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Homework Assignment 5
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1. The Division Algorithm

1. What are the quotient and remainder when

a) 44 is divided by 8?

• **Solution**

$$\text{Set } 44 = q \cdot 8 + r$$

here we can now start to solve for q and r

now we solve for q and r

$$\therefore \text{quotient (q) = 5 and remainder (r) = 4}$$

b) -1 is divided by 23?

• **Solution**

$$\text{Set } -1 = q \cdot 23 + r$$

now we solve for quotient (q) and remainder (r)

$$\therefore q = -1 \text{ and } r = 22$$

c) -2002 is divided by 87?

• **Solution**

$$\text{Set } -2002 = q \cdot 87 + r$$

now we solve for quotient (q) and remainder (r)

$$\text{this gives us } q = -24 \text{ and } r = 86$$

d) 0 is divided by 17?

• **Solution**

$$\text{Set } 0 = q \cdot 17 + r$$

now we solve for quotient (q) and remainder (r)

$$\text{since the result is 0, this means both } q \text{ and } r = 0$$

2. What time does a 24-hour clock read

a) 100 hours after it reads 2:00?

- **Solution**

Since it is 2:00 we can add it to 100hrs

this will give us 102hrs

now we divide 102 by number of hours in a day (24)

this give us a remainder of 6 which represents the time it will be after 100 hours

\therefore 6:00

b) 168 hours after it reads 19:00?

- **Solution**

Since it is 19:00 we add $19 + 168$

this gives us 187

we divide 187 by 24

this gives us a remainder of 19

\therefore 19:00

2. Decide whether each of these integers is congruent to 3 modulo 7.

a) 37

- **Solution**

when we take $37 \bmod 7$ we get a remainder of 2

$2 \neq 3$

\therefore not congruent

a) -17

- **Solution**

when we take $-17 \bmod 7$ we get a remainder of 4

$4 \neq 3$

\therefore not congruent

2. Modular Arithmetic.

1. Complete the following operations modulo m where $m = 13$.

a) $4+_m 11$

- **Solution**

we know $4 + 11 = 15$

then $15 = 2 \cdot 4 + 7$

and then $15 \bmod 4 = 7$

$\therefore 4+_m 11 = 7$

a) $4*_m 11$

- **Solution**

we know $4 * 11 = 44$

then $44 = 3 \cdot 13 + 5$

and then $44 \bmod 13 = 5$

$\therefore 4*_m 11 = 5$