

AP Precalculus  
Rewriting Exponential Expressions

Rewriting Exponential Expressions | APPC-U02-P05

96 problems · Four activity formats

|    |                            |              |
|----|----------------------------|--------------|
| 01 | Answer Bank Challenge      | 24 tasks     |
| 02 | Grid Rounds                | 24 tasks     |
| 03 | Match & Move               | 24 cards     |
| 04 | Error Analysis & Strategy  | 24 tasks     |
| 05 | Quick Answer Key           | 96 answers   |
| 06 | Full Worked Solutions      | 96 solutions |
| 07 | Teacher / Parent Use Guide | included     |
| 08 | Terms of Use & License     | included     |

Topic focus

Across 96 tasks this topic asks for general proof and counterargument, normalized formulas and graph distinction, vertical multiplier and interpretation, exact multiplier, multiplier and interpretation and decision and normalized comparison.

8 PDFs and a README; 67 buyer pages.

## AP Precalculus

## Rewriting Exponential Expressions

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

|                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Rewrite <math>3(2^{x+2})</math> in the form <math>A(B^x)</math>. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value.</p> <p>_____</p> <p>Bank label: _____</p>                                      | <p>Write <math>2^{-x}</math> with <math>x</math> as a positive exponent. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value.</p> <p>_____</p> <p>Bank label: _____</p>                   |
| <p>Put <math>2(5^{x-1})</math> in the form <math>A(B^x)</math>. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value.</p> <p>_____</p> <p>Bank label: _____</p>                                          | <p>Write <math>10^{-x}</math> using a positive exponent <math>x</math> and a base below 1. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value.</p> <p>_____</p> <p>Bank label: _____</p> |
| <p>Rewrite <math>7(3^{x+1})</math> as <math>A(B^x)</math>. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value.</p> <p>_____</p> <p>Bank label: _____</p>                                               | <p>Express <math>(\text{cube root of } 125)^x</math> without a radical. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value.</p> <p>_____</p> <p>Bank label: _____</p>                    |
| <p>For <math>f(x) = 3^x</math>, express <math>f(x+2)</math> as a constant multiple of <math>f(x)</math>. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value.</p> <p>_____</p> <p>Bank label: _____</p> | <p>Normalize <math>5(3^{2x-1})</math> into <math>A(B^x)</math>, with an exact coefficient. For the answer bank, record the complete response required by the original task; use the given context to distinguish responses that share a numerical value.</p> <p>_____</p> <p>Bank label: _____</p> |



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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

|                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>START</b></p> <p>Normalize <math>\left(\frac{1}{7}\right)^{2-x}</math> as <math>A(B^x)</math> with <math>B &gt; 1</math>. Use the complete final response to identify the next Match &amp; Move card; show the reasoning required by the original task.</p> <p>Your response: _____</p>                       | <p><b>Incoming:</b> <math>\left(\frac{1}{49}\right)(7^x)</math></p> <p>Convert <math>256^{3\frac{5}{8}}</math> to a single exponential with an integer base. Use the complete final response to identify the next Match &amp; Move card; show the reasoning required by the original task.</p> <p>Your response: _____</p>                                |
| <p><b>Incoming:</b> <math>8^x</math></p> <p>Express <math>f(x + \frac{1}{3})</math> as a multiple of <math>f(x)</math> when <math>f(x) = 8^x</math>. Use the complete final response to identify the next Match &amp; Move card; show the reasoning required by the original task.</p> <p>Your response: _____</p>  | <p><b>Incoming:</b> <math>f(x + \frac{1}{3}) = 2f(x)</math>.</p> <p>Write <math>(\frac{1}{2})(81^{\frac{5}{4} + \frac{1}{2}})</math> as <math>A(B^x)</math> with <math>B</math> an integer. Use the complete final response to identify the next Match &amp; Move card; show the reasoning required by the original task.</p> <p>Your response: _____</p> |
| <p><b>Incoming:</b> <math>(\frac{9}{2})(3^x)</math></p> <p>Find <math>a</math> so that <math>a(2^{x+1}) = 14(2^x)</math> for all real <math>x</math>. Use the complete final response to identify the next Match &amp; Move card; show the reasoning required by the original task.</p> <p>Your response: _____</p> | <p><b>Incoming:</b> <math>a = 7</math></p> <p>Express <math>3^{2-x}</math> as <math>A(B^x)</math> with <math>0 &lt; B &lt; 1</math>. Use the complete final response to identify the next Match &amp; Move card; show the reasoning required by the original task.</p> <p>Your response: _____</p>                                                        |

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Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Find  $h$  so that  $2^{x+h} = 8(2^x)$  for every real  $x$ . Student work:  $h = 4$  Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens.

The table shows  $f(x) = 4^x + 2$  and  $g(x) = 2^x + 2$  agree at  $x = 0$ . Are they identical? Use the normalized bases to explain. Student work: No. They share the translated anchor at  $x = 0$ , but bases 5 and 2 give different values for other inputs. Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens.

Precision: Given values are exact

| $x$ | $f(x)$ | $g(x)$ |
|-----|--------|--------|
| -1  | 2.25   | 2.5    |
| 0   | 3      | 3      |
| 1   | 6      | 4      |

## Rewriting Exponential Expressions

### Full Worked Solutions - excerpt

#### Worked example

**Problem.** A student writes  $3^{x+2} = 3^x + 9$ . Identify the failed exponent law and give the correct rewrite.

**Answer.** Exponents add when same-base powers are multiplied, not added. The correct identity is  $3^{x+2} = 9(3^x)$ .

#### Explanation and check.

Use  $3^{x+2} = 3^x \cdot 3^2$ .

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#### Worked example

**Problem.** Show that shifting  $f(x) = 2^x$  right 3 units produces the same graph as a vertical scaling. State the scale factor.

**Answer.**  $f(x - 3) = 2^{x-3} = (\frac{1}{8})2^x$ , so the right shift equals multiplying outputs by  $\frac{1}{8}$ .

#### Explanation and check.

The constant exponent  $-3$  factors out as  $2^{-3}$ .