# Lost Treasure!!!

A trigonometry group project

## Introduction

A team of explorers finds a treasure map from 1747 with these directions to the treasure:

*From the tallest palm tree (P), sight the highest hill (H).*
*Drop your eyes vertically until you sight the base of the hill.*
*Turn 40 degrees clockwise from that line and walk 70 paces to the big red rock (R).*
*From there walk 50 paces back to the sight line between the palm tree and the hill.*
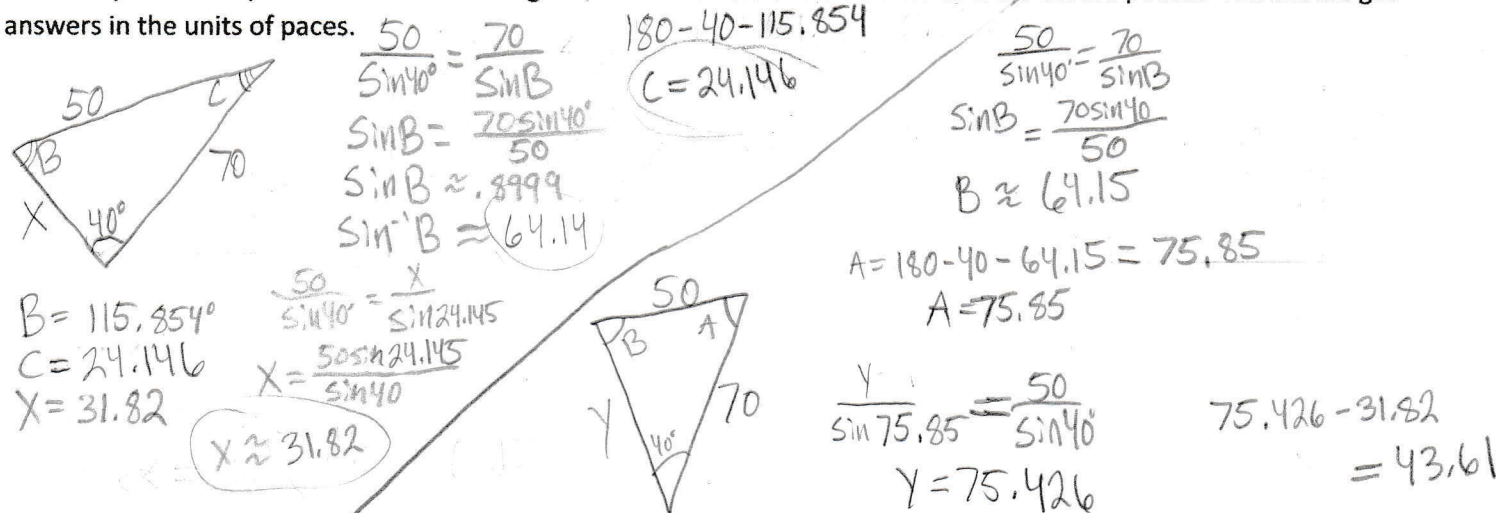*Dig there (X).*

The trouble is that after so long, the palm tree no longer exists. So, the team contacts you to decipher the map and give them a plan for finding the lost treasure. Determine a plan to locate the position of the lost palm tree and write out an explanation of your procedure for the explorers.

## Directions

OK! Let's begin. On the next page you will find a mostly blank map to use. Do the following work on that page.

- Start at the red rock R. Draw a circle centered around R with an appropriate radius. Use the following conversion factor to determine the radius:

  10 paces = 1 centimeter, so 70 paces = _____7_____ cm.

- Now find the point along the circle that has 40 degrees be the angle between the lines of sights to the hill H and the rock R. Mark this place P with a palm tree demonstrating your artistic merit.

Next you are going to use trigonometry to determine the two distances you should walk towards the hill from the palm. On your drawing, draw a second circle around R representing 50 paces. You will notice that this circle crosses the PH line of sight at two spots. These are the predicted locations of the treasure! Now it's a 50/50 chance on finding the treasure your first try! Use the laws of triangles to solve for the two distances to the treasure points. You should get answers in the units of paces.

$$\frac{50}{\sin 40°} = \frac{70}{\sin B}$$

$$\sin B = \frac{70 \sin 40°}{50}$$

$$\sin B \approx .8999$$

$$\sin^{-1} B \approx 64.14$$

$$180 - 40 - 115.854$$

$$\boxed{C = 24.146}$$

$$B = 115.854°$$
$$C = 24.146$$
$$X = 31.82$$

$$\frac{50}{\sin 40°} = \frac{X}{\sin 24.145}$$

$$X = \frac{50 \sin 24.145}{\sin 40}$$

$$\boxed{X \approx 31.82}$$

$$\frac{50}{\sin 40°} = \frac{70}{\sin B}$$

$$\sin B = \frac{70 \sin 40}{50}$$

$$B \approx 64.15$$

$$A = 180 - 40 - 64.15 = 75.85$$

$$A = 75.85$$

$$\frac{Y}{\sin 75.85} = \frac{50}{\sin 40}$$

$$Y = 75.426$$

$$75.426 - 31.82 = 43.61$$

The first distance from the palm along the line of sight to the hill is ___31.82___ ft. From this first spot, walk an additional _____43.61_____ ft towards the hill to find the second spot to dig.

