Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Exponent Rules & Scientific Notation | Algebra 1 | 6-Topic Bundle

6-topic bundle | 576 problems | Four activity formats

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01 **Product of Powers**

View individual product and its full preview

02 **Quotient of Powers**

View individual product and its full preview

03 **Zero Exponents**

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04 **Negative Exponents**

View individual product and its full preview

05 **Operations with Scientific Notation**

View individual product and its full preview

06 **Comparing Scientific Notation**

View individual product and its full preview

In every topic

Answer Bank Challenge	24 tasks
Grid Rounds	24 tasks
Match & Move	24 cards
Error Analysis & Strategy	24 tasks
Quick Answer Key and Full Worked Solutions	included
Teacher / Parent Use Guide and Terms of Use	included

Product previews

The following preview pages show the cover, all four activity formats, and worked examples for each included resource, in the listed order.

48 PDFs and 6 READMEs; 326 buyer PDF pages across the 6 products.

Preview pages are not included in the buyer page count. Check the list against resources you already own.

This is a fixed collection of the listed products. Purchase includes the existing individual resource files. To open a product's online preview, follow its title link and select View Preview.

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Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Product of Powers

Product of Powers | A1-U07-P01

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for exact expression or conclusion with exponent-rule justification.

8 PDFs and a README; 54 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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Algebra 1

Product of Powers

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.

Treat the equation as a formal power identity in the displayed base y. Assume n must be a positive integer. Solve $y^6y^n = y^8$ for n, or explain why no admissible value exists. Use the requested final expression or admissible exponent as the matching response; also complete the original justification. Bank label: _____	The fixed numerical base (-2) has absolute value greater than 1. Assume n must be a positive integer. Solve $(-2)^7(-2)^n = (-2)^{10}$ for n, or explain why no admissible value exists. Use the requested final expression or admissible exponent as the matching response; also complete the original justification. Bank label: _____
The fixed numerical base 2 has absolute value greater than 1. Assume n must be a positive integer. Solve $2^n \cdot 2^n \cdot 2^3 = 2^{11}$ for n, or explain why no admissible value exists. Use the requested final expression or admissible exponent as the matching response; also complete the original justification. Bank label: _____	The fixed numerical base 7 has absolute value greater than 1. Assume n must be a positive integer. Solve $7^n \cdot 7^n \cdot 7^n \cdot 7^4 = 7^{19}$ for n, or explain why no admissible value exists. Use the requested final expression or admissible exponent as the matching response; also complete the original justification. Bank label: _____
Treat the equation as a formal power identity in the displayed base m. Assume n must be a positive integer. Solve $m^nm^nm^5 = m^{17}$ for n, or explain why no admissible value exists. Use the requested final expression or admissible exponent as the matching response; also complete the original justification. Bank label: _____	The fixed numerical base 3 has absolute value greater than 1. Assume n must be a positive integer. Solve $3^n \cdot 3^n \cdot 3^3 = 3^8$ for n, or explain why no admissible value exists. Use the requested final expression or admissible exponent as the matching response; also complete the original justification. Bank label: _____
Rewrite $(x+1)^2(x+1)^3$ as one power. Identify the common base and justify the exponent in the result by counting repeated factors. Use the requested final expression or admissible exponent as the matching response; also complete the original justification. Bank label: _____	Rewrite $(y-2)^3(y-2)^3$ as one power. Identify the common base and justify the exponent in the result by counting repeated factors. Use the requested final expression or admissible exponent as the matching response; also complete the original justification. Bank label: _____

Algebra 1

Product of Powers

Name: _____ **Date:** _____ **Class:** _____

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.

Treat the equation as a formal power identity in the displayed base a. Assume n must be a positive integer. Solve $a^n a^n a^1 = a^5$ for n, or explain why no admissible value exists.	Treat the equation as a formal power identity in the displayed base b. Assume n must be a positive integer. Solve $b^n b^n b^n b^2 = b^{11}$ for n, or explain why no admissible value exists.
Design a same-base product equal to s^{11} using two even positive exponents. All exponents must be positive integers. Give one product and verify every condition, or prove the restrictions incompatible.	Design a same-base product equal to $(u-3)^{12}$ using three distinct exponents, each at least 3. All exponents must be positive integers. Give one product and verify every condition, or prove the restrictions incompatible.
Treat the equation as a formal power identity in the displayed base x. Assume n must be a positive integer. Solve $x^n x^n x^2 = x^8$ for n, or explain why no admissible value exists.	Design a same-base product equal to v^9 using two distinct exponents, each greater than 4. All exponents must be positive integers. Give one product and verify every condition, or prove the restrictions incompatible.

Algebra 1

Product of Powers

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.

Incoming: $w^3w^6 = w^9$.

Simplify $x^5y^3x^2$ by combining only powers whose bases are identical. State which factors must remain in separate base groups. Use the requested final expression or admissible exponent as the matching response; also complete the original justification.

Your response: _____

Incoming: $p^5q^4p^2 = p^7q^4$.

Rewrite x^2x^4 as one power. Identify the common base and justify the exponent in the result by counting repeated factors. Use the requested final expression or admissible exponent as the matching response; also complete the original justification.

