180 - 209

$\frac{N}{3} = \frac{\alpha}{3} + \frac{\beta}{3}$

2 : 0
3 : 1
5 : 4

(0, 1, 4)

R_2 R_3 R_5

$0(1,0,0) + 1(0,1,0) + 4(0,0,1)$

$= 10 + 4(6)$

$= 34$

$= 4$

214

184

154

7 11 13

$924 = 77 \cdot 12 = (0,0,1)$

$364 = 91 \cdot 4 = (0,1,0)$

$715 = 143 \cdot 5 = (1,0,0)$

$77x \equiv 1 \mod 13 \Rightarrow 11x \equiv 2 \Rightarrow 66x = 12 \Rightarrow x = 12$

$91x \equiv 1 \mod 11 \Rightarrow 3x = 1 \Rightarrow 12x = 4 \Rightarrow x = 4$

$143x \equiv 1 \mod 7 \Rightarrow 3x = 1 \Rightarrow 15x = 5 \Rightarrow x = 5$

$1001 = 7 \cdot 11 \cdot 13$

$|0| \mod 7 \equiv 3$

$|0| \mod 11 = 2$

$|0| \mod 13 = 10$

$(3, 2, 10) \rightarrow 3 \cdot (715) + 2 \cdot (364) + 10 \cdot (924)$

7 11 13

$2145 + 728 + 9240$

$12113 \equiv 101$

$a \cdot F_1$ "=" $a \cdot F_2$

↓

$$\frac{a \cdot F_1}{b} = Q_1 + \frac{R}{b}$$

$$\frac{a \cdot F_2}{b} = Q_2 + \frac{R}{b}$$

	1	2
1	0	1
2	-1	0

$$\frac{a \cdot (F_1 - F_2)}{b} = Q_1 - Q_2$$

	1	2	3
1	0	1	2
2	-1	0	1
3	-2	-1	0

$$\frac{a \cdot F_{\text{ROMADONTREUSE}}}{b} = \text{integer}$$

equiv $a \cdot F_{\text{ROMADONTREUSE}} \rightarrow 0 \bmod b$

possible values of F_1 and F_2: $1, 2, \dots, b$

$F_{\text{ROMADONTREUSE}}$ is a multiple of b

$F_1 - F_2$ is a multiple of b

Possible values of $(F_1 - F_2)$:

smallest: ~~b~~ $-(b-1)$

biggest: $b-1$

$-(b-1), \dots, -1, 0, 1, \dots, b-1$

candidates: 0

$F_1 - F_2 = 0$

$F_1 = F_2$

$a \cdot (F_S) + b(-Q) = 1$

$b, 11$

$a \cdot F_S \to 1$

$\frac{a \cdot F_S}{b} = Q + \frac{1}{b}$

$a \cdot F_S = b \cdot Q + 1$

$b \cdot n$ is 0 mod 11

$b \cdot n$ is divisible by 11 (multiple of 11)

n is a multiple of 11

a, b — co-prime

$F = 1, 2, 3, \ldots, b$

$a \cdot F$ is 0 mod b

$a \cdot F$ is divible by b

F is a multiple of b

$F = b$

$a \cdot F_1 = a \cdot F_2$

$F_1 = F_2$

~~35 50 7~~

$6p+10q=2$

6, 10, 15

3·2 5·2 3·5

$6x+10y+15z=1$

2 5

6, 10

↓

2 / 3, 5

↓

1

6, 15

↓

5 / 2, 3

↓

1

$5a+2b=1$

$a=1$

$b=-2$

$15\cdot(1)+10\cdot(-1)=5$

$6\cdot(2)+10\cdot(-1)=2$

$\left(15\cdot(1)+10\cdot(-1)\right)\cdot(1)+\left(6\cdot(2)+10\cdot(-1)\right)\cdot(-2)=1$

$15\cdot(1)+$

$10\cdot(-1+2)$

$+\ 6\cdot(-4)=1$

$x=-4$

$y=1$

$z=1$

(0, 1, 1)

