

HOMEWORK #2 - HISTORY OF MATH

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①. In order to use the Chinese remainder theorem, we have to make sure that the divisors are relatively prime with each other. This means that the G.C.D.'s must be equal to 1.

Next, we want to define $f(x) := (x \pmod{n_1}, x \pmod{n_2}, \dots, x \pmod{n_k})$ and construct a chart of plugging in various x values.

The bijection maps ~~that maps to~~ we create a table by selecting a closed interval between two numbers to select the range in which we want our x value to exist. ~~That range~~ We get this range by multiplying our ~~with~~ ~~we create a mapping where~~ divisors and subtracting by 1. So our closed interval is $[0, (n_1 n_2 \dots n_k) - 1]$

Our map will look like $[0, (n_1 n_2 \dots n_k) - 1] \rightarrow [0, n_1 - 1] \cdot [0, n_2 - 1] \dots [0, n_k - 1]$. This is a bijection.

After creating our chart listing all the $f(x) := (x \pmod{n_1}, \dots, x \pmod{n_k})$ between the x values of $[0, (n_1 n_2 \dots n_k) - 1]$ we can solve the problem.

② $\frac{1}{2} + \frac{1}{3} + \frac{1}{5} = \frac{31}{30} \Rightarrow FF\left(\frac{31}{30}\right) = x \Rightarrow \frac{1}{x} = \frac{30}{31}$ ~~ceil($\frac{30}{31}$) = 0~~

$$x = \frac{31}{\frac{30}{31}} = 1 \frac{1}{30} \Rightarrow \boxed{\frac{1}{2} + \frac{1}{2} + \frac{1}{30}}$$

In the context of dividing pizzas, the $\frac{1}{2} + \frac{1}{3} + \frac{1}{5}$ method is the best way to divide the pizza

③ (a) $f(x) := (x \pmod{3}, x \pmod{7}) \Rightarrow [0, 20]$

$f(0) = (0, 0)$	$f(5) = (2, 5)$	$f(10) = (1, 3)$	$f(15) = (0, 1)$
$f(1) = (1, 1)$	$f(6) = (0, 6)$	$f(11) = (2, 4)$	$f(16) = (1, 2)$
$f(2) = (2, 2)$	$f(7) = (1, 0)$	$f(12) = (0, 5)$	$f(17) = (2, 3)$
$f(3) = (0, 3)$	$f(8) = (2, 1)$	$f(13) = (1, 6)$	$f(18) = (0, 4)$
$f(4) = (1, 4)$	$f(9) = (0, 2)$	$f(14) = (2, 0)$	$f(19) = (1, 5)$
			$f(20) = (2, 6)$

$$\boxed{x_1 = 20 \quad x_2 = 41}$$

	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
3	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0	1	2	0
7	0	1	2	3	4	5	6	0	1	2	3	4	5	6	0	1	2	3	4	5	6	0

(b) $f(x) := (x \pmod{3}, x \pmod{2})$; $\mathbb{Z} := (\mathbb{Z}, +) \Rightarrow [0, 20]$

$x_1 = 4 \quad x_2 = 25$

(c) $x_1 = 9 \quad x_2 = 51$

	43	44		48		51								
3	1	2	0	1	2	0	1	2	0	1	2	0	1	2
7	1	2	3	4	5	6	0	1	2	3	4	5	6	0

$\frac{1}{3} + \frac{1}{5} + \frac{1}{7} = \frac{31}{105}$

- (1) $(0, 0) = (0, 0)$
- (2) $(0, 1) = (1, 0)$
- (3) $(0, 2) = (2, 0)$
- (4) $(0, 3) = (3, 0)$
- (5) $(0, 4) = (4, 0)$
- (6) $(0, 5) = (5, 0)$
- (7) $(0, 6) = (6, 0)$
- (8) $(0, 0) = (0, 0)$
- (9) $(1, 0) = (1, 0)$
- (10) $(1, 1) = (2, 1)$
- (11) $(1, 2) = (3, 2)$
- (12) $(1, 3) = (4, 3)$
- (13) $(1, 4) = (5, 4)$
- (14) $(1, 5) = (6, 5)$
- (15) $(1, 6) = (7, 6)$
- (16) $(2, 0) = (2, 0)$
- (17) $(2, 1) = (3, 1)$
- (18) $(2, 2) = (4, 2)$
- (19) $(2, 3) = (5, 3)$
- (20) $(2, 4) = (6, 4)$
- (21) $(2, 5) = (7, 5)$
- (22) $(2, 6) = (8, 6)$
- (23) $(3, 0) = (3, 0)$
- (24) $(3, 1) = (4, 1)$
- (25) $(3, 2) = (5, 2)$
- (26) $(3, 3) = (6, 3)$
- (27) $(3, 4) = (7, 4)$
- (28) $(3, 5) = (8, 5)$
- (29) $(3, 6) = (9, 6)$
- (30) $(4, 0) = (4, 0)$
- (31) $(4, 1) = (5, 1)$
- (32) $(4, 2) = (6, 2)$
- (33) $(4, 3) = (7, 3)$
- (34) $(4, 4) = (8, 4)$
- (35) $(4, 5) = (9, 5)$
- (36) $(4, 6) = (10, 6)$
- (37) $(5, 0) = (5, 0)$
- (38) $(5, 1) = (6, 1)$
- (39) $(5, 2) = (7, 2)$
- (40) $(5, 3) = (8, 3)$
- (41) $(5, 4) = (9, 4)$
- (42) $(5, 5) = (10, 5)$
- (43) $(5, 6) = (11, 6)$
- (44) $(6, 0) = (6, 0)$
- (45) $(6, 1) = (7, 1)$
- (46) $(6, 2) = (8, 2)$
- (47) $(6, 3) = (9, 3)$
- (48) $(6, 4) = (10, 4)$
- (49) $(6, 5) = (11, 5)$
- (50) $(6, 6) = (12, 6)$

$A = x \quad 10 = x$