Patterns in the Place Value System

Name: _____ **Class:** _____ **Date:** _____

Quick Review

Our number system uses **base ten**, meaning each place value is ten times greater than the place immediately to its right.

Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
1,000	100	10	1	0.1	0.01	0.001

Important Patterns

- Multiplying by 10 makes a number 10 times as large.
- Multiplying by 100 makes a number 100 times as large.
- Multiplying by 1,000 makes a number 1,000 times as large.
- Dividing by 10 makes a number one-tenth as large.
- Dividing by 100 makes a number one-hundredth as large.
- Dividing by 1,000 makes a number one-thousandth as large.

When multiplying by powers of ten, digits shift to the left in a place value chart. When dividing, digits shift to the right.

Examples:

- $34 \times 10 = 340$
- $5.6 \times 100 = 560$
- $720 \div 10 = 72$
- $48 \div 100 = 0.48$

Part A — Multiple Choice

1. What happens to the value of a digit when it moves one place to the left in a place value chart?

A. It becomes 10 times greater.
B. It becomes 10 times smaller.
C. It stays the same.
D. It becomes 100 times smaller.

2. What is 47×100?

A. 470
B. 4,700
C. 47,000
D. 4.7

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3. What is 850 ÷ 10?

A. 8,500
B. 8.5
C. 85
D. 0.85

4. Which number is one-tenth of 6,000?

A. 60,000
B. 6
C. 60
D. 600

5. What is 3.8 × 1,000?

A. 3,800
B. 380
C. 38
D. 0.0038

Part B — Multiplication Patterns

Complete the table.

Number	× 10	× 100	× 1,000.
6	_____	_____	_____
24	_____	_____	_____
3.5	_____	_____	_____
0.72	_____	_____	_____
105	_____	_____	_____

1. What pattern do you notice when multiplying by 10, 100, and 1,000?

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2. Explain why 4.6 × 100 = 460.

Part C — Division Patterns

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Complete the table.

Number	÷ 10	÷ 100	÷ 1,000
500	_____	_____	_____
7,200	_____	_____	_____
45	_____	_____	_____
8.6	_____	_____	_____
3,000	_____	_____	_____

1. What happens to the value of each digit when a number is divided by 100?

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2. Why is 75 ÷ 1,000 equal to 0.075?

Part D — Place Value Patterns

Complete the missing numbers in each sequence.

1. 4, 40, 400, _____, _____

2. 90,000, 9,000, 900, _____, _____

3. 0.6, 6, 60, _____, _____

4. 5,000, 500, 50, _____, _____

5. 0.003, 0.03, 0.3, _____, _____

6. 72,000, 720, 7.2, _____, _____

7. Explain the rule used in Sequence 6.

Part E — Understanding Place Value

Consider the number **4,582.36**.

1. What is the value of the digit 5?

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2. What is the value of the digit 3?

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3. What happens to the value of the digit 8 when the entire number is multiplied by 10?

4. What is 4,582.36 ÷ 100?

5. Explain why the digits move to different place value positions when multiplying or dividing by powers of ten.

Part F — Real-World Applications

1. School Supplies One box contains 24 pencils.

a) How many pencils are in 10 boxes?

b) How many pencils are in 100 boxes?

2. Water Measurement A container holds 3.5 litres of water.

a) How many millilitres are in the container? (1 L = 1,000 mL)

b) If the water is shared equally among 10 smaller containers, how many litres will each contain?

3. Distance A student walks 1.25 km to school.

a) How many metres is this?

b) If the distance were divided by 100, what would the new distance be in kilometres?

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Exit Ticket

1. What is 6.4 × 100?

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2. What is 5,600 ÷ 1,000?

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3. Complete the pattern: 0.8, 8, 80, _____, _____

4. What happens to the value of a digit when it moves three places to the right in a place value chart?

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5. Why is understanding place value useful when working with large and small numbers?

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Patterns in the Place Value System
Patterns in the Place Value System — Answer Key

Part A — Multiple Choice

Question	Answer	Explanation
1	A — It becomes 10 times greater.	Moving one place to the left increases a digit's value by a factor of 10.
2	B — 4,700	47 × 100 = 4,700.
3	C — 85	850 ÷ 10 = 85.
4	D — 600	6,000 ÷ 10 = 600.
5	A — 3,800	3.8 × 1,000 = 3,800.

Part B — Multiplication Patterns

Number	× 10	× 100	× 1,000
6	60	600	6,000
24	240	2,400	24,000
3.5	35	350	3,500
0.72	7.2	72	720
105	1,050	10,500	105,000

1. What pattern do you notice when multiplying by 10, 100, and 1,000?

When multiplying by 10, 100, or 1,000, each digit moves one, two, or three places to the left in the place value chart.

The number becomes 10, 100, or 1,000 times as large.

