Virtual Learning

Essential Math 4

Unit 11

Lesson 3: Extending Exponents

May 13, 2020

Essential Math 4
Lesson: May 13, 2020

Learning Target:

I can use multiplication and fractions to understand exponents.

Essential Math 4

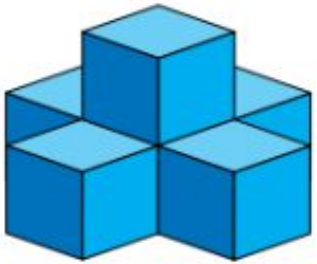
You will explore the use of multiplication and its relationship to exponents.

Directions:

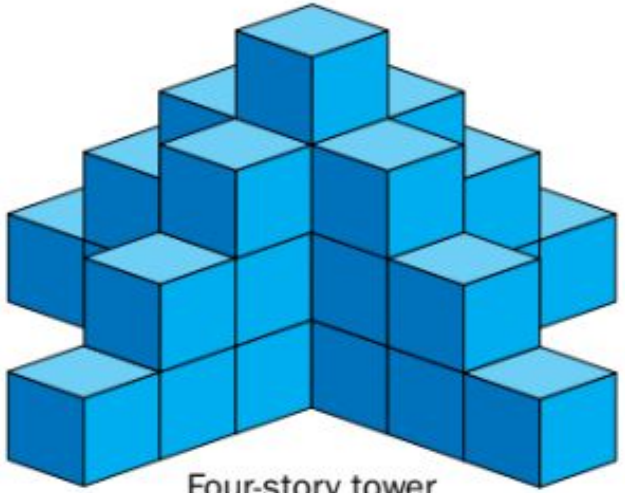
1. Click through the slides.
2. Watch all videos on slides.
3. Do what each slide asks on a separate sheet of paper.

Essential Math 4

Bell Work: May 13, 2020



Two-story tower

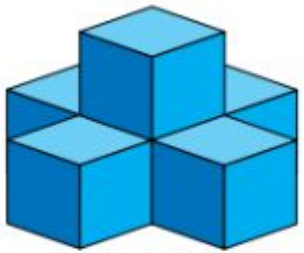


Four-story tower

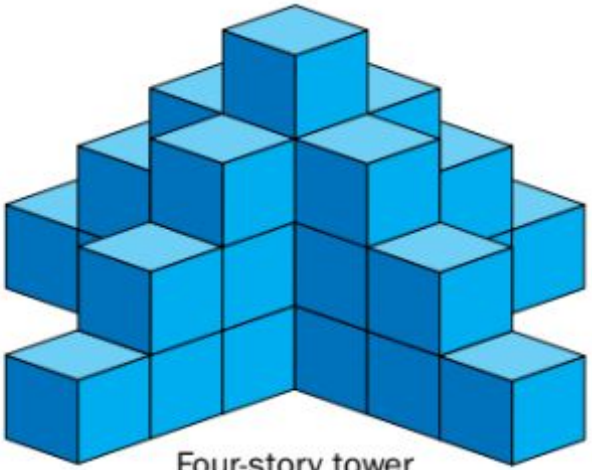
Use blocks to re-create the four-story tower. How many blocks do you need in total?

