3.1 Factors & Multiples of Whole Numbers.

NC 3.1 Concepts: #1,2,4

FP 10.1 Part A: Students will demonstrate understanding of factors of whole numbers by determining the prime factors, greatest common factor (GCF) and least common multiple (LCM).

Online Video Lessons: https://goo.gl/zsOsNu & https://goo.gl/ezNO1Q

Factor: To take a given number and break it down into smaller numbers that all multiply together to turn into your original number.

Ex: The factors of 6 are 3 and 2 because $6 = 3 \cdot 2$

Prime Number: A number that is both **greater than one** and that is only divisible by 1 and itself. The following numbers are a list of prime number from 1 – 40

2,3,5,7,11,___,___,___,___,___,___,___

Composite Number

A number that is not prime because it can be divided by other numbers than 1 and itself.

4,6,8,9,10,___,___,___,___,___,___,___,___,___,___,___,___

Prime Factorization: To take a given number and break it down into factors that are only **Prime Numbers.** The actual list of individual numbers is the list of Prime Factors.

Ex: The prime factorization of 12 is: $12 = (2)(2)(3)$ or $(2)^2(3)$ but the but the prime factors of 12 are 2 & 3

Example #1: Write the prime factorization of 1540. What are all the prime factors?

Write your answer in POWER FORM.

Greatest Common Factor:
Given two or more numbers, the Greatest Common Factor is the largest number (prime or composite) that will divide into all of the given numbers. It is often called **GCF** for short.

Ex: The Greatest Common Factor between 12 and 18 is 6 because 6 is the largest number that will divide into both 12 and 18.

Example #2: Find the GCF of 24 and 60.

Steps to finding The Greatest Common Factor (GCF):

1. Find the prime factorization of both (or all) numbers.
2. Create a new list by finding all numbers in common between both prime factorizations. You can have repeats in this new list as well. As usual, put a · between all numbers in this new list to show multiplication.
3. Take and actually multiply all the numbers together in your new list. This answer is the Greatest Common Factor or GCF.

Example #3: Find the GCF of 245, 280 and 385

Multiple of a Number: Given a number, the multiple of that number is a list of successive numbers that the given number will divide into. An easy way to make a list of multiples is to simply multiply your given number by 2, 3, 4, 5, etc.

Ex: The first 4 multiples of 3 are 3, 6, 9, 12

Example #4: Find the first 6 multiples of 4.

Least Common Multiple:
Given two or more numbers, the Least Common Multiple (it is often called LCM for short) is the smallest number that all of given numbers will evenly divide INTO. The LCM will always be bigger than or the same size as your given numbers – NEVER smaller!

Ex: The LCM of 8, 6 and 4 is 24 because it is the smallest number that all three will divide into.

Example #5: Find the LCM of 12 and 15.

Steps to finding The Least Common Multiple (LCM):

1. Find the prime factorization of both (or all) numbers. In this case, be sure to write it so that any repeated prime factors are grouped together in each list.
2. Rewrite your prime factorizations using powers if you have repeated prime numbers in your lists. For example: $2 \cdot 2 \cdot 2 = 2^3$.
3. Compare your two lists. Make a new list which contains all of the different prime factors you see in your original lists (even if you don't see them in both lists). If you see that prime factor in both lists, choose the one with the highest power for your new list.
4. Multiply out your new list. This new number is the LCM of your original numbers.

Example #6: Find the LCM of 28, 42 and 63.

Example #7:
Two ropes are 48 m and 32 m long. Each rope is to be cut into equal sized pieces and all pieces must have the same length that is a whole number of metres. What is the greatest possible length of each piece?

HOMEWORK:

- Since you will be handing in the Foundational Assignment and will get a homework check for the Upper Level Assignment (which will be needed in order to do 2nd attempts in this class) it is important that you do your assignments on looseleaf, number each page (so you can put them back in the right order after I hand them back to you) and fully label each assignment you do as follows:
- **Page # YOUR NAME (First & Last) DATE Section # FA List of *all* questions in FA**

- You can have the Mid and Upper Level Assignment on the same or different page.
  - Remember that the Foundational Assignment only indicates the MINIMUM work needed to pass this class.
    - Should you wish to receive a mark above 50% you MUST do some of the Mid level questions.
    - If you plan on staying in AP you need to be doing some of the Upper Level Questions.