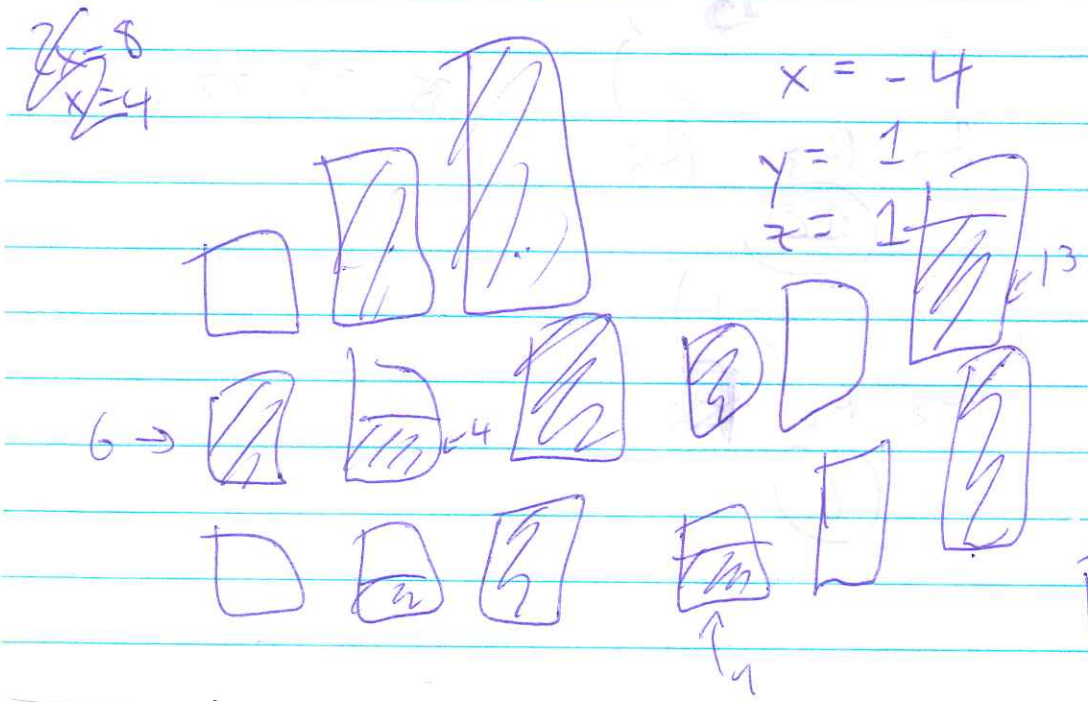
(0, 1, 1)

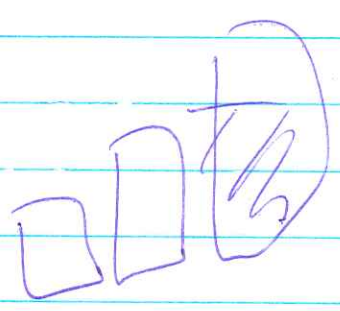
(-1, 1, 1)

(-1, 1, 1)

(-1, 1, 1)

(-2, 1, 1)





2·3 2·5 3·5

$6\cdot(1)+10\cdot(1)+15\cdot(-1)=1$

$(0,0,1)\quad(0,1,0)\quad(1,0,0)$

$2\cdot3\cdot5=30$

$0,\dots,29$

$(x,y,z)=x(1,0,0)+y(0,1,0)+z(0,0,1)$

$R_2\quad R_3\quad R_5$

$0+10+0=1$

$(1,0,0)$ $(0,1,0)$ $(0,0,1)$

R_2 R_3 R_5

15

$(0,1,0)$

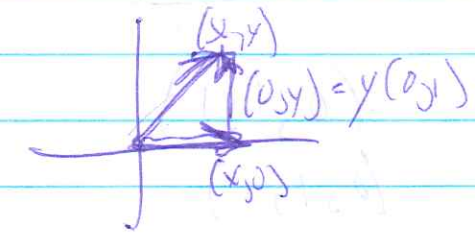
R_2 R_3 R_5

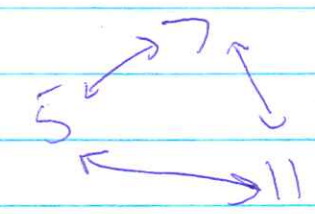
10

$(0,0,1)$

R_2 R_3 ~~R_5~~

6





35, 55, 77

$$35x + 55y + 77z = 1$$

$7 \uparrow 5$ $\quad 11 \uparrow 5$ $\quad 11 \uparrow 7$

$35, 55 \downarrow 5 \;/\; 7, 11 \Rightarrow 1$

$55, 77 \downarrow 11 \;/\; 5, 7 \Rightarrow 1$

$5a + 11b = 1$

$a = -2$

$b = 1$

~~$35(\quad) + 55(\quad) = 5$~~ $\quad 5(3) + 7(-2) = 1$

$7(-3) + 11(2) = 1$

~~$[5] \cdot (-2) + [11] \cdot (1) = 1$~~

$[35(-3) + 55(2)] \cdot (-2) + [55(3) + 77(-2)] \cdot (1) = 1$

$35(6) + [55(-4) + 55(3)] + 77(-2) = 1$

$35(6) + 55(-1) + 77(-2) = 1$

Sharona Franko

Sharona Franko

Sharona Franko

$2x = 10$

$x = 5$

Danny Hermes

Danny Hermes

Sharona Franko

Daniel Jerome Hermes

D D

Sharona Franko

$\frac{n}{2}$

ice how?

