Multiplication as Scaling

Multiplication as Scaling: Models and Computation

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

For a positive quantity, a factor between 0 and 1 shrinks it; factor 1 preserves it; a factor greater than 1 enlarges it. Compare the whole factor with 1, not just its numerator.

Worked example

Without multiplying first, compare $14 \times \frac{5}{7}$ with 14. Then compute to check.

1. The factor $\frac{5}{7}$ is less than 1, so the product is smaller than the original.
2. Multiply: $14 \times \frac{5}{7} = 10$.
3. The computed result 10 is smaller than 14, as predicted.
Answer: 10; smaller than 14.

Practice Problems

Show your thinking.

1. Without multiplying first, compare $6 \times \frac{2}{3}$ with 6. Then compute to check.

2. A bar has length $\frac{5}{2}$ cm. A scaled copy is $\frac{3}{2}$ times as long. Find the new length and state whether it shrinks, stays, or grows.

3. Without multiplying first, compare 8×1 with 8. Then compute to check.

4. Correct: Multiplying $\frac{3}{4}$ by $\frac{1}{2}$ must make it larger because multiplication always increases.

5. A length changes from 12 cm to 15 cm. Find the scale factor and say whether it is below, equal to, or above 1.

6. Compare $\frac{7}{3} \times \frac{3}{7}$ and $\frac{7}{3} \times 1$. Find the difference in sizes.

7. A map scales a 9 cm segment by factor $\frac{4}{3}$. Find its image length and describe the size change.

8. Without multiplying first, compare $5 \times \frac{3}{5}$ with 5. Then compute to check.

Answer Key

1. 4; smaller than 6.
2. $\frac{15}{4}$ cm; greater than $\frac{5}{2}$ cm.
3. 8; equal to 8.
4. $\frac{3}{8}$; smaller than $\frac{3}{4}$.
5. Scale factor $\frac{5}{4}$, greater than 1.
6. 1 is smaller than $\frac{7}{3}$; difference $\frac{4}{3}$.
7. 12 cm; greater than 9 cm.
8. 3; smaller than 5.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The factor $\frac{2}{3}$ is less than 1, so the product is smaller than the original.

2. Multiply: $6 \times \frac{2}{3} = 4$.

3. The computed result 4 is smaller than 6, as predicted.

Problem 2

1. The factor $\frac{3}{2}$ is greater than 1, so the product is greater than the original.

2. Multiply: $\frac{5}{2} \times \frac{3}{2} = \frac{15}{4}$ cm.

3. The computed result $\frac{15}{4}$ cm is greater than $\frac{5}{2}$ cm, as predicted.

Problem 3

1. The factor 1 is equal to 1, so the product is equal to the original.

2. Multiply: $8 \times 1 = 8$.

3. The computed result 8 is equal to 8, as predicted.

Problem 4

1. The factor $\frac{1}{2}$ is less than 1, so the product is smaller than the original.

2. Multiply: $\frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$.

3. The computed result $\frac{3}{8}$ is smaller than $\frac{3}{4}$, as predicted.

Problem 5

1. Use the same unit for both: 12 original parts and 15 new parts, each $\frac{1}{1}$ cm.

2. New size is 15 out of every 12 original parts: $\frac{15}{12} = \frac{5}{4}$, greater than 1.

3. Check: $12 \times \frac{5}{4} = 15$ cm.

Problem 6

1. Factor 1 keeps the original: $\frac{7}{3} \times 1 = \frac{7}{3}$.

2. The other product is $\frac{7}{3} \times \frac{3}{7} = 1$.

3. Subtract smaller from larger: $\frac{7}{3} - 1 = \frac{4}{3}$.

Problem 7

1. The factor $\frac{4}{3}$ is greater than 1, so the product is greater than the original.

2. Multiply: $9 \times \frac{4}{3} = 12$ cm.

3. The computed result 12 cm is greater than 9 cm, as predicted.

Problem 8

1. The factor $\frac{3}{5}$ is less than 1, so the product is smaller than the original.

2. Multiply: $5 \times \frac{3}{5} = 3$.

3. The computed result 3 is smaller than 5, as predicted.

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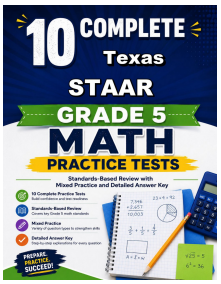

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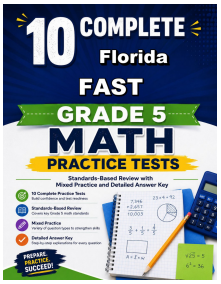

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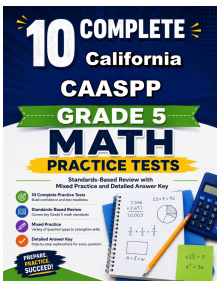

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