

Recall: Modular Arithmetic

Divisibility by 3 and 9

No missing.

+2B #17, 28

+B #16, 18, 20, 21, 8, 9

1] Divisibility by 6

0, 1, 2, 3, 4, 5, 6, ... 17

mod 6

mod 3

	0	1	2
0	0	4	2
mod 2 1	3	1	5

$$721 \xrightarrow{\text{mod } 6} \equiv 1 \pmod{6}$$

2] Divisibility by 11

← ... + - +

$$12345 = 1 \cdot 10^4 + 2 \cdot 10^3 + 3 \cdot 10^2 + 4 \cdot 10^1 + 5$$

$$\equiv 1(-1)^4 + 2(-1)^3 + 3(-1)^2 + 4(-1) + 5 \pmod{11}$$

$$\equiv 1 - 2 + 3 - 4 + 5$$

$$\equiv 3 \pmod{11}$$

alternate +/− R to L

← - + - +

$$2345 \equiv 2 \pmod{11}$$

e.g.

05562267

$$\underbrace{0} \quad \underbrace{55} \quad \underbrace{62} \quad \underbrace{26} \quad \underbrace{7} \\ 5 \quad 1 \quad 0 \quad 1 \quad = 7$$

$$\cancel{055} \cancel{622} \cancel{67} \equiv 7$$

Exer

$$3334440 \equiv ?$$

3) Divisibility by 7

$$8612345 = 8 \cdot 10^6 + 6 \cdot 10^5 + 1 \cdot 10^4 + 2 \cdot 10^3 + 3 \cdot 10^2 + 4 \cdot 10^1 + 5$$

$$\begin{array}{ccccccc} \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ \dots & 1 & -2 & -3 & -1 & 2 & 3 & 1 \end{array} \pmod{7}$$

$$\equiv 8 + (-1)(-2) + 1(-3) + (2)(-1) + (3)(2) + 12 + 5$$

$$\equiv 1 + 2 - 3 - 2 - 1 + 5 + 5$$

$$\equiv 7 \equiv 0 \pmod{7}$$

exer

$$\textcircled{1} \quad \underline{1 \ 000 \ 000} \equiv 1$$

$$\textcircled{2} \quad 1 \ 254 \ 254 \equiv 1$$

$$\begin{array}{ccc} \overbrace{1 \ -2 \ -3} & \overbrace{-1 \ 2 \ 3} & 1 \\ 2 \ 5 \ 4 & 2 \ 5 \ 4 & 2 \end{array} \equiv 2$$

$$\underline{2 \ 000 \ 005}^+ \equiv 2000000 + 5 \equiv 7$$

Jeopardy Game :

Room : F P D S V M

Fatima Z

Faisal F

Rola A 650

+2B#17,28
Shaima A 400

Talha B —
Amer F

Nora L 150
+B#16,18,20,21,8,9

+B Faisal A 200