Your response: _____

Incoming: $p^5p^4 = p^9$.

Rewrite q^2q^5 as one power. Identify the common base and justify the exponent in the result by counting repeated factors. Use the requested final expression or admissible exponent as the matching response; also complete the original justification.

Your response: _____

Incoming: $r^3r^5 = r^8$.

Rewrite u^5u^5 as one power. Identify the common base and justify the exponent in the result by counting repeated factors. Use the requested final expression or admissible exponent as the matching response; also complete the original justification.

Your response: _____

Incoming: $x^5y^3x^2 = x^7y^3$.

Rewrite $(-2)^4(-2)^6$ as one power. Identify the common base and justify the exponent in the result by counting repeated factors. Use the requested final expression or admissible exponent as the matching response; also complete the original justification.

Your response: _____

Incoming: $v^2v^6 = v^8$.

Rewrite w^3w^6 as one power. Identify the common base and justify the exponent in the result by counting repeated factors. Use the requested final expression or admissible exponent as the matching response; also complete the original justification.

Your response: _____

Algebra 1

Product of Powers

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.

A first group contains 2 copies of the base 4, and a second group contains 3 more copies of that identical base. Without evaluating the base, explain why multiplying the groups gives 4^5. Compare two proposed explanations: concatenate the two factor lists and add their lengths, or multiply the two list lengths. Which gives a valid general justification? Explain using the original groups; do not evaluate the base.

Audit the claim $x^3x^5 = x^8$. Decide whether it is valid under the product rule. If it is invalid, identify the first structural error and give a repair or a numerical counterexample. A learner justifies this by saying: "Any two powers can be combined by adding their exponents, even when their bases differ." Evaluate the equality and this justification separately. Identify and repair the missing condition in the justification.

A first group contains 3 copies of the base x, and a second group contains 4 more copies of that identical base. Without evaluating the base, explain why multiplying the groups gives x^7. Compare two proposed explanations: concatenate the two factor lists and add their lengths, or multiply the two list lengths. Which gives a valid general justification? Explain using the original groups; do not evaluate the base.

Audit the claim $y^3y^4 = y^{12}$. Decide whether it is valid under the product rule. If it is invalid, identify the first structural error and give a repair or a numerical counterexample.

Product of Powers

Full Worked Solutions - excerpt

Worked example

Problem. Audit the claim $a^2b^5 = a^7$. Decide whether it is valid under the product rule. If it is invalid, identify the first structural error and give a repair or a numerical counterexample.

Answer. The claim is invalid: the bases a and b are not identical; the product stays a^2b^5.

Explanation and check.

First check the operation and the exact bases before touching exponents. The bases a and b are not identical; the product stays a^2b^5. At $a = 2$ and $b = 3$, the claimed sides are 972 and 128.

Worked example

Problem. Audit the claim $t^2 + t^3 = t^5$. Decide whether it is valid under the product rule. If it is invalid, identify the first structural error and give a repair or a numerical counterexample.

Answer. The claim is invalid: the product rule does not apply across addition.

Explanation and check.

First check the operation and the exact bases before touching exponents. The product rule does not apply across addition. At $t = 2$, the sides are 12 and 32.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Quotient of Powers

Quotient of Powers | A1-U07-P02

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for simplified expression, retained restriction, and exact justification.

8 PDFs and a README; 63 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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Algebra 1

Quotient of Powers

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.

Assume $x \neq 0$. Simplify $\frac{x^2}{x^1}$ by displaying the cancellation count, then state the positive exponent left in the numerator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation. Bank label: _____	Assume $y \neq 0$. Simplify $\frac{y^3}{y^2}$ by displaying the cancellation count, then state the positive exponent left in the numerator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation. Bank label: _____
Assume $t \neq 0$. Simplify $\frac{t^4}{t^3}$ by displaying the cancellation count, then state the positive exponent left in the numerator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation. Bank label: _____	Assume $a \neq 0$. Simplify $\frac{a^5}{a^4}$ by displaying the cancellation count, then state the positive exponent left in the numerator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation. Bank label: _____
Assume $x \neq 2$. Simplify $\frac{(x-2)^7}{(x-2)^5}$ by displaying the cancellation count, then state the positive exponent left in the numerator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation. Bank label: _____	Assume $y \neq -3$. Simplify $\frac{(y+3)^8}{(y+3)^6}$ by displaying the cancellation count, then state the positive exponent left in the numerator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation. Bank label: _____
Assume $t \neq 2$. Simplify $\frac{(2t-4)^3}{(2t-4)^1}$ by displaying the cancellation count, then state the positive exponent left in the numerator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation. Bank label: _____	Assume $p \neq -2$. Simplify $\frac{(3p+6)^4}{(3p+6)^2}$ by displaying the cancellation count, then state the positive exponent left in the numerator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation. Bank label: _____

Algebra 1

Quotient of Powers

Name: _____ **Date:** _____ **Class:** _____

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.

The factor diagram has numerator labels $N1{:}x$, $N2{:}x$, $N3{:}x$ and denominator labels $D1{:}x$, $D2{:}x$. Use the diagram to match every denominator factor with one numerator factor. State the remaining factor count and the nonzero-base condition.

Numerator

N1	N2	N3
x	x	x

Denominator

D1	D2
x	x

The factor diagram has numerator labels $N1{:}(x-2)$, $N2{:}(x-2)$, $N3{:}(x-2)$, $N4{:}(x-2)$, $N5{:}(x-2)$ and denominator labels $D1{:}(x-2)$, $D2{:}(x-2)$, $D3{:}(x-2)$. Use the diagram to match every denominator factor with one numerator factor. State the remaining factor count and the nonzero-base condition.

Numerator

N1	N2	N3	N4	N5
$(x-2)$	$(x-2)$	$(x-2)$	$(x-2)$	$(x-2)$

Denominator

D1	D2	D3
$(x-2)$	$(x-2)$	$(x-2)$

The factor diagram has numerator labels $N1{:}2$, $N2{:}2$, $N3{:}2$, $N4{:}2$, $N5{:}2$, $N6{:}2$, $N7{:}2$ and denominator labels $D1{:}2$, $D2{:}2$, $D3{:}2$, $D4{:}2$. Use the diagram to match every denominator factor with one numerator factor. State the remaining factor count and the nonzero-base condition.

Numerator

N1	N2	N3	N4	N5	N6	N7
2	2	2	2	2	2	2

Denominator

D1	D2	D3	D4
2	2	2	2

The factor diagram has numerator labels $N1{:}(y+3)$, $N2{:}(y+3)$, $N3{:}(y+3)$, $N4{:}(y+3)$, $N5{:}(y+3)$, $N6{:}(y+3)$ and denominator labels $D1{:}(y+3)$, $D2{:}(y+3)$. Use the diagram to match every denominator factor with one numerator factor. State the remaining factor count and the nonzero-base condition.

Numerator

N1	N2	N3	N4	N5	N6
$(y+3)$	$(y+3)$	$(y+3)$	$(y+3)$	$(y+3)$	$(y+3)$

Denominator

D1	D2
$(y+3)$	$(y+3)$

Algebra 1

Quotient of Powers

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.

Incoming: $\frac{a^8(3p+6)^9}{a^3(3p+6)^5} = a^5(3p+6)^4$; original denominator conditions: $a \neq 0$ and $p \neq -2$.

Assume $p \neq -2$. Simplify $\frac{(3p+6)^{12}}{(3p+6)^6}$ by displaying the cancellation count, then state the positive exponent left in the numerator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation.

Your response: _____

Incoming: $\frac{(r+1)^8}{(r+1)^4} = (r+1)^4$; original condition: $r \neq -1$.

Simplify $\frac{(x-2)^8 \cdot 5^2 (y+3)^6}{(x-2)^4 (y+3)^3}$. Cancel and subtract exponents separately for each exact base, preserve any unmatched numerator factor, and list every restriction inherited from the original denominator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation.

Your response: _____

Incoming: $\frac{t^6 a^5}{t^3 a^2} = t^3 a^3$; original denominator conditions: $t \neq 0$ and $a \neq 0$.

Assume $r \neq -1$. Simplify $\frac{(r+1)^8}{(r+1)^4}$ by displaying the cancellation count, then state the positive exponent left in the numerator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation.

Your response: _____

Incoming: $\frac{m^9(r+1)^9}{m^4(r+1)^5} = m^5(r+1)^4$; original denominator conditions: $m \neq 0$ and $r \neq -1$.

Simplify $\frac{(y+3)^6 a^6 n^6}{(y+3)^1 n^2}$. Cancel and subtract exponents separately for each exact base, preserve any unmatched numerator factor, and list every restriction inherited from the original denominator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation.

Your response: _____

Incoming: $\frac{(3p+6)^{12}}{(3p+6)^6} = (3p+6)^6$; original condition: $p \neq -2$.

Simplify $\frac{m^9(r+1)^9}{m^4(r+1)^5}$. Cancel and subtract exponents separately for each exact base, preserve any unmatched numerator factor, and list every restriction inherited from the original denominator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation.

Your response: _____

Incoming: $\frac{a^7}{a^2} = a^5$; original condition: $a \neq 0$.

Simplify $\frac{2^8 \cdot 3^7}{2^4 \cdot 3^4}$. Cancel and subtract exponents separately for each exact base, preserve any unmatched numerator factor, and list every restriction inherited from the original denominator. For the matching response, record both the requested final power/product or exponent and all original denominator restrictions. Also complete the original explanation.

Your response: _____

Algebra 1

Quotient of Powers

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.

Simplify $\frac{x^2t^2y^3}{x^1y^2}$. Preserve any unmatched numerator factor and list every restriction inherited from the original denominator. Choose between matching numerator and denominator factors by identical whole base, or matching factors merely because their exponents agree. Justify which strategy applies to this quotient, then use it to complete the original simplification and domain requirements.

Simplify $\frac{t^3a^3}{t^2a^2}$. Preserve any unmatched numerator factor and list every restriction inherited from the original denominator. Choose between matching numerator and denominator factors by identical whole base, or matching factors merely because their exponents agree. Justify which strategy applies to this quotient, then use it to complete the original simplification and domain requirements.

