 2, 3, 4, 6, 9, (12), 18, 36

  GCF (24, 36) = 12

- Least Common Multiple: