**Lesson 11 Notes: Divisibility Rules**

**ANSWER KEY**

The study of non-zero whole numbers and their relationships

**What is Number Theory?**

“a is a factor of b”

\* a is a factor of b

\* b is a multiple of a

factor

One important relationship in number theory is that between a **factor** and a **multiple**:

If one number is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a second number, then the

second number is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the first.

Example: 3 is a factor of 12 and 12 is a multiple of 3.

We can also say that “3 divides 12”

multiple

a | b

**Divides:**

So, “a divides b” means that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

and we write this as \_\_\_\_\_\_\_\_\_\_

**Example:**

27 is a multiple of 3

3 is a **factor** of 27 because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3 | 27 \* remember, no remainder!

In other words, “3 **divides** 27” written as \_\_\_\_\_\_\_\_\_\_

It is false that 4 | 10 because 10 is not a multiple of 4 and 10/4 = 2R2…there is a remainder!

**Example:**

4 is not a factor of 10 because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Example:** True or False

1. 15 l 60 (b) 2 l 8 (c) 8 l 2

FALSE

TRUE

TRUE

1. 8 l 3 (e) 2 l 0 (f) 3 l 19

0/2??

FALSE

FALSE

TRUE

Any number that can be exactly divided by 2

**\* Definition of Even**

Any number that cannot be exactly divided by 2

**\* Definition of Odd**

**Divisibility Rules**

We will explore some tips and tricks for Divisibility Rules for #1-13!!

\*\*See other handout: Lesson 11 Divisibility Rules

**Example:** True or False, explain WHY using the Divisibility Rules.

1. 2 l 13,776 (b) 5 l 3135

True, b/c the number ends in 5

True, b/c the number is even

1. 3 l 2847 (d) 9 l 147,389

1+4+7+3+8+9=32 and 32/9 is false

2+8+4+7=21 and 21/3 or 3 | 21

False, b/c 9 does not divides into the sum of digits

True, b/c 3 divides into the sum of digits

1. 6 l 2,100,000,472 (f) 4 l 476,025,314

False, b/c 4 does not divide into the sum of digits

4 | 14? No

False, b/c the number is not divisible by both 2 and 3.

2? Yes 3? 2+1+4+7+2= 16 but false 16/3

A number that divides the given number exactly with NO remainder!

**Definition of Factor**

\*Construct a table listing the factors of the following numbers:

|  |  |  |
| --- | --- | --- |
| Number | Factors | Number of Factors |
| 8 | 1, 8, 2, 4 | 4 |
| 22 | 1, 22, 2, 11 | 4 |
| 30 | 1, 30, 2, 15, 3, 10, 5, 6 | 8 |
| 44 | 1, 44, 2, 22, 4, 11 | 6 |
| 50 | 1, 50, 2, 25, 5, 10 | 6 |
| 60 | 1, 60, 2, 30, 3, 20, 4, 15, 5, 12, 6, 10 | 12 |
| 17 | 1, 17 | 2 |
| 25 | 1, 25, 5 | 3 |
| 9 | 1, 9, 3 | 3 |
| 1 | 1 | 1 |

**Questions:**

1. Will there be numbers other than 1 with only one factor?

NO

1. What kinds of numbers have an odd number of factors?

Perfect square root numbers

1. Are there numbers with more than six factors?

YES

1. What kind of numbers have only two factors?

Prime numbers

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Divisibility Rules**

**Divisibility Rules**

**1** All numbers are divisible by 1.

**2** If the last digit is even, the number is divisible by 2.

**3** If the sum of the digits is divisible by 3, the number is also.

**4** If the last two digits form a number divisible by 4, the number is also.

**5** If the last digit is a 5 or a 0, the number is divisible by 5.

**6** If the number is divisible by both 3 and 2, it is also divisible by 6.

**7** Take the last digit, double it, and subtract it from the rest of the number; if the answer is divisible by 7 (including 0), then the number is also.

**8** If the last three digits form a number divisible by 8, then so is the whole number.

**9** If the sum of the digits is divisible by 9, the number is also.

**10** If the number ends in 0, it is divisible by 10.

**11** Alternately add and subtract the digits from left to right. (You can think of the first digit as being 'added' to zero.) If the result (including 0) is divisible by 11, the number is also. Example: to see whether 365167484 is divisible by 11, start by subtracting: [0+]3-6+5-1+6-7+4-8+4 = 0; therefore 365167484 is divisible by 11.

**12** If the number is divisible by both 3 and 4, it is also divisible by 12.

**13** Delete the last digit from the number, then subtract 9 times the deleted digit from the remaining number. If what is left is divisible by 13, then so is the original number.