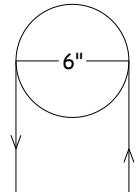


To receive full credit: You must **show your work**, it must be **clearly legible** with answers **simplified** and **boxed-in** or circled. Inexact answers must be accurate to **two decimal places** and include **units**. (20 points)

1) A chain wraps partially around a gear to operate a lifting mechanism as shown.

(a) The gear rotates at 15 rpm. What is that in degrees/sec?

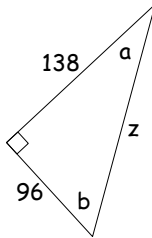
(b) The gear rotates at 15 rpm. How fast does the chain move in ft/sec?



2) Find a, z

a = \_\_\_\_\_

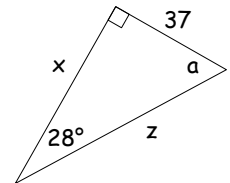
z = \_\_\_\_\_



3) Find x, z

x = \_\_\_\_\_

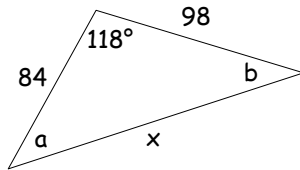
z = \_\_\_\_\_



4) Find x and a

x = \_\_\_\_\_

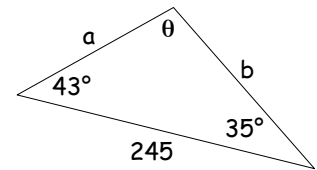
a = \_\_\_\_\_



5) Find a and b

a = \_\_\_\_\_

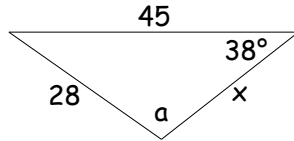
b = \_\_\_\_\_



6) Find a and x

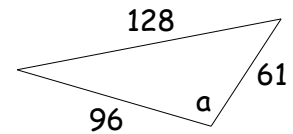
x = \_\_\_\_\_

a = \_\_\_\_\_



7) Find a

a = \_\_\_\_\_

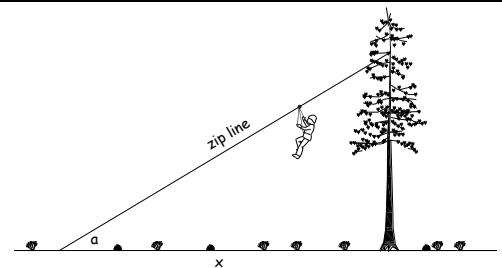


**Applications**

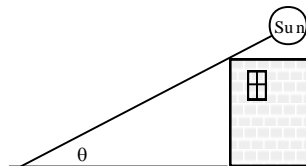
8) Doug sets up a zip line with 150' of cable (pulled tight) and attaches it 40' up a vertical tree.

(a) What angle does the wire make with the ground?

(b) At what point will the wire attach to the ground?

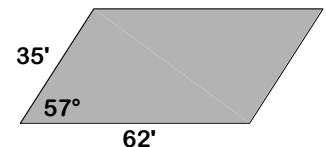


9) A building casts a 150 ft shadow when the sun is 42° above the horizon ( $\theta = 42^\circ$ ). How tall is the building?



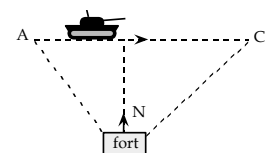
10) Find the area of the parallelogram.

a = \_\_\_\_\_



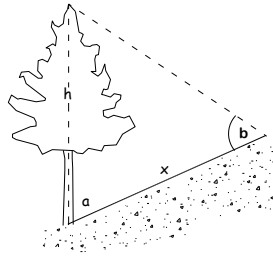
11) From the Fort to 'A' is 30 km at a bearing of N 38° W. Position 'C' is 38 km from the fort and due east of 'A'. See diagram.

How far is it from position 'A' to 'C'?



12)  $a = 59^\circ$ ,  $b = 66^\circ$   
 $x = 130'$ ; Find  $h$ .

