UNIT **2** – 2016-2017

Factors, Multiples, Prime Factorization, GCF, LCM

CCM6 and CCM6+

Name: _____

Math Teacher:_____

Projected Test Date:_____

Most Wanted Project Due Date: _____

Vocabulary of Unit 2

composite number	A number with more than two factors.
factor	Numbers you multiply together to get another number.
fraction	a number in the form , where b 0
greatest common factor	The largest common factor of two or more given numbers.
least common multiple	The smallest number, other than zero, that is a multiple of two or more given numbers.
multiple	The product of any number and a whole number is a multiple of that number
prime factorization	A number written as a product of its prime factors.
prime number	A number with exactly two factors.

Divisibility Rules to remember…

2	A number divides by 2 if….	
	Examples that work	Examples that don't
3	A number divides by 3 if….	
	Examples that work	Examples that don't
4	A number divides by 4 if….	
	Examples that work	Examples that don't
5	A number divides by 5 if….	
	Examples that work	Examples that don't
6	A number divides by 6 if….	
	Examples that work	Examples that don't
9	A number divides by 9 if….	
	Examples that work	Examples that don't
10	A number divides by 10 if….	
	Examples that work	Examples that don't

Why are divisibility rules helpful to know?

Prime, Composite, Factor, and Multiple

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prime numbers:

composite numbers:

To be prime or composite, a number must be larger than ___________. So only ___________ numbers can be prime or composite. This rules out numbers like _______________________.

~~~~~~

FACTORS and MULTIPLES—Don't mix them up!
What is a factor?

What is a multiple?

5 factors of 12 are:

5 multiples of 12 are:

3 factors of 18 are:

3 multiples of 18 are:

This is the only number that is BOTH a number's factor and its multiple:

This is a factor of every number.

What two numbers are factors of every even number?

FACTORS CHART

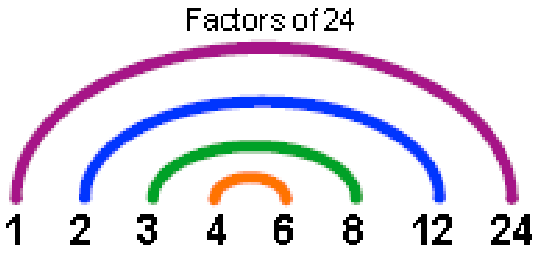
N	ODD or EVEN	Factors of N	Prime (P)or Composite (C)	Make factor pairs
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				

N	ODD or EVEN	Factors of N	Prime (P)or Composite (C)	Make factor pairs
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				

Methods for listing factors of a number:

Method 1: Factor Rainbow.

Create a factor rainbow to find the factors of 24.



Steps for Factor Rainbow

1. Start with 1 and 24, which is the range for finding possible factors.
2. Determine if the next prime number has a factor that creates 24.
3. Continue until all of the factors are determined.

Method 2: Factor T – Chart.

List all of the factors of 24 using a T-Chart.

24	
1	24
2	12
3	8
4	6

Steps for T-Chart

1. Start with 1 and 24, which is the range for finding possible factors.
4. Determine if the next consecutive number has a factor that creates 24
5. Continue until all of the factors are determined and they do not repeat.

Practice:

List all the factors of each number. You can use either the rainbow method or the T-Chart method.
Factors need to be arranged in order from least to greatest.

1. 49
2. 12
3. 52
4. 75

5. 48
6. 60
7. 81
8. 16

Name:_____ Period:_____ Date:_____

Prime & Composite Numbers

Circle all the prime numbers.

Place an X over all the composite numbers.

Leave other numbers blank.

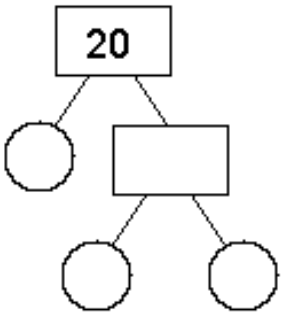
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Name : _____ Score : _____

Teacher : _____ Date : _____

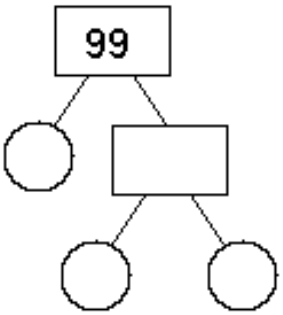
Find the Prime Factors of the Numbers

1)



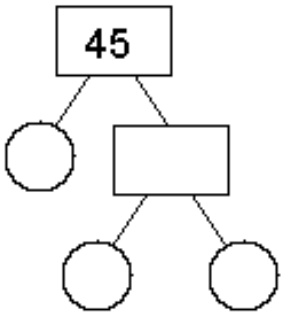
Prime Factors
_ x _ x _ = 20

2)



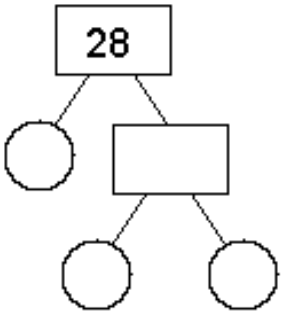
Prime Factors
_ x _ x _ = 99

3)



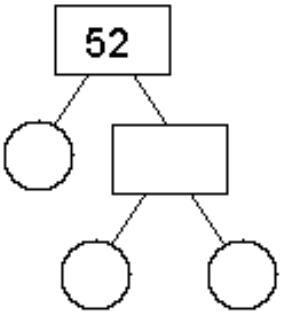
Prime Factors
_ x _ x _ = 45

4)



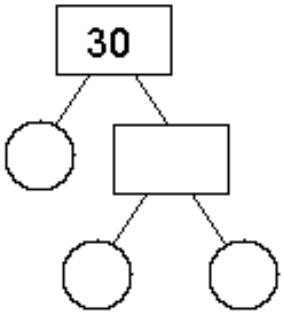
Prime Factors
_ x _ x _ = 28

5)



Prime Factors
_ x _ x _ = 52

6)



Prime Factors
_ x _ x _ = 30

Name: _____

Factor Tree Matching

Show all of your work and then put the correct letter on the line at the bottom of the page.

1.) 56	2.) 18	3.) 68
4.) 28	5.) 86	6.) 40
7.) 32	8.) 74	9.) 19
10.) 45	11.) 27	12.) 25

1.) _____	2.) _____	3.) _____	4.) _____	5.) _____	6.) _____
7.) _____	8.) _____	9.) _____	10.) _____	11.) _____	12.) _____

Factor Tree Matching:

1.) 56	A.) $2^2 \bullet 7$
2.) 18	B.) $2 \bullet 43$
3.) 68	C.) $2^2 \bullet 17$
4.) 28	D.) $2 \bullet 3^2$
5.) 86	E.) $2 \bullet 37$
6.) 40	F.) $2^3 \bullet 5$
7.) 32	G.) $1 \bullet 19$
8.) 74	H.) 3^3
9.) 19	I.) $2^3 \bullet 7$
10.) 45	J.) 5^2
11.) 27	K.) $3^2 \bullet 5$
12.) 25	L.) 2^5

**These are the answer choices for page 10.

Greatest Common Factor

Factors shared by two or more whole numbers are called **common factors**.
The largest of the common factors is called the **Greatest Common Factor (GCF).**
There are three methods we will be learning.

List the Factors. Method 1.

Ex.
Factors of **24**: 1, 2, 3, 4, 6, 8, 12, 24
Factors of **36:** 1, 2, 3, 4, 6, 9, 12, 18, 36
Look to see what factors that both 24 and 36 share. They share 1,2,3,4,6, and 12. The Greatest factor is 12. So the Greatest Common Factor or **GCF is 12**.
Sometimes you come across large numbers and it is hard to find all the common factors.

Use Prime Factorization. Method 2.

Ex. I have Bolded the common factors.
12: 2 * 2 * 3 12: **2 * 2 * 3**
24: 2 * 2 * 2 * 3 24: **2 * 2** * 2 * **3**
36: 2 * 2 * 3 * 3 36: **2 * 2 * 3** * 3
So now we look at the prime numbers they all have in common. They have a 2, and another 2 and a 3. So they share 2*2*3. We need to multiply these together to get the GCF. 2*2*3=12. **GCF: 12**

Using the Ladder Method. Method 3.

This is similar to using division, but we only divide by prime numbers.
We will use the same example as the one above to show that it doesn't matter what method you use you get the same answer.

12	**24**	**36**

45	**90**

**You can use any method you wish, BUT use the same method for the entire problem. **DO NOT mix methods within one problem. You may choose other methods for different problems.

Find the GCF of these problems:

1. 60 and 84
2. 14 and 17
3. 10, 35 and 110
4. 21 and 306
5. 630 and 712
6. 75, 225, and 150
7. 16, 24,30 and 42
8. 2x2x3 and 2x2

Greatest Common Factor Word Problems

1.) Students in the drama club had a party. They had 185 mini sandwiches and 148 brownies. The drama club shared the sandwiches and brownies equally. How many members could there be?

