

Math Sheet

Name _____ Score _____ Teacher _____ Date _____

Mixture Word Problems

Define x , write an exact conservation equation, solve without rounding intermediate values, and give exact answers plus nearest-hundredth values in the requested unit. Percentages in liquid stories are by volume; other mixture percentages are by mass.

1. How many pounds of a 72% silver alloy and a 21% silver alloy are needed to make 8 lb at 62% silver by mass?

2. 5 L of a 74% vinegar solution is mixed with 11 L of a 30% vinegar solution. Assuming volumes add, what is the mixture's vinegar percentage by volume?

3. 13 mL of one acid solution is mixed with 6 mL of a 48% acid solution. Assuming volumes add, the mixture is 76% acid by volume. Find the first solution's acid percentage by volume.

4. 16 mL of one salt solution is mixed with 18 mL of a 71% salt solution. Assuming volumes add, the mixture is 79% salt by volume. Find the first solution's salt percentage by volume.

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5. How many pounds of a 58% peanut mix and a 22% peanut mix are needed to make 18 lb at 39% peanuts by mass?

6. 11 oz of soil containing 70% clay by mass is mixed with 14 oz containing 44% clay by mass. What percentage clay by mass is in the mixture?

7. A 5 lb apple mixture is 62% red apples by mass. It is combined with 20 lb that is 46% red apples by mass. What percentage of the combined mass is red apples?

8. A starting alloy is 53% gold by mass. What mass of this alloy should be combined with 12 g of pure gold to produce an alloy that is 91% gold by mass?

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9. A trail mix combines 19 lb of peanuts at \$4/lb, 3 lb of raisins at \$3/lb, and 7 lb of cashews at \$4/lb. What is the exact unit cost of the mixture, and what is it to the nearest hundredth of a dollar per pound?

10. 5 L of cranberry juice is mixed with 16 L of apple juice containing 6% sugar. Under an ideal additive-volume model, the final mixture is 9% sugar by volume. What was the cranberry juice sugar percentage by volume?

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Answer Key

Define x , write an exact conservation equation, solve without rounding intermediate values, and give exact answers plus nearest-hundredth values in the requested unit. Percentages in liquid stories are by volume; other mixture percentages are by mass.

1. How many pounds of a 72% silver alloy and a 21% silver alloy are needed to make 8 lb at 62% silver by mass?

Let x be the mass of the 72% silver alloy.

Component conservation equation (percentage products are divided by 100 on both sides): $72 \times x + 21 \times (8 - x) = 496$.

Solve: $51 \times x + 168 = 496 \rightarrow 51 \times x = 328 \rightarrow x = 328/51$.

The second amount is total mass - x , using the exact value of x .

72% silver alloy: exact $328/51$ lb; nearest hundredth 6.43 lb | 21% silver alloy: exact $80/51$ lb; nearest hundredth 1.57 lb

Check: $6 \frac{22}{51} + 1 \frac{29}{51} = 8$ lb total mass.

Check: $(72 \times 6 \frac{22}{51} + 21 \times 1 \frac{29}{51}) / 100 = 4 \frac{24}{25}$ lb component.

2. 5 L of a 74% vinegar solution is mixed with 11 L of a 30% vinegar solution. Assuming volumes add, what is the mixture's vinegar percentage by volume?

Let x be the mixture vinegar percentage by volume.

Component conservation equation (percentage products are divided by 100 on both sides): $700 = 16 \times x$.

Solve: $-16 \times x + 700 = 0 \rightarrow -16 \times x = -700 \rightarrow x = 175/4$.

vinegar mixture: exact $175/4$ %; nearest hundredth 43.75 %

Check: Exact component amounts match after dividing percentage products by 100: $7 = 7$.

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3. 13 mL of one acid solution is mixed with 6 mL of a 48% acid solution. Assuming volumes add, the mixture is 76% acid by volume. Find the first solution's acid percentage by volume.

Let x be the first solution's acid percentage by volume.

Component conservation equation (percentage products are divided by 100 on both sides): $13 \times x + 288 = 1444$.

Solve: $13 \times x = 1156 \rightarrow x = 1156/13$.

first solution: exact 1156/13 %; nearest hundredth 88.92 %

Check: Exact component amounts match after dividing percentage products by 100: $14 \frac{11}{25} = 14 \frac{11}{25}$.

4. 16 mL of one salt solution is mixed with 18 mL of a 71% salt solution. Assuming volumes add, the mixture is 79% salt by volume. Find the first solution's salt percentage by volume.

Let x be the first solution's salt percentage by volume.

Component conservation equation (percentage products are divided by 100 on both sides): $16 \times x + 1278 = 2686$.

