

Team Name:

Instructions

Only one sheet per team will be turned in. Each team member can work on their own sheet for practice, but then the group as a whole should discuss the answers and collaborate on the turn-in sheet. Everyone can take home their own sheets.

Team Info (only fill out for the sheet to be turned in)

Team Name:

Group members (up to four):

1.

2.

3.

4.

Introduction 1

Modulus is a mathematical operation where the result is the *remainder* of a division.

For example, $9 / 2 = 4.5$ (or, $4 + 1/2$)

If we did integer division (meaning no remainder), $9 / 2 = 4$.

Then, if we do $9 \bmod 2$, the result of that is 1.

In general terms, $a \bmod b = r$, and $a = b \cdot q + r$

$$\begin{array}{r} 4 \text{ r } 1 \\ 2 \overline{) 9} \\ \underline{- 8} \\ 1 \end{array}$$

Question 1

Calculate the following. Also express $a = b \cdot q + r$, where $0 \leq r < b$; r is the answer.

a) $13 \bmod 5$ ($13 = 5 \cdot q + r$)

b) $-19 \bmod 3$

c) $7 \bmod 9$

d) $21 \bmod 7$

Introduction 2

A counterexample is a way to disprove a proposition. For implications, if we can come up with *some hypothesis* that results in the *conclusion* being false, then we can disprove a statement.

In Practice Problem 4 from book, the statement is made...:

For every integer $n \geq 1$, if n is odd, then $n^2 + 4$ is a prime number.

Several examples given don't disprove this statement:

$$3^2 + 4 = 13, \quad 5^2 + 4 = 29, \quad 7^2 + 4 = 53$$

But as long as at least one can be found, then we can use this as a counterexample to disprove it:

$$9^2 + 4 = 85, \quad 85 \text{ is divisible by } 5 \text{ and } 17.$$

Question 2

Prove the following: If n is odd, then $n^2 + 2n$ is odd.