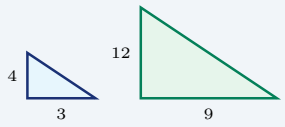
Similarity and Ratios

Name: _____	Date: _____	Score: _____ / 24

Quick Review and Helpful Hints

Similar figures have the same shape but different sizes. Their corresponding (matching) sides are in proportion – they share one common ratio called the *scale factor*. To find a missing side, set up a proportion of corresponding sides and cross-multiply.

▷ **Example:** Two triangles are similar. The small one has a side of 3 matching a side of 9 in the large one. If the small one also has a side of 4, find the matching side. **Work:** Set up a proportion of corresponding sides: $\frac{3}{9} = \frac{4}{x}$. Cross-multiply: $3x = 9 \cdot 4 = 36$, so $x = 12$. ★ **Answer:** $x = 12$

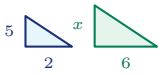


Corresponding sides share the ratio $\frac{3}{9} = \frac{4}{12}$.

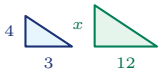
Practice Problems

Use the similar figures shown. Set up a proportion and solve for the missing side.

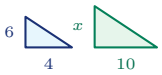
1. Find x: $\frac{2}{6} = \frac{5}{x}$.



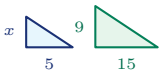
2. Find x: $\frac{3}{12} = \frac{4}{x}$.



3. Find x: $\frac{4}{10} = \frac{6}{x}$.

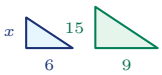


4. Find x: $\frac{5}{15} = \frac{x}{9}$.

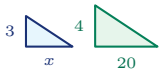


5. Find x: $\frac{8}{x} = \frac{2}{3}$.

6. Find x: $\frac{6}{9} = \frac{x}{15}$.

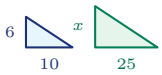


7. Find x: $\frac{x}{20} = \frac{3}{4}$.

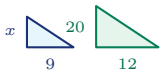


8. Find x: $\frac{7}{14} = \frac{x}{8}$.

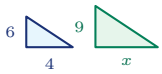
9. Find x: $\frac{10}{25} = \frac{6}{x}$.



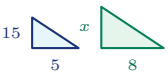
10. Find x: $\frac{9}{12} = \frac{x}{20}$.



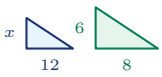
11. Find x: $\frac{4}{x} = \frac{6}{9}$.



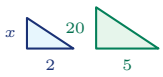
12. Find x: $\frac{5}{8} = \frac{15}{x}$.



13. Find x: $\frac{12}{8} = \frac{x}{6}$.

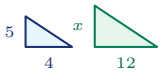


14. Find x: $\frac{2}{5} = \frac{x}{20}$.



Word Problems

15. Similar triangles: 4 cm matches 12 cm. If another small side is 5 cm, find the matching large side.



16. A 6-ft man casts a 4-ft shadow. A tree casts a 20-ft shadow. How tall is the tree?

17. A scale drawing has 3 in for 18 ft. What real length does 5 in represent?

18. Similar rectangles: the smaller is 8 cm by 5 cm. The larger matching long side is 24 cm. Find the larger short side.

19. On a map, 2 inches represent 50 miles. How many miles are represented by 7 inches?

20. A 4 in by 6 in photo is enlarged so the 4-in side becomes 10 in. Find the new length of the 6-in side.

21. A model truck uses a scale where 1 inch on the model represents 24 inches on the real truck. If the model is 7 inches long, how long is the real truck?

22. A 4-ft mailbox casts a 3-ft shadow. At the same time, a flagpole casts an 18-ft shadow. How tall is the flagpole?

23. A floor plan shows a 12-ft wall as 3 inches. On the same plan, how long should a 16-ft wall be?

24. Two similar signs have matching widths 5 ft and 15 ft. If the smaller sign's perimeter is 26 ft, find the larger sign's perimeter.

Answer Keys

1. $x = 15$	**7.** $x = 15$	**13.** $x = 9$	**19.** 175 miles
2. $x = 16$	**8.** $x = 4$	**14.** $x = 8$	**20.** 15 in
3. $x = 15$	**9.** $x = 15$	**15.** 15 cm	**21.** 168 in
4. $x = 3$	**10.** $x = 15$	**16.** 30 ft	**22.** 24 ft
5. $x = 12$	**11.** $x = 6$	**17.** 30 ft	**23.** 4 in
6. $x = 10$	**12.** $x = 24$	**18.** 15 cm	**24.** 78 ft

Step-by-Step Explanations

1. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Use the matching sides in the diagrams: $\frac{2}{6} = \frac{5}{x}$. Cross-multiply: $2x = 30$, so $x = 15$. So the final answer is $x = 15$.

2. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The matching sides give $\frac{3}{12} = \frac{4}{x}$. Cross-multiply: $3x = 48$, so $x = 16$. So the final answer is $x = 16$.

3. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Set corresponding sides equal: $\frac{4}{10} = \frac{6}{x}$. Then $4x = 60$, so $x = 15$. So the final answer is $x = 15$.

4. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Match the first pair and second pair: $\frac{5}{15} = \frac{x}{9}$. Cross-multiply: $15x = 45$, so $x = 3$. So the final answer is $x = 3$.

5. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Use the same side order across both triangles: $\frac{8}{x} = \frac{2}{3}$. Then $2x = 24$, so $x = 12$. So the final answer is $x = 12$.

6. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The diagrams show $\frac{6}{9} = \frac{x}{15}$. Cross-multiply: $9x = 90$, so $x = 10$. So the final answer is $x = 10$.

7. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Corresponding sides give $\frac{x}{20} = \frac{3}{4}$. Cross-multiply: $4x = 60$, so $x = 15$. So the final answer is $x = 15$.

8. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Use $\frac{7}{14} = \frac{x}{8}$. Cross-multiply: $14x = 56$, so $x = 4$. So the final answer is $x = 4$.

9. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Matching sides form $\frac{10}{25} = \frac{6}{x}$. Then $10x = 150$, so $x = 15$. So the final answer is $x = 15$.

10. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The proportion is $\frac{9}{12} = \frac{x}{20}$. Cross-multiply: $12x = 180$, so $x = 15$. So the final answer is $x = 15$.

11. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Use $\frac{4}{x} = \frac{6}{9}$. Cross-multiply: $6x = 36$, so $x = 6$. So the final answer is $x = 6$.

12. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Corresponding sides give $\frac{5}{8} = \frac{15}{x}$. Then $5x = 120$, so $x = 24$. So the final answer is $x = 24$.

13. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Use $\frac{12}{8} = \frac{x}{6}$. Cross-multiply: $8x = 72$, so $x = 9$. So the final answer is $x = 9$.

14. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Use $\frac{2}{5} = \frac{x}{20}$. Cross-multiply: $5x = 40$, so $x = 8$. So the final answer is $x = 8$.

15. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Pair up the matching sides in the similar triangles: $\frac{4}{12} = \frac{5}{x}$. Cross-multiply ($4x = 60$) to get $x = 15$ cm. So the final answer is 15 cm.

16. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The person and tree make similar right triangles: $\frac{6}{4} = \frac{h}{20}$. Cross-multiply ($4h = 120$), so the tree is 30 ft tall. So the final answer is 30 ft.

17. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The scale drawing keeps the same ratio: $\frac{3}{18} = \frac{5}{x}$. Cross-multiply ($3x = 90$) to get $x = 30$ ft. So the final answer is 30 ft.

18. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Match long side to long side and short side to short side: $\frac{8}{24} = \frac{5}{x}$. Cross-multiply ($8x = 120$), so $x = 15$ cm. So the final answer is 15 cm.

19. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Use the map scale as a proportion: $\frac{2}{50} = \frac{7}{x}$. Cross-multiply to get $2x = 350$, so $x = 175$ miles. So the final answer is 175 miles.

20. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The photo scale factor is $10 \div 4 = 2.5$. The matching side becomes $6 \times 2.5 = 15$ inches. So the final answer is 15 in.

21. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The model scale is $1 : 24$, so multiply the model length by 24: $7 \times 24 = 168$ inches. So the final answer is 168 in.

22. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The mailbox and flagpole make similar triangles with their shadows: $\frac{4}{3} = \frac{h}{18}$. Thus $3h = 72$, so $h = 24$ ft. So the final answer is 24 ft.

23. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The scale is 3 inches for 12 feet, so 1 inch represents 4 feet. A 16-ft wall is $16 \div 4 = 4$ inches. So the final answer is 4 in.

24. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The matching widths change by a factor of $15 \div 5 = 3$. Perimeter scales by the same factor, so $26 \times 3 = 78$ ft. So the final answer is 78 ft.

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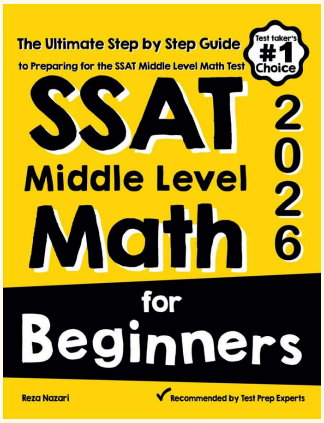

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