2.) A farmer decided to divide his sheep and cattle among his sons. He had 45 head of sheep and 72 head of cattle. The division of animals came out even. What is the largest possible number of sons the farmer could have?

3.) In a parade, one school band will march directly behind one another. All rows must have the same number of students. The first band has 36 students, and the second band has 60 students. What is the greatest number of students who can be in each row?

4.) Jason is trying to make picnic lunches. He has 12 sandwiches, 18 apples and 30 pieces of candy. How many lunches can he make if he wants each lunch to have the same number of each kind of food and use all of the food?

5.) Carolyn has 24 bottles of shampoo, 36 tubes of hand lotion, and 60 bars of lavender soap to make gift baskets. She wants to have the same number of each item in every basket. What is the greatest number of baskets she can make without having any of the items left over?

6.) Kim packed 6 boxes with identical supplies. It was the greatest number she could pack and use all the supplies. Which of these is her supply list?

a. 24 pencils, 36 pens, 10 rulers
b. 12 rulers, 30 pencils, 45 pens
c. 42 pencils, 18 rulers, 72 pens
d. 60 pens, 54 pencils, 32 rulers

You can use the LADDER METHOD for finding LCM, too!

LCM = Least Common Multiple is _____.

GCF = Greatest Common Factor is _____.

Some **Multiples of 12** are _____

Some **Factors of 12** are _____

****Product of #'s on left = GCF**

****Product of #'s on left and bottom (L-shape) = LCM**

****Bottom #'s are simplified fraction (numerator then denominator).**

If you google Ladder Method GCF and LCM there are GREAT videos!

EXAMPLE:

5 • 9
GCF = 45

5	45 and 90	*What can 45 and 90 both divide by?* 5
9	9 18	*What can 9 and 18 both divide by?* 9
	1 2	*Is there any factor they share bigger than 1?* No.

5 • 9 • 1 • 2

LCM = 90

$\frac{45}{90} = \frac{\mathbf{1}}{\mathbf{2}}$ **= simplified fraction**

Use the LADDER METHOD to find the GCF and LCM and to simplify the fraction.

1) | 8 12

2) | 12 30

3) | 24 60

GCF = _____ GCF = _____ GCF = _____

LCM = _____ LCM = _____ LCM = _____

$\frac{8}{12}$ = _____ $\frac{12}{30}$ = _____ $\frac{24}{60}$ = _____

More problems with LADDER METHOD:

4) 15 and 60 GCF = _____ LCM = _____ $\frac{15}{60}$ =	5) 10 and 25 GCF = _____ LCM = _____ $\frac{10}{25}$ =	6) 30 and 75 GCF = _____ LCM = _____ $\frac{30}{75}$ =
7) 12 and 30 GCF = _____ LCM = _____ $\frac{12}{30}$ =	8) 44 and 66 GCF = _____ LCM = _____ $\frac{44}{66}$ =	9) 16 and 40 GCF = _____ LCM = _____ $\frac{16}{40}$ =
10) 42 and 63 GCF = _____ LCM = _____ $\frac{42}{63}$ =	11) 60 and 90 GCF = _____ LCM = _____ $\frac{60}{90}$ =	12) 15 and 50 GCF = _____ LCM = _____ $\frac{15}{50}$ =

Name:_____ Period:_____ Date:_____

GCF and LCM Worksheet

For #1 - 4, find the GCF and the LCM. Show your work on the back.

1. 10, 50

LCM =

GCF =

2. 12, 48

LCM =

GCF =

3. 14, 28

LCM =

GCF =

4. 9, 15

LCM =

GCF =

For #5 and 6, use the GCF or the LCM to solve each problem.

5. Mr. Statler, supervisor of the intramural basketball league, explained that he could form half-court teams of five players each or full-court teams of eight players each. What is the least number of students who signed up for intramural basketball if all would be placed on a team?

ANSWER: _____

6. Three schools agree to a debate competition. Students from each school are divided into teams of equal size. What is the greatest number of students that each team can have if Midland has 20 students, Copeland has 16 students, and Abbott 8 has students?

ANSWER: _____

Challenge Problems

Find a pair of numbers whose LCM is the product of the numbers.

Find a pair of numbers whose LCM is less than the product of the numbers.

What number has the prime factorization $3^3 \times 7^2$?

How can you determine whether the GCF of two numbers is 1 by looking at their prime factorizations?

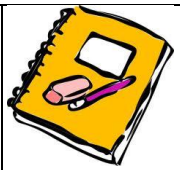
Choose the number that is the product of exactly four different prime numbers.

60 81 210 525

For the number you circled above, what four different prime numbers does it consist of?

GCF and LCM Word Problems

1. There are 14 girls and 21 boys in Mrs. Andrews's gym class. To play a certain game, the students must form teams. Each team must have the same number of boys and girls. What is the greatest number of teams Mrs. Andrews can make if every student is on a team?



2. As 100 students entered the auditorium they were each given a prize. If every 6th student received a pencil and every 9th student received a notebook, how many participants received both a pencil and a notebook?

3. Ralph and his brother are at a carnival. They separate from each other at the ferris wheel at 1:00 PM, and they agree that they will each meet back at the ferris wheel from time to time to see whether the other is ready to leave. Ralph checks the ferris wheel every 15 minutes. Joe checks in every 24 minutes. At what time will they meet at the ferris wheel again? (***Hint: Don't forget you're looking for a time)***

