Study Guide: 5.3 Prime/Composite and Even/Odd

Standard: 5.1- The student will a) identify and describe the characteristics of prime and composite numbers; and b) identify and describe the characteristics of even and odd numbers.

What you need to know how to do:

- Identify prime numbers less than 100. (a)
- Identify composite numbers less than or equal to 100. (a)
- Demonstrate with concrete or pictorial representations and explain orally or in writing why a number is prime or composite. (a)
- Identify which numbers are even or odd. (b)
- Demonstrate with concrete or pictorial representations and explain orally or in writing why a number is even or odd. (b)
- Demonstrate with concrete or pictorial representations and explain orally or in writing why the sum or difference of two numbers is even or odd. (b)
- Students should use rules to categorize numbers into groups of odd or even. Rules can include:
  - ⇒ An odd number does not have two as a factor and is not divisible by two.
  - ⇒ The sum of two even numbers is even.
  - ⇒ The sum of two odd numbers is even.
  - ⇒ The sum of an even number and an odd number is odd.
  - ⇒ Even numbers have an even number or zero in the ones place.
  - ⇒ Odd numbers have an odd number in the ones place.
  - ⇒ An even number has two as a factor and is divisible by two.
  - ⇒ The product of two even numbers is even.
  - ⇒ The product of two odd numbers is odd.
  - ⇒ The product of an even number and an odd number is even

Key Vocabulary:

Natural numbers– The counting numbers starting at one (some people include 0).

Integers– Any number with no fractional parts (includes positive counting numbers, 0, and negative numbers)

Factors– numbers that are multiplied together to get another number (example-2x4=8, 2 and 4 are factors)

Prime number– A natural number, other than one, that has exactly two different factors, one and the number itself.

Composite number- A composite number is a natural number that has factors other than one and itself

Odd number– Any integer that **cannot** be divided evenly by 2. When divided by 2, there all odd numbers have a remainder of 1.

Even number– Any integer that **can** be divided evenly by 2. There is NO remainder when divided by 2.

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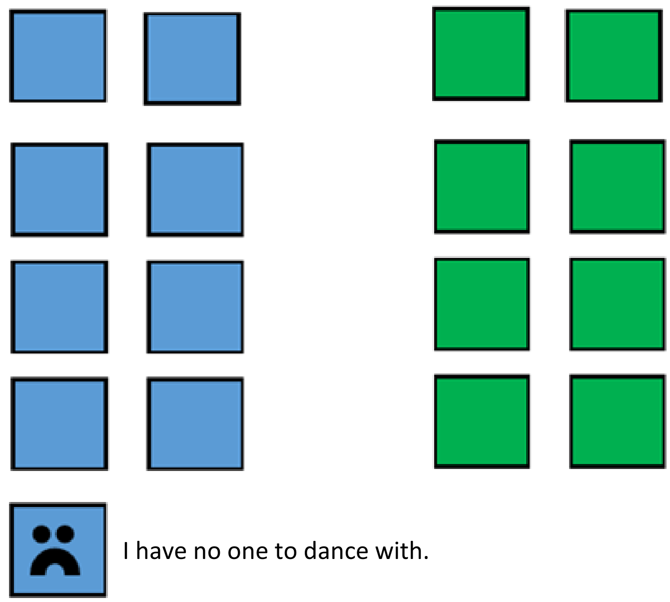
Conceptual Examples of Even and Odd:

All of evens end in a 0, 2, 4, 6, or 8 and all odds can end with 1, 3, 5, 7, or 9.

Let's pretend you are about to do a line dance in PE. For a line dance to work, everyone needs a partner.

If all of the people have a "dancing partner," there is an even number of people.

If there is one "lonely" person without a "dancing partner," there is an odd number of people because one "odd man out" is left standing alone near the wall. All odd numbers have a remainder of 1 split into pairs (which is the same as dividing by 2).



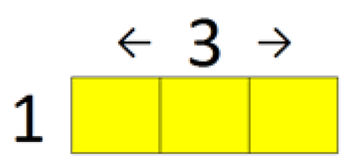
Conceptual Examples of Prime and Composite:

Prime numbers only have two factors (factors are numbers you can multiply together to get another number)- one and itself.

