4.1 Completed Notes

4.1: Divisibility

Definition: For two whole numbers a and b, $b \neq 0$, we say b divides a, written as $b \mid a$, if $a \div b$ is a whole number. Other ways to say this are "a is divisible by b", "b is a divisor of a", "a is a multiple of b", and "b is a factor

Divisibility Rules: Let n be a whole number.

 $2 \mid n$ if and only if n ends in an even number.

 $3 \mid n$ if and only if the sum of the digits of n is divisible by 3. Example: Show 3 | 5352

 $4 \mid n$ if and only if 4 divides the last 2 digits of n. Example: Show $4 \mid 1880$.

 $5 \mid n$ if and only if n ends in either 0 or 5

- 2 | 0, so 2 | 1680 3 |+6+8+0=15. 3 | 15, so 3 | 1680 4) 4 | 80, so 4 | 1680
- B ends in 0, so 5/1680
- 6 23 1680, 50 6 1680
- D 168-2.0=168 16-2.8=0 7/0, su 7/1680
- © 8 | 680, so 8 | 1680

 9 9 | 15, so 9 | 1680

 Adoes not divide

- (10) ends in 0, so 10/1680
- (1) $1680 \rightarrow 1-6+8-0=3$ 11/13, so 11/1680.

Example: Determine which of the numbers 2 through 11 divide 13860.

4 60, so 4 13860

6 Ends in 0, so 5 | 13860.

62,3 | 13860, so 6 | 13860.

138-2.6= 126

12-2-6=0

7/0, so 7/13860.

Divisibility Rules: Let n be a whole number

 $6 \mid n$ if and only if $2 \mid n$ and $3 \mid n$.

For 7, form a new number k by taking off the last digit of n and subtracting its double from the result. Then $7 \mid n$ if and only if $7 \mid k$. Example: Show that $7 \mid 3654$.

7 21, 50 7 357 365-2.4=357 Thus, 7 3654 35-2.7=21

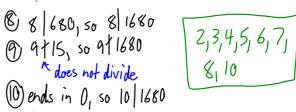
 $8 \mid n$ if and only if 8 divides the last 3 digits of n.

 $9 \mid n$ if and only if the sum of the digits of n is divisible by 9

 $10 \mid n$ if and only if n ends in 0

For 11, we form a new number k by adding then subtracting the digits of n. It is important that we consider the sign of the first digit as part of this addition and subtraction. Then $11 \mid n$ if and only if $11 \mid k$. Example: Show that $11 \mid 1485$.

Example: Determine which of the numbers 2 through 11 divide 1680. Justify



$$0 \downarrow 680 \rightarrow 1-6+8-0=3$$

$$11 \uparrow 3, so 11 \uparrow 1680.$$

Example: Determine which of the numbers 2 through 11 divide 13860. Justify each of your tests.

8) 8+860, so 8+13860

9) 9/18, so 9/13860

(10) ends in 0, so 10, 13860

(1) $\frac{13860}{13860} \rightarrow 1-3+8-6+0=0$ 110, so 11/1386C.