Simplify $\frac{(x-2)^4(y+3)^3}{(x-2)^3(y+3)^2}$. Preserve any unmatched numerator factor and list every restriction inherited from the original denominator. Choose between matching numerator and denominator factors by identical whole base, or matching factors merely because their exponents agree. Justify which strategy applies to this quotient, then use it to complete the original simplification and domain requirements.

Simplify $\frac{(2t-4)^5a^5m^4}{(2t-4)^4m^3}$. Preserve any unmatched numerator factor and list every restriction inherited from the original denominator. Choose between matching numerator and denominator factors by identical whole base, or matching factors merely because their exponents agree. Justify which strategy applies to this quotient, then use it to complete the original simplification and domain requirements.

Quotient of Powers

Full Worked Solutions - excerpt

Worked example

Problem. Audit the worked simplification: $\frac{3^8}{3^3} = 3^{11}$. Identify the first quotient-rule or domain error, repair it, and use the supplied structure or a counterexample to justify the verdict.

Answer. The work is invalid: a quotient subtracts exponent counts: the repair is 3^5.

Explanation and check.

Check exact base equality, then subtract denominator exponent from numerator exponent, and finally retain every original denominator exclusion. A quotient subtracts exponent counts: the repair is 3^5. The numerator has only five uncanceled copies.

Worked example

Problem. Audit the worked simplification: $\frac{(x-1)^7}{(x-1)^3} = (x-1)^4$ for every real x. Identify the first quotient-rule or domain error, repair it, and use the supplied structure or a counterexample to justify the verdict.

Answer. The work is invalid: the power is correct, but the domain must keep $x \neq 1$.

Explanation and check.

Check exact base equality, then subtract denominator exponent from numerator exponent, and finally retain every original denominator exclusion. The power is correct, but the domain must keep $x \neq 1$. At $x = 1$, the original denominator is zero.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Zero Exponents

Zero Exponents | A1-U07-P04

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for exact value, condition, or boundary-aware conclusion with justification.

8 PDFs and a README; 50 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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Algebra 1

Zero Exponents

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.

Evaluate $(4-11)^0$. First compute the expression that forms the base; then decide whether the zero power is defined. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions. Bank label: _____	Evaluate $((3)(6)-18)^0$ under the real-number zero-exponent convention used in this course. Explain the boundary case. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions. Bank label: _____
Evaluate $-(-5)^0$. State which operations are outside the exponent's scope. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions. Bank label: _____	Evaluate 3^0+11^0. Replace only each defined zero-powered group by 1 and retain every operation outside that group. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions. Bank label: _____
Evaluate $6^0-(-4)^0$. Replace only each defined zero-powered group by 1 and retain every operation outside that group. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions. Bank label: _____	Evaluate $\frac{8}{5^0}$. Replace only each defined zero-powered group by 1 and retain every operation outside that group. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions. Bank label: _____
Evaluate $(2\cdot 5)^0+3$. Replace only each defined zero-powered group by 1 and retain every operation outside that group. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions. Bank label: _____	Find the exact real domain of $((2x+3)(x-4))^0$. Account for every way the complete base can be zero or undefined. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions. Bank label: _____

Algebra 1

Zero Exponents

Name: _____ **Date:** _____ **Class:** _____

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.

Evaluate $((-3)^2 + 1)^0$. First compute the expression that forms the base; then decide whether the zero power is defined.	Evaluate $((\frac{14}{7}) - 5)^0$. First compute the expression that forms the base; then decide whether the zero power is defined.
Evaluate $2^0 \cdot 9^0$. Replace only each defined zero-powered group by 1 and retain every operation outside that group.	Evaluate $4(6^0 + 10^0)$. Replace only each defined zero-powered group by 1 and retain every operation outside that group.
Evaluate $2(3 + 4)^0$. Replace only each defined zero-powered group by 1 and retain every operation outside that group.	Evaluate $3 - 2(-7)^0$. Replace only each defined zero-powered group by 1 and retain every operation outside that group.

Algebra 1

Zero Exponents

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.

Incoming: undefined

For which real x is $(x-3)^0$ defined? Give the restriction before simplifying the power. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions.

Your response: _____

Incoming: $-\frac{1}{2}$

Determine whether $0(4-4)^0$ is defined. Do not let an outside factor or operation hide a zero base. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions.

Your response: _____

Incoming: -1

Evaluate $4 \cdot 3^0$. State which operations are outside the exponent's scope. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions.

Your response: _____

Incoming: 5

Evaluate $\frac{3^0}{7}$. Replace only each defined zero-powered group by 1 and retain every operation outside that group. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions.

Your response: _____

START

Evaluate $((2^3)-3)^0$. First compute the expression that forms the base; then decide whether the zero power is defined. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions.

Your response: _____

Incoming: all real x except x = 7

Find the exact real domain of $((x-2)(x+5))^0$. Account for every way the complete base can be zero or undefined. Use the complete requested value, domain, or coefficient conditions as the matching response and retain the original explanation and restrictions.

Your response: _____

Algebra 1

Zero Exponents

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.

