

Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

LESSON: THE POWER OF 10!

Assuming you were alive the whole time, what might you have been doing?

Identifying and explaining patterns is one of the major math practices that leads to fluency in many areas of mathematics. In *The Power of 10!*, Dr. Vector introduces us to the latest project coming out of Vector Labs: time travel! While Dr. Vector can't give away all the details on this latest invention, she does inform us that the device is built on the power of ten. To better demonstrate the power of ten, Dr. Vector encourages us to partake in an exercise she's developed, titled "Dr. Vector's Journey of the Mind," in which we use the powers of ten to go back in time that many minutes and determine what was happening at that moment. The data provided is the exercise workspace which lists several powers of ten which need to be converted to an amount of time (minutes/hours/days/months/years).

Download the Detailed Lesson Plan
Available on the Teacher Dashboard

The Math Simulator™



1 Immersion

- Play *The Power of 10! Immersion* video, whole-class.
- Restate the question: **Assuming you were alive the whole time, what might you have been doing?**
- Facilitate classroom discussion; ask students: "What do we need to know?"

Number of Minutes Ago	Description of where you were, what you might have been doing, and/or what might have been happening in the world
10^2	
10^3	
10^4	
10^5	
10^6	
10^7	
10^8	

2 Data & Computation

- Print the *Data Artifact* and distribute to students.
- Allow students work time. Ask students: "Does your answer make sense?"
- Consider using a sharing protocol leading to mathematical insights and/or highlighting misconceptions.
- Allow students to revise their work.



3 Resolution

- Play *The Power of 10! Resolution* video, whole-class.
- Prepare and give brief lecture (*Teacher Instruction*).



+ Simulation Trainer (Use student headphones.)

- Assign the *Simulation Trainer*.
- Use protocols that encourage students to help each other.
- Use *Progress Monitoring* to access real-time data for the classroom.
- Provide individual help for students who are not making progress.

Instruction at a Glance



**Gladys
Graham**



**Kevin
Simpson**



**Megan
LeBleu**

Gladys: You may want to work with your students to create a chart illustrating the names of place values and their importance for your class to use as a reference.

Kevin: Consider using base 10 blocks to help struggling students understand place values and support full comprehension of translating from concrete to abstract representation and vice versa.

Megan: Student understanding may be bolstered by exposure to numerous examples of the patterns created when multiplying and dividing by powers of 10. Using patterns created by both whole numbers and decimals, ask students what they notice, and press them for precision and clarity in language.

Standard Math Procedures

Ex. Clicker Quiz #5

A package delivery van can carry 160 boxes at one time.

What is the approximate weight of all the boxes if an average box weighs 10 pounds?

A 16,000 pounds **B** 16 pounds
C 1,600 pounds **D** 1.6 pounds

- Multiply 160 and 10 (add one zero to the right of 160 or shift the digits of 160 to the left one place).

$$160 \times 10 = 1600$$

Clicker Quiz

Launch the *Clicker Quiz*, whole-class.

Dr. Vector loves to challenge herself. She is converting 10^9 into minutes to see how far back in time the time machine would take her.

How many zeros will there be?

A 10 **B** 9
C 8 **D** 7

Which expression has the solution 0.1463?

A $14.63 \div 10^2$
B $14.63 \div 10^3$
C 14.63×10^3
D 14.63×10^4

How many times do you multiply by 10 to get from 0.123 to 12.3?

A 0
B 1
C 2
D 3

Michael and Darren were asked to complete the number sentence:

Michael $\times 10^3 = 4.23$ Darren

0.423 **0.000423**

Who is correct?

A Michael **B** Darren **C** Both **D** Neither

A package delivery van can carry 160 boxes at one time.

What is the approximate weight of all the boxes if an average box weighs 10 pounds?

A 16,000 pounds **B** 16 pounds
C 1,600 pounds **D** 1.6 pounds

Which expression is not equivalent to 120?

A 1.2×10^2 **B** $12,000 \div 10^2$
C $1,200 \div 10^2$ **D** 12×10



THE POWER OF 10!

Assuming you were alive the whole time, what might you have been doing?

Dr. Vector is excited about the prospect of the new time travel device and knows that, in addition to traveling back to the past, it could also one day be used to travel into the future. So Dr. Vector created a new exercise looking into the future, but this time the power of 10 represents *seconds*.

Complete the time travel exercise. Record what you might be doing at that moment in the future and/or your thoughts on what the world might be like.

Doctor Vector's "Journey of the Mind" Time Travel Exercise		
	Number of seconds into the future	Description of where you might be, what you might be doing, or what might be happening in the world
	10^9	
	10^{10}	
	10^{11}	

5.NBT.A.2

About this standard

Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

APPLYING THE STANDARD

How might this standard appear on a test?



CHECK OUT MY WORKED EXAMPLE #10

1) Match each expression to its solution by drawing a line between them.

- a) 0.356×10^2 b) $356 \div 10^2$ c) 0.356×10^3 d) 0.356×10^4 e) $356 \div 10^4$

- 3.56 35.6 3,560 0.0356 356

2) Fill in the sentence below by circling the word that makes the sentence true.

To get from 41.628 to 4162.8, you could
multiply / divide by ten one / two / three / four times.

3) Fill in the missing power of 10 so that each number sentence is true.

- $32 \times \underline{\hspace{2cm}} = 32,000$ $4.7 \div \underline{\hspace{2cm}} = 0.047$ $68 \div \underline{\hspace{2cm}} = 0.0068$
 $96 \times \underline{\hspace{2cm}} = 960$ $2.5 \times \underline{\hspace{2cm}} = 2,500$ $814 \div \underline{\hspace{2cm}} = 0.000814$

4) Fill in the missing number so that each number sentence is true.

- $\underline{\hspace{2cm}} \times 10^3 = 2,100$ $\underline{\hspace{2cm}} \div 10^4 = 0.0005$ $\underline{\hspace{2cm}} \div 10^5 = 0.0035$
 $\underline{\hspace{2cm}} \times 10^4 = 76,000$ $\underline{\hspace{2cm}} \times 10^3 = 3,000$ $\underline{\hspace{2cm}} \div 10^2 = 140$

5) Gustavo earned \$15.25 a day playing his guitar at La Playa Grill. How much will Gustavo earn if he plays:

- a) 10 days in one month? _____
 b) 10 days a month for 10 months? _____
 c) 10 days a month for 10 months for 10 years? _____

