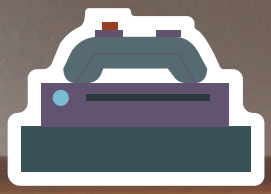
Unit 1

Factors and Multiples

Essential Questions

- What are factors and multiples of a number?
- What patterns can be seen in the factors and multiples of a number?
- How do rectangles represent factors and multiples?



Unit Story: I Contain Multitudes

You can read the Unit Story with your student by visiting the Unit Story page on the Caregiver Hub.

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Unit Investigation

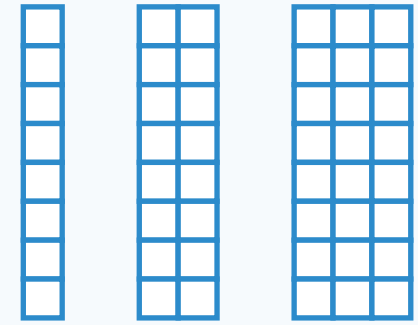
Lesson 1 is the Unit Investigation. Students look for patterns in the multiplication table with factors up to 9 to build curiosity and apply their own knowledge in a variety of ways. Use the **Caregiver Connection** to help students continue to explore the math they will see in the unit.

Caregiver Connection

Students may enjoy creating their own patterns by using objects they have at home or by drawing different shapes or numbers. You may choose to take turns creating patterns and challenging each other to determine what comes next.

Summary | Lesson 2

Visual patterns that grow can be described using numerical patterns. The features of the visual and numerical patterns can be used to extend the patterns and make predictions.



8, 16, 24

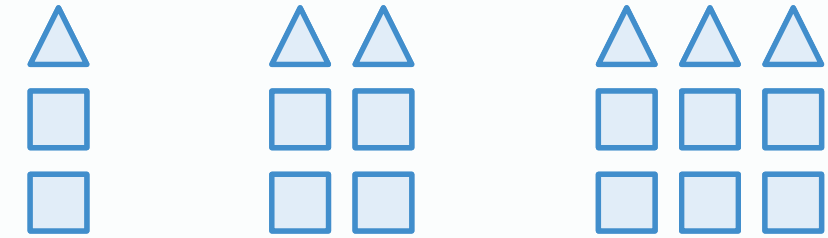
1 × 8, 2 × 8, 3 × 8

Step 5: 5 × 8 = 40

Step 10: 10 × 8 = 80

Try This

Diego followed a rule to build the pattern of squares and triangles shown. Use Diego's pattern for Problem 1.



1 What would the next 2 steps in Diego's pattern look like?

Draw

Step 4:

Step 5:

Summary | Lesson 3

The structure of numbers, such as what makes a number even or odd, can be used to make predictions about number patterns.

Rule: Add 2

7, 9, 11, 13, 15, 17, 19

Rule: Add 2

8, 10, 12, 14, 16, 18

Try This

1 For each number in the table, multiply it by 3 and subtract 2.

Number	Multiply by 3, subtract 2
2	
4	
5	
8	
9	

Summary | Lesson 4

Multiplication equations represent the relationship between factors and **multiples**. The product is a multiple of each of the factors.

$3 \times 2 = 6$

factor factor multiple

6 is a multiple of 3.

6 is a multiple of 2.

$6 \times 4 = 24$

factor factor multiple

24 is a multiple of 6.

24 is a multiple of 4.

Try This

Use the chart for Problems 1–3.

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

1. Draw a circle around *all* the multiples of 9 in the chart.

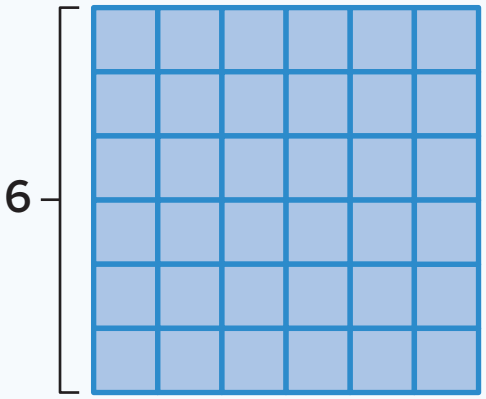
2. Draw a square around *all* the multiples of 4 in the chart.

3. List *all* the multiples that 9 and 4 have in common. _____

Summary | Lesson 5

Multiplication facts can be used to determine whether a number is a multiple of another number.

$6 \times 1 = 6$
$6 \times 2 = 12$
$6 \times 3 = 18$
$6 \times 4 = 24$
$6 \times 5 = 30$
$6 \times 6 = 36$



Try This

1 Han wants to build a rectangle with an area of 20 square units and a width of 4 units. Could Han make this rectangle? Explain your thinking.