- If you receive a 2 or less on any concept check question, you will need to be prepared to hand in the FOUNDATIONAL homework (complete and fully labelled) on the day that you get the concept check back. This will often be several days after the homework was assigned. Late assignments will NOT be accepted. **A zero on foundational homework assignments count for the incentive.**

  - In addition to receiving a zero for an incomplete foundational assignment, students with an incomplete Foundational assignment will **not get the opportunity to rewrite this concept check and have it count for an improvement in grades**. They will get the opportunity to rewrite the concept in order to improve their learning (and ultimately help their mark in the Comprehensive Test) but the rewritten mark will not replace their original mark (unless it demonstrates a decreased mark from the original). I am a huge advocate of improving learning by building on mistakes in comprehension but will only allow this if you demonstrate you are doing the minimum workload in order to achieve success.

- It is VERY important that you always check your answers with the ones at the back of the book. Sometimes the instructions specify details about how the answer is to be given. Marks will be taken off if you do not state the answer as instructed on concept checks and comprehensive tests. Get in the habit of writing your answers correctly from the beginning!

NO CALCULATORS ALLOWED!!!

3.1 *FA (Foundational Assignment) *Indicates Concept Number
P140 #3a$_{C1}$**, 4f**$_{C1}$**, 5c**$_{C1}$**, 6d**$_{C1}$**, 8ae**$_{C1}$**, 9ac**$_{C1}$**, 10bd**$_{C2}$**, 11bd**$_{C2}$**, 13**$_{C4}$

3.1 MLA (Mid-Level Assignment) (All C4)
P140 #7, 12, 14, 15a, 17, 18

3.1 ULA (Upper Level Assignment)
P140 19, 20, 22

NC 3.1 Assignments for Concepts #1, 2, 4

NO CALCULATORS

Note: be careful to check your answers to ensure they are in the correct form – several of the questions are actually testing to see if you understand the language of mathematics

3.2 Perfect Squares, Perfect Cubes and Their Roots

NC 3.2A Concepts: #3, 4

FP 10.1 Part B: Students will demonstrate understanding of factors of whole numbers by determining the principal square root and cube root

Online Video Lesson: https://goo.gl/W9SsTt

You are given one square. This represents the size of an entire square room. Since it is the whole room, we will say it has an area of one whole number, which is 1 square unit.

Imagine that you are given squares that you can put together to make a new room. Is it possible to put these two squares together (without cutting them) to make a new room that is square? ____________

What if you given 3 squares? Can you arrange them (again without cutting) so that your new room is a square?________________

To simplify this process, complete the following task of creating "new rooms" out of the given number of squares by drawing what each new room will look like on the graph paper given. Can you create a new "square room" out of the given number of squares or not?

What about 4 squares? _______________

What about 5 squares? _______________

What about 6 squares? _______________

What about 7 squares? _______________

What about 8 squares?_______________

What about 9 squares?_______________

What about 10 squares?_______________

What about 11 squares?_______________

What about 12 squares?_______________

What about 13 squares?_______________

What about 14 squares?_______________

What about 15 squares?_______________

What about 16 squares?_______________

All of the above numbers who able to form a square room are called

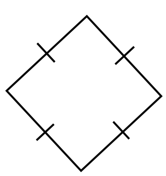
PERFECT SQUARE NUMBERS.

Example #1: List all the perfect squares between 1 and 100 AND find the square root of each number.

When finding the Prime Factorization of Perfect Square Numbers there will always be two identical groups of numbers within the actual prime factorization list. If you find the product of each two group they will produce the same number. This product represents the side length of the square that the actual Perfect Square Number forms.

Example #2: Determine the square root of 1764 using prime factorization.

Example #3: Determine the side length of the square using prime factorization.



Area = $225x^2y^6z^4$

Example #4: Describe in words the relationship between the square root of a number and its association with the area of a polygon.

NO CALCULATORS ALLOWED!!! Be sure to properly label this assignment on your looseleaf.

3.2 *FA (Foundational Assignment) Indicates Concept Number
P146 #4$_{C3}$, 7$_{C4}$, 17a$_{C4}$

3.2 MLA (Mid-Level Assignment)
P147 #15

NC 3.2 Assignment for Concepts #3, 4

NO CALCULATORS

3.2 Continued… Perfect Cubes and Their Roots

NC 3.2BConcepts: #3, 4

This time you are given one cube. This represents the size of an entire cubic swimming pool. Since it is the whole pool, we will say it has a volume of one whole number, which is 1 cubic unit.