Evaluate 2^0. Identify the entire base before applying the zero-exponent rule. Choose a justified first step: apply the nonzero-base rule directly if its condition is already established, or first evaluate/check the entire base to establish whether the rule applies. Explain your choice for this expression, then give its value or explain why it is undefined.

Evaluate $(-2)^0$. Identify the entire base before applying the zero-exponent rule. Choose a justified first step: apply the nonzero-base rule directly if its condition is already established, or first evaluate/check the entire base to establish whether the rule applies. Explain your choice for this expression, then give its value or explain why it is undefined.

Evaluate $(\frac{1}{2})^0$. Identify the entire base before applying the zero-exponent rule. Choose a justified first step: apply the nonzero-base rule directly if its condition is already established, or first evaluate/check the entire base to establish whether the rule applies. Explain your choice for this expression, then give its value or explain why it is undefined.

Evaluate $(-\frac{3}{4})^0$. Identify the entire base before applying the zero-exponent rule. Choose a justified first step: apply the nonzero-base rule directly if its condition is already established, or first evaluate/check the entire base to establish whether the rule applies. Explain your choice for this expression, then give its value or explain why it is undefined.

Zero Exponents

Full Worked Solutions - excerpt

Worked example

Problem. Determine whether $5 + 0(9 - 9)^0$ is defined. Do not let an outside factor or operation hide a zero base.

Answer. undefined

Explanation and check.

The powered base is zero, so the product term is undefined before the outside zero can act; hence the whole sum is undefined.

Worked example

Problem. Determine whether $-2((3 \cdot 3 - 9)^0) + 7$ is defined. Do not let an outside factor or operation hide a zero base.

Answer. undefined

Explanation and check.

The grouped base $3 \cdot 3 - 9$ equals zero. External multiplication and addition cannot make that zero power defined.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Negative Exponents

Negative Exponents | A1-U07-P05

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for exact positive-exponent form, integer exponent, ordering, or domain-aware correction.

8 PDFs and a README; 52 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.

Published by Tusils LLC.

Algebra 1

Negative Exponents

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 $(-3)^{-2}$ using a positive exponent, then give its exact value. Invert the complete base rather than changing its sign. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption. Bank label: _____	Rewrite x^{-2} using only positive exponents and state the original real-domain condition. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption. Bank label: _____
Rewrite y^{-5} using only positive exponents and state the original real-domain condition. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption. Bank label: _____	Rewrite $(-m)^{-3}$ using only positive exponents and state the original real-domain condition. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption. Bank label: _____
Rewrite $(2a)^{-2}$ using only positive exponents and state the original real-domain condition. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption. Bank label: _____	Rewrite $(-3b)^{-3}$ using only positive exponents and state the original real-domain condition. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption. Bank label: _____
Rewrite $(uv)^{-2}$ using only positive exponents and state the original real-domain condition. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption. Bank label: _____	Rewrite $(-rs)^{-3}$ using only positive exponents and state the original real-domain condition. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption. Bank label: _____

Algebra 1

Negative Exponents

Name: _____ **Date:** _____ **Class:** _____

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.

Rewrite $(x-4)^{-2}$ using only positive exponents and state the original real-domain condition.	Rewrite $(t+7)^{-3}$ using only positive exponents and state the original real-domain condition.
Rewrite $(2p-5)^{-1}$ using only positive exponents and state the original real-domain condition.	Rewrite $(3q+1)^{-4}$ using only positive exponents and state the original real-domain condition.
Rewrite $((k+2)(k-1))^{-2}$ using only positive exponents and state the original real-domain condition.	Rewrite $(z^2+1)^{-3}$ using only positive exponents and state the original real-domain condition.

Algebra 1

Negative Exponents

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.

Incoming: $\frac{1}{4^2} = \frac{1}{16}$

Rewrite 5^{-3} using a positive exponent, then give its exact value. Invert the complete base rather than changing its sign. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption.

Your response: _____

START

Rewrite 2^{-1} using a positive exponent, then give its exact value. Invert the complete base rather than changing its sign. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption.

Your response: _____

Incoming: $(\frac{7}{4})^2 = \frac{49}{16}$

Rewrite $(\frac{5}{2})^{-2}$ with a positive exponent and evaluate exactly. Preserve the sign as part of the reciprocal base. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption.

Your response: _____

Incoming: $\frac{1}{10^1} = \frac{1}{10}$

Rewrite 10^{-3} using a positive exponent, then give its exact value. Invert the complete base rather than changing its sign. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption.

Your response: _____

Incoming: $\frac{1}{6^2} = \frac{1}{36}$

Rewrite 10^{-1} using a positive exponent, then give its exact value. Invert the complete base rather than changing its sign. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption.

Your response: _____

Incoming: $(\frac{4}{3})^2 = \frac{16}{9}$

Rewrite $(\frac{3}{5})^{-3}$ with a positive exponent and evaluate exactly. Preserve the sign as part of the reciprocal base. Use the requested exact positive-exponent expression/value as the matching response, complete the original explanation, and retain every stated nonzero assumption.

Your response: _____

Algebra 1

Negative Exponents

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.

