

Algebra 1
Units, Conversions, and Defining Quantities

Operations with Measurements and Unit Conversion | A1-U01-COMB-P07-P08

96 problems · Four activity formats

01	Answer Bank Challenge	24 tasks
02	Grid Rounds	24 tasks
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Topic focus
Across 96 tasks this topic asks for compatibility verdict with dimensional trace, coordinate value with axis units, defect list and repaired definition, definition with datum and sign meanings, equivalent measurement with cancellation and equivalent rate with two unit cancellations.
8 PDFs and a README; 77 buyer pages.

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Name: _____ Date: _____ Class: _____

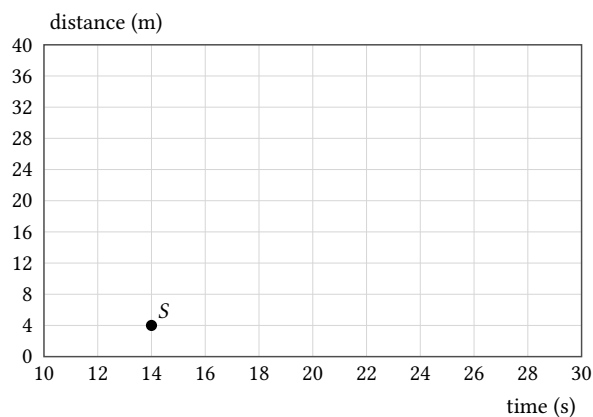
Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

One board is 6 ft 11 in long and another is 14 in long. Find their combined length in inches. Organize all quantities in one consistent unit system before calculating.

Quantity	Value	Unit
first piece feet	6	<i>ft</i>
first piece inches	11	in
second piece	14	in

Bank label: _____

A graph uses an x -axis starting at 10 s with 2 s per tick and a y -axis starting at 0 m with 4 m per tick. Point S is at tick indices (2, 1). Report its coordinate pair with units.



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.

There are exactly 5 identical items, each measured as 28.4 g to the nearest 0.1 g. A calculator gives 142.0 g. State an appropriately reported total and explain why the exact count does not add measurement precision. 	The data are 105, 118, 131, 144 units. The table gives two axis proposals. Choose a proposal that shows every value and uses at least half of its available intervals from the smallest to largest value. Justify by computing each displayed range and the data span. <table border="1" data-bbox="824 617 1471 741"> <thead> <tr> <th>proposal</th> <th>origin</th> <th>units per tick</th> <th>available intervals</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>0</td> <td>20</td> <td>8</td> </tr> <tr> <td>B</td> <td>100</td> <td>5</td> <td>10</td> </tr> </tbody> </table> 	proposal	origin	units per tick	available intervals	A	0	20	8	B	100	5	10
proposal	origin	units per tick	available intervals										
A	0	20	8										
B	100	5	10										
In $T = rt + b$, the known units are T: $^{\circ}\text{C}$, r: $^{\circ}\text{C}/\text{min}$, t: min. Infer the required unit of b by reversing the dimensional operations. Build a numerator-denominator unit ledger and cancel known factors. Verify the result in the formula. 	There are exactly 3 identical items, each measured as 26.3 g to the nearest 0.1 g. A calculator gives 78.9 g. State an appropriately reported total and explain why the exact count does not add measurement precision. 												

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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: 24 in Compare these legitimate variable choices: m = elapsed time in minutes; h = elapsed time in hours. State their relationship ($m = 60h$) and decide which choice is more direct for the stated focus “minutes.” Do not construct or solve a full model. Your response: _____	Incoming: Relationship: $m = 60h$. The m definition answers a question requesting minutes directly. Compare these legitimate variable choices: u = liters used; r = liters remaining from an initial T liters. State their relationship ($r = T - u$) and decide which choice is more direct for the stated focus “remaining.” Do not construct or solve a full model. Your response: _____												
Incoming: 420 min Using 1 ft = 12 in, convert 2 ft to in. Write a ratio equal to 1 so that ft cancels, and check whether the new magnitude is sensible. Your response: _____	Incoming: Let e be the elapsed time from first alarm to all-clear, measured in seconds. A report asks for the distinct customers, not the number of purchases. Define the variable c operationally: name exactly what is counted or measured and include its unit. Clarify its scope so it cannot be confused with a nearby total, rate, object, or reference interval. Your response: _____												
Incoming: kg/m³ Material costs 4 USD/kg. What is the cost of 4 packages of 350 g each? Organize all quantities in one consistent unit system before calculating. <table border="1" data-bbox="154 1486 795 1612"> <thead> <tr> <th>Quantity</th> <th>Value</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>unit price</td> <td>4</td> <td>USD/kg</td> </tr> <tr> <td>mass per package</td> <td>350</td> <td>g</td> </tr> <tr> <td>packages</td> <td>4</td> <td>count</td> </tr> </tbody> </table> Your response: _____	Quantity	Value	Unit	unit price	4	USD/kg	mass per package	350	g	packages	4	count	Incoming: 0.158 m Using 1 lb = 16 oz, convert 21 oz to lb. Write a ratio equal to 1 so that oz cancels, and check whether the new magnitude is sensible. Your response: _____
Quantity	Value	Unit											
unit price	4	USD/kg											
mass per package	350	g											
packages	4	count											

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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.

Audit this worked solution: $5 \text{ m} \left(\frac{100 \text{ cm}}{1 \text{ m}} \right) \left(\frac{100 \text{ cm}}{1 \text{ m}} \right) = 50000 \text{ cm}$. Identify the first invalid stage, if any, track the units, and give the corrected conclusion.

Choose the strategy that directly produces the required value and units, and justify the unit operations. Choice A: use $\left(\frac{1 \text{ km}}{1000 \text{ m}} \right) (3600 \text{ s}/(1 \text{ hr}))$. Choice B: use $(1 \text{ km}/(1000 \text{ m})) (1 \text{ hr}/(3600 \text{ s}))$. Convert 3 m/s to $\frac{\text{km}}{\text{hr}}$. Use the supplied relations $1 \text{ km} = 1000 \text{ m}$ and $1 \text{ hr} = 3600 \text{ s}$, orienting one ratio for the numerator unit and one for the denominator unit. Show both cancellations. Explain why reversing either factor would leave an unwanted unit or create a reciprocal-rate error.

Audit this worked solution: Because $A = L^2$ has area units, it must be the correct area formula for every shape. Identify the first invalid stage, if any, track the units, and give the corrected conclusion.

Audit this worked solution: Convert 6 m/s to $\frac{\text{km}}{\text{hr}}$: $6 \left(\frac{1 \text{ km}}{1000 \text{ m}} \right) = \frac{3}{500} \text{ km/hr}$. Identify the first invalid stage, if any, track the units, and give the corrected conclusion.

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Full Worked Solutions - excerpt

Worked example

Problem. Audit this worked solution: An axis starts at 0 and rises by 2.5 per tick; tick 6 is labeled 6. Identify the first invalid stage, if any, track the units, and give the corrected conclusion.

Answer. First invalid stage: axis reading. Correct conclusion: 15 units.

Explanation and check.

Multiply the tick index by 2.5.

Worked example

Problem. Diagnose the proposed definition “Let b be the bicycle.” Identify the missing semantic component or components, then rewrite it as an operational variable definition.

Answer. Missing: quantity measured. Repair: Let b be the distance the bicycle travels, in kilometers.

Explanation and check.

A symbol must represent a measurable attribute, not the physical object.