Composite numbers have three or more factors, and the number 1 only has one factor (1) so it is neither prime nor composite.

In order to understand what this looks like, students you can make arrays to figure out all of the different factors a number has. Those numbers that only have one array (1 x itself) are prime. Here are a couple examples.

3- Since we are trying to determine if three is prime or composite, we grab three tiles. Then we think of all the ways we can arrange the three tiles in a rectangle (which are basically multiplication arrays), always starting with one row of tiles (meaning 1 row times 3 tiles = 3). Then we think of any more rectangles we can make with just the three tiles.



The only rectangle I can make with the three tiles is a 1 by 3 (written mathematically as 1x3). A 3x1 rectangle, which the commutative property proves is the same, results in the same type of rectangle so we only count it once. The only two numbers (factors) that can be multiplied times each other to make 3 are 1 and 3.

Therefore, I know that 3 is **prime** because it has exactly two factors- 1 and itself (3).

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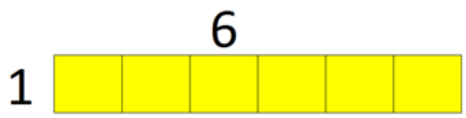
Conceptual Examples of Prime and Composite Numbers (continued):

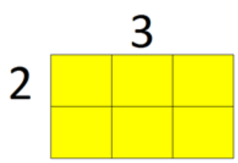
6- In order to figure out if this number is prime or composite, we think of all the different rectangles we can create with 6 tiles, starting with one.

I start with the factor 1. Making one row with all 6 tiles.



This rectangle shows one way we can multiply two factors together to get 6– 1 row x 6 tiles.

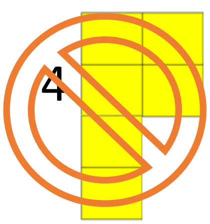
Next, I try to make a rectangle with two rows of tiles.



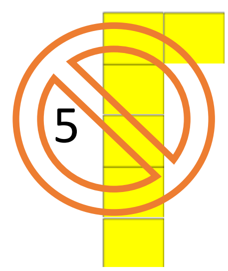
This array shows that the factors 2 and 3 can be multiplied together to make 6 because I can make a rectangle with 2 rows of 3 tiles each.

Since I already have 3 as a factor, I skip making 3 rows and move to the next number– 4.

I can't make a rectangle with four rows and 6 tiles, so I know 4 is not a factor of 6.



After 4, we try 5 rows. 5 is not a factor either since we can't make a rectangle with 6 tiles.

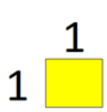


The next number is 6, which we've already included, so we know that we can stop.

Once you reach a factor you've already found, it means that you don't have to keep going because you've found them all.

Therefore, the number 6 has 2 different arrays and 4 factors: 1, 2, 3, and 6. Since it has **more than one array** and **three or more factors**, it is **composite**.

1- In order to figure out if this number is prime or composite, we think of all the numbers we can multiply times each other to get 1. We then make arrays to model the multiplication problems, like so.



The only factor that can be multiplied times 1 to get 1 IS 1, so I really only have 1 factor for 1. Therefore, 1 is NEITHER prime nor composite because it doesn't even have two factors (which are needed to be prime-remember, prime numbers have exactly two factors and composite numbers have three or more factors).

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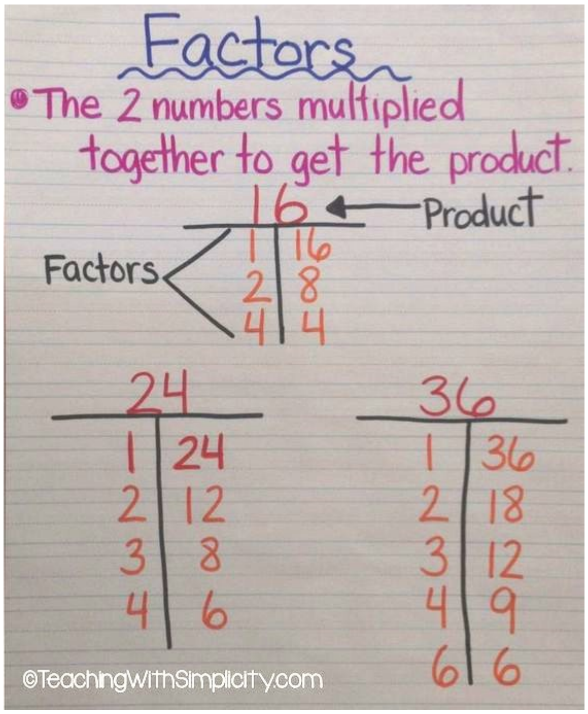
How to do figure out if a number is prime or composite:

Steps:

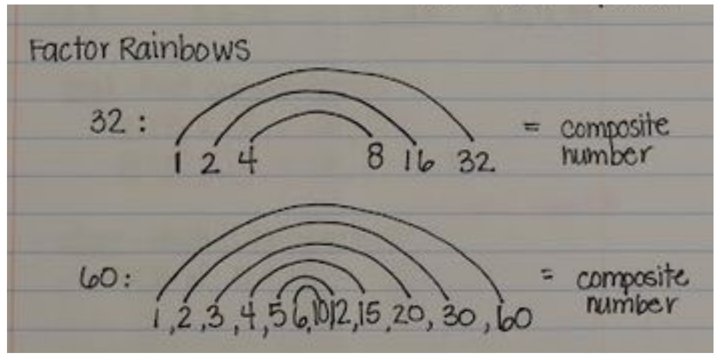
1. **Find all factors of the number.**

    There are several ways to do this, but no matter which way you choose, be sure to always start with the factor 1:

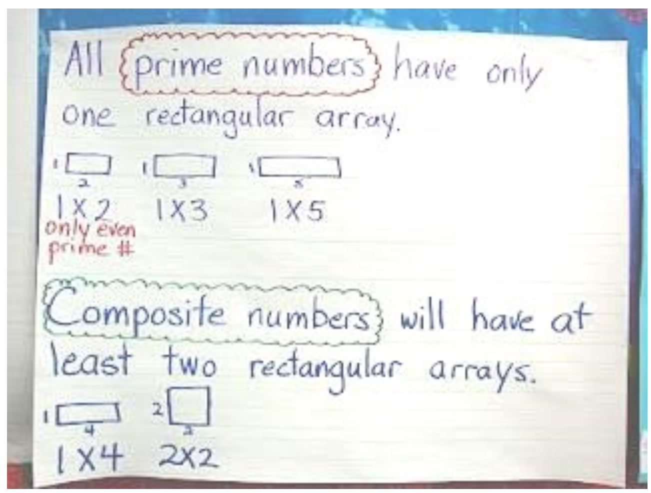
Factor T-chart:



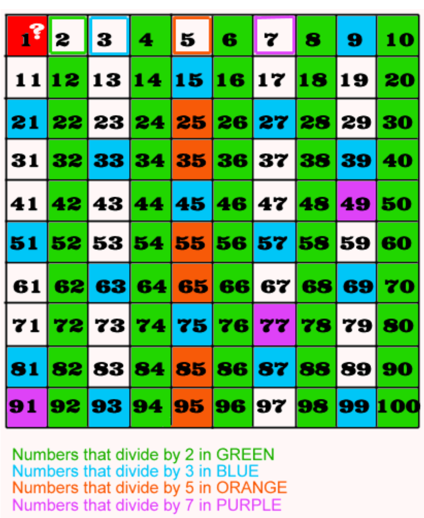
Factor Rainbows:



Arrays:



Sieve of Eratosthenes on a hundreds chart:



1?	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Numbers that divide by 2 in GREEN
Numbers that divide by 3 in BLUE
Numbers that divide by 5 in ORANGE
Numbers that divide by 7 in PURPLE

2. If the number has only two factors, 1 and itself, then it is prime.

3. If the number has more than two factors, then it is composite.

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But what if I don't know if a number is a factor of another number?

Use your **DIVISIBILITY RULES!**

DIVISIBILITY RULES

2- If the last digit of a number is even, then the number is divisible by 2.

3- If the sum of all the digits in a number is divisible by 3, then the number is divisible by 3.

4- If the last two digits of a number are divisible by 4, then the number is divisible by 4.

