Heights and Distances Practice Worksheet

12 board-style questions: ratios, values, identities and heights & distances. Draw a diagram for every word problem. Answers on page 2.

#	Type	Question	Diagram / working
1	Ratios	If sin A = 5/13, find cos A and tan A.	
2	Values	Evaluate sin 60° cos 30° + sin 30° cos 60°.	
3	Values	Evaluate cos 45° / (sec 30° + cosec 30°).	
4	Identity	Prove: $(1 + \sec A)/\sec A = \sin^2 A/(1 - \cos A)$.	
5	Identity	Prove: $(\sin\theta - 2\sin^3\theta)/(2\cos^3\theta - \cos\theta) = \tan\theta$.	
6	Values	If tan A = $1/\sqrt{3}$ and A is acute, find A.	
7	H&D; (sin)	A kite is flying at a height of 60 m. The string makes 60° with the ground. Find the length of the string, assuming no slack.	
8	H&D; (tan)	The Sun’s elevation is 60°. Find the length of the shadow of a 15 m tall tower.	
9	H&D; (cos)	A ladder makes 60° with the ground and its foot is 2.5 m from the wall. Find the length of the ladder.	
10	H&D; (2 points)	The angle of elevation of a tower’s top is 30°. After walking 40 m towards it, the angle is 60°. Find the height of the tower.	
11	H&D; (2 objects)	From the top of a 100 m lighthouse, the angles of depression of two ships on opposite sides are 30° and 45°. Find the distance between the ships.	
12	H&D; (2 objects)	From the top of a 7 m building, the angle of elevation of a tower’s top is 60° and the angle of depression of its foot is 45°. Find the height of the tower.	

Answers and key steps

Use √3 = 1.732 for decimals. Exact answers (like 20√3 m) are acceptable unless the question asks for a decimal.

#	Answer
1	cos A = 12/13, tan A = 5/12 (base = √(169 − 25) = 12)
2	(√3/2)(√3/2) + (1/2)(1/2) = 3/4 + 1/4 = 1
3	(1/√2) ÷ (2/√3 + 2) = √3/(2√2(1 + √3)) = (3√2 − √6)/8 ≈ 0.224
4	LHS = (1 + 1/cos A) ÷ (1/cos A) = cos A + 1. RHS = (1 − cos²A)/(1 − cos A) = 1 + cos A. Hence LHS = RHS
5	LHS = sin θ(1 − 2sin²θ) / [cos θ(2cos²θ − 1)]. Using sin²θ + cos²θ = 1, both brackets equal cos²θ − sin²θ, so LHS = sin θ/cos θ = tan θ
6	A = 30°
7	sin 60° = 60/L ⇒ L = 60 × 2/√3 = 40√3 m ≈ 69.28 m
8	tan 60° = 15/s ⇒ s = 15/√3 = 5√3 m ≈ 8.66 m
9	cos 60° = 2.5/L ⇒ L = 2.5 × 2 = 5 m
10	h√3 − h/√3 = 40 ⇒ 2h/√3 = 40 ⇒ h = 20√3 m ≈ 34.64 m
11	100 cot 30° + 100 cot 45° = 100√3 + 100 = 100(√3 + 1) m ≈ 273.2 m
12	Distance = 7 cot 45° = 7 m; extra height = 7 tan 60° = 7√3 m; tower = 7 + 7√3 = 7(1 + √3) m ≈ 19.12 m

Score tracker

Type	Questions	Correct	What went wrong
Ratios and values	1, 2, 3, 6		
Identities	4, 5		
Heights & distances (one triangle)	7, 8, 9		
Heights & distances (two triangles)	10, 11, 12		