Percent Error: How Close Are Your Estimates?

Spot mistakes, reason, and work backward

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

QUICK REVIEW

The error fraction is $|\text{estimate} - \text{accepted}|/\text{accepted}$. Multiply by 100 to get the percent number, then attach $\%$. An estimate 19 cm for a 20 cm object has 1 cm absolute error and error fraction $1/20 = 0.05 = 5\%$. Use the accepted value below the fraction.

Worked example

Example ruler reading (cm): estimate 19, accepted value 20. Find absolute error and percent error.

1. Absolute error: $|19 - 20| = 1$ cm.
2. Use the accepted value 20 cm as the denominator: $1/20 = \frac{1}{20}$.
3. The percent-error number is $\frac{1}{20}(100) = 5$; therefore the error is 5%.
Answer: Absolute error 1 cm; percent error 5%.

Practice Problems

Show your thinking.

1. Length in cm: estimate 48, accepted value 50. Nia divides the error by 48. Correct the denominator and the percent error.

2. Mass in g: estimate 84, accepted value 80. Nia divides the error by 84. Correct the denominator and the percent error.

3. Item count: estimate 95, accepted value 100. Nia divides the error by 95. Correct the denominator and the percent error.

4. Volume in mL: estimate 126, accepted value 120. Nia divides the error by 126. Correct the denominator and the percent error.

5. An accepted mass is 400 g. Find the smallest and largest estimates allowed by a 5% error limit.

6. For an accepted length of 400 cm, two estimates are 380 cm and 420 cm. Do their percent errors differ?

7. Measuring tape (cm): estimate 58, accepted value 60. Nia divides the error by 58. Correct the denominator and the percent error.

8. An estimate of 52 cm is exactly 4% ABOVE the accepted length. Recover the accepted length.

Answer Key

1. Denominator 50 cm; percent error 4%.
2. Denominator 80 g; percent error 5%.
3. Denominator 100 items; percent error 5%.
4. Denominator 120 mL; percent error 5%.
5. 380 g through 420 g, inclusive.
6. No. Both have 5% error.
7. Denominator 60 cm; percent error $\frac{10}{3}\%$.
8. 50 cm.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Absolute error: $|48 - 50| = 2$ cm.
2. Use the accepted value 50 cm as the denominator: $2/50 = \frac{1}{25}$.
3. The percent-error number is $\frac{1}{25}(100) = 4$; therefore the error is 4%.

Problem 2

1. Absolute error: $|84 - 80| = 4$ g.
2. Use the accepted value 80 g as the denominator: $4/80 = \frac{1}{20}$.
3. The percent-error number is $\frac{1}{20}(100) = 5$; therefore the error is 5%.

Problem 3

1. Absolute error: $|95 - 100| = 5$ items.
2. Use the accepted value 100 items as the denominator: $5/100 = \frac{1}{20}$.
3. The percent-error number is $\frac{1}{20}(100) = 5$; therefore the error is 5%.

Problem 4

1. Absolute error: $|126 - 120| = 6$ mL.
2. Use the accepted value 120 mL as the denominator: $6/120 = \frac{1}{20}$.
3. The percent-error number is $\frac{1}{20}(100) = 5$; therefore the error is 5%.

Problem 5

1. Maximum absolute error: $400(5/100) = 20$ g.
2. Lower estimate: $400 - 20 = 380$ g.
3. Upper estimate: $400 + 20 = 420$ g.

Problem 6

1. Low estimate error: $|380 - 400| = 20$ cm.
2. High estimate error: $|420 - 400| = 20$ cm.
3. Both use denominator 400, so the percent-error number is $(20/400)100 = 5$; each estimate has 5% error.

Problem 7

1. Absolute error: $|58 - 60| = 2$ cm.
2. Use the accepted value 60 cm as the denominator: $2/60 = \frac{1}{30}$.
3. The percent-error number is $\frac{1}{30}(100) = \frac{10}{3}$; therefore the error is $\frac{10}{3}\%$.

Problem 8

1. Above by 4% means estimate $= 1.04a$.
2. $1.04a = 52$ gives $a = 52/1.04 = 50$ cm.
3. Check the percent-error number $|52 - 50|/50 \times 100 = 4$, so the error is 4%.

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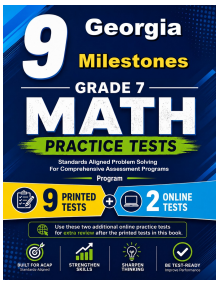

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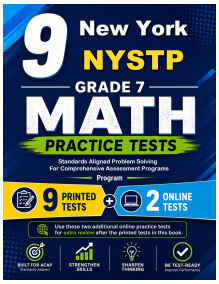

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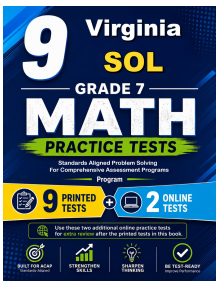

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