Unit Rates with Fractions

Explore ideas and representations

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QUICK REVIEW

A unit rate divides an amount by its time or other denominator: $k = a \div b$. Dividing by a fraction means multiplying by its reciprocal. For example, $\frac{3}{4} \div \frac{1}{2} = \frac{3}{2}$ liters per hour. Keep the requested unit order.

Worked example

A pump uses $\frac{2}{3}$ units in $\frac{1}{4}$ hour. Find units per hour.

1. The unit rate is $\frac{2}{3} \div \frac{1}{4}$.
2. Use the reciprocal: $\frac{2}{3} \times 4 = \frac{8}{3}$.
3. Check: $\frac{8}{3} \times \frac{1}{4} = \frac{2}{3}$ units.
Answer: $\frac{8}{3}$ units per hour.

Practice Problems

Show your thinking.

1. A pump uses $\frac{3}{4}$ units in $\frac{1}{2}$ hour. Find units per hour.

2. A printer uses $\frac{5}{6}$ units in $\frac{2}{3}$ minute. Complete $(t, u) = (1, \square), (3, \square)$.

3. A mixer uses $\frac{7}{8}$ units in $\frac{1}{4}$ minute. Find units per minute.

4. A filter uses $\frac{9}{10}$ units in $\frac{3}{5}$ hour. Complete $(t, u) = (1, \square), (3, \square)$.

5. A machine uses $\frac{5}{4}$ units in $\frac{5}{6}$ hour. Jo reports $\frac{2}{3}$ units per hour. Correct the reversed rate.

6. A filler runs at 2 units per minute. How long does $\frac{7}{3}$ units take?

7. A paint sprayer uses $\frac{5}{6}$ L in $\frac{2}{3}$ hour. Find L per hour.

8. A cloth cutter uses $\frac{9}{8}$ m in $\frac{3}{4}$ minute. Complete $(t, u) = (1, \square), (3, \square)$.

9. A feed dispenser runs at $\frac{7}{4}$ kg per hour. How long does $\frac{7}{5}$ kg take?

10. A juice blender uses $\frac{11}{12}$ L in $\frac{1}{3}$ minute. Jo reports $\frac{4}{11}$ L per minute. Correct the reversed rate.

Answer Key

1. $\frac{3}{2}$ units per hour.
2. $(1, \frac{5}{4}), (3, \frac{15}{4})$.
3. $\frac{7}{2}$ units per minute.
4. $(1, \frac{3}{2}), (3, \frac{9}{2})$.
5. $\frac{3}{2}$ units per hour; Jo found hour per unit.
6. $\frac{7}{6}$ minute.
7. $\frac{5}{4}$ L per hour.
8. $(1, \frac{3}{2}), (3, \frac{9}{2})$.
9. $\frac{4}{5}$ hour.
10. $\frac{11}{4}$ L per minute; Jo found minute per unit.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The unit rate is $\frac{3}{4} \div \frac{1}{2}$.
2. Use the reciprocal: $\frac{3}{4} \times 2 = \frac{3}{2}$.
3. Check: $\frac{3}{2} \times \frac{1}{2} = \frac{3}{4}$ units.

Problem 2

1. One minute: $\frac{5}{6} \div \frac{2}{3} = \frac{5}{4}$ units.
2. Three minute: $3(\frac{5}{4}) = \frac{15}{4}$ units.
3. Both rows have $u/t = \frac{5}{4}$.

Problem 3

1. The unit rate is $\frac{7}{8} \div \frac{1}{4}$.
2. Use the reciprocal: $\frac{7}{8} \times 4 = \frac{7}{2}$.
3. Check: $\frac{7}{2} \times \frac{1}{4} = \frac{7}{8}$ units.

Problem 4

1. One hour: $\frac{9}{10} \div \frac{3}{5} = \frac{3}{2}$ units.
2. Three hour: $3(\frac{3}{2}) = \frac{9}{2}$ units.
3. Both rows have $u/t = \frac{3}{2}$.

Problem 5

1. Jo divided $\frac{5}{6} \div \frac{5}{4} = \frac{2}{3}$.
2. The requested order is units divided by hour: $\frac{5}{4} \div \frac{5}{6} = \frac{3}{2}$.
3. Check $\frac{3}{2}(\frac{5}{6}) = \frac{5}{4}$ units.

Problem 6

1. Time $= \frac{7}{3} \div 2$.
2. $\frac{7}{3} \times \frac{1}{2} = \frac{7}{6}$ minute.
3. Check $2(\frac{7}{6}) = \frac{7}{3}$ units.

Problem 7

1. The unit rate is $\frac{5}{6} \div \frac{2}{3}$.
2. Use the reciprocal: $\frac{5}{6} \times \frac{3}{2} = \frac{5}{4}$.
3. Check: $\frac{5}{4} \times \frac{2}{3} = \frac{5}{6}$ L.

Problem 8

1. One minute: $\frac{9}{8} \div \frac{3}{4} = \frac{3}{2}$ m.
2. Three minute: $3(\frac{3}{2}) = \frac{9}{2}$ m.
3. Both rows have $u/t = \frac{3}{2}$.

Problem 9

1. Time $= \frac{7}{5} \div \frac{7}{4}$.
2. $\frac{7}{5} \times \frac{4}{7} = \frac{4}{5}$ hour.
3. Check $\frac{7}{4}(\frac{4}{5}) = \frac{7}{5}$ kg.

Problem 10

1. Jo divided $\frac{1}{3} \div \frac{11}{12} = \frac{4}{11}$.
2. The requested order is L divided by minute: $\frac{11}{12} \div \frac{1}{3} = \frac{11}{4}$.
3. Check $\frac{11}{4}(\frac{1}{3}) = \frac{11}{12}$ L.

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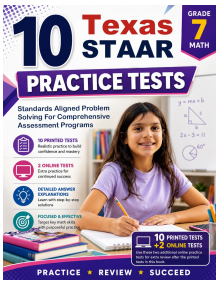

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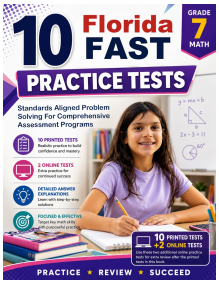

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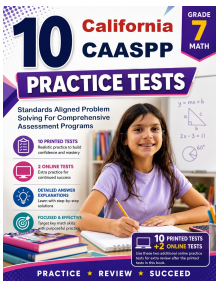

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