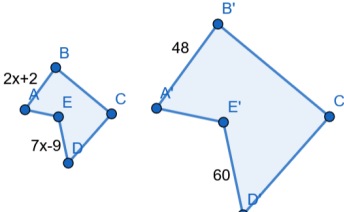
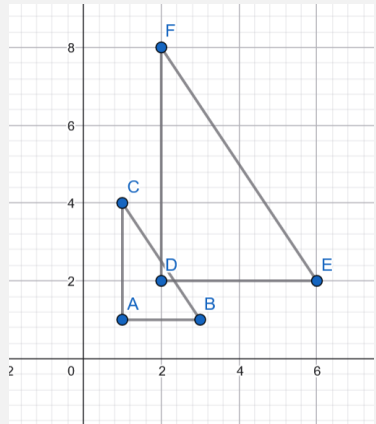
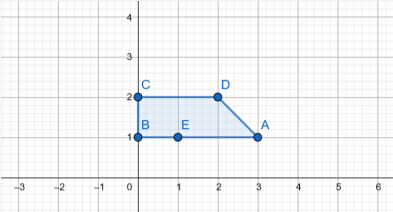
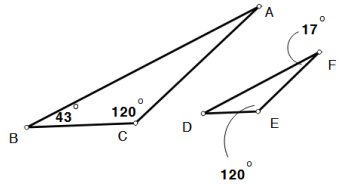
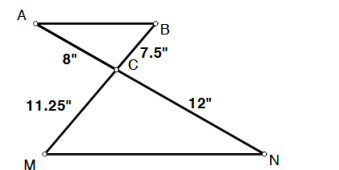
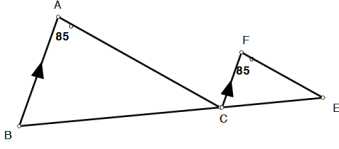
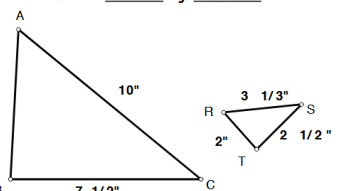
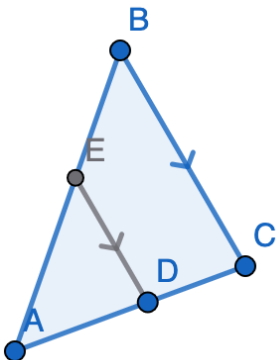


Check Your Understanding 6.6 — Review

Show all work. Before applying any property of similar triangles, first justify that the triangles are similar.

Use your navigation instrument to find your starting point on each row. Work at your level. Move up when you are ready.

Basic	Intermediate	Advanced
Proportional Reasoning and Scale → The engine behind similarity		
<i>Basic</i> 1. How would you describe similar shapes to a 5-year-old? What would you add for a fellow geometry student to make sure they understand the concept precisely?	<i>Intermediate</i> 2. Two similar rectangles have widths of 5 and 15. If the smaller rectangle has a length of 8, find the length of the larger rectangle. 2.b Given $ABCDE \sim A'B'C'D'E'$, solve for x. 	<i>Advanced</i> 3. Use the distance formula and what you know about similar triangles to determine if the following triangles are similar. Show all work. You may not graph. Triangle A: $\{(1, 2), (5, 3), (3, 7)\}$ Triangle B: $\{(2, 1), (10, 3), (6, 11)\}$
Dilation and Similarity Defined → From experience to definition		
<i>Basic</i> 4. In the diagram, is $\triangle A'B'C'$ a dilation of $\triangle ABC$? Show work to justify your answer. If yes, state the scale factor and identify the point of dilation. 	<i>Intermediate</i> 5. Scale the quadrilateral shown using E as the point of dilation and a scale factor of 2. Show all construction lines. 	<i>Advanced</i> 6. Triangle $ABC \sim$ Triangle $A'B'C'$ with scale factor $1/2$. $A = (0, 0)$, $B = (4, 0)$, $C = (2, 4)$, and the center of dilation is the origin. (a) Find A', B', C'. (b) Confirm the scale factor using distance. (c) Prove that the two triangles are similar by showing all corresponding angles are equal and all corresponding side ratios are equal.

