Similar Figures and Proportions

Explore ideas and representations

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

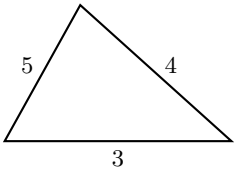
An original 7 cm side matches 10.5 cm in a similar copy. What matches an 8 cm original side?

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.

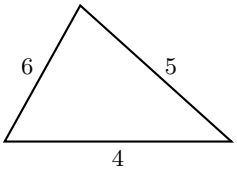
Practice Problems

Show your thinking.

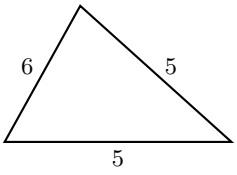
1. Similar triangles have corresponding side lengths $(3, 4, 5)$ and $(6, x, 10)$ cm. Find the original-to-copy factor and x.



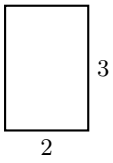
2. Check whether triangles with sides $4, 5, 6$ cm and $12, 15, 18$ cm are similar by comparing all three ratios.



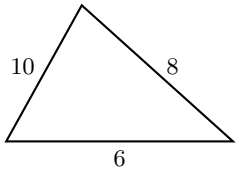
3. A triangle has sides $5, 5, 6$ cm. A similar copy uses factor 2. Find both perimeters and their ratio, copy to original.



4. A 2 cm by 3 cm rectangle is enlarged by length factor 3. Find the new dimensions and compare the length and area factors.



5. A triangle has sides $6, 8, 10$ cm. Find the sides under scale factor $1/2$ and explain why it is a reduction.



6. Two similar figures match a 4 cm original side to a 6 cm copy side. Find the copy side matching another 6 cm original side and check the proportion.

7. Similar triangles have corresponding sides 5 cm and 15 cm. The smaller other sides are $6, 8$ cm. Find the larger sides and perimeter.

8. A 3 by 4 cm rectangle is enlarged by length factor $3/2$. Find new sides and area.

Answer Key

1. Factor 2; matching length 8 cm.
2. Yes; all three ratios are 3.
3. Original 16 cm; copy 32 cm; copy-to-original ratio $2:1$.
4. New sides 6 and 9 cm; length factor 3, area factor 9.
5. Sides $3, 4, 5$ cm; $1/2 < 1$ so all sides shrink.
6. Matching length 9 cm.
7. Sides $15, 18, 24$ cm; perimeter 57 cm.
8. New sides $9/2$ and 6 cm; area 27 cm^2.

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. Check $8/4 = 6/3 = 2$. The inverse factor would shrink the side, not enlarge it.

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 $18/6 = 3$. All three match, so the triangles are similar by SSS.

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. Divide both terms of $32:16$ by 16 to get $2:1$.

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.

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. Each new side is shorter because the length factor $1/2$ is less than 1.

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. Check $9(4) = 6(6) = 36$.

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: $57/(5 + 6 + 8) = 3$.

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 $27/[3(4)] = 9/4$.

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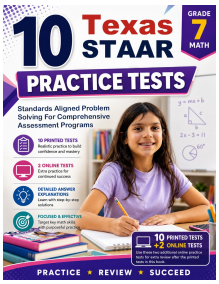

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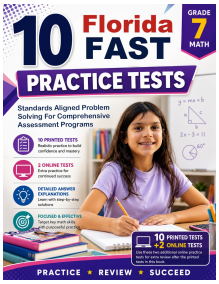

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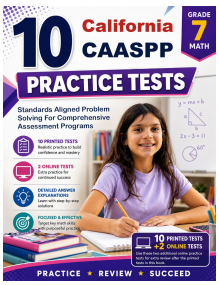

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