Angles of Depression and Elevation
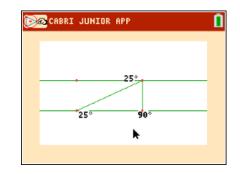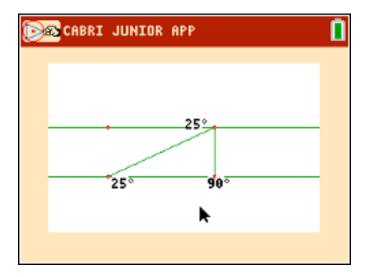## Student Activity

Name _____

Class _____

Trigonometry is a branch of math that uses triangles to help solve problems. Initially, trigonometry dealt with relationships among the sides and angles of triangles and was commonly used in the development of astronomy, navigation, building and surveying. In this activity we will use this idea of triangle trigonometry with a focus combined with the idea of angles of depression and elevation.

The prior knowledge needed for this activity is understanding what the angles of depression and elevation are and what their relationship is with one another.

Looking at the picture below, discuss with a partner the relationships you see. Share your results with the class.

Using the same picture below, label both the angle of elevation and angle of depression. Remember, when looking up, the angle of elevation is the angle created with the person's horizontal line of sight and the upward tilt of their head to look at an object. Also, when looking down, the angle of depression is the angle created with the person's horizontal line of sight and the downward tilt of their head to look at an object.
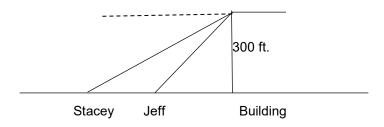
Problem 1

Mr. Jeffries took his Geometry class outside for class today. Their goal was to find the height of the tall tree behind the school. The students are to work in pairs. One pair of students used a tape measure to walk away from the tree and stop 15 ft. away. One of the pair stood at that spot 15 ft. away and looked straight at the tree. Her partner used a measuring app on her phone that allowed her to measure angles with her camera. She lined her phone's camera up with her partner's head and measured the angle of elevation to be 55°. Using the student's information, and the fact that the student who looked up at the tree was 5 ft. 4 in. tall, draw a diagram, label the angle of elevation and find the height of the tree.

Problem 2

Robert was standing on an Oceanside cliff enjoying the view, when all of a sudden he noticed a fire which seemed to be coming from a boat off shore. He decided he needed to contact the coast guard and give them as much information about the boat as he could. Because he visited this cliff often, he knew the cliff to be 50 ft. high. Robert estimated his angle of depression to be roughly 25°. Draw a diagram, label the angle of depression and find the distance the distressed boat is from the shoreline.

Problem 3

Alex was bird watching with her binoculars at the top of a 300 ft. building. When she looked down toward the street at an angle of approximately 48°, she noticed her friend Jeff walking toward the building. She then lifted her binoculars another 20° and saw her friend Stacey walking toward the building as well. Using the diagram below, find the distance between Jeff and Stacey, labelling any angle of elevation or depression used.
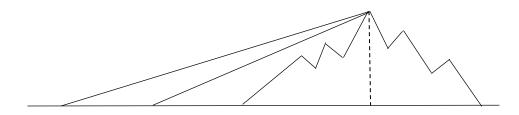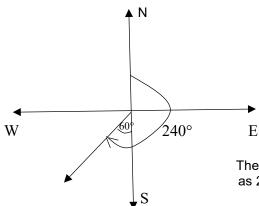
Problem 4

The Scott family was talking a road trip out west and were approaching a mountain range. The family was debating how tall the highest point was in front of them. When they first looked at the top of the mountains their angle of elevation was 20°. After driving another 10 miles, their new angle of elevation was 28°. Using the diagram below, find the approximate height of the highest point of the mountain range labelling the angles of elevation.

Further Extension:

Bearings

A bearing is used to indicate the direction of an object from a given point. Three figure bearings are measured clockwise from North and can be written as three figures, such as 135°, 063°, or 275°.

Compass bearings are measured from either N or from S, and can be written such as N 40° E, N 75° W, S 36° E, or S 45° W. Below is an example diagram of a compass bearing.

These are equivalent but can be written as 240° (from the north) or S 60° W.

Problem 5

A boat travels on a bearing of N 86° W for 30 km.

(a) How many miles north has the boat travelled?

(b) How many miles west has the boat travelled?

education.ti.com