Basic	Intermediate	Advanced
Triangle Similarity Shortcuts → Proving similarity		
<i>Basic</i> 7. Determine if each pair of triangles is similar. If they are, write the similarity statement and justify with the correct shortcut. $\triangle ABC \sim \triangle \underline{\hspace{1cm}}$ by $\underline{\hspace{1cm}}$  a. $\triangle ABC \sim \triangle \underline{\hspace{1cm}}$ by $\underline{\hspace{1cm}}$  b. $\triangle ABC \sim \triangle \underline{\hspace{1cm}}$ by $\underline{\hspace{1cm}}$  c. $\triangle ABC \sim \triangle \underline{\hspace{1cm}}$ by $\underline{\hspace{1cm}}$  d. $\triangle ABC \sim \triangle \underline{\hspace{1cm}}$ by $\underline{\hspace{1cm}}$	<i>Intermediate</i> 8. In the diagram, line segment DE is inside $\triangle ABC$ with D on AB and E on AC.  If $AB = 12$, $AD = 4$, and $BC = 9$, find DE. Justify why the triangles are similar before computing.	<i>Advanced</i> 9. In triangle ABC, line segment DE is drawn parallel to BC (D on AB, E on AC). Prove that $AE/AC = DE/BC$. Write a complete flowchart or paragraph proof. State every reason.
Indirect Measurement → Applying similarity		
<i>Basic</i> 10. A 4-foot stick casts a 2-foot shadow. At the same time, a tree casts a 10-foot shadow. How tall is the tree? Show your proportion and justify why this method works.	<i>Intermediate</i> 11. Describe how you could use a mirror to measure the height of a flagpole. Justify why the method works. Make up numbers for the parts you would measure and solve for the height.	<i>Advanced</i> 12. A surveyor wants to measure the width of a river without crossing it. Describe a method using similar triangles. Include a diagram, justify why the triangles are similar (citing the shortcut and all conditions), and solve using made-up measurements.

Basic	Intermediate	Advanced
Scaling Laws → Similarity in different dimensions		
<i>Basic</i> 13. A triangle has perimeter 10 and area 15. It is scaled by a factor of 4. (a) What is the new perimeter? (b) What is the new area?	<i>Intermediate</i> 14. A rectangular prism has volume 12 ft^3. It is dilated by a factor of 3. (a) What is the new volume? (b) Explain why volume scaled as it did — do not just state a rule. Explain why the rule is true.	<i>Advanced</i> 15. Cells rely on surface area to exchange materials their interior needs. (a) Explain why increasing cell size creates a biological problem. (b) Based on your reasoning, explain why most cells must be small.

Answers — CYU 6.6

Proportional Reasoning and Scale

1. Similar shapes look the same — they are just bigger or smaller pictures of the same shape. In similar shapes all corresponding angles are congruent and corresponding sides are proportional.
2. Scale factor = $15/5 = 3$. Length = $8 \times 3 = 24$. For the pentagon: set up proportion using corresponding sides, cross-multiply, solve for x .
3. $AB = \sqrt{17}$, $BC = \sqrt{20}$, $AC = \sqrt{29}$. $DE = 2\sqrt{17}$, $EF = 2\sqrt{20}$, $DF = 2\sqrt{29}$. All ratios = 2. Similar by SSS~.

Dilation and Similarity Defined

4. Check that all ratios of corresponding sides are equal. Lines through corresponding vertices meet at a single point. Accept diagram-specific answers.
5. Construction check — each image vertex should be on the ray from E through the original vertex, at twice the distance from E.
- 6a. $A'(0,0)$, $B'(2,0)$, $C'(1,2)$.
- 6b. $AB = 4$, $A'B' = 2$. Ratio = $1/2$. ✓
- 6c. Angles: dilation preserves all angle measures. Side ratios: all equal $1/2$. ✓

Triangle Similarity Shortcuts

7. Accept diagram-specific answers. Each must name the shortcut (AA, SAS~, or SSS~) and write a correct similarity statement with matching vertex order.
8. $DE \parallel BC \rightarrow \angle ADE = \angle ABC$ (corresponding angles). $\angle A = \angle A$ (reflexive). $\triangle ADE \sim \triangle ABC$ (AA). $AD/AB = DE/BC \rightarrow 4/12 = DE/9 \rightarrow DE = 3$.
9. $DE \parallel BC \rightarrow \angle ADE = \angle ABC$ (corresponding angles). $\angle A = \angle A$ (reflexive). $\triangle ADE \sim \triangle ABC$ (AA). Corresponding sides proportional: $AE/AC = DE/BC$. ■

Indirect Measurement

10. $4/2 = h/10 \rightarrow h = 20$ feet.
11. Accept any valid description with numbers. Law of reflection gives equal angles; perpendicularity to ground gives right angles; AA similarity established. Work will vary.
12. Accept any valid method. Must include diagram, shortcut name, justification of both angle conditions, and a solved numerical example.

Scaling Laws

- 13a. 40.
- 13b. $15 \times 16 = 240$.
- 14a. $12 \times 27 = 324 \text{ ft}^3$.
- 14b. Each of the three linear dimensions scales by 3, so each dimension contributes a factor of 3 to the product $l \times w \times h$. The volume is the product of three lengths, each scaled by k , giving k^3 total.
- 15a. Volume grows by k^3 but surface area only by k^2 , so the surface-area-to-volume ratio decreases as the cell grows. A larger cell has proportionally less surface area to exchange the nutrients its larger interior needs.
- 15b. A cell that grows too large cannot get nutrients across its surface fast enough. Division keeps each cell small enough for diffusion to work effectively.