

Similar Triangles and Trigonometry Review

Answer key Final answers only. Try first, then check.

CORE SKILLS

- K1**
- a) Similar (AA) but not congruent; scale factor 1.4
 - b) Not similar: $\frac{9}{6} = 1.5$ but $\frac{11}{8} = 1.375$
 - c) $k = 1.5$; area = 45 cm²

- K2**
- a) $x = 3$
 - b) $y = 10$
 - c) $TU = 9$, $SU = 10.5$

- K3**
- a) $\sin A = \frac{21}{29}$, $\cos A = \frac{20}{29}$, $\tan A = \frac{21}{20}$
 - b) $\sin B = \frac{20}{29}$, $\cos B = \frac{21}{29}$, $\tan B = \frac{20}{21}$
 - c) $\tan \theta = \frac{3}{4}$ (adjacent side = 12 cm)

- K4**
- a) $x \approx 20.9$
 - b) $x \approx 11.5$
 - c) $\theta \approx 72.5^\circ$

- K5**
- a) $QR = 40$ cm
 - b) $\angle P \approx 77.3^\circ$
 - c) $\angle R \approx 12.7^\circ$

REAL WORLD

- A1**
- a) 9 m
 - b) 7.2 m
 - c) No: the sun is lower at 5 p.m., so the height-to-shadow ratio has changed; the triangles are similar only at the same moment. With the 5 p.m. ratio, $22.5 \times \frac{1.6}{4.0} = 9$ m, the same height as before.

- A2**
- a) ≈ 128 m
 - b) ≈ 49 m (from ≈ 128 m to ≈ 79 m)
 - c) $\tan 0^\circ = 0$, so $\frac{32}{\tan 0^\circ}$ is undefined. A horizontal line of sight never meets the water, so no boat on the water is seen at 0° ; the smaller the angle, the farther away the boat.

- A3**
- a) Run = 9 m; angle $\approx 4.8^\circ$
 - b) ≈ 5.4 m; it does not meet the guideline: $8^\circ > 4.8^\circ$ (it rises 1 m for about every 7.1 m of run)
 - c) No: it needs 9 m of run and only 6 m is available. The builder can split the ramp into two runs joined by a landing (a switchback), or run it along the front wall of the building.

THINK IT THROUGH

- T1**
- a) AB is the hypotenuse, so it must be longer than the leg $AC = 15$ cm, and $11.8 < 15$.
 - b) The student multiplied instead of dividing: $x \cos 38^\circ = 15$, so $x = \frac{15}{\cos 38^\circ} \approx 19.0$ cm.
 - c) $\sin^{-1}$ is the inverse (the angle whose sine is 0.6), not the reciprocal $\frac{1}{\sin}$. $\theta = \sin^{-1}(0.6) \approx 36.9^\circ$.
- T2**
- a) e.g. a 3-4-5 triangle (acute angles $\approx 36.9^\circ$ and $\approx 53.1^\circ$) and an isosceles right triangle (acute angles 45° and 45°): their angles differ, so they are not similar.
 - b) The triangles are similar (AA), with scale factor 2.4: $EF = 2.4 BC$ and $DE = 2.4 AB$, so the factor 2.4 cancels in the ratio. The ratio is $\sin 32^\circ$; it depends only on the angle.
 - c) Both legs $5\sqrt{2} \approx 7.1$ cm (an isosceles right triangle); $\angle A = 45^\circ$

BOSS LEVEL

- Boss**
- a) 2 m
 - b) 2 m (the height does not depend on the distance)
 - c) $\frac{20}{3} \approx 6.7$ m
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