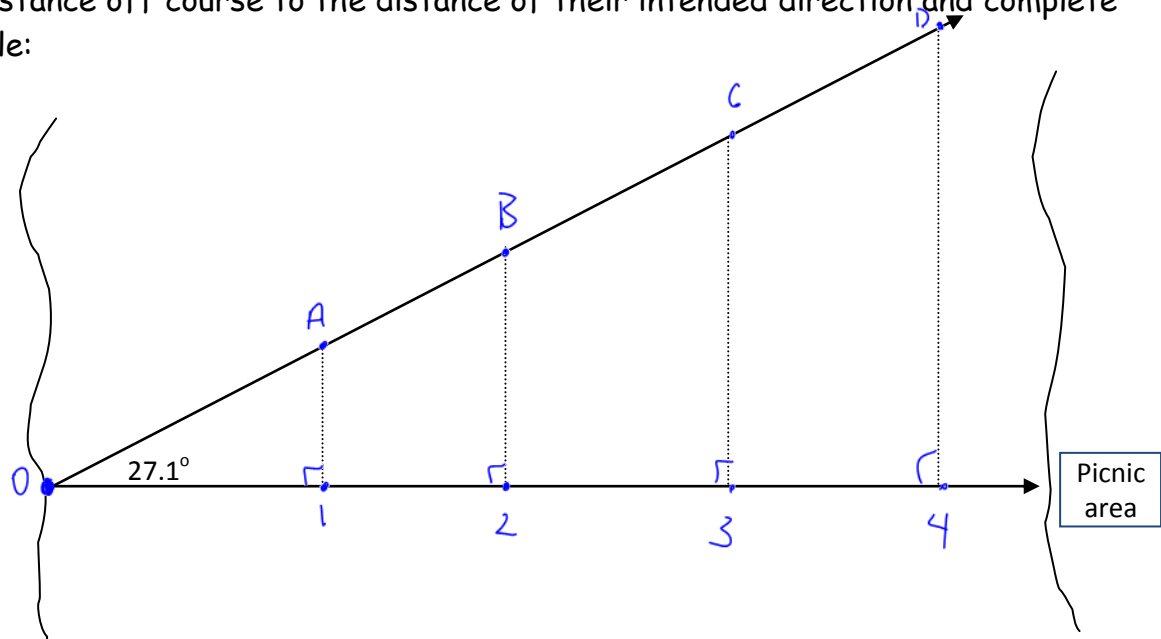Date: <u>SEPT 19</u>

3.1 The Tangent Ratio

Chris and Aimee are trying to canoe across Lake Isaac and reach the picnic area. However, due to the wind, they are getting blown off course. Find the ratio of their distance off course to the distance of their intended direction and complete the table:


Triangle	Off course distance	Intended distance	Off Course Intended
#1	1.8 (1-A)	3.6 (0-1)	$\frac{1.8}{3.6} = .5$
#2	3.1 (2-B)	6 (0-2)	$\frac{3.1}{6} = .52$
#3	4.5 (3-C)	9 (0-3)	$\frac{4.5}{9} = .5$
#4	6.0 (4-D)	11.75 (0-4)	$\frac{6}{11.75} = .51$