Summary | Lesson 6

Factor pairs for a specific whole number are 2 factors that when multiplied together result in that number. The whole number is a multiple of each of its factors.

factor pairs of 36: 1×36, 2×18, 3×12, 4×9, 6×6

36 is a multiple of 1, 2, 3, 4, 6, 9, 12, 18, and 36.

Try This

1 Determine whether the side lengths given are possible for each area.

Side lengths	Area (square units)	Possible? (*yes* or *no*)
5×8	40	
4×9	37	
7×4	26	
8×4	32	

Summary | Lesson 7

Whole numbers with more than 2 factors are **composite numbers**. Whole numbers with only 2 factors are **prime numbers**. The number 1 has only 1 factor, so it is neither prime nor composite.

1	19	24
1×1	1×19	1×24, 2×12, 3×8, 4×6
factor: 1	factors: 1, 19	factors: 1, 2, 3, 4, 6, 8, 12, 24

Practice

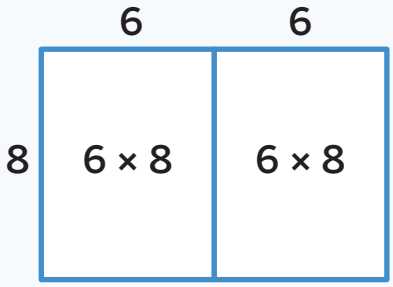
1 Complete the table to determine whether each number is *prime* or *composite*.

	Factor pairs	Prime or composite?	How do you know?
37			
27			
47			
77			

Summary | Lesson 8

You can use the Distributive Property to decompose one of the factors in a multiplication expression into addends, multiply each addend by the other factor, and then add the products.

Determine the product 12 × 8.

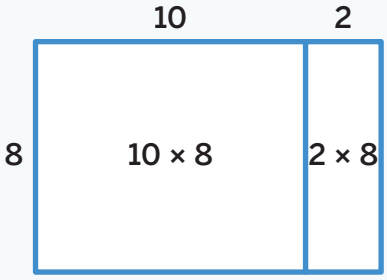


(6 + 6) × 8

6 × 8 = 48

6 × 8 = 48

48 + 48 = 96

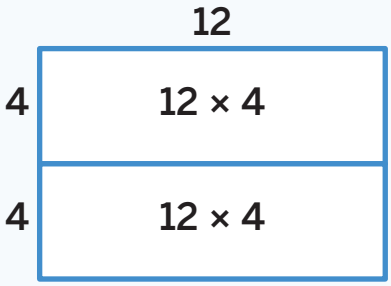


(10 + 2) × 8

10 × 8 = 80

2 × 8 = 16

80 + 16 = 96



12 × (4 + 4)

12 × 4 = 48

12 × 4 = 48

48 + 48 = 96

Try This

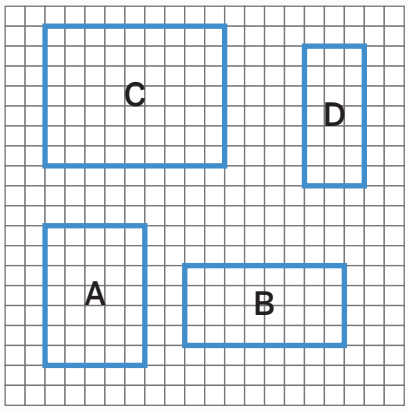
For Problems 1–4, determine the area of the rectangle in square units. Each grid square has an area of 1 square unit.

1 **area of A:** _____ square units

2 **area of B:** _____ square units

3 **area of C:** _____ square units

4 **area of D:** _____ square units



Sub-Unit 1 | Summary

In this sub-unit . . .

- We used our understanding of the area of rectangles to learn about factors, multiples, factor pairs, prime numbers, and composite numbers. If we know the side length of a rectangle, we can determine the areas that the rectangle could have.
  - A rectangle with a side length of 3 could have an area of 3, 6, 9, 12, 15, or other numbers that result from multiplying a whole number and 3. We call these numbers **multiples** of 3.

- If we know the area of a rectangle, we can determine the side lengths that the rectangle could have.
  - A rectangle with an area of 24 square units could have side lengths of 1 and 24, 2 and 12, 3 and 8, or 4 and 6. We call these possible side lengths the **factor pairs** of 24.

