

Name: _____

Key

Quiz Score: _____ /20

Quiz 10: Friday, April 24, 2015*No calculators.*

1. (4 pts) Complete the following (formal) definition.

Let $n \in \mathbb{N}$. For two integers a and b , we say that a is congruent to b modulo n and write $a \equiv b \pmod{n}$, if

$$n \mid (a - b).$$

2. (16 pts) On the planet Modula, each day is divided into 13 hours total (so midnight is 13 o'clock).

- (a) If it is now 10 o'clock, what time will it be in 10 hours?

$$10 + 10 = 20 \equiv 7 \pmod{13}$$

So it will be 7:00.

- (b) If a doctor works a 20-hour shift starting at 4 o'clock, what time will it be when her shift ends?

$$4 + 20 = 24 \equiv 11 \pmod{13}$$

So it will be 11:00.

- (c) A lawyer with a big case coming up starts working at 5 o'clock and completes his billable hours for the case at 5 o'clock. What can you say about how long the lawyer worked?

*He worked some multiple of 13 hours.**(13, 26, 39, ... etc.)*

- (d) A team of 6 people, working against a deadline, starts today at 3 o'clock. The team members work 9-hour shifts one after another. If every team member works one shift, what time will it be when they finish? (Ignore the day of the week.)

$$3 + 6(9) = 3 + 54 = 57 \equiv 5 \pmod{13}$$

So it will be 5:00.