Move on to page 3 for detailing the plan.

50

Y

50

70

40°

P
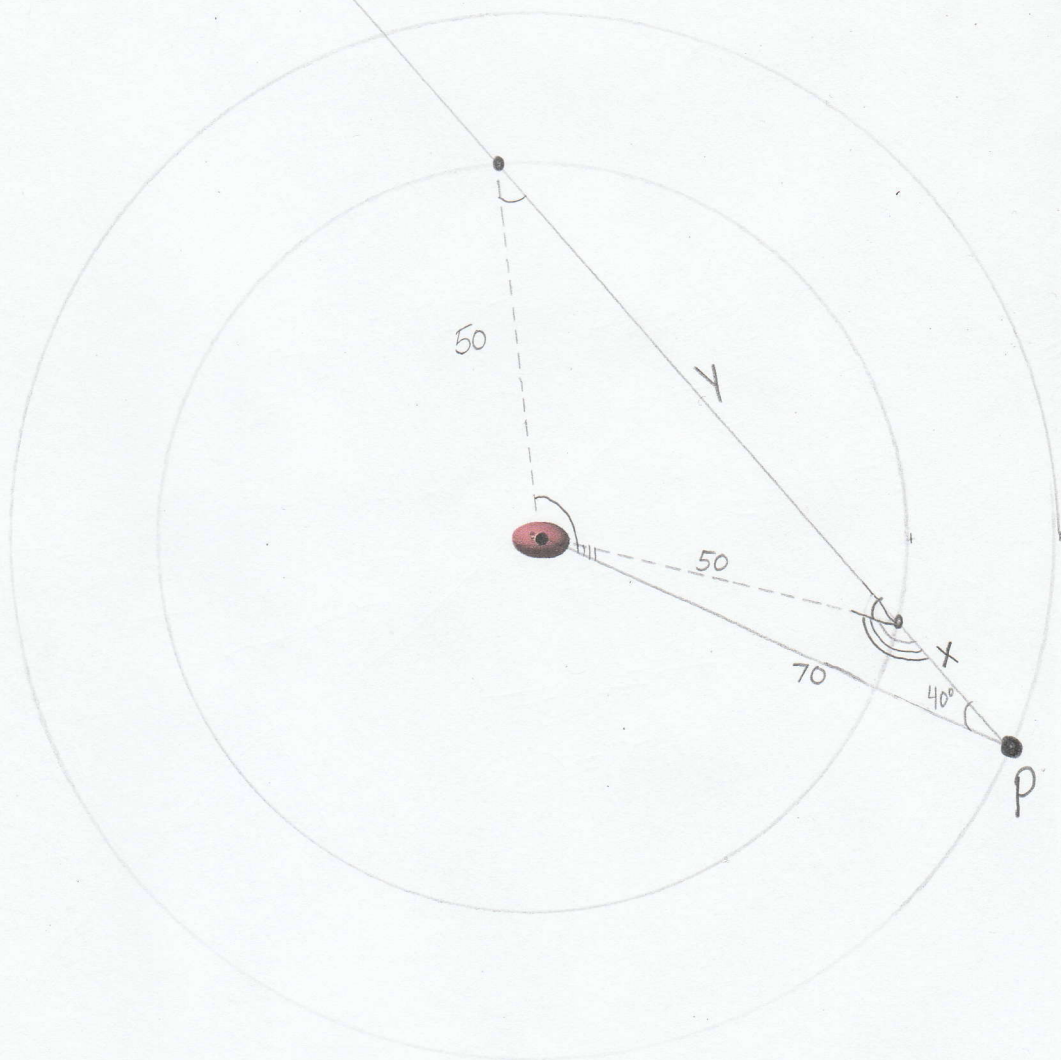
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**Now, you are going to detail your plan for finding the treasure so you can tell your team on site exactly what to do. The only equipment they have to work with is a tape measure, lots of rope, a sharp knife, shovels, and a protractor. You all decide that a pace will be approximated by 3 feet, so make sure to convert your numbers to feet so they can accurately measure!**

- First, we need a circle centered at red rock R with a radius of 50 paces. Second, I need a larger circle centered at red rock R with a radius of 70 paces. I will use the law of Sines with the angle of 40 degrees and the opposite side of 50 paces to find one missing angle of the triangle. I need two angles so I can find the third angle of the triangle by subtracting the two angles I know by 180 degrees. I will then find the distance along the line of sight. Once we go to the first point I will subtract the distance in the path and then I will have the distance to the second point. Then, we will be guided straight to go and open the treasure!

## Reflection

- Over the last ten years I have been working for Modern Construction as a Superintendent mainly completing general construction projects. I could have saved myself a lot of work and frustration if I would have put in the work to complete this trigonometry class in high school. I have learned so many cool things from this class I am so grateful for. I will continue to be a lifelong learner and math lover! In construction trigonometry is used for almost everything. I am always cutting materials on an angle so they fit snugly. I love the power math has to make stuff work more efficiently. Brain power equals less labor! In construction it is important to be smart and make accurate calculations. I like that I have practiced patience, perseverance, and dedication in math because I am going to need a lot more of those skills!