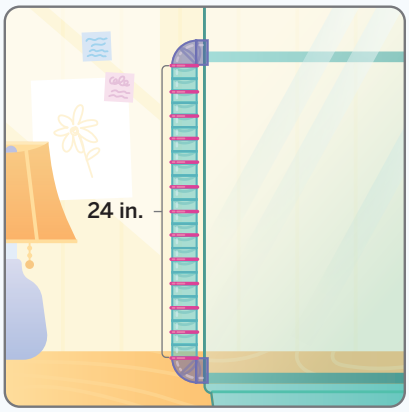
- We also learned that a number that has only 1 factor pair — 1 and the number itself — is called a **prime number**.
  - 5 is prime because it has only 1 factor pair — 1 and 5.
- A number that has 2 or more factor pairs is a **composite number**.
  - 15 is composite because it has more than 1 factor pair — 1 and 15, and 3 and 5.

Math tip: 2 is the only even prime number.

Summary | Lesson 9

Factors and multiples can be used to solve real-world problems involving equal groups.

Tube lengths of 1, 2, 3, 4, 6, 8, 12, and 24 inches could connect to a platform with a height of 24 inches.



Try This

Use the information for Problems 1 and 2.

Blue pens are sold in packs of 5, and black pens are sold in packs of 6. Select which color pen a student should buy to have no extras.

Show or explain your thinking.

1. Jada wants to buy 48 of the same color pen for her class.

blue **black**

2. Han wants to buy 55 of the same color pen for his class.

blue **black**

Summary | Lesson 10

Depending on the relationship between given numbers, the same number can be a factor and a multiple.

20 is a multiple of 5: 5, 10, 15, 20

20 is a factor of the following numbers:
20, 40, 60, 80, . . .

Try This

1. List *all* the factors of 24.

2. List *all* the factors of 36.

3. List *all* the numbers that are factors of both 24 and 36.

4. List *all* the multiples of 6 that are less than or equal to 50.

Summary | Lesson 11

Numbers can be described and identified using information about their factors, multiples, and whether they are prime or composite.

21

21 is a multiple of 7.
3 is a factor of 21.
21 is a composite number.

Try This

1 Match the numbers with the given clues.

15	40	32

3 is a factor of this number. _____

This number has 6 factors. _____

This number is a multiple of 10. _____

2 Identify the mystery number using the clues.

- Clue 1: This number is composite.
- Clue 2: 8 is a factor of this number.
- Clue 3: 128 is a multiple of this number.
- Clue 4: This number is a multiple of 4.

mystery number: _____

Sub-Unit 2 | Summary

In this sub-unit . . .

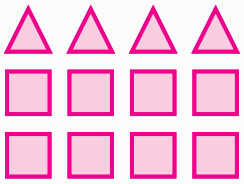
- We used what we learned about factors, multiples, and prime and composite numbers in the range 1–100 to play games and solve problems.

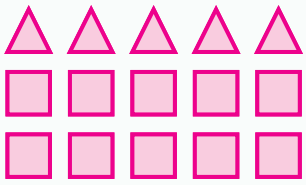
- We learned that numbers can share factors and multiples. For example:
  - The number 2 is a factor of 6 and a factor of 8.
  - The number 24 is a multiple of 6 and a multiple of 8.

  Math tip: A common multiple is a number that is a multiple of 2 given numbers.

- Knowing about factors and multiples helped us answer questions, such as:
  - Could we put 24 chairs in 6 equal rows? What about 7 equal rows or 8 equal rows?
  - Could a rectangle have a side length of 5 and an area of 35? What about an area of 42?

Lesson 2

1 Step 4: 

Step 5: 

Lesson 3

1

Number	Multiply by 3, subtract 2
2	4
4	10
5	13
8	22
9	25

Lesson 4

1–2

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

3 36, 72

Lesson 5

1 Sample response: Yes, Han can build a rectangle with a width of 4 units if the length is 5 units because 4 × 5 = 20.

Lesson 6

1

Side lengths	Area (square units)	Possible? (*yes* or *no*)
5 × 8	40	yes
4 × 9	37	no
7 × 4	26	no
8 × 4	32	yes

Lesson 7

1 Sample response:

	Factor pairs	Prime or composite?	How do you know?
37	1 × 37	prime	2 factors
27	1 × 27 3 × 9	composite	more than 2 factors
47	1 × 47	prime	2 factors
77	1 × 77 7 × 11	composite	more than 2 factors

Lesson 8

1 35
2 32
3 63
4 21

Lesson 9

1. black
   Sample work: 6 × 8 = 48
2. blue
   Sample work: 5 × 11 = 55

Lesson 10

1. 1, 2, 3, 4, 6, 8, 12, 24
2. 1, 2, 3, 4, 6, 9, 12, 18, 36
3. 1, 2, 3, 4, 6, 12
4. 6, 12, 18, 24, 30, 36, 42, 48

Lesson 11

1. 3 is a factor of this number. 15
   This number has 6 factors. 32
   This number is a multiple of 10. 40
2. **mystery number:** Sample response: 64