

WARM-UP

Problem 1 Illustrate $323 + 615 = 938$ with diagrams similar to Theorem 1.5 on page 112 of P & B using the “...” notation.

Problem 2 Use the Divisibility Test for 11 to determine whether or not 10,234,341 is divisible by 11.

Problem 3 Use the Divisibility Test for 8 to determine whether or not 10,234,824 is divisible by 8.

PROBLEMS

Problem 4 State and prove the Divisibility Test for 5. Be prepared to present your solution to me at the board.

Problem 5 In mathematics, most theorems are stated in the form “If PROPOSITION ONE then PROPOSITION TWO”, where this is taken to mean that whenever PROPOSITION ONE is true, then PROPOSITION TWO is true. PROPOSITION ONE is called the *hypothesis* and PROPOSITION TWO is called the conclusion. For this problem, we will discuss the (baby) theorem “If a number is divisible by 4, then it is divisible by 2.”

- First, write down a few examples to convince yourself that our theorem is true.
- In our theorem, what is the hypothesis? What is the conclusion?
- The *converse* of a theorem is the same statement, but with PROPOSITION ONE and PROPOSITION TWO reversed. In other words, the converse to “If PROPOSITION ONE then PROPOSITION TWO” is “If PROPOSITION TWO then PROPOSITION ONE.” What is the converse of our theorem?
- Is the converse of our theorem true?
- The *contrapositive* of a statement is the “negated converse” of the statement; in other words, the contrapositive of “If PROPOSITION ONE then PROPOSITION TWO” is “If PROPOSITION TWO IS FALSE then PROPOSITION ONE IS FALSE.” What is the contrapositive of our theorem?
- Is the contrapositive of our theorem true?

Problem 6 Use the Divisibility Lemma (on page 114 of P & B) to answer the following questions:

- Suppose that A is divisible by k and B is not divisible by k . Is $A + B$ divisible by k ?
- Suppose that A is not divisible by k and $A + B$ is not divisible by k . Is B divisible by k ?

There should be 7 similar questions (in total, including the two above) that you can ask. List them and answer them.