Assume x and y are nonzero. Rewrite $x^{-2}y^{3}$ using only positive exponents. Explain which factor crosses the fraction bar. Choose a route: replace each negative-powered factor by its reciprocal before combining, or first combine signed exponents of identical bases and then rewrite the result with positive exponents. Explain why your chosen route fits this expression, use it, and retain all original nonzero assumptions.

Assume x and y are nonzero. Rewrite $\frac{x^{2}}{y^{-3}}$ using only positive exponents. Explain which factor crosses the fraction bar. Choose a route: replace each negative-powered factor by its reciprocal before combining, or first combine signed exponents of identical bases and then rewrite the result with positive exponents. Explain why your chosen route fits this expression, use it, and retain all original nonzero assumptions.

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Negative Exponents

Full Worked Solutions - excerpt

Worked example

Problem. Compare 3^{-4} and 3^{-2} using <, =, or > without relying on decimal approximations. Explain the reciprocal order or negative-base parity that decides the result.

Answer. $3^{-4} < 3^{-2}$

Explanation and check.

Because $3^4 > 3^2 > 0$, their reciprocals satisfy $3^{-4} < 3^{-2}$.

Worked example

Problem. A student rewrites $(2x)^{-2}$ as $\frac{1}{2x^2}$. Identify the first structural error, then give the corrected expression and every original-domain restriction.

Answer. $(2x)^{-2} = \frac{1}{4x^2}$, with $x \neq 0$.

Explanation and check.

The exponent applies to the entire product, so both 2 and x must be squared after inversion.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Operations with Scientific Notation

Operations with Scientific Notation | A1-U07-P07

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for exact normalized scientific notation with any required units or explicit final rounding, decision with exact calculation and justification, missing normalized quotient with a substitution check, exact quotient and order-of-magnitude confirmation, sign justification and normalized quotient and exact normalized quotient and power-of-ten scale check.

8 PDFs and a README; 52 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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Algebra 1

Operations with Scientific Notation

Name: _____ **Date:** _____ **Class:** _____

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

Multiply $-1.2 \cdot 10^{3}$ by $-8.3 \cdot 10^{2}$. Keep the calculation exact, add the powers of ten, and normalize the final coefficient. Bank label: _____	Multiply $-7.7 \cdot 10^{8}$ by $-1.3 \cdot 10^{0}$. Keep the calculation exact, add the powers of ten, and normalize the final coefficient. Bank label: _____
Multiply $2.01 \cdot 10^{-4}$ by $3.02 \cdot 10^{-5}$. Keep the calculation exact, add the powers of ten, and normalize the final coefficient. Bank label: _____	Multiply $3.125 \cdot 10^{3}$ by $3.2 \cdot 10^{2}$. Keep the calculation exact, add the powers of ten, and normalize the final coefficient. Bank label: _____
Multiply $-2.005 \cdot 10^{8}$ by $4.9 \cdot 10^{0}$. Keep the calculation exact, add the powers of ten, and normalize the final coefficient. Bank label: _____	Multiply $9.999 \cdot 10^{12}$ by $9.999 \cdot 10^{-12}$. Keep the calculation exact, add the powers of ten, and normalize the final coefficient. Bank label: _____
Multiply $9.05 \cdot 10^{-6}$ by $-1.12 \cdot 10^{9}$. Keep the calculation exact, add the powers of ten, and normalize the final coefficient. Bank label: _____	Multiply $-3.333 \cdot 10^{7}$ by $3.003 \cdot 10^{-7}$. Keep the calculation exact, add the powers of ten, and normalize the final coefficient. Bank label: _____

Algebra 1

Operations with Scientific Notation

Name: _____ **Date:** _____ **Class:** _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

Divide $9 \cdot 10^{-2}$ by $3 \cdot 10^{-5}$. Keep any nonterminating coefficient as an exact fraction, subtract the denominator exponent, and normalize.	Divide $4.8 \cdot 10^{4}$ by $-1.2 \cdot 10^{0}$. Keep any nonterminating coefficient as an exact fraction, subtract the denominator exponent, and normalize.
For $\frac{-6.3 \cdot 10^{7}}{-3.5 \cdot 10^{-3}}$, determine the sign before doing any magnitude arithmetic. Then calculate the exact quotient.	Evaluate $\frac{-9.05 \cdot 10^{10}}{2.5 \cdot 10^{-7}}$. Track the sign independently from the exponent subtraction so neither is lost.
The direct coefficient in $\frac{1.02 \cdot 10^{-8}}{-5.1 \cdot 10^{6}}$ is -0.2. Carry the negative sign through the normalization step and state the final result.	In $\frac{2.02 \cdot 10^{-2}}{4.04 \cdot 10^{3}}$, the denominator coefficient is twice the numerator coefficient. Use that relation to get the coefficient quotient, then handle the powers.

Algebra 1

Operations with Scientific Notation

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.

Incoming: $1.2 \cdot 10^{6}$ grams

Evaluate $\frac{9.996 \cdot 10^{3}}{1.0001 \cdot 10^{7}}$ exactly, then round the final normalized result to 3 significant digits. If the coefficient rounds to 10, renormalize and change the exponent.

