Assoc. Prof. Lisa Brown

Notes and Class Participation

Directions: Print this handout. Use this handout to take notes as you read pages 199 -208, watch the lecture video, and view the PowerPoint slides. After you complete this handout, scan pages 1-7, and attach them to Lesson 12 Class Participation Assignment. Hyperlinks are on page 7.

Section 4.2 Lecture Video PowerPoint Slides

Definitions

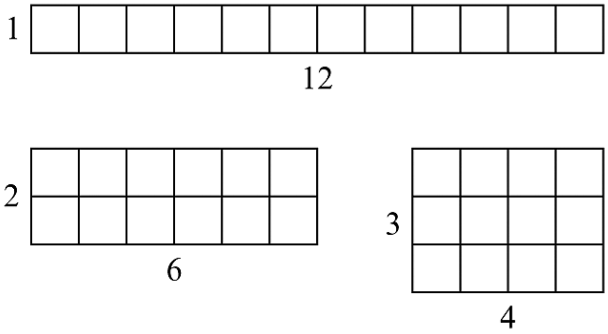
Define *prime number*.

Define *composite number*.

Modeling Factors

Rectangles

The following rectangles represent factors of the number 12.



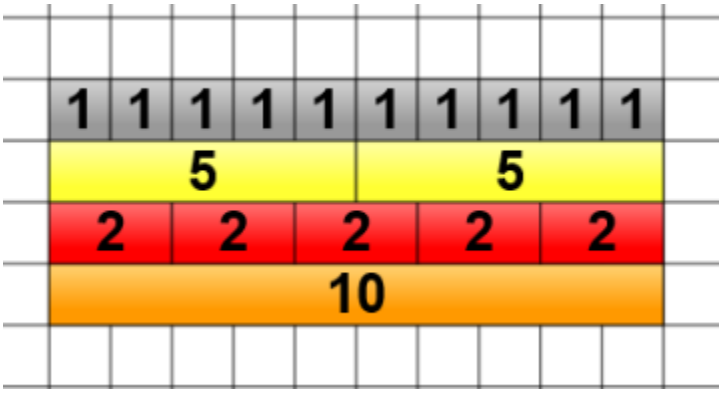
Watch this fun video about how different numbers make different rectangles.

The number 12 has 6 divisors: 1, 2, 3, 4, 6, and 12.

Determine the number of factors of 18 by using the rectangle model of factors.

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This is a model of the factors of 10. Using Cuisenaire rods, make all the trains of one color that are equal 10. The figure was created on this website. Take time to explore this playground for Cuisenaire rods.



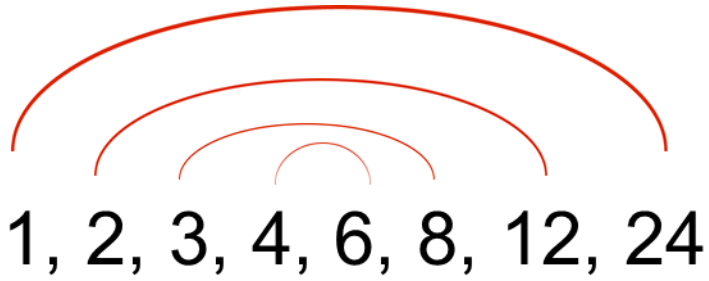
The number 10 has 4 divisors: 1, 2, 5, and 10.

Watch this video for an example of showing the concept of factors to students.

Model the factors of 9 using Cuisenaire rods. Use the website to complete the following. You can draw what you create or take screenshots of your work and submit it on a separate paper.

Listing Factors of a Number

How many whole number divisors does 24 have? We are not asking how many prime divisors, but the number of divisors.



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One way of organizing divisors is to write them in pairs. There are 8 whole number divisors of 24.

For each of the numbers from 1 to 26 give all of the factors. Number 6 is completed as an example.

Number	List of Factors	Number	List of Factors
1		14	
2		15	
3		16	
4		17	
5		18	
6	1, 2, 3, 6	19	
7		20	
8		21	
9		22	
10		23	
11		24	
12		25	
13		26	

For the whole numbers from 1 to 26 which have exactly 1 factor?

For the whole numbers from 1 to 26 which have exactly 2 factors?

For the whole numbers from 1 to 26 which have exactly 3 factors?

For the whole numbers from 1 to 26 which have exactly 4 factors?

For the whole numbers from 1 to 26 which have exactly 5 factors?

For the whole numbers from 1 to 26 which have exactly 6 factors?

For the whole numbers from 1 to 26 which have exactly 7 factors?

For the whole numbers from 1 to 26 which have exactly 8 factors?

For the whole numbers from 1 to 26 which have exactly 9 factors?

For the whole numbers from 1 to 26 which have exactly 10 factors?

What do you notice about the numbers that have an odd number of factors? What type of numbers will have an odd number of factors?

Prime Factorization

Watch this video to understand prime factorization.

