# rules of modular arithmetic

## Addition (and subtraction)

If $a \equiv b \mod m$ and

$c \equiv d \mod m$ then

$$a + c \equiv b + d \mod m$$

## Multiplication

If $a \equiv b \mod m$ and

$c \equiv d \mod m$ then

$$a \times c \equiv b \times d \mod m$$

# Division

The remainder after division is always congruent to the number we are dividing.

# Example.

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# rules of modular arithmetic

**Addition (and subtraction)**

If $a \equiv b \mod m$ and

$c \equiv d \mod m$ then

$a + c \equiv b + d \mod m$

Example,

$87 \equiv 2 \mod 17$ and

$222 \equiv 1 \mod 17$

$\implies 87 + 222 \mod 17 \equiv 2 + 1 \mod 17 \equiv 3 \mod 17$

**Multiplication**

If $a \equiv b \mod m$ and

$c \equiv d \mod m$ then

$a \times c \equiv b \times d \mod m$

Example,

$9876 \equiv 6 \mod 10$ and

$17642 \equiv 2 \mod 10$

$\implies 9876 \times 17642 \mod 10 \equiv 6 \times 2 \mod 10 \equiv 2 \mod 10$

**Division**

The remainder after division is always congruent to the number we are dividing.

Example,

What is the remainder of $17 \times 18$ when it is divided by $19$?

We know that $17 \equiv -2 \mod 19$ and $18 \equiv -1 \mod 19$

$\implies 17 \times 18 \equiv (-2) \times (-1) = 2 \mod 19$

# Boolean algebra