5- If the last digit of a number is 0 or 5, then the number is divisible by 5.

6- If a number is divisible by both 2 and 3, then the number is divisible by 6.

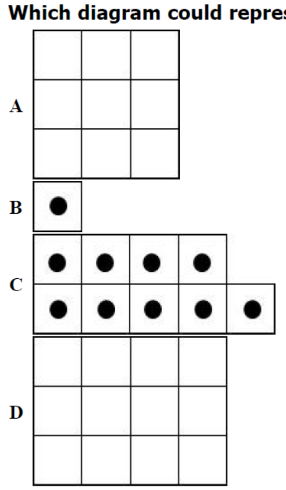
8- If the last three digits of a number are divisible by 8, then the number is divisible by 8.

9- If the sum of all the digits in a number is divisible by 9, then the number is divisible by 9.

10- If the last digit of a number is 0, then the number is divisible by 10.

How you may see the questions presented on the SOL test:

1. **Which diagram could represent an even number?**



2. If E represents an even number and O represents an odd number, which of these statements are always true? (Circle all correct answers)

E + E = O	E + E = E	O + O = E
E + O = E	O + O = O	E + O = O

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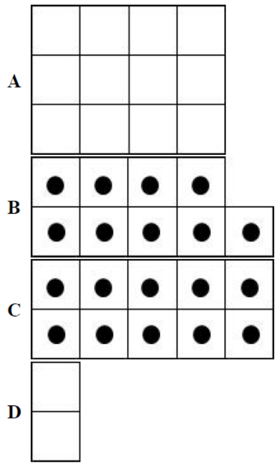
3. **Which diagram could represent an odd number?**



4. Sharon is inviting a group of people over for a game night. They will be playing a game that requires everyone to have a partner. 15 people will be attending the game night, including Sharon. Will everyone have a partner? Is this considered even or odd?

5. Which of the following digits could be found in the ones place of a number that is divisible by 2 ?

A. 0

B. 1

C. 3

D. 5

6. Which sets of numbers only include 2 even and one odd number?

21, 45, 2	35, 52, 15	14, 21, 35	34, 47, 94
5, 10, 20	72, 15, 27	46, 78, 15	82, 93, 51

7. Which best describes an even number?

A. A number that can be divided by 2 with 0 remaining

B. A number that represents part of a whole

C. A number that cannot be grouped in twos

D. A number based on groupings of 5

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8. Which digit could be found in the ones place of an odd number?

A. 4

B. 1

C. 0

D. 2

9. Which best describes an odd number?

A. A number with only two factors

B. A number that cannot be grouped in twos

C. A number that represents part of a whole

D. A number that is divisible by 2 with 0 remainder

10. Identify all of the prime numbers.

1 2 3 9 17 21 25 27 29 31 51 67 87 91 93

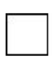
11. Which best describes a composite number?

A. A number that cannot be grouped in twos

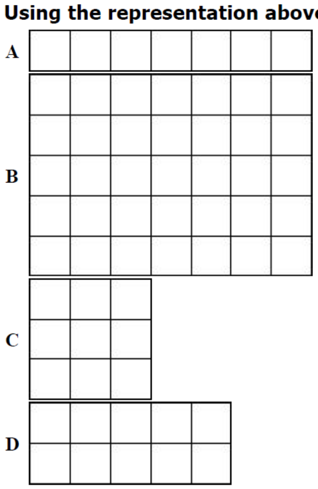
B. A number with more than two factors

C. A number that can be divided by 2 with 0 remaining

D. A number with exactly two factors

12.  represents 1 unit

Using the representation above, which figure has a prime number of total units?



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13. A prime number can best be described as —

A. always an odd number

B. a number with more than 2 different factors

C. always an even number

D. a number with exactly 2 different factors

14. Which of the following is NOT a prime number?

A. 47

B. 51

C. 61

D. 37

15. Select all of the composite numbers listed below.

12 41 51 3 57 7

16. Identify the lists that contain two prime numbers and two composite number.

31, 39, 43, 63	13, 43, 53, 63	27, 47, 57, 97	11, 12, 1, 2

17. Give an example of a prime number and an example of a composite number. Use words and drawings to explain how to tell the difference between a prime number and a composite number.