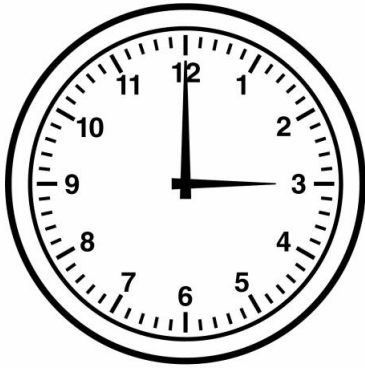


UW Math Circle
January 19th, 2017

1. Modular arithmetic practice! Fill in the blank with the smallest non-negative integer that satisfies the equation.

- (a) $6 \equiv \underline{\hspace{1cm}} \pmod{4}$
- (b) $-14 \equiv \underline{\hspace{1cm}} \pmod{4}$
- (c) $43 \equiv \underline{\hspace{1cm}} \pmod{4}$
- (d) $80 \equiv \underline{\hspace{1cm}} \pmod{4}$
- (e) $163 \equiv \underline{\hspace{1cm}} \pmod{4}$
- (f) $80 \cdot 163 \equiv \underline{\hspace{1cm}} \pmod{4}$
- (g) $9 \equiv \underline{\hspace{1cm}} \pmod{7}$
- (h) $22 \equiv \underline{\hspace{1cm}} \pmod{7}$
- (i) $75 \equiv \underline{\hspace{1cm}} \pmod{7}$
- (j) $2 \cdot 22 + 4 \cdot 75 \equiv \underline{\hspace{1cm}} \pmod{7}$
- (k) $(n + 1)^2 \equiv \underline{\hspace{1cm}} \pmod{n}$
- (l) $2 + 4 + 6 + \cdots + 2n \equiv \underline{\hspace{1cm}} \pmod{n}$



2. Show that $n^3 + 2n$ is always divisible by 3.

3. Show that a number is divisible by 4 if and only if its last two digits are divisible by 4.

4. Show that a number is divisible by 9 if and only if the sum of its digits is divisible by 9.

5. What is the last digit of 2016^{2016} ? What about 2017^{2017} ?

6. What day of the week will it be 200017 days from today?