$a \cdot F \to 0$

$a \cdot F$

b

let me try the other one

a, b → $2 \cdot a$ → $3 \cdot a$ → multiples of a

$a \mid 0$

$b \mid 0$

$b \cdot a = 0$

Verify:

Assume: a, b co-prime

Verify: Circle has all values $0, 1, 2, \ldots, b-1$

$b \cdot a = 0$, no other multiples of a are 0

(7,11) (17,61)

$7x + 11y = 1$

11, 22, 33, 44, 55, 66, 77...

7

$7(-3) + 11(2) = 1$

$11 = 7(1) + 4$

$7 = 4(1) + 3$

$4 = 3(1) + 1$

$11 = E \quad 7 = S$

$4 = E - S(1)$

$S = 4(1) + 3$

$S = (E - S(1))(1) + 3$

$3 = S - E + S(1)$

$3 = 2S - E$

$1 = 4 - 3$

$1 = (E - S) - (2S - E)$

$1 = 2E - 3S$

$1 = 2(11) - 3(7)$

$17x + 61y = 1$

$61 = 17(3) + 10$

$17 = 10(1) + 7$

$10 = 7(1) + 3$

$7 = 3(2) + 1$

~~$17 = 8 = 61$~~

$A = 17 \quad B = 61$

$10 = B - 3A$

~~$7 = A - 1(B - 3A)$~~

$7 = 4A - B$

~~$3 = B - 3A - 4A + B$~~

$3 = 2B - 7A$

~~$1 = 4A - B - 2(2B - 7A)$~~

$1 = 4A - B - 4B + 14A$

$1 = 18A - 5B$

$x = 18$

$y = -5$

a, b = constants > 0

$ax = b$
$x = b/a$

$ax + by = 1$

$\Updownarrow$

$a = Ad$
$b = Bd$

$Adx + Bdy = 1$
$d(Ax + By) = 1$

$d = 1$

Need: a, b ~~can't share factor~~ (other than 1)

$\Downarrow$

~~Is~~ there always solution?

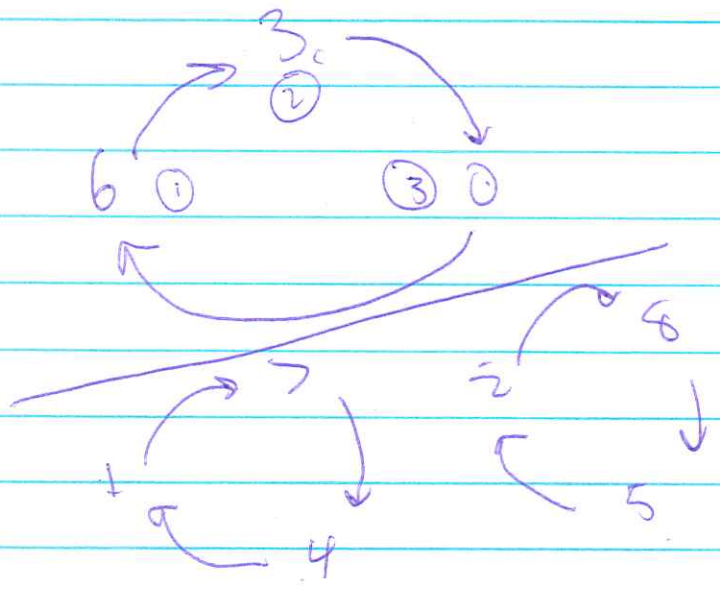
$2x + 5y = 1 \Rightarrow (-2, 1)$
$6x + 7y = 1 \Rightarrow (-1, 1)$
$5x + 13y = 1 \Rightarrow (-5, 2)$