Solve: $16 \times x = 1408 \rightarrow x = 88$.

first solution: exact 88 %; nearest hundredth 88.00 %

Check: Exact component amounts match after dividing percentage products by 100: $26 \frac{43}{50} = 26 \frac{43}{50}$.

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Define x , write an exact conservation equation, solve without rounding intermediate values, and give exact answers plus nearest-hundredth values in the requested unit. Percentages in liquid stories are by volume; other mixture percentages are by mass.

5. How many pounds of a 58% peanut mix and a 22% peanut mix are needed to make 18 lb at 39% peanuts by mass?

Let x be the mass of the 58% peanut mix.

Component conservation equation (percentage products are divided by 100 on both sides): $58 \times x + 22 \times (18 - x) = 702$.

Solve: $36 \times x + 396 = 702 \rightarrow 36 \times x = 306 \rightarrow x = 17/2$.

The second amount is total mass - x , using the exact value of x .

58% peanut mix: exact 17/2 lb; nearest hundredth 8.50 lb | 22% peanut mix: exact 19/2 lb; nearest hundredth 9.50 lb

Check: $8 \frac{1}{2} + 9 \frac{1}{2} = 18$ lb total mass.

Check: $(58 \times 8 \frac{1}{2} + 22 \times 9 \frac{1}{2}) / 100 = 7 \frac{1}{50}$ lb component.

6. 11 oz of soil containing 70% clay by mass is mixed with 14 oz containing 44% clay by mass. What percentage clay by mass is in the mixture?

Let x be the mixture clay percentage by mass.

Component conservation equation (percentage products are divided by 100 on both sides): $1386 = 25 \times x$.

Solve: $-25 \times x + 1386 = 0 \rightarrow -25 \times x = -1386 \rightarrow x = 1386/25$.

soil mixture: exact 1386/25 %; nearest hundredth 55.44 %

Check: Exact component amounts match after dividing percentage products by 100: $13 \frac{43}{50} = 13 \frac{43}{50}$.

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7. A 5 lb apple mixture is 62% red apples by mass. It is combined with 20 lb that is 46% red apples by mass. What percentage of the combined mass is red apples?

Let x be the red-apple percentage of the combined mass.

Component conservation equation (percentage products are divided by 100 on both sides): $1230 = 25 \times x$.

Solve: $-25 \times x + 1230 = 0 \rightarrow -25 \times x = -1230 \rightarrow x = 246/5$.

combined apple mixture: exact 246/5 %; nearest hundredth 49.20 %

Check: Exact component amounts match after dividing percentage products by 100: $12 \frac{3}{10} = 12 \frac{3}{10}$.

8. A starting alloy is 53% gold by mass. What mass of this alloy should be combined with 12 g of pure gold to produce an alloy that is 91% gold by mass?

Let x be the mass of the starting alloy.

Component conservation equation (percentage products are divided by 100 on both sides): $53 \times x + 1200 = 91 \times (x + 12)$.

Solve: $53 \times x + 1200 = 91 \times x + 1092 \rightarrow -38 \times x + 1200 = 1092 \rightarrow -38 \times x = -108 \rightarrow x = 54/19$.

starting alloy: exact 54/19 g; nearest hundredth 2.84 g

Check: Exact component amounts match after dividing percentage products by 100: $13 \frac{481}{950} = 13 \frac{481}{950}$.

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9. A trail mix combines 19 lb of peanuts at \$4/lb, 3 lb of raisins at \$3/lb, and 7 lb of cashews at \$4/lb. What is the exact unit cost of the mixture, and what is it to the nearest hundredth of a dollar per pound?

Let x be the mixture unit cost.

Total-cost conservation equation: $113 = 29 \times x$.

Solve: $-29 \times x + 113 = 0 \rightarrow -29 \times x = -113 \rightarrow x = 113/29$.

trail mix: exact $113/29$ \$/lb; nearest hundredth 3.90 \$/lb

Check: $19 \times \$4 + 3 \times \$3 + 7 \times \$4 = \$113$ total cost.

Check: $3 \leq 3 \frac{26}{29} \leq 4$ dollars per pound.

10. 5 L of cranberry juice is mixed with 16 L of apple juice containing 6% sugar. Under an ideal additive-volume model, the final mixture is 9% sugar by volume. What was the cranberry juice sugar percentage by volume?

Let x be the cranberry juice sugar percentage by volume.

Component conservation equation (percentage products are divided by 100 on both sides): $5 \times x + 96 = 189$.

Solve: $5 \times x = 93 \rightarrow x = 93/5$.

cranberry juice: exact $93/5$ %; nearest hundredth 18.60 %

Check: Exact component amounts match after dividing percentage products by 100: $1 \frac{89}{100} = 1 \frac{89}{100}$.