

Prime and Composite Numbers

Lockers in View

SUGGESTED LEARNING STRATEGIES: Shared Reading, Role Play, Activating Prior Knowledge, Look for a Pattern, Think/Pair/Share, Debriefing, Group Presentation, Question the Text

My Notes

Euler Middle School has 500 lockers, numbered from 1 through 500. On the first day of summer vacation, the custodian opens and cleans all of them, leaving the doors open.

During the remaining days of summer vacation, she checks the lockers to make sure that their doors do not squeak. However, as time goes on, she checks fewer and fewer of them. On the second day, she goes through the school and closes every *second* locker, beginning with Locker 2.

1. At the end of Day 2, Mr. Chang looks out the door of his classroom, where he can see lockers 1 through 10.
 - a. Which of these are open and which are closed?
 - b. Tell how you decided which lockers were open or closed. What patterns did you notice?

2. At the same time, Mrs. Fisher is looking out the door of her classroom further down the hall, where she can see lockers 110 through 120. Using the patterns you noticed in question 1, tell which of these lockers are open and which are closed.

3. On Day 3, the custodian changes the door of every third locker, beginning with Locker 3; if she finds the locker closed, she opens it, and if she finds the locker open, she closes it.

- a. At the end of Day 3, which of the 10 lockers across from Mr. Chang's room (Lockers 1 through 10) change?
- b. Tell how you decided which lockers changed from open to closed, or from closed to open. What patterns did you notice?
- c. At the end of Day 3, which lockers across from Mrs. Fisher's room (Lockers 110 through 120) are changed?

MATH TERMS

In the first part of this unit, you will be working with natural numbers. **Natural numbers**, sometimes called counting numbers, are 1, 2, 3, 4, and so on. Natural numbers are related to the whole numbers. **Whole numbers** are the natural numbers plus zero: 0, 1, 2, 3, and so on.

My Notes

SUGGESTED LEARNING STRATEGIES: Activating Prior Knowledge, Role Play, Look for a Pattern, Think/Pair/Share, Debriefing, Group Presentation, Shared Reading, Question the Text, Create Representations

4. The custodian continues changing locker doors on Day 4.
 - a. Explain what she does on Day 4 and tell which locker she begins with.
 - b. Which lockers across from Mr. Chang's room (lockers 1 through 10) will be changed at the end of this day?
 - c. Tell how you decided which lockers were changed. What patterns did you notice?
 - d. Which lockers across from Mrs. Fisher's room (Lockers 110 through 120) will be changed at the end of Day 4?

5. The custodian continues this pattern: on Day 5, she changes every fifth locker; on Day 6, she changes every sixth locker; on Day 7, she changes every seventh locker; on Day 8, she changes every eighth locker; on Day 9, she changes every ninth locker; and on Day 10, she changes every tenth locker.

In the table below mark an "X" in each box that shows a day on which the locker changes. The first row is filled in for you.

		Locker Numbers									
Day	1	2	3	4	5	6	7	8	9	10	
1	X	X	X	X	X	X	X	X	X	X	
2											
3											
4											
5											
6											
7											
8											
9											
10											

CONNECT TO AP

The ability to organize mathematical information and to identify and describe patterns is essential for both AP Calculus and AP Statistics.

SUGGESTED LEARNING STRATEGIES: Create Representations, Look for a Pattern, Debriefing, Think/Pair/Share, Self/Peer Revision, Interactive Word Wall, Quickwrite, Group Presentation

6. Use patterns in the table in Question 5 to complete this table.

Locker Number	Days the Locker Changes	Total Number of Times the Locker Changes
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

7. Use at least one locker in the list to explain why the numbers in the “Days the Locker Changes” column are **factors**.

8. What do you notice about the numbers in the column “Total Number of Times the Locker Changes”? Explain using at least one example.

9. The custodian continues this pattern for the entire summer.

a. On which days will Locker 12 be changed? Use factors to explain your answer.

b. On which days will Locker 37 be changed? Explain below.

My Notes

ACADEMIC VOCABULARY

A prime number is a natural number greater than 1 that has exactly two factors, 1 and itself.

MATH TERMS

A composite number is a natural number that has more than two different factors.

ACADEMIC VOCABULARY

A **factor** is one of the numbers you multiply to get a product.

My Notes

ACADEMIC VOCABULARY

A **prime number** is a natural number greater than 1 that has exactly two factors, 1 and itself.

MATH TERMS

A **composite number** is a natural number that has more than two different factors.

SUGGESTED LEARNING STRATEGIES: Interactive Word Wall, Think/Pair/Share, Debriefing, Quickwrite, Look for a Pattern, Shared Reading, Summarize/Paraphrase/Retell, Predict and Confirm

Some of the lockers in the school will only be changed two times, on Day 1 and again on the day of the locker's number. Numbers that have only two factors are called **prime numbers**.

- List the locker numbers from 1 through 10 that are prime numbers.
- Some of the lockers will change on more than two days. Numbers that have more than two factors are called **composite numbers**. List the locker numbers from 1 through 10 that are composite numbers.
- One of the locker numbers from 1 through 10 is not in the list of prime numbers or the list of composite numbers. Tell which number is not on either list and explain why.
- On what days and how many times will Locker 100 be changed? Explain how you determined your answer.
- Is 100 a prime number or a composite number? Explain how you know.
- In the set of numbers from 1 through 100, do you think there are more prime numbers or composite numbers? Make a prediction and explain your thinking.

SUGGESTED LEARNING STRATEGIES: Predict and Confirm, Create Representations, Look for a Pattern, Debriefing, Quickwrite

My Notes

16. Use the 100 grid below to confirm your prediction.

- First, find the number that is neither prime nor composite. What number is that? Circle the number.
- Second, shade the squares of all the numbers that have 2 as a factor and are composite, but do not shade the number 2. Why is 2 not shaded?
- Third, find the next prime number. Shade the square of all the composite numbers that have this number as a factor. Do not shade the prime number.
- Continue finding prime numbers and shading in composite numbers that have them as factors until only 1 and prime numbers are left unshaded in the grid.

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

- Are there more prime or composite numbers in the set of numbers from 1 through 100? Explain why this is true.
- Was your prediction correct?

CONNECT TO HISTORY

In the third century B.C.E., Eratosthenes, a Greek scholar and athlete, developed the process you used in Question 16 to find the prime numbers in a list of numbers. This method is now called the *Sieve of Eratosthenes*.