Your response: _____

Incoming: $3.6 \cdot 10^{-3}$

Compute $\frac{[0.000505(8 \cdot 10^{9})]}{2 \cdot 10^{4}}$ exactly. Convert the decimal only as preparation, respect the product-then-quotient dependency, and normalize once at the end.

Your response: _____

Incoming: X = $1.6 \cdot 10^{7}$

In the relationship $\frac{9.01 \cdot 10^{-2}}{X} = R$, let $R = (\frac{901}{300}) \cdot 10^{-7}$. Recover the missing normalized quantity X using the correct inverse operation, then verify it by substitution.

Your response: _____

Incoming: $6 \cdot 10^{6}$

Multiply $1.5 \cdot 10^{3}$ by $4 \cdot 10^{2}$. Keep the calculation exact, add the powers of ten, and normalize the final coefficient.

Your response: _____

Incoming: $3 \cdot 10^{-8}$

Compute $0.000505(2 \cdot 10^{9})$ exactly. First interpret the decimal input, then perform the stated operation and give a normalized scientific-notation result.

Your response: _____

Incoming: $3.9 \cdot 10^{5}$ meters

A rectangular panel is $3.2 \cdot 10^{4}$ centimeters by $2.5 \cdot 10^{3}$ centimeters. A coating uses $1.5 \cdot 10^{-2}$ grams per square centimeter. Determine the requested total or per-unit quantity in normalized scientific notation. Let the units decide whether to multiply or divide, and retain the resulting unit.

Your response: _____

Algebra 1

Operations with Scientific Notation

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.

A proposed quotient for $\frac{9.1\cdot10^{-2}}{1.3\cdot10^{3}}$ is $7\cdot10^{-5}$. Verify it by multiplication and report the exact result.

Compare converting 0.0042 to scientific notation first with multiplying the decimals first. Choose a valid exact route for $0.0042(3.5\cdot10^{6})$, explain why it works, and normalize the result.

A device reports $(-3.5\cdot10^{6})$. To divide this by $-7\cdot10^{2}$, should you interpret $E6$ as times 10^{6} or as times 6? Choose, justify the sign and exponent operations, and compute exactly.

For $\frac{[1250000(1.6\cdot10^{-5})]}{4\cdot10^{2}}$, choose between grouping the numerator product before dividing and multiplying all three quantities. Explain which respects the expression and compute exactly.

Operations with Scientific Notation

Full Worked Solutions - excerpt

Worked example

Problem. Multiply $2 \cdot 10^{2}$ by $3 \cdot 10^{4}$. Keep the calculation exact, add the powers of ten, and normalize the final coefficient.

Answer. $6 \cdot 10^{6}$

Explanation and check.

Multiply coefficients to get 6 and add exponents to get 6. Thus the direct product is $6 \cdot 10^{6}$; normalizing it gives $6 \cdot 10^{6}$.

Worked example

Problem. Multiply $1.5 \cdot 10^{3}$ by $4 \cdot 10^{2}$. Keep the calculation exact, add the powers of ten, and normalize the final coefficient.

Answer. $6 \cdot 10^{5}$

Explanation and check.

Multiply coefficients to get 6 and add exponents to get 5. Thus the direct product is $6 \cdot 10^{5}$; normalizing it gives $6 \cdot 10^{5}$.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Comparing Scientific Notation

Comparing Scientific Notation | A1-U07-P08

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for assigned power, selected decade label, selected power and threshold comparison, selected power, area interval and boundary-crossing conclusion and inclusive total interval and decade conclusion.

8 PDFs and a README; 55 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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Algebra 1

Comparing Scientific Notation

Name: _____ **Date:** _____ **Class:** _____

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

Find the multiplicative factor that compares 2.7×10^{-4} to 9×10^{-3}; that is, evaluate the first quantity divided by the second. Interpret a result below 1. Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Bank label: _____	Sample A has 1.2×10^{7} particles and sample B has 8×10^{5} particles. A student says A has about 100 times as many because the exponents differ by 2. Compute the actual factor and explain why 100 is misleading. Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Bank label: _____
Estimate $\frac{7.8\times10^{9}}{2.1\times10^{6}}$ to one significant digit. Is $1,000$ or $4,000$ the better description of the scale factor? Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Bank label: _____	An oak is 2.4×10^{1} m tall and a seedling is 6×10^{-1} m tall. How many times as tall is the oak as the seedling? Then state the seedling's height as a multiplicative fraction of the oak's. Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Bank label: _____
A table shows a quantity changing from 2.4×10^{-6} moles to 9.6×10^{-4} moles. By what multiplicative factor did it increase? Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Bank label: _____	The value 0.000001 is an exact power-of-ten boundary. Express it as a power of ten, then give the next larger adjacent power. Do not claim it is strictly between them. Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Bank label: _____
A component is 38 mm long. Using $1,000$ mm = 1 m, convert the length to meters and bracket it between adjacent powers of ten measured in meters. Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Bank label: _____	For $M = 2.6 \times 10^{7}$, $N = 4.1 \times 10^{-2}$, and $P = 10^{3}$, give the adjacent power-of-ten bounds for each. For the exact boundary P, state equality rather than using two strict inequalities. Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Bank label: _____