4. Mrs. Lovejoy makes flower arrangements. She has 36 red carnations, 60 white carnations, and 72 pink carnations. Each arrangement must have the same number of each color. What is the greatest number of arrangements she can make is she uses every carnation?

5. Juice comes in packs of 6 and granola bars come in packs of 8. If there are 24 players on the soccer team, what is the least number of packs needed so that each player has a drink and granola bar and there are none left over? (Hint: You will have 2 answers)

6. Vincent has 12 jars of grape jam, 16 jars of strawberry jam, and 24 jars of raspberry jam. He wants to place the jam into the greatest possible number of boxes so that each box has the same number of jars of each kind of jam. How many boxes does he need?

7. Carolyn has 24 bottles of shampoo, 36 tubes of hand lotion, and 60 bars of lavender soap to make gift baskets. She wants to have the same number of each item in every basket. What is the greatest number of baskets she can make without having any of the items leftover?

8. Two faucets are dripping. One faucet drips every 4 seconds and the other faucet drips every 9 seconds. If a drop of water falls from both faucets at the same time, how many seconds will it be before you see the faucets drip at the same time?

In terms of science, make 1 inference as to why the water is dripping.

9. Mr. Stevenson is ordering shirts and hats for his Boy Scout Troop. There are 60 scouts in the troop. Hats come in packs of 3, and shirts come in packs of 5. What is the least number of packs each he should order so that each scout will have 1 hat and 1 shirt, and none will be left over?

10. Mr. Thompson's class was competing in field day. There were 16 boys and 12 girls in his class. He divided the class into the greatest number of teams possible with the same number of boys and girls on each team. How many teams were made if each person was on a team? How many girls were on each team? How many boys were on each team?

11. Josie has 15 quarters, 30 dimes, and 48 nickels. He wants to group the money so that each group has the same number of each coin. What is the greatest number of groups he can make? How many of each coin will be in the group? How much money will each group be worth?

12. Two students in Mrs. Albring's preschool class are stacking blocks, one on top of the other. Reece's blocks are 6 cm high, and Maddy's blocks are 16 cm high. How tall will their stacks be when they are the same height for the first time?

Most Wanted:

On your project you put the number

On the BACK and make sure it doesn't show through to the front!

- It is divisible by 2, 3, 6 and 9.
- It is a composite number.
- Some factors are 2, 3, 6, 9, 18, and 27.
- The sum of its digits is 9.
- The product of its digits is 20.
- The difference of the digits is 1.

REWARD: $10,000,000,000

Most Wanted: NUMBERS

Your Turn to create a most wanted poster for a number.

Be creative!

Directions:

1.) Choose a number between 20 and 500.

2.) Create 6 clues that describe your chosen number.

- must include divisibility, prime or composite, all factors except for the number you chose, sum of digits, product of digits and one of your choice.

3.) After writing a rough draft, have a peer or your teacher edit your sentences, making sure they are correct.

4.) Create your most wanted poster on a piece of construction paper. All words should be neatly written in pencil first and then use marker over the pencil or type final copy.

STUDY GUIDE Unit 2 CCM6 and CCM6+

Prime and Composite Numbers

For the following numbers, put a check in the box if the number is divisible by 2, 3, 4, 5, 6, 9 or 10.

NUMBER	Divisible by 2	Divisible by 3	Divisible by 4	Divisible by 5	Divisible by 6	Divisible by 9	Divisible by 10
120							
50							
54							

Use a t-chart or a rainbow to list all the factors of the following numbers.

4. 36

5. 20

6. Name 4 factors of 12:_____

7. Name 4 multiples of 12:_____

GCF and LCM - know ladder method and prime factorization and exponential notation.

Use a ladder diagram **to find the GCF, LCM, and a simplified fraction of the following pairs of numbers**.

8. 12 and 42

GCF:_____

LCM:_____

$$\frac{12}{42} =$$

9. 16 and 24

GCF:_____

LCM:_____

$$\frac{16}{24} =$$

10. In a race, every 4th person across the finish line gets a hat, and every 6th person across the finish line gets a t-shirt. Which person will be the first to get both a hat and a t-shirt (what place did this person finish the race?)?

Hint: GCF or LCM?

11. Find the **prime factorization** of 90. Write your answer in **exponential form**. Use a factor tree.

12. I am thinking of a number. The number is the LCM of 9 and 45. What could my number be?

13. I am thinking of a number. My number has 8 and 1 as factors. What is the smallest my number could be?

14. LaTonya has a pet iguana and a pet snake. She feeds her iguana every 4 days and her snake every 6 days. If she feeds both on Monday, when will she feed them both on the same day again?