

8TH GRADE OPEN RESPONSE INTEGERS AND POWERS

The **academic expectations** addressed by “Integers and Powers” are:

- 1.5 Students use mathematical ideas and procedures to communicate, reason, and solve problems.
- 2.7 Students understand number concepts and use number appropriately and accurately.

The **core content** addressed by this item includes

- MA-M-1.1.5: Students will describe properties of, define, give examples of, and/or apply to both real-world and mathematical situations: positive whole number exponents.
- MA-M-1.2.1: Students will perform the following mathematical operations and/or procedures accurately and efficiently, and explain how they work in real-world or mathematical situations: multiply rational numbers (integers) to solve problems.
- MA-M-4.3.1: Students will show connections and how connections are made between concepts and skills, explain why procedures work, and make generalizations about mathematics in meaningful ways for the following relationships: how everyday situations, patterns, verbal rules relate to each other.

$$(-2)^1 = f \quad (-2)^2 = h \quad (-2)^3 = j \quad (-2)^4 = n \quad (-2)^5 = r \quad (-2)^6 = t$$

- A. Solve the equations above for the given variables.
- B. When a negative integer is raised to an odd power, is the result a positive or negative integer? Explain your reasoning.
- C. When a negative integer is raised to an even power, is the result a positive or negative integer? Explain your reasoning.
- D. Provide 2 new examples for part B and 2 new examples for part C to support your reasoning.

BE SURE TO LABEL YOUR RESPONSES (A), (B), (C), and (D)

NAME _____

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INTEGERS AND POWERS**

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Rubric for
8th Grade Open Response
Integers and Powers

Score	Description
4	Students score 4 points.
3	Students score 3 to $3\frac{1}{2}$ points.
2	Student scores $1\frac{1}{2}$ to $2\frac{1}{2}$ points.
1	Student scores $\frac{1}{2}$ to 1 points. OR Student shows minimal understanding
0	Response is totally incorrect or irrelevant.

Score Points:

Part A: **f = - 2** **h = 4** **j = - 8** **n = 16** **r = - 32** **t = 64**

1 point for correct solution to all 6 given variables
.5 point for correct solution to 3 or more given variables
0 points for less than 3 correct solutions to given variables

Part B: 1 point for correct determination that a negative integer raised to an odd power results in a negative integer - with correct explanation that a negative integer multiplied an odd number of times will result in a negative integer.
.5 point negative integer - just provides answer, no explanation or incorrect explanation.
0 points incorrect answer - no explanation or incorrect explanation.

Part C: 1 point for correct determination that a negative integer raised to an even power results in a positive integer - with correct explanation that a negative integer multiplied an even number of times will result in a positive integer.
.5 point positive integer - just provides answer, no explanation or incorrect explanation.
0 points incorrect answer - no explanation or incorrect explanation.

Part D: 1 point 4 total new correct examples - 2 new correct examples each for Part B and Part C.
.5 point 2 or 3 total new correct examples.
0 points 1 or no correct examples.

8th Grade Open Response
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Distinguished Response Example

Part A: $f = -2$ $h = 4$ $j = -8$ $n = 16$ $r = -32$ $t = 64$

Part B: A negative integer raised to an odd power results in a negative integer. Negative integers raised to an odd power will always result in a negative integer because a negative integer multiplied an odd number of times will be a negative number. For example, multiply a negative number 3 times: $- \cdot - \cdot -$, a negative times a negative is a positive, then times another negative is a negative number. If you multiply a negative number 5 times: $- \cdot - \cdot - \cdot - \cdot -$, a negative times a negative is a positive, times another negative is a negative, times another negative is a positive, times another negative is a negative.
 $(-2)^5 = -2 \cdot -2 \cdot -2 \cdot -2 \cdot -2 = -32$

Part C: A negative integer raised to an even power results in a positive integer. Negative integers raised to an even power will always result in a positive integer because a negative integer multiplied an even number of times will be a positive number. For example, multiply a negative number 2 times: $- \cdot -$, a negative times a negative is a positive number. If you multiply a negative number 4 times: $- \cdot - \cdot - \cdot -$, a negative times a negative is a positive, times another negative is a negative, times another negative is a positive.
 $(-2)^4 = -2 \cdot -2 \cdot -2 \cdot -2 = 16$

Part D: Two new examples for part B are: $(-5)^3 = -5 \cdot -5 \cdot -5 = -125$
 $(-7)^7 = -7 \cdot -7 \cdot -7 \cdot -7 \cdot -7 \cdot -7 \cdot -7 = -823543$

Two new examples for part C are: $(-6)^2 = -6 \cdot -6 = 36$
 $(-4)^8 = -4 \cdot -4 \cdot -4 \cdot -4 \cdot -4 \cdot -4 \cdot -4 \cdot -4 = 65536$