

Algebra 1
Comparing Scientific Notation

Comparing Scientific Notation | A1-U07-P08

96 problems · Four activity formats

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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.

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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 $\frac{7.8 \times 10^9}{2.1 \times 10^6}$ 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 $1,000 \text{ mm} = 1 \text{ m}$, 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: _____

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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. 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 $3.2m^2$ and panel B has area $3.1 \times 10^4 cm^2$. Given $1m^2 = 10^4 cm^2$, which panel has greater area? Write the comparison in square centimeters.
Event A lasts 0.0042s, B lasts 3,900 microseconds, and C lasts 4.5ms. With $1s = 1,000ms$ and $1ms = 1,000$ 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 5,900mg, 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.

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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.

Incoming: 1.5 Reading A is 8.4×10^{-5} and reading B is 1.2×10^{-7}. Is A 70, 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 $10^0\text{cm}^3 < 7.2\text{cm}^3 < 10^1\text{cm}^3$ 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: _____

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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.

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 $6 \times 10^7 \leq N \leq 8 \times 10^7$ and $2 \leq D \leq 4$, 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 $1 \text{ km} = 1,000 \text{ m}$, 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.

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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 .