$5x + by = 1 \rightarrow$ b not multiple of 5

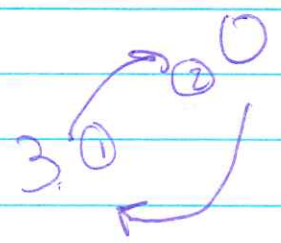
2.6, 3.6, 9.6

6,9

mult. of 6



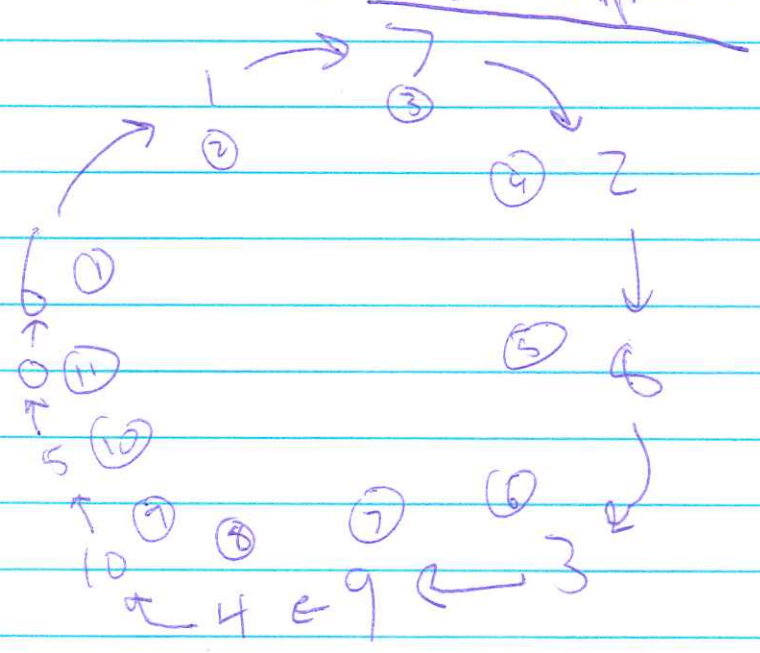
9,6



6,11

$6 \cdot n \to 0 \pmod{11}$

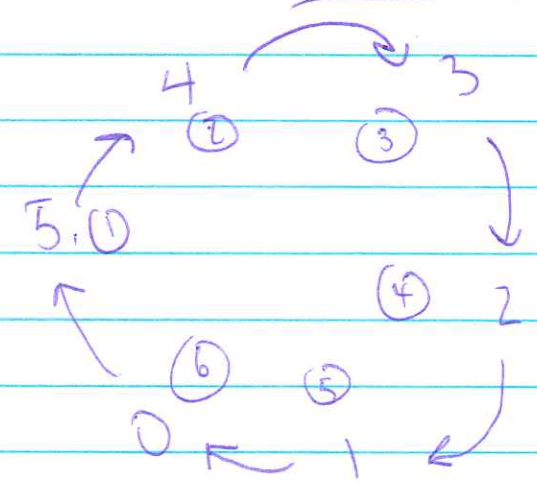
↳ n is multiple of 11



11,6

$11 \cdot n \to 0 \pmod{6}$

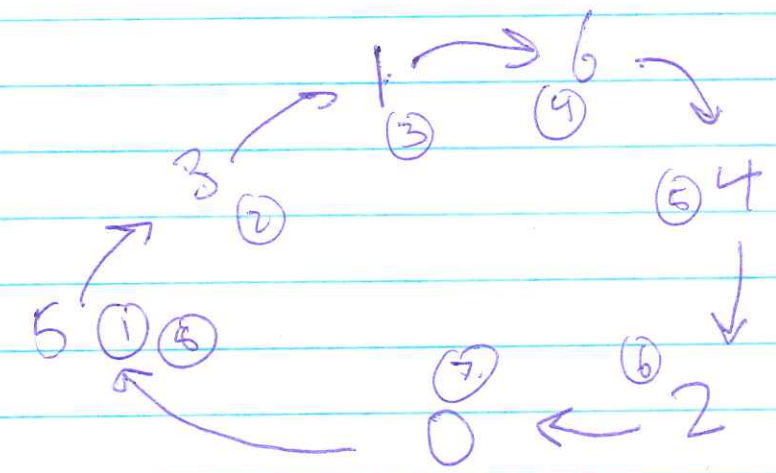
↳ n is multiple of 6.



$11 \cdot 6 \leftrightarrow 0$

5, 7 $5(3)+7(-2)=1$

5, 2.5, 3.5, 4.5, 5.5, 6.5, 7.5



$\frac{N}{D} = Q + \frac{R}{D}$

$\frac{N+V}{D} = \frac{N}{D} + \frac{V}{D}$

$= Q + \frac{R}{D} + \frac{V}{D}$

$= Q, \neq \frac{(R+V)}{D}$