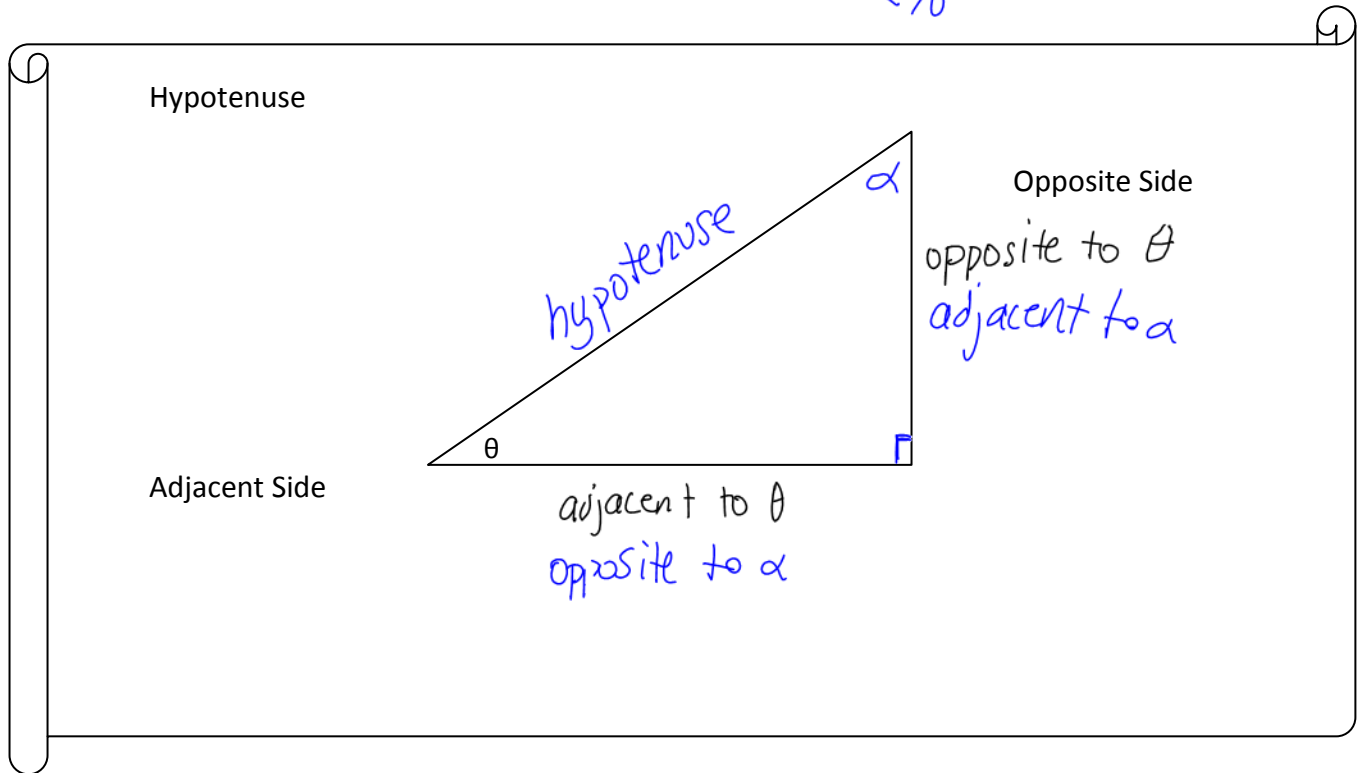How should the ratio of the off course distance and the intended distance change?

It should not change largely because you are looking at similar triangles

Use your calculator to find the tangent of 27.1°, the angle which they are being blown off course.

$\tan 27.1 = 0.5117$

.5117
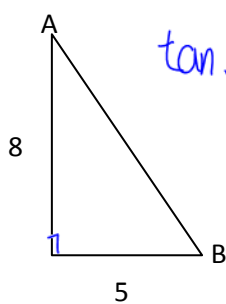
27.1

1
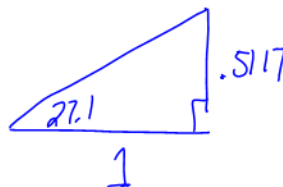
The _tangent_ ratio is found in a right triangle, and shows the ratio of the

opposite & _adjacent_ sides from the acute angle being considered

$< 90°$

Hypotenuse

hypotenuse

adjacent to θ

opposite to α

Opposite Side

opposite to θ
adjacent to α

Adjacent Side

adjacent to θ
opposite to α
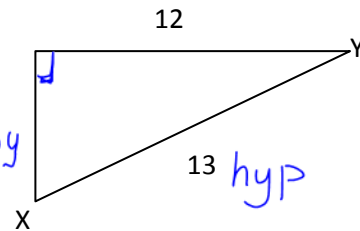
θ

α

1. <u>Finding the tangent ratio</u>

Find the tangent ratios for each triangle:

$\tan A = \dfrac{5}{8}$

$\tan B = \dfrac{8}{5}$

A

8

5

B

$\tan A = \dfrac{opposite}{adjacent}$

12

Y

y

X

13 hyp

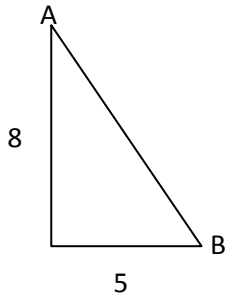$\tan X = \dfrac{12}{5}$ $\tan Y = \dfrac{5}{12}$

use Pythag thm
to find this number

$y^2 = 13^2 - 12^2$
$y^2 = 169 - 144$
$y^2 = 25$
$y = 5$

Your calculator can also work backwards and tell you what angle corresponds to your tangent ratio.