Essential Math 4

Bell Work Key
May 13, 2020



Two-story tower

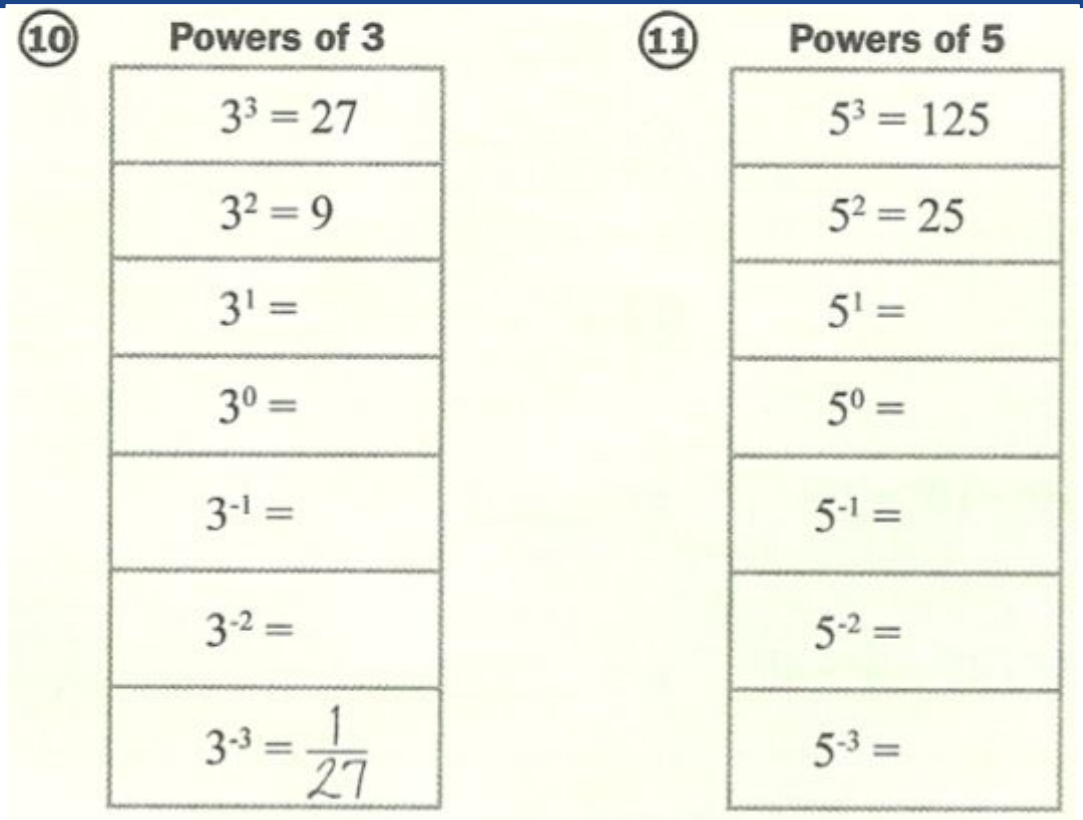


Four-story tower

Use blocks to re-create the four-story tower. How many blocks do you need in total? 28 blocks

Essential Math 4

Practice Problems:
Unit 11
Lesson 3
page 13, # 10-11



10 Powers of 3

$3^3 = 27$
$3^2 = 9$
$3^1 =$
$3^0 =$
$3^{-1} =$
$3^{-2} =$
$3^{-3} = \frac{1}{27}$

11 Powers of 5

$5^3 = 125$
$5^2 = 25$
$5^1 =$
$5^0 =$
$5^{-1} =$
$5^{-2} =$
$5^{-3} =$

Essential Math 4

Answer Key: After completing the problems, check your answers for page 13 here.

10 **Powers of 3**

$3^3 = 27$
$3^2 = 9$
$3^1 = 3$
$3^0 = 1$
$3^{-1} = \frac{1}{3}$
$3^{-2} = \frac{1}{9}$
$3^{-3} = \frac{1}{27}$

11 **Powers of 5**

$5^3 = 125$
$5^2 = 25$
$5^1 = 5$
$5^0 = 1$
$5^{-1} = \frac{1}{5}$
$5^{-2} = \frac{1}{25}$
$5^{-3} = \frac{1}{125}$

Essential Math 4

Practice Problems: Unit 11 Lesson 3 (page 19)

Additional Practice

A Cross out the one expression that isn't equivalent to all the others.

The equivalent expressions all equal _____.

$x^5 \div x^0$ $\quad \frac{x^{15}}{x^2 x}$ $\quad x^2 x^3$

$\frac{x^{10}}{x^5}$ $\quad x^{-1}x^6$ $\quad \frac{x^3 x^4}{x^2}$

B Cross out the one expression that isn't equivalent to all the others.

The equivalent expressions all equal _____.

$x^{-5}x$ $\quad \frac{x^2}{x^6}$ $\quad x^{-2}x^2$

$x^{-3}x^{-1}$ $\quad \frac{1}{xx^3}$ $\quad 1 \div x^4$

Essential Math 4

Answer Key: After completing the problems, check your answers for page 19 here.

Additional Practice

(A) Cross out the one expression that isn't equivalent to all the others.

The equivalent expressions all equal x^5.

$x^5 \div x^0$ $\quad$ ~~$\frac{x^{15}}{x^2 x}$~~ $\quad$ $x^2 x^3$

$\frac{x^{10}}{x^5}$ $\quad$ $x^{-1}x^6$ $\quad$ $\frac{x^3 x^4}{x^2}$

(B) Cross out the one expression that isn't equivalent to all the others.

The equivalent expressions all equal x^{-4}.

$x^{-5}x$ $\quad$ $\frac{x^2}{x^6}$ $\quad$ ~~$x^{-2}x^{-2}$~~

$x^{-3}x^{-1}$ $\quad$ $\frac{1}{xx^3}$ $\quad$ $1 \div x^4$

Essential Math 4

Practice Problems: Unit 11 Lesson 3 page 19

Write three equivalent expressions for each of the following.