Define factorization

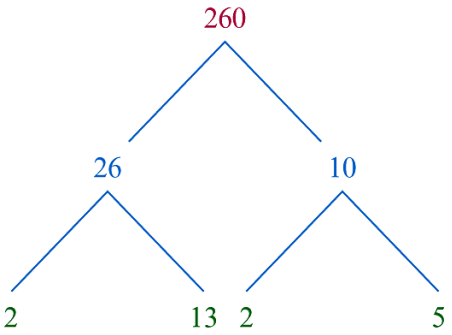
Define prime factorization

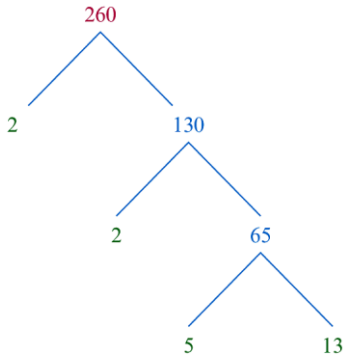
State the Fundamental Theorem of Arithmetic

Methods for Determining Prime Factorization of a Number

Factor Tree

Below are two different factor tree for the number 260. Notice the resulting prime factorization is the same.



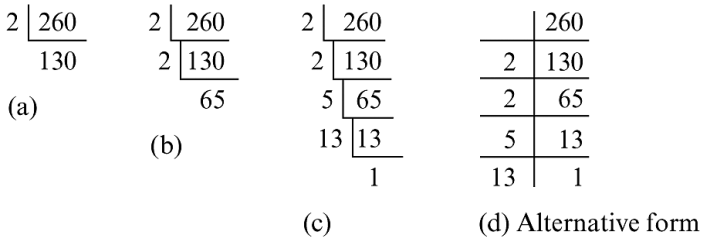


Watch this video that demonstrates factor trees.

Prime Factorization for $260 = 2^2 \cdot 5 \cdot 13$

Determine the prime factorization for the number 462 using a factor tree.

Dividing down



Watch this video of prime factorization using the dividing down method.

Determine the prime factorization for the number 462 using dividing down. Show your work.

Determining if a Number is Prime

Steps to determine if a number is prime.

- Take the square root of the number.
- List all prime numbers less than or equal to the square root of the number.
- Determine if any of the primes listed divide the number.
- If any of these primes divide the number, the number is composite.
- If the number is not composite, it is prime.
- One and zero are neither prime nor composite.

Is 397 composite or prime?

- The square root of 397 approximately equals 19.92. (Determined by a calculator)
- List all primes numbers less than or equal to 19: 2, 3, 5, 7, 11, 13, 17, and 19
- Determine if any of the prime numbers above divide 397 without a remainder.
    - 2 will not divide 397 as the ones place is not even
    - 3 will not divide 397 as 3 + 9 + 7 = 13 and 3 does not divide 13
    - 5 will not divide 397 as the ones place is not a 0 or 5
    - 397 divided by 7 is not a whole number so 7 does not divide 397
    - 397 divided by 11 is not a whole number so 7 does not divide 397
    - 397 divided by 13 is not a whole number so 7 does not divide 397
    - 397 divided by 17 is not a whole number so 7 does not divide 397
    - 397 divided by 19 is not a whole number so 7 does not divide 397

Determine if 727 is prime or composite. Show your work as in the example on page 5.

Determine if 793 is prime or composite. Show your work as in the example on page 5.

Sieve of Eratosthenes

One way to find all the primes less than a given number is to use the Sieve of Eratosthenes. If all the whole numbers greater than 1 are considered (or placed in the sieve), the numbers that are not prime are methodically crossed out (or drop through the holes of the sieve). The remaining numbers are prime.

View this video about the Sieve of Eratosthenes.

Follow the direction on the "School Book Page" on page 205 in the textbook to determine the prime numbers less than 100.

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

Infinitude of Primes

Read the textbook starting on page 206 and going to the top of page 207. Understand that there is an infinite number of primes. Watch this video about how to prove there is an infinite number of primes.

Let $M = 2 \cdot 3 \cdot 5 \cdot 7 \cdot 11 \cdot 13$. Review Theorem 4.1 on page 186. Notice that Theorem 4.1 proves M is divisible by 2, 3, 5, 7, 11, and 13.

Knowing that 2, 3, 5, 7, 11, 13 are prime numbers, what part of Theorem 4.2 (a, b, c, d, or e) on page 187 would be used to show that the number M + 1 would not have a prime factorization that would include any of the numbers 2, 3, 5, 7, 11, or 13? Write this part of the theorem below.

Review Terms:

Review terms from Section 4.2 by using flashcards found here. Select chapter 4 and then select section 2. Review the terms until you know them.

Hyperlinks

- Lecture video: https://mediaplayer.pearsoncmg.com/assets/BMT13_sl_0402
- PowerPoint slides: https://cwoer.ccbcmd.edu/math/math131/Lesson12Section4.2.ppsx
- Prime Composite Song: https://www.youtube.com/embed/1qAc22WxsWA?r=0
- Cuisenaire Rod Playground: https://nrich.maths.org/4348
- Cuisenaire Rod Video: http://www.youtube.com/embed/qHw3LikHbf8?r=0
- Factor Tree Video: http://www.youtube.com/embed/LBOzSQpxquE?r=0
- Factors and Prime Factorization Vide: https://youtu.be/7n5Qak9hnEU?r=0
- Prime Factors by Dividing Down Video: http://www.youtube.com/embed/uwUqzeHth6s?r=0
- Sieve of Eratosthenes: http://www.youtube.com/embed/V08g_lkKj6Q?r=0
- Infinite Number of Primes Video: http://www.youtube.com/embed/ctC33JAV4FI?r=0
- Flashcards: https://media.pearsoncmg.com/aw/aw_billstein_mathforteachers_13/flashcards/launch.html