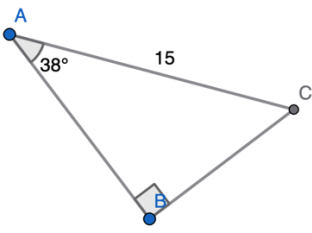


Check Your Understanding 7.2

Show all work.

Basic	Intermediate	Advanced
Row 1 Spiral — Trig Ratios → Discovering the invariants		
<i>Basic — Spiral</i> 1. A right triangle has legs 9 and 40, hypotenuse 41. Angle θ is opposite the leg of length 9. (a) Write $\sin \theta$, $\cos \theta$, $\tan \theta$. (b) Write $\sin$, $\cos$, $\tan$ for the other acute angle.	<i>Intermediate — Spiral</i> 2. In a right triangle, $\cos \theta = 5/13$. (a) Find $\sin \theta$ and $\tan \theta$ without a calculator. (b) Explain why $\text{adj}/\text{hyp} < 1$ for any acute angle.	<i>Advanced — Spiral</i> 3. A student writes: ' $\sin 40^\circ$ and $\sin 80^\circ$ differ because the triangles are different sizes.' Identify the error and write a corrected statement referencing AA similarity.
Solving for Missing Sides → Using invariants		
<i>Basic</i> 4. Estimate first, then solve exactly.  (a) Find opposite side in the diagram above. (b) Right triangle: 54° angle, $\text{adj} = 11$ cm. Find hypotenuse. (c) Right triangle: 27° angle, $\text{opp} = 6$ ft. Find adjacent side.	<i>Intermediate</i> 5. A kite flies on an 80 m string at 52° to the ground. How high is the kite? Estimate first. 6. A ramp rises at 8° to horizontal. The ramp surface is 5 m long. Find the height and horizontal distance. 7. A ladder 6 m long leans at 71° to the ground. How high up the wall does it reach?	<i>Advanced</i> 8. From a window 18 m above ground, the angle of depression to a car is 34° . Find the horizontal distance from the building to the car, and the straight-line distance from the window to the car. 9. A surveyor sights a hilltop at 17° elevation. After walking 200 m toward the hill, the angle is 31° . Find the height of the hill. (Set up two right triangles sharing the height.)
Algebra Spiral Expand	<i>Algebra Spiral</i> Expand each expression completely. (a) $(x - 9)(x + 4)$ (b) $(2a + 7)^2$ (c) $(4y - 3)(y + 5)$	

Answers — CYU 7.2**Row 1 Spiral**

1a. $\sin \theta = 9/41$, $\cos \theta = 40/41$, $\tan \theta = 9/40$.

1b. $\sin = 40/41$, $\cos = 9/41$, $\tan = 40/9$.

2a. $\text{adj} = 5$, $\text{hyp} = 13$, $\text{opp} = 12$. $\sin \theta = 12/13$, $\tan \theta = 12/5$.

2b. Hypotenuse is always longest, so $\text{adj} < \text{hyp}$ and the ratio < 1 .

3. Error: trig ratios differ because the angles differ, not because triangles are different sizes. Corrected: $\sin 40^\circ \neq \sin 80^\circ$ because different angles produce different invariant ratios regardless of triangle size.

Solving for Missing Sides

4a. $15 \sin 38^\circ \approx 9.23$ m.

4b. $11 / \cos 54^\circ \approx 18.73$ cm.

4c. $6 / \tan 27^\circ \approx 11.78$ ft.

5. $80 \sin 52^\circ \approx 63.04$ m.

6. Rise = $5 \sin 8^\circ \approx 0.70$ m. Run = $5 \cos 8^\circ \approx 4.95$ m.

7. $6 \sin 71^\circ \approx 5.67$ m.

8. Horizontal = $18 / \tan 34^\circ \approx 26.68$ m. Straight-line = $18 / \sin 34^\circ \approx 32.17$ m.

9. $h/\tan 17^\circ - h/\tan 31^\circ = 200$. $h = 200/(1/\tan 17^\circ - 1/\tan 31^\circ) \approx 200/(3.271 - 1.664) \approx 124.5$ m.

Algebra Spiral

(a) $x^2 - 5x - 36$

(b) $4a^2 + 28a + 49$

(c) $4y^2 + 17y - 15$