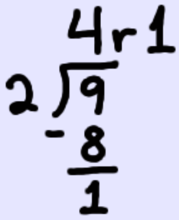
1. More definitions

Modulus

"In computing, the modulo operation finds the remainder after division of one number by another (sometimes called modulus).

Given two positive numbers, a (the dividend) and n (the divisor), a modulo n (abbreviated as a mod n) is the remainder of the Euclidean division of a by n." [a]



9 mod 2 = 1

If we're dividing a by b, the result is a quotient q. If we're calculating a mod b, the result is the remainder r.

We can also write this out as:
$a = b \cdot q + r$, where $0 \leq r < b$, and q and r are the only two integers that will satisfy the equation.

[a]From https://en.wikipedia.org/wiki/Modulo_operation

Rational numbers

In mathematics, a rational number is any number that can be expressed as the quotient or fraction p/q of two integers, a numerator p and a non-zero denominator q.[1] Since q may be equal to 1, every integer is a rational number. [a]

The set of rational numbers is written as $\mathbb{Q}$.

[a]From https://en.wikipedia.org/wiki/Rational_number

Question 1
Prove the following

Example: Solve 13 mod 5
13 / 5 = 2, 13 mod 5 = 3, $13 = 5 \cdot 2 + 3$

a. 9 mod 7 $(13 = 15 \cdot q + r ...)$ 9 mod 7 = 2; $9 = 7 \cdot 1 + 2$

b. 5 mod 2 5 mod 2 = 1; $5 = 2 \cdot 2 + 1$

c. 15 mod 3 15 mod 3 = 0; $15 = 3 \cdot 5 + 0$

d. -7 mod 2 -7 mod 2 = 1; $-7 = 2 \cdot -4 + 1$

Question 2
Prove the following propositions:

a. If a divides b and a divides c, then a divides $b + c$. [1]

Start with: $b = ak$ and $c = aj$ and calculate $b + c$.

$b = ak, c = aj$ $=> b + c = ak + aj$ $=> a(k + j)$

b. If a divides b and c divides d, then ac divides bd. [2]

Start with: $b = ak, d = cj$ and calculate bd.

$b = ak, d = cj$ $=> bd = (ak)(cj)$ $=> (ac)(kj)$

[1] From Discrete Mathematics by Ensley and Crawley
[2] From Discrete Mathematics by Ensley and Crawley