Linked triangles

6 questions | 17 marks

Equivalent correct methods earn the corresponding marks.

1. Two right triangles share a height. One has base 8 cm and hypotenuse 17 cm; the other base is 20 cm. Find its hypotenuse. [3 marks]

Height $= \sqrt{17^2 - 8^2} = 15$ cm.

Other hypotenuse $= \sqrt{15^2 + 20^2} = 25$ cm.

Answer: 25 cm

2. A 10 m ladder moves from base distance 6 m to 8 m. Find its top drop. [3 marks]

Heights are $\sqrt{100 - 36} = 8$ m and $\sqrt{100 - 64} = 6$ m.

Drop $= 8 - 6 = 2$ m.

Answer: 2 m

3. A 12 m mast has ground anchors 5 m and 9 m from its base on opposite sides. Find both cable lengths and anchor separation. [3 marks]

Lengths are $\sqrt{12^2 + 5^2} = 13$ m and $\sqrt{12^2 + 9^2} = 15$ m.

Anchor separation $= 5 + 9 = 14$ m.

Answer: 13 m and 15 m; 14 m apart

4. A symmetrical triangular roof has span 20 m and rise 9 m. Find either slope to 0.1 m. [3 marks]

Half-span is 10 m.

Slope $= \sqrt{10^2 + 9^2} = \sqrt{181}$ m.

Answer: 13.5 m

5. Points on level ground are 20 m and 40 m from a 12 m tower. Find both elevation angles to 0.1°. [3 marks]

Angles are $\tan^{-1}\left(\frac{12}{20}\right)$ and $\tan^{-1}\left(\frac{12}{40}\right)$.

The nearer point has the larger angle.

Answer: 31.0° and 16.7°

6. Two adjacent right triangles have bases 3 m and 4 m and share a height. Why cannot 7 m be used as the base of each triangle? [2 marks]

Each calculation uses sides of one right triangle.

The bases remain 3 m and 4 m respectively.

Answer: 7 m is the full span, not the base of either individual triangle.