A

8

5

B

Determine the tangent ratio of angle A and use the inverse function to find out how big angle A is.

$$\tan A = \frac{5}{8}$$

$$A = \tan^{-1}(5 \div 8)$$

$$A = 32°$$

You can use decimal values for your ratio or fractions

$$\tan A = .625$$
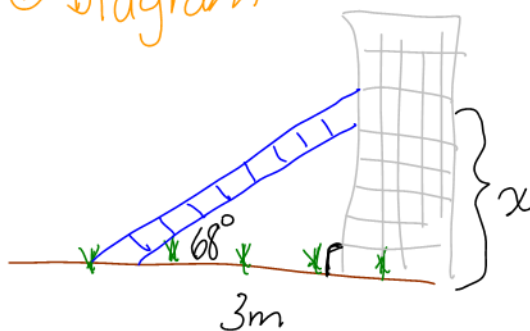
$$A = \tan^{-1}(.625)$$

$$A = 32°$$

Complete the table:

θ	tan θ
30°	.577
52°	1.279
72.8°	3.230

θ	tan θ
26.565°	0.5
45°	1
57.99°	$\frac{8}{5}$

Using the Tangent Ratio

A ladder is leaning against a wall. If the base of the ladder is 3m from the wall and forms a 68° angle with the ground, how high does the ladder reach?

① Diagram

68°

3m

x

② Tan Ratio

$$\frac{\tan 68}{1} = \frac{x}{3}$$

③ Cross Multiply

$$x = 3 \cdot \tan 68$$

$$x = 7.43m \quad ④ \text{Answer}$$

Sam Surveyor is using a theodolite to measure the angle to the top of the really, really tall glacier. He knows that the horizontal distance to the base of the glacier is 24m, and the angle to the top of glacier is 30°. If the theodolite is resting on a platform that is 1.4m tall, what is the height of the glacier?
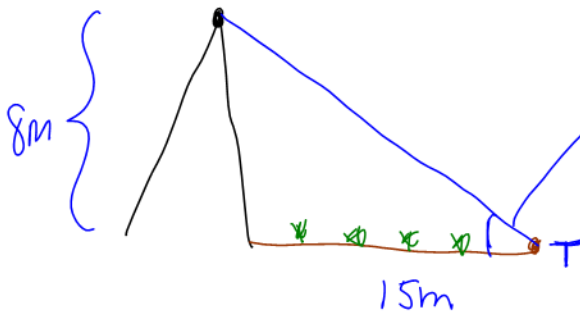(is it really really, really tall?)
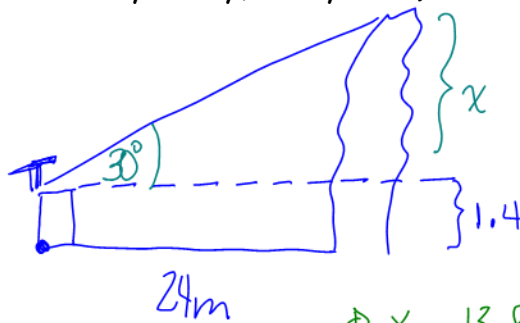
$\tan 30 = \dfrac{x}{24}$

$x = 24 \cdot \tan 30$

$x = 13.86 m$

Height $= 13.86 + 1.4$

$= 15.26 m$

Two of Sam's helpers are messing around and decide to try and measure the angle from the theodolite to the top of the tower. They know that the tower is 8m tall, and they are approximately 15m from the base of the tower. If the theodolite was placed at ground level, what angle would it be measuring?

$\tan T = \dfrac{8}{15}$

$T = \tan^{-1}(8 \div 15)$

$T = \tan^{-1}(.5\overline{3})$

$T = 28.07°$

More than just a tanned gent!