Imagine that you are given cubes that you can put together to make a new pool. Is it possible to put these two cubes together (without cutting them) to make a new pool that is cubic (it's length, width and height are all the same size)? ____________

What if you given 3 cubes? Can you arrange them (again without cutting) so that your new pool is in the shape of a cube?_______________

To simplify this process, complete the following task of creating "new pools" out of the given number of cubes by using the cube-a-link blocks to create the actual objects. Can you create a new "pool that is in the shape of a cube" out of the given number of cubes or not?

4 cubes? ____________ 5 cubes? ____________ 6 cubes? ____________

7 cubes? ____________ 8 cubes? ____________ 9 cubes? ____________

10 cubes? ____________ 11 cubes? ____________ 12 cubes? ____________

13 cubes? ____________ 14 cubes? ____________ 15 cubes? ____________

16 cubes? ____________	17 cubes? ____________	18 cubes? ____________
19 cubes? ____________	20 cubes? ____________	21 cubes? ____________
22 cubes? ____________	23 cubes? ____________	24 cubes? ____________
25 cubes? ____________	26 cubes? ____________	27 cubes? ____________
28 cubes? ____________	29 cubes? ____________	30 cubes? ____________
31 cubes? ____________	32 cubes? ____________	33 cubes? ____________
34 cubes? ____________	35 cubes? ____________	36 cubes? ____________
37 cubes? ____________	38 cubes? ____________	39 cubes? ____________
40 cubes? ____________	41 cubes? ____________	42 cubes? ____________
43 cubes? ____________	44 cubes? ____________	45 cubes? ____________
46 cubes? ____________	47 cubes? ____________	48 cubes? ____________
49 cubes? ____________	50 cubes? ____________	51 cubes? ____________
52 cubes? ____________	53 cubes? ____________	54 cubes? ____________
55 cubes? ____________	56 cubes? ____________	57 cubes? ____________
58 cubes? ____________	59 cubes? ____________	60 cubes? ____________
61 cubes? ____________	62 cubes? ____________	63 cubes? ____________
64 cubes? ____________	65 cubes? ____________	66 cubes? ____________

- All of the above numbers who are able to form a room in the shape of a cube are called perfect Cube Numbers
- Perfect Cube Number is any whole number that can be represented as the __________ of a cube. The side length of the cube is the ________________________ of the cube

- When finding the Prime Factorization of Perfect Cube Numbers there will always be one or more triples of numbers within the actual prime factorization list. If you find the product of each of the three groups they will produce the same number. This product represents the side length of the cube that the actual Perfect cube Number forms.
- A cube root is written using the following format: $\sqrt[3]{}$. The little "3" on the outside of the root sign is called an index and tells you what type of root it is. Technically, a square root has an index of a 2 on the outside but we are allowed to omit writing it.

Any whole number that can be represented as the volume of a cube with a whole number edge length is a perfect cube. The edge length of the cube is the cube root of the volume of the cube.

Example #1: Determine the cube root of 3375 using prime factorization.

Example #2: A cube has volume 512 m^3. How long is each side of the cube? What is the surface area of one face of the cube? What is the surface area of the entire cube?

Example #3: Determine the side length of a cube with volume $125x^3y^6$.

Example #4: Use prime factorization to determine if 784 is a perfect square number, a perfect cube number, neither or both.

NO CALCULATORS ALLOWED!!! Be sure to properly label this assignment on your looseleaf.

3.2B *FA (Foundational Assignment)
P146 #5be$_{C3}$, 6cdf$_{C3}$, 8a$_{C4}$, 12b$_{C4}$

3.2B MLA (Mid-Level Assignment) (All C4)
P147 #9, 10, 11, 13, 14, 16, 17b

NC 3.2B Assignment
for Concepts #3, 4

NO CALCULATORS

List of Foundational Assignments for Each Concept in This Topic

Concept 1 FA: P140 #3a, 4f, 5c, 8ac, 9ac
Concept 2 FA: P140 #10bd, 11bd
Concept 3 FA: P 146 #4, 5abe, 6cdf,
Concept 4 FA: P 140 #13 P146 # 8a, 12b, 17a
Midlevel for Concept 4: P140 #7, 12, 14, 15a, 17, 18 P147 #9, 10, 11, 13, 14, 15, 16, 17b