Algebra 1

Comparing Scientific Notation

Name: _____ **Date:** _____ **Class:** _____

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

A student orders three concentrations as $Y < X < Z$, where $X = 7.9 \times 10^{-6}$, $Y = 1.2 \times 10^{-5}$, and $Z = 6.4 \times 10^{-7}$. Correct the order and explain the student's likely exponent mistake.	Panel A has area $3.2 m^2$ and panel B has area $3.1 \times 10^{4} cm^2$. Given $1 m^2 = 10^{4} cm^2$, which panel has greater area? Write the comparison in square centimeters.
Event A lasts $0.0042 s$, B lasts $3,900$ microseconds, and C lasts $4.5 ms$. With $1 s = 1,000 ms$ and $1 ms = 1,000$ microseconds, order the events from shortest duration to longest.	File A is 0.84 MB and file B is 8.6×10^{5} bytes. Using 1 MB = 10^{6} bytes, determine which file is larger and the size difference in bytes.
A stone has mass 0.0062 kg, a bead has mass $5,900 mg$, and a clip has mass 6.05 g. Convert to grams and order them from greatest mass to least.	Order 2.03×10^{-2}, 9.7×10^{-4}, 1.99×10^{-2}, and 3.1×10^{-3} from least to greatest. Explain how the exponents organize the comparison.

Algebra 1

Comparing Scientific Notation

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.

Incoming: 1.5 Reading A is 8.4×10^{-5} and reading B is 1.2×10^{-7}. Is A70,700, or 7,000 times B? Use the coefficient ratio as well as the exponent gap. Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Your response: _____	**Incoming:** 15 Locate 6.7×10^{4} between two adjacent powers of ten. Write a complete inequality. Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Your response: _____
Incoming: $10^{4} < 6.7 \times 10^{4} < 10^{5}$ Without rounding the value, place 0.00082 between adjacent powers of ten and explain how its decimal position determines the bounds. Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Your response: _____	**Incoming:** $7.2cm^{3}$, so $10^{0}cm^{3} < 7.2cm^{3} < 10^{1}cm^{3}$ The arithmetic midpoint between 10^{4} and 10^{5} is 5.5×10^{4}. If a midpoint tie is assigned to the upper power, what is the nearest-power estimate of 5.5×10^{4}? Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Your response: _____
START About how many times as large is 6.4×10^{8} as 1.6×10^{6}? Separate the coefficient ratio from the power-of-ten ratio. Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Your response: _____	**Incoming:** 4 Mass A is 1.35×10^{-3} g and mass B is 4.5×10^{-5} g. Which statement is defensible: A is 3 times, 30 times, or 300 times B? Justify using both coefficients and exponents. Use the complete originally requested response for the match, including both factors, the complete inequality, or both policy results when asked. Preserve the specified units, estimate convention, tie rule and precision; give the original justification. Your response: _____

Algebra 1

Comparing Scientific Notation

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.

A positive factor A is between 2×10^3 and 3×10^3, inclusive, while B is between 4×10^2 and 5×10^2, inclusive. Bound AB using endpoints. Do the bounds force AB to stay in one decade? Choose the endpoint method appropriate to the displayed operation: pair lower with lower and upper with upper for a product of positive factors, or pair a lower numerator with an upper denominator and vice versa for a positive quotient. Explain which method applies here, then use it to answer the original bound and decade questions.

Let $6 \times 10^7 \le N \le 8 \times 10^7$ and $2 \le D \le 4$, with both positive. Find the tight endpoint bounds for $\frac{N}{D}$. Is its decade determined by these data? Choose the endpoint method appropriate to the displayed operation: pair lower with lower and upper with upper for a product of positive factors, or pair a lower numerator with an upper denominator and vice versa for a positive quotient. Explain which method applies here, then use it to answer the original bound and decade questions.

A report compares 3.2 km with 480 m and says, “The longer distance is about 0.0067 times the shorter distance.” Using 1 km $= 1,000$ m, identify the scale error and give a defensible factor.

A data rate stays between 3×10^4 and 4×10^4 bytes per second for a duration between 2×10^2 and 2.5×10^2 seconds. Bound the total bytes using positive endpoints. Does every possible total lie strictly in the 10^6 decade? Choose the endpoint method appropriate to the displayed operation: pair lower with lower and upper with upper for a product of positive factors, or pair a lower numerator with an upper denominator and vice versa for a positive quotient. Explain which method applies here, then use it to answer the original bound and decade questions.

Comparing Scientific Notation

Full Worked Solutions - excerpt

Worked example

Problem. Which is larger, 8.7×10^6 or 1.02×10^7? Rewrite one value so the coefficient comparison is direct.

Answer. 1.02×10^7 is larger.

Explanation and check.

Rewrite 1.02×10^7 as 10.2×10^6. Since $10.2 > 8.7$, the second quantity is larger.

Worked example

Problem. Estimate $\frac{6.2 \times 10^{-7}}{1.7 \times 10^{-9}}$ to one significant digit. Show why the answer is closer to 400 than to 100.

Answer. About 4×10^2, or 400

Explanation and check.

The power ratio is 10^2 and $\frac{6.2}{1.7}$ is about 3.65. The product is about 3.65×10^2, which rounds to 4×10^2.