

**Just In Time Quick Check**  
**Standard of Learning (SOL) 7.1a**

**Strand: Number and Number Sense**

**Standard of Learning (SOL) 7.1a**

*The student will investigate and describe the concept of negative exponents for powers of ten.*

**Grade Level Skills:**

- Recognize powers of 10 with negative exponents by examining patterns.
- Represent a power of 10 with negative exponents in fraction and decimal form.

**Just in Time Quick Check**

**Just in Time Quick Check Teacher Notes**

**Supporting Resources:**

- VDOE Mathematics Instructional Plans (MIPS)
  - [7.1a – Powers of Ten](#) (Word) / [PDF Version](#)
- VDOE Algebra Readiness Formative Assessments
  - [SOL 7.1a](#) (Word) / [PDF Version](#)
- VDOE Algebra Readiness Remediation Plans
  - [Scientific Notation](#) (Word) / [PDF Version](#)
- VDOE Word Wall Cards: Grade 7 ([Word](#)) | ([PDF](#))
  - Powers of Ten
- Desmos Activity
  - [7.1 Powers of Ten](#)

Supporting and Prerequisite SOL: [6.2a](#), [6.4](#), [5.2a](#)

## SOL 7.1a - Just in Time Quick Check

- 1) a. Complete the chart.

| Exponential Form | Expanded Form                                                           | Fraction Form       |
|------------------|-------------------------------------------------------------------------|---------------------|
| $10^{-3}$        |                                                                         |                     |
|                  | $\frac{1}{10} \cdot \frac{1}{10} \cdot \frac{1}{10} \cdot \frac{1}{10}$ |                     |
|                  |                                                                         | $\frac{1}{100,000}$ |

- b. Show what each entry would be in the row showing an exponential form of  $10^{-7}$ .  
Describe the pattern that supports your answer.

- 2) Determine if the following statements are true or false. Justify your reasoning for each statement.

| Statement          | True or False | Justify Reasoning |
|--------------------|---------------|-------------------|
| $10^0 = 1$         |               |                   |
| $10^{-3} = 0.003$  |               |                   |
| $10^{-4} = 0.0001$ |               |                   |

- 3) Consider the chart below.

| Power of 10 | Value |
|-------------|-------|
| $10^2$      | 100   |
| $10^1$      | 10    |
| $10^0$      | 1     |
| $10^{-1}$   | 0.1   |
| $10^{-2}$   | 0.01  |

- a. What is the value of  $10^6$ ? \_\_\_\_\_
- b. What is the value of  $10^{-6}$ ? \_\_\_\_\_
- c. Represent  $10^{-5}$  as a fraction and as a decimal: Fraction \_\_\_\_\_ Decimal \_\_\_\_\_

## SOL 7.1a - Just in Time Quick Check Teacher Notes

### Common Errors/Misconceptions and their Possible Indications

- 1) a. Complete the chart.

| Exponential Form | Expanded Form                                                           | Fraction Form       |
|------------------|-------------------------------------------------------------------------|---------------------|
| $10^{-3}$        |                                                                         |                     |
|                  | $\frac{1}{10} \cdot \frac{1}{10} \cdot \frac{1}{10} \cdot \frac{1}{10}$ |                     |
|                  |                                                                         | $\frac{1}{100,000}$ |

- b. Show what each entry would be in the row showing an exponential form of  $10^{-7}$ .  
Describe the pattern that supports your answer.

*A common misconception (error) a student may make is comprehending the associated vocabulary (exponential form and expanded form). This may indicate a need to emphasize mathematical vocabulary. For example, students may provide answers for expanded form such as:  $10 \cdot -3$  (multiplying the base and the exponent);  $-10 \cdot -10 \cdot -10$  (delineating the base as a negative 10 three times); or, vice versa  $-3 \cdot -3 \cdot -3 \cdot -3 \cdot -3 \cdot -3 \cdot -3 \cdot -3 \cdot -3$  (delineating the exponent of -3 ten times). This misconception underscores students' not understanding that negative exponents for powers of 10 are used to represent numbers between 0 and 1. The same reasoning may affect the responses given for portion b of this problem as students may not recognize the pattern of negative powers of 10.*

*When encountering negative powers of ten, it might be helpful for the student to write the reciprocal of 10 the same number of times as the power (expanded form).*

- 2) Determine if the following statements are true or false. Justify your reasoning for each statement.

| Statement          | True or False | Justify Reasoning |
|--------------------|---------------|-------------------|
| $10^0 = 1$         |               |                   |
| $10^{-3} = 0.003$  |               |                   |
| $10^{-4} = 0.0001$ |               |                   |

*Statement  $10^0 = 1$ : A misconception for this statement is for students to multiply the base and the exponent, thus resulting in a value of 0 and a student responding that the statement is **false**. Students must understand that any number raised to the power of 0 is one.*

*Statement  $10^{-3} = 0.003$ : A misconception for this statement is for students to have the appropriate number of digits behind the decimal point, but to use the given exponent in the thousandths place; thus, resulting in a value of 0.003 and a student responding with **true**. For negative powers of 10, students should move the decimal to the left and place a 1 in the appropriate place value.*

*Statement  $10^{-4} = 0.0001$ : This misconception is tied to proceeding statement. Students may err by denoting this statement as **false**. For negative powers of 10, students should move the decimal to the left and place a 1 in the appropriate place value.*

3) Consider the chart below.

| Power of 10 | Value |
|-------------|-------|
| $10^2$      | 100   |
| $10^1$      | 10    |
| $10^0$      | 1     |
| $10^{-1}$   | 0.1   |
| $10^{-2}$   | 0.01  |

- a. What is the value of  $10^6$ ? \_\_\_\_\_
- b. What is the value of  $10^{-6}$ ? \_\_\_\_\_
- c. Represent  $10^{-5}$  as a fraction and as a decimal: Fraction \_\_\_\_\_ Decimal \_\_\_\_\_

*For parts a and b of this problem, students may not understand powers of 10 and negative powers of 10 by recognizing patterns. Some students may respond to similarly to question 1 and provide such answers as 60 (multiplying the base by the exponent) or 60,466,176 (multiplying the exponent of 6 ten times). For the fraction representation, a student may respond by writing  $\frac{1}{10^{-5}}$ . This indicates that a student may not have a clear understanding of using reciprocals of bases when associated with a negative power. For the decimal representation, common errors that students may make is to write either 0.000001 or 0.00005. Responses other than 0.00001 represent misconceptions of the meaning of a negative power of 10.*

*Students will benefit from examining patterns of powers of 10 using an expanded chart or table. An example with all forms can be found in the Grade 7 Mathematics Curriculum Framework [Standard 7.1a].*