Name: _____ Date: _____

4.1 Special Angles

BLM 4–3

1. a) When using the unit circle to find the trigonometric ratios for 150°, a reference angle of 30° is used. What reference angle would you need to use to find the trigonometric ratios for 225°? Explain your answer.

b) Construct a unit circle to find the exact trigonometric ratios for 225°.

2. A ladder that is 15 m long is leaning up against a building. The ladder makes an angle of 60° with the ground.

a) Represent this situation with a labelled diagram.

b) Find an exact expression for the height at which the top of the ladder contacts the wall of the building.

3. A tree is anchored by a guy wire that is attached 13 m from the base of the tree and makes an angle of 60° with the ground. Find the exact value of the height of the tree.

4. The arm of a crane is 20 m long. The angle of inclination of the boom of the crane has a minimum value of 45° and a maximum value of 60°.

a) Find an exact value for the vertical displacement of the boom of the crane as it moves from its minimum to its maximum inclination angles.

b) Find the value of this vertical displacement to the nearest tenth of a metre.

5. A boat is 15 km south of a harbour. A lighthouse is 15 km west of the harbour.

a) Use trigonometry to find the distance between the boat and the lighthouse.

b) Check your answer using another method. State the method you used to check the answer.

6. a) Complete the following table (use a calculator and record answers to four decimal places).

θ	sin θ	Quadrant	Sign
60°			
120°			
240°			
300°			

b) Relate the sign of sin θ with the quadrant. Are the signs as you expected?

c) Complete the following table (use a calculator and record answers to four decimal places).

θ	cos θ	Quadrant	Sign
30°			
150°			
210°			
330°			

d) Relate the sign of cos θ, with the quadrant. Are the signs as you expected?

7. The Leaning Tower of Pisa, which has a height of 55.86 m from base to top, is leaning to the southwest at an angle of 3.97° to the vertical.

a) What is the vertical distance from the ground to the top of the tower, on the southwest side?

b) If you were standing directly under the top of the tower, on the southwest side, how far would you be from the base?

8. Alicia and Jenita are holding a hot-air balloon using guide ropes. On one side of the balloon, Alicia is holding her 15-m rope at an angle of 30° to the ground. On the other side of the balloon, Jenita is holding her rope at an angle of 45° to the ground.

a) How high is the balloon?

b) How long is Jenita's rope?

c) How far apart are Alicia and Jenita?

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