2. Explain why 4.6 × 100 = 460.

Multiplying by 100 shifts each digit two places to the left in the place value chart.

4.6 × 10 = 46

46 × 10 = 460

Therefore, 4.6 × 100 = 460.

Part C — Division Patterns

Number	÷ 10	÷ 100	÷ 1,000
500	50	5	0.5

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7,200	720	72	7.2
45	4.5	0.45	0.045
8.6	0.86	0.086	0.0086
3,000	300	30	3

1. What happens to the value of each digit when a number is divided by 100?

Each digit moves two places to the right in the place value chart.

Its value becomes one-hundredth of its original value.

2. Why is 75 ÷ 1,000 equal to 0.075?

Dividing by 1,000 shifts every digit three places to the right in the place value chart.

75 ÷ 10 = 7.5

7.5 ÷ 10 = 0.75

0.75 ÷ 10 = 0.075

Therefore, 75 ÷ 1,000 = 0.075.

Part D — Place Value Patterns

1. 4, 40, 400, 4,000, 40,000

Rule: Multiply by 10 each time.

2. 90,000, 9,000, 900, 90, 9

Rule: Divide by 10 each time.

3. 0.6, 6, 60, 600, 6,000

Rule: Multiply by 10 each time.

4. 5,000, 500, 50, 5, 0.5

Rule: Divide by 10 each time.

5. 0.003, 0.03, 0.3, 3, 30

Rule: Multiply by 10 each time.

6. 72,000, 720, 7.2, 0.072, 0.00072

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Rule: Divide by 100 each time.

7. Explain the rule used in Sequence 6.

Each number is divided by 100 to obtain the next number.

This means every digit shifts two places to the right in the place value chart.

Part E — Understanding Place Value

Consider the number 4,582.36.

1. What is the value of the digit 5?

500 (five hundreds).

2. What is the value of the digit 3?

0.3 (three tenths).

3. What happens to the value of the digit 8 when the entire number is multiplied by 10?

The digit 8 originally represents 80 (eight tens).

After multiplying by 10, it represents 800 (eight hundreds).

Its value becomes 10 times greater.

4. What is 4,582.36 ÷ 100?

45.8236

5. Explain why the digits move to different place value positions when multiplying or dividing by powers of ten.

Our number system is based on powers of ten. Each position is worth ten times as much as the position immediately to its right.

When multiplying by 10, 100, or 1,000, digits shift one, two, or three places to the left.

When dividing by these numbers, digits shift one, two, or three places to the right.

The digits keep their identities, but their place values change.

Part F — Real-World Applications

1. School Supplies

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One box contains 24 pencils.

a) How many pencils are in 10 boxes?

24 × 10 = 240 pencils

b) How many pencils are in 100 boxes?

24 × 100 = 2,400 pencils

2. Water Measurement

A container holds 3.5 litres of water.

a) How many millilitres are in the container?

3.5 × 1,000 = 3,500 mL

b) If the water is shared equally among 10 smaller containers, how many litres will each contain?

3.5 ÷ 10 = 0.35 L

3. Distance

A student walks 1.25 km to school.

a) How many metres is this?

1.25 × 1,000 = 1,250 m

b) If the distance were divided by 100, what would the new distance be in kilometres?

1.25 ÷ 100 = 0.0125 km

Exit Ticket

1. What is 6.4 × 100?

640

2. What is 5,600 ÷ 1,000?

5.6

3. Complete the pattern: 0.8, 8, 80, _____, _____

800, 8,000

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Rule: Multiply by 10 each time.

4. What happens to the value of a digit when it moves three places to the right in a place value chart?

Its value becomes 1/1,000 of its original value, or 1,000 times smaller.

5. Why is understanding place value useful when working with large and small numbers?

Acceptable answers include:

- It helps us multiply and divide by powers of ten.
- It makes it easier to understand very large and very small numbers.
- It helps with converting metric units.
- It allows us to recognize numerical patterns.
- It helps us predict missing numbers in sequences.

Teacher Notes — Common Mistakes

- Adding zeros incorrectly: Students may think multiplying any number by 10 means simply adding a zero. This does not work for decimals. For example, $3.5 \times 10 = 35$, not 3.50.
- Confusing the direction of movement: Multiplication by 10 shifts digits left in the place value chart; division by 10 shifts digits right.
- Forgetting decimal place values: When dividing 45 by 1,000, the result is 0.045, not 0.45.
- Missing a pattern involving 100: In Part D, Question 6, each term is divided by 100 rather than 10.
- Confusing digit and value: In Part E, the digit 8 stays the same, but its value changes from 80 to 800.

Assessment focus: Students should demonstrate that they understand why multiplication and division by powers of ten change place values, recognize repeating patterns, and apply these patterns to calculations and real-world situations.

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