Unit Rates with Fractions

Apply the skill to decisions and designs

Name _____ **Date** _____ **Score** _____ / 10

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 $\frac{13}{12}$ units in $\frac{1}{2}$ hour. A second uses $\frac{25}{12}$ units in the same time. Which rate is larger, and by how much?

2. A printer must deliver $\frac{7}{2}$ units in $\frac{4}{3}$ minute. Its current rate is $\frac{7}{4}$ units per minute. Find the required rate and extra rate needed.

3. A mixer uses $\frac{29}{24}$ units in $\frac{1}{4}$ minute. A second uses $\frac{53}{24}$ units in the same time. Which rate is larger, and by how much?

4. A filter must deliver $\frac{37}{10}$ units in $\frac{6}{5}$ hour. Its current rate is $\frac{37}{18}$ units per hour. Find the required rate and extra rate needed.

5. A machine runs at $\frac{19}{10}$ units per hour. How long does $\frac{19}{6}$ units take?

6. A filler uses $\frac{3}{2}$ units in $\frac{7}{12}$ minute. Jo reports $\frac{7}{18}$ units per minute. Correct the reversed rate.

7. A paint sprayer must deliver 3 L in $\frac{4}{3}$ hour. Its current rate is $\frac{3}{2}$ L per hour. Find the required rate and extra rate needed.

8. A cloth cutter uses $\frac{31}{24}$ m in $\frac{3}{4}$ minute. A second uses $\frac{55}{24}$ m in the same time. Which rate is larger, and by how much?

9. A feed dispenser runs at $\frac{13}{6}$ kg per hour. How long does $\frac{26}{15}$ kg take?

10. A juice blender must deliver $\frac{13}{4}$ L in $\frac{2}{3}$ minute. Its current rate is $\frac{13}{4}$ L per minute. Find the required rate and extra rate needed.

Answer Key

1. The second, by 2 units per hour.
2. Required $\frac{21}{8}$; extra $\frac{7}{8}$ units per minute.
3. The second, by 4 units per minute.
4. Required $\frac{37}{12}$; extra $\frac{37}{36}$ units per hour.
5. $\frac{5}{3}$ hour.
6. $\frac{18}{7}$ units per minute; Jo found minute per unit.
7. Required $\frac{9}{4}$; extra $\frac{3}{4}$ L per hour.
8. The second, by $\frac{4}{3}$ m per minute.
9. $\frac{4}{5}$ hour.
10. Required $\frac{39}{8}$; extra $\frac{13}{8}$ L per minute.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. First rate: $\frac{13}{12} \div \frac{1}{2} = \frac{13}{6}$.
2. Second rate: $\frac{25}{12} \div \frac{1}{2} = \frac{25}{6}$.
3. Difference: $\frac{25}{6} - \frac{13}{6} = 2$ units per hour.

Problem 2

1. Required rate: $\frac{7}{2} \div \frac{4}{3} = \frac{21}{8}$.
2. Extra rate: $\frac{21}{8} - \frac{7}{4} = \frac{7}{8}$.
3. Check $\frac{21}{8}(\frac{4}{3}) = \frac{7}{2}$ units.

Problem 3

1. First rate: $\frac{29}{24} \div \frac{1}{4} = \frac{29}{6}$.
2. Second rate: $\frac{53}{24} \div \frac{1}{4} = \frac{53}{6}$.
3. Difference: $\frac{53}{6} - \frac{29}{6} = 4$ units per minute.

Problem 4

1. Required rate: $\frac{37}{10} \div \frac{6}{5} = \frac{37}{12}$.
2. Extra rate: $\frac{37}{12} - \frac{37}{18} = \frac{37}{36}$.
3. Check $\frac{37}{12}(\frac{6}{5}) = \frac{37}{10}$ units.

Problem 5

1. Time $= \frac{19}{6} \div \frac{19}{10}$.
2. $\frac{19}{6} \times \frac{10}{19} = \frac{5}{3}$ hour.
3. Check $\frac{19}{10}(\frac{5}{3}) = \frac{19}{6}$ units.

Problem 6

1. Jo divided $\frac{7}{12} \div \frac{3}{2} = \frac{7}{18}$.
2. The requested order is units divided by minute: $\frac{3}{2} \div \frac{7}{12} = \frac{18}{7}$.
3. Check $\frac{18}{7}(\frac{7}{12}) = \frac{3}{2}$ units.

Problem 7

1. Required rate: $3 \div \frac{4}{3} = \frac{9}{4}$.
2. Extra rate: $\frac{9}{4} - \frac{3}{2} = \frac{3}{4}$.
3. Check $\frac{9}{4}(\frac{4}{3}) = 3$ L.

Problem 8

1. First rate: $\frac{31}{24} \div \frac{3}{4} = \frac{31}{18}$.
2. Second rate: $\frac{55}{24} \div \frac{3}{4} = \frac{55}{18}$.
3. Difference: $\frac{55}{18} - \frac{31}{18} = \frac{4}{3}$ m per minute.

Problem 9

1. Time $= \frac{26}{15} \div \frac{13}{6}$.
2. $\frac{26}{15} \times \frac{6}{13} = \frac{4}{5}$ hour.
3. Check $\frac{13}{6}(\frac{4}{5}) = \frac{26}{15}$ kg.

Problem 10

1. Required rate: $\frac{13}{4} \div \frac{2}{3} = \frac{39}{8}$.
2. Extra rate: $\frac{39}{8} - \frac{13}{4} = \frac{13}{8}$.
3. Check $\frac{39}{8}(\frac{2}{3}) = \frac{13}{4}$ L.

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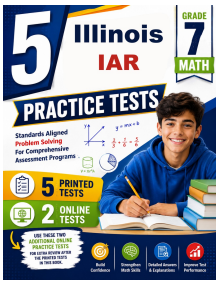

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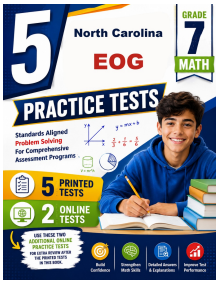

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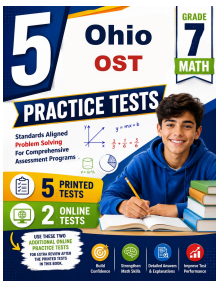

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