Sets & Steps
Math Practice & Worked Solutions

AP Precalculus

Log Properties and Change of Base

Log Properties and Change of Base | APPC-U02-P21

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for value to nearest thousandth, correction and denominator issue, valid subset and failing branch, correct interval, correct form and domain and source domain and extra condensed intervals.

8 PDFs and a README; 60 buyer pages.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

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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.

Rewrite the logarithm using natural logarithms. 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. Start with $\log_2(7)$. Bank label: _____	Combine the two terms and carry along the original domain. 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. Start with $\log_5(u) + \log_5(v)$. Bank label: _____
Separate the positive factors into individual base-five logarithms. 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. Start with $\log_5(7rs)$. Bank label: _____	Convert the expression to a quotient of common logarithms. 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. Start with $\log_5(11)$. Bank label: _____
Combine the difference into one base-eight logarithm and retain both source restrictions. 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. Start with $\log_8(p) - \log_8(q)$. Bank label: _____	Expand the product into separate logarithms of its constant and variable factors. 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. Start with $\ln(11at)$. Bank label: _____
Represent the value using only natural logarithms. 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. Start with $\log_6(13)$. Bank label: _____	Correct the proposed power-law rewrite so it is equivalent on the full domain of the original expression. 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. The candidate expression is $2\ln(x)$. Start with $\ln(x^2)$. Bank label: _____

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Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

Expand the logarithm completely, keeping the positive constant inside its own logarithm. Start with $\log_2(3xy)$.	Condense to one logarithm and retain the domain of the displayed expression. Start with $\log_3(x) + \log_3(y)$.
Decide whether the claim is an identity, and justify the decision with one exact counterexample if it is false. Evaluate the claim $\ln(u + v) = \ln(u) + \ln(v)$.	Identify the first invalid line and state what valid law could replace the mistaken idea. The student writes: $\ln(a + b) = \ln(a) + \ln(b) = \ln(ab)$.
Write the expression as a sum and difference of natural logarithms with no powers inside them. Start with $\ln(a^2 \cdot \frac{\sqrt{b}}{c})$.	Produce an equivalent single logarithm and report the original restrictions. Start with $2\ln(a) - \ln(b)$.

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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.

START

Expand the quotient and simplify the logarithm of the numerical factor. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task.

Start with $\log_6(\frac{x}{36yz})$.

Your response: _____

Incoming: Yes; the equality holds for every allowed a and x.

Combine the shifted logarithms and derive the allowed x-values from the separate terms. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task.

Start with $\log_7(x+2) + \log_7(x-4)$.

Your response: _____

Incoming: $k = \frac{1}{2}$

Express the function using a base-three logarithm and simplify the coefficient. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task.

Use logarithms with base 3.

Start with $\log_9(y)$.

Your response: _____

Incoming: 1.661

Pull the exponent in front without losing inputs less than the center. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task.

Start with $\log_7((z-1)^2)$.

Your response: _____

Incoming: $6\log_5|2x-1|$, with $x \neq \frac{1}{2}$

Test the proposed quotient rule and disprove it exactly if it is not an identity. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task.

Evaluate the claim $\log_4(\frac{u}{v}) = \frac{\log_4(u)}{\log_4(v)}$.

Your response: _____

Incoming: $\log_3(m^4 \cdot \frac{\sqrt[3]{p}}{n^2})$, with $m > 0, n > 0, p > 0$

Find the scaling constant that makes the two logarithmic functions identical. Use the complete final response to identify the next Match & Move card; show the reasoning required by the original task.

Use the identity $K\log_3(x) = \log_{81}(x)$.

Your response: _____

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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.

Evaluate the identity claim and, if needed, refute it using powers of 2. Identify the precise error or unsupported step in the stated claim or method, then give the corrected conclusion and justify it from the supplied information.

Evaluate the claim $\log_2(uv) = \log_2(u)\log_2(v)$.

Use base 2 as the change-of-base reference to find the exact value. Student work: $-\frac{3}{1}$ Identify the precise mathematical error or omitted condition, then complete the original task and verify the correction from the supplied givens.

The reference logarithm base is 2.

Start with $\log_{\frac{1}{4}}(8)$.

Log Properties and Change of Base

Full Worked Solutions - excerpt

Worked example

Problem. Expand the logarithm completely, keeping the positive constant inside its own logarithm.

Start with $\log_2(3xy)$.

Answer. $\log_2(3) + \log_2(x) + \log_2(y)$

Explanation and check.

The argument is a product of the three positive factors $3, x$, and y, so the product law separates them.

Worked example

Problem. Decide whether the claim is an identity, and justify the decision with one exact counterexample if it is false.

Evaluate the claim $\ln(u + v) = \ln(u) + \ln(v)$.

Answer. False; $u = v = 1$ gives $\ln(2)$ on the left and 0 on the right.

Explanation and check.

Logarithms convert products, not sums, into sums; the positive pair $1, 1$ directly contradicts the claim.