Similar Figures and Proportions

Apply the skill to decisions and designs

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

QUICK REVIEW

Similar figures have equal matching angles. Divide copy length by original length to find their common length factor k. Multiply a perimeter by k and an area by k^2. Keep corresponding sides in the same order.

Worked example

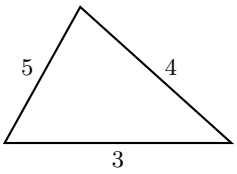
An original 7 cm side matches 10.5 cm in a similar copy. What matches an 8 cm original side?

1. Length factor $= 10.5/7 = 1.5$.
2. The matching side is $8(1.5) = 12$ cm.
3. Check $12/8 = 10.5/7 = 1.5$.
Answer: 12 cm.

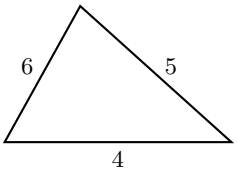
Practice Problems

Show your thinking.

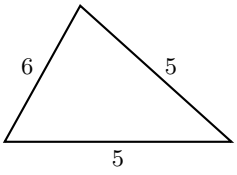
1. A triangular sign with sides $3, 4, 5$ cm is enlarged so the 3 cm side becomes 6 cm. Find the other copy sides and its perimeter.



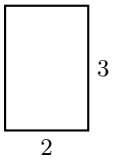
2. A frame maker proposes sides $12, 15, 19$ cm as a scale copy of $4, 5, 6$ cm. Accept or reject using ratios.



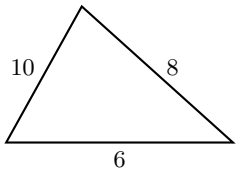
3. Ribbon borders a triangular sign of sides $5, 5, 6$ cm and a similar sign with length factor 2. How much ribbon does each need?



4. A 2 cm by 3 cm photo is enlarged by length factor 3. Find the new area and decide whether three times the old paper area is enough.



5. A model sail uses half the lengths of a sail with sides $6, 8, 10$ cm. Find the model sides and how much border length is saved.



6. The copy-to-original edge ratio is $6 : 4$. A designer cuts a 10 cm copy edge to match a 6 cm original edge. Find the correct copy edge and the amount to trim.

7. A triangular frame enlarges sides $5, 6, 8$ cm so 5 matches 15. A border strip is 56 cm long. Find the required perimeter and shortage.

8. A 3 by 4 cm photo is enlarged by length factor $3/2$. By total area alone, is 28 cm^2 of paper enough? Find unused area, ignoring cutting layout.

Answer Key

1. Other sides 8 and 10 cm; perimeter 24 cm.
2. Not similar; $19/6$ does not equal 3.
3. 16 cm for the original sign and 32 cm for the copy.
4. New area 54 cm^2; 18 cm^2 is not enough.
5. Model sides $3, 4, 5$ cm; saves 12 cm of border.
6. Correct length 9 cm; trim 1 cm.
7. Required perimeter 57 cm; short 1 cm.
8. Yes by area alone; 1 cm^2 unused.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The copy length divided by the original length is $6/3 = 2$, so the copy doubles each side.

2. The length matching 4 cm is $4(2) = 8$ cm.

3. The remaining side is $5(2) = 10$ cm; perimeter $6 + 8 + 10 = 24$ cm.

Problem 2

1. The first corresponding ratio is $12/4 = 3$.

2. The second corresponding ratio is $15/5 = 3$.

3. The third ratio is $19/6$, not 3. Without one common factor the triangles are not similar.

Problem 3

1. Add the given lengths for the original perimeter: $5 + 5 + 6 = 16$ cm.

2. Every side doubles, so their sum doubles: $2(16) = 32$ cm for the copy.

3. Ribbon runs along the edges, so each sign needs its own perimeter in ribbon.

Problem 4

1. The side lengths triple: $2(3) = 6$ and $3(3) = 9$ cm.

2. The old area is $2(3) = 6$ cm^2; the new area is $6(9) = 54$ cm^2.

3. The area factor is $54/6 = 9 = 3^2$, since both dimensions are tripled.

4. Three times the old area is $3(6) = 18$ cm^2, less than the required 54 cm^2.

Problem 5

1. The factor $1/2$ means dividing each original side length by 2.

2. Halve the sides: $6/2 = 3$, $8/2 = 4$, and $10/2 = 5$ cm.

3. The original perimeter is $6 + 8 + 10 = 24$ cm. The model perimeter is $3 + 4 + 5 = 12$ cm.

4. The model uses $24 - 12 = 12$ cm less border.

Problem 6

1. Use the same copy-to-original ratio: $x/6 = 6/4$.

2. Multiply by 6: $x = 6(6/4) = 9$ cm.

3. Trim $10 - 9 = 1$ cm.

Problem 7

1. Corresponding length factor $15/5 = 3$.

2. The other sides are $6(3) = 18$ and $8(3) = 24$ cm. The perimeter is $15 + 18 + 24 = 57$ cm.

3. Check that the perimeter scales by the same factor: $57/(5 + 6 + 8) = 3$.

4. The strip is 56 cm long, so the shortage is $57 - 56 = 1$ cm.

Problem 8

1. New sides $3(3/2) = 9/2$ cm and $4(3/2) = 6$ cm.

2. The new area is $(9/2)(6) = 27$ cm^2.

3. Both sides scale, so the area factor is $(3/2)^2 = 9/4$. Check $27/[3(4)] = 9/4$.

4. The paper has $28 - 27 = 1$ cm^2 to spare by total area, without considering layout.

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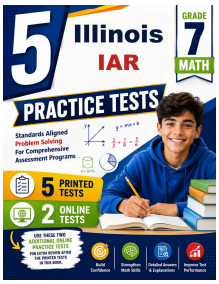

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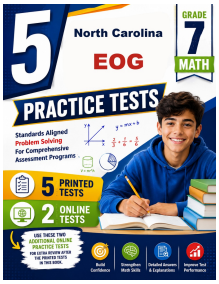

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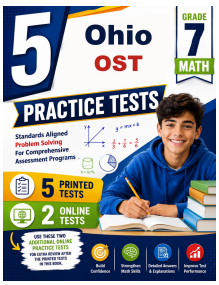

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