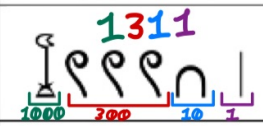
Chapter 01
Homework 01 - 1.1, 1.6, 1.7, 1.10

3 more

Exercise 1.1. Complete the following table so that in each row the numerals represent the same number.

Type 2: Multiplicative Grouping System (similar to the positional system; instead of indicating which power of b is being used by a digit's position, the power of b is explicitly written) — Chinese	Type 3: Simple Grouping System (symbols are added up) — Egyptian	Type 4: Ciphered Systems (uses some base b, but also need symbols for 1,2,3,…,b−1, but for the b and multiples of b) — Roman	Hindu-Arabic	Base-6
一千 三百 十一 (1000 300 10 1)	 (1311)	MCCCXI (1000 300 10 1)	1311	$(10023)_6$ $(1\cdot6^4)+(0\cdot6^3)+(0\cdot6^2)+(2\cdot6^1)+(3\cdot6^0)$ 1296 0 0 12 3
七千三百九 (7309) (7000 300 9)		VIICCCIX (7000 300 9)	7309	$(53501)_6$
三百 (300)		CCCX (300 10)	310	$1\cdot6^3+2\cdot6^2+3\cdot6^1+4\cdot6^0=310$ $(1234)_6$ $1\cdot6^3=216$ $2\cdot6^2=72$ $3\cdot6^1=18$ $4\cdot6^0=4$
六百二十五 (600 20 5)		DCXXV (500 100 20 5)	625	$(2521)_6$
一千二百七十五 (1000 200 70 5)		1275 MCCLXXV (1000 200 70 5)	1275	$(5523)_6$

Exercise 1.6. Give two situations where "zero" and "nothing" mean the same thing, and two situations where they don't.

Mean the same

- Debt: You owe Dr. Cummings $5... You give him $5... You now owe him zero dollars... You owe him nothing.
- Dinning: You're at a restaurant with friends. The restaurant only offers BBQ, but you're vegan. So you order nothing... you didn't order one item... You were there for the "vibes" and company.

Don't mean the same

- Record Keeping: Have information on people's first name and last name, but now want to keep note of their birthday. Until the fields are updated we have "nothing" ↓ NULL
- Using sets: $S=\{0,1,2,3,4\}$ In the set we have zero, one, two, three, and four as element in the set. The cardinality of the set is 5. If we were to remove all 5 elements in the set we wouldn't have 0 element... We would have an empty set... we would have nothing.

Exercise 1.7.

(a) In your opinion, why do/should people do math?

(b) In your opinion, why do/should people learn math?

(c) In your opinion, why do/should people teach math?

(d) How are these questions different?

(a) We do math because it is in our nature. Math isn't "invented" but is a function of all things… Without thinking an individual acts one way, but in a crowed they behave in another way. That it is advantageous for one, in an evolution standpoint, to know the difference of an and finding the tree that had many apples…

(b) People should learn math not necessarily for it's function and outputs, but to challenge one's logic and reasoning skills. To learn abstract tools and apply them in a specific/unique problem.

(c) Similar to part (b)… To articulate one's understanding is to teach it. Ideas or notions once thought was clear or is unknown can be challenge by others who have a different insight or worked out in collaboration.

(d) These questions are different, for that part-a questions if math is an invention by people or is inherent to all things: nature and the universe (you now know my stance). Part-b provokes the good for individual versus the masses/society… What does one gain by challenging yourself to learn math or what does society benefit from learning math concepts and principles.

Exercise 1.10. Show how one could calculate the following using the Tsinghua multiplication table.

$20+120+200+1200=1540$ $2.5+45+400=447.5$ $.25+2+5+25+200+500=732.25$

(a) $35 \cdot 44 = 1540$ (b) $89.5 \cdot 5 = 447.5$ (c) $50.5 \cdot 14.5 = 732.25$

1/2	1	2	3	4	5	6	7	8	9	10	20	30	40	50	60	70	80	90	
45	90	180	270	360	450	540	630	720	810	900	1800	2700	3600	4500	5400	6300	7200	8100	90
40	80	160	240	320	400	480	560	640	720	800	1600	2400	3200	4000	4800	5600	6400	7200	80
35	70	140	210	280	350	420	490	560	630	700	1400	2100	2800	3500	4200	4900	5600	6300	70
30	60	120	180	240	300	360	420	480	540	600	1200	1800	2400	3000	3600	4200	4800	5400	60
25	50	100	150	200	250	300	350	400	450	500	1000	1500	2000	2500	3000	3500	4000	4500	50
20	40	80	120	160	200	240	280	320	360	400	800	1200	1600	2000	2400	2800	3200	3600	40
15	30	60	90	120	150	180	210	240	270	300	600	900	1200	1500	1800	2100	2400	2700	30
10	20	40	60	80	100	120	140	160	180	200	400	600	800	1000	1200	1400	1600	1800	20
5	10	20	30	40	50	60	70	80	90	100	200	300	400	500	600	700	800	900	10
4 1/2	9	18	27	36	45	54	63	72	81	90	180	270	360	450	540	630	720	810	9
4	8	16	24	32	40	48	56	64	72	80	160	240	320	400	480	560	640	720	8
3 1/2	7	14	21	28	35	42	49	56	63	70	140	210	280	350	420	490	560	630	7
3	6	12	18	24	30	36	42	48	54	60	120	180	240	300	360	420	480	540	6
2 1/2	5	10	15	20	25	30	35	40	45	50	100	150	200	250	300	350	400	450	5
2	4	8	12	16	20	24	28	32	36	40	80	120	160	200	240	280	320	360	4
1 1/2	3	6	9	12	15	18	21	24	27	30	60	90	120	150	180	210	240	270	3
1	2	4	6	8	10	12	14	16	18	20	40	60	80	100	120	140	160	180	2
1/2	1	2	3	4	5	6	7	8	9	10	20	30	40	50	60	70	80	90	1
1/4	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	10	15	20	25	30	35	40	45	1/2