(C) u^{-10}

(D) $c^{13} \div c^{5}$

(E) $\frac{m^{20}}{m^{5}}$

(F) $n^{-8}n^{20}$

Essential Math 4

Answer Key: After completing the problems, check your answers for page 19 here.

Write three equivalent expressions for each of the following. (Many possible responses.)

(C) u^{-10} $\frac{u^0}{u^{10}}$ $\frac{u^2}{u^4 u^8}$ $u^3 \cdot u^{-11} \cdot u^{-2}$ $u^{-1} \cdot u^{-9}$

(D) $c^{13} \div c^5$ $\frac{c^{13}}{c^5}$ $c^{-1} \cdot c^{-4} \cdot c^5$ $c^4 \cdot c^4$ c^8

(E) $\frac{m^{20}}{m^5}$ $\frac{m^9}{m^4}$ m^{15} $m^5 \cdot m^5 \cdot m^5$ $m^{-1} \cdot m^{16}$

(F) $n^{-8}n^{20}$ $\frac{n^{20}}{n^8}$ n^{12} $n^2 \cdot n^5 \cdot n^5$ $n^{13} \cdot n^{-1}$

Essential Math 4

Practice Problems: Unit 11 Lesson 3 (page 13, # 16)

Discuss & Write What You Think

(16) Carla and Jacob are debating their strategies for answering $5^3 \cdot 5^{-2} =$ _____.

Carla says: "Negative exponents are fractions. So we can write the problem as $5 \cdot 5 \cdot 5 \cdot \frac{1}{5} \cdot \frac{1}{5}$."

Jacob says: "Negative exponents mean division. So we can write the problem as $5 \cdot 5 \cdot 5 \div 5 \div 5$."

Explain how they can both be correct.

Answer Key: After completing the problems, check your answers for page 13 here.

Discuss & Write What You Think

(16) Carla and Jacob are debating their strategies for answering $5^3 \cdot 5^{-2} =$ 5.

Carla says: "Negative exponents are fractions. So we can write the problem as $5 \cdot 5 \cdot 5 \cdot \frac{1}{5} \cdot \frac{1}{5}$."

Jacob says: "Negative exponents mean division. So we can write the problem as $5 \cdot 5 \cdot 5 \div 5 \div 5$."

Explain how they can both be correct.

Multiplying by $\frac{1}{5}$ is the same as dividing by 5.
Both strategies show both multiplying and dividing by 5.
$5 \cdot \frac{1}{5} = 1$ and $5 \div 5 = 1$, so in both cases the expressions are equivalent to $5 \cdot 1 \cdot 1 = 5$.

Essential Math 4

Practice Problems: Unit 11 Lesson 3 (page 13)

Thinking Out Loud

Finish and perform this dialogue.

Michael: Can we come up with a way to explain five to the zero (*he writes* 5^0)? I know that it's 1 (*he writes* $5^0 = 1$), but every time I see it, I still think it's zero.

Answer Key: After completing the problems, check your answers for page 13 here.

Finish and perform this dialogue.

Michael: Can we come up with a way to explain five to the zero (*he writes* 5^0)? I know that it's 1 (*he writes* $5^0 = 1$), but every time I see it, I still think it's zero.

(Dialogues will vary.)
Listen for arguments like: $5^2 \div 5 = 5^1$ and $5^1 \div 5 = 5^0$
As exponents decrease, we divide by the base number. So 5^0 is $5^1 \div 5$, which is 1.
Multiplying terms with the same base works by adding exponents. So, for example, $5^2 \cdot 5^5 = 5^7$. To follow with this rule, $5^0 \cdot 5^5$ should be 5^5, which would make $5^0 = 1$.
Multiplying by 1 doesn't change a number. So 5^2 can be written as $1 \cdot 5 \cdot 5$, 5^1 can be written as $1 \cdot 5$, and 5^0 can be written as 1 without any 5's multiplied.

Essential Math 4

Fun Stuff:

MysteryGrid **1, 2, 3, 4**

6,×	4	2,−	
	8,×		
	6,×		12,×
2,÷			

Essential Math 4

Fun Stuff: Key

MysteryGrid **1, 2, 3, 4**

6,× 2	4 4	2,− 3	1
3	8,× 1	4	2
1	6,× 3	2	12,× 4
2,÷ 4	2	1	3

Essential Math 4

Resources were developed at EDC (Education Development Center, Inc).
EDC owns the copyright © 2011-2019

transition to algebra
make algebra make sense

Research-based National Science Foundation-funded

EDC Learning transforms lives.

firsthand HEINEMANN
Dedicated to Teachers™