$h =$  \_\_\_\_\_

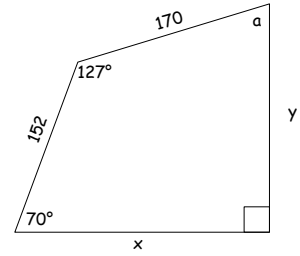


13) Find  $a$ ,  $x$  and  $y$

$a =$  \_\_\_\_\_

$x =$  \_\_\_\_\_

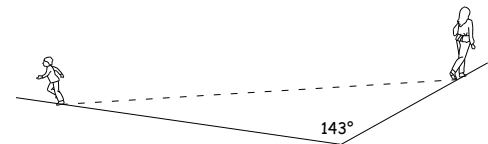
$y =$  \_\_\_\_\_



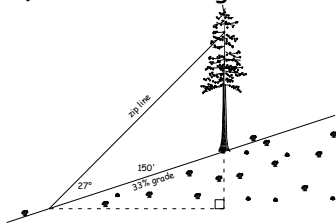
14) A race starts at 12:00 noon with the boat Crack O' Noon heading at  $20^\circ$  azi at 6 knots. At 12:45 pm Crack O' Noon tacks to  $310^\circ$  azi. On that heading she makes 8 knots. Assume Crack O' Noon does not change course again. At 2 pm, how far (in a direct line, nautical miles) is she from her noon starting position?



15) A mother jogs away from an intersection at 6 mph while her son rushes away in the other direction at 10 mph. How far apart are they after 45 min?

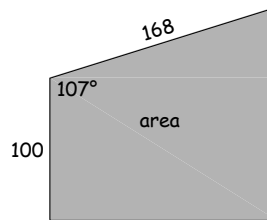


16) Find the length of the zip line



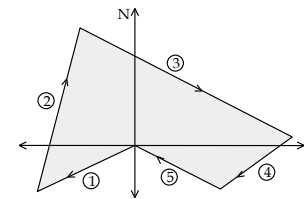
zip line = \_\_\_\_\_

17) Find the Area.

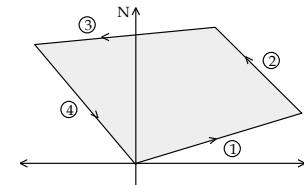


Area = \_\_\_\_\_

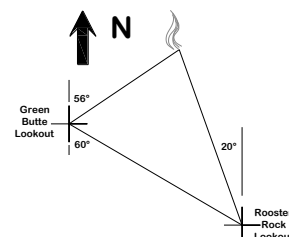
18) Path 1: 3,107 ft @ S  $65^\circ$  W      Path 2: 4,805 ft @ N  $17^\circ$  E  
 Path 3: 6,892 ft @ S  $62^\circ$  E      Path 4: 2,592 ft @ S  $52^\circ$  W  
 Find the Distance and Heading back to the origin for Path 5.



19) Path 1: 4,960 ft @ N  $73^\circ$  E      Path 2: 3,500 ft @ NW  
 Path 3: 1 mile @ S  $85^\circ$  W  
 Find the Distance and Heading back to the origin for Path 4.  
 Find the enclosed area.



20) From Green Butte Lookout (GBL) to Rooster Rock Lookout (RRL) is 22.5 mi @ S  $60^\circ$  E. GBL spots smoke at N  $56^\circ$  E while RRL spots the smoke at N  $20^\circ$  W. Using GBL as the origin, find the  $(x, y)$  coordinates of the smoke.



Smokey says  
 If you can't prevent 'em,  
 use trig to find 'em.

1a)  $15 \frac{\text{rev}}{\text{min}} \frac{1 \text{ min}}{60 \text{ sec}} \frac{360 \text{ deg}}{1 \text{ rev}} = \underline{90 \text{ deg/sec}}$

1b)  $15 \frac{\text{rev}}{\text{min}} \frac{1 \text{ min}}{60 \text{ sec}} \frac{0.5 \pi \text{ ft}}{1 \text{ rev}} = \underline{0.39 \text{ ft/sec}}$

2)  $\tan a = 96/138 \quad a = \underline{34.82^\circ} \quad 96^2 + 138^2 = z^2 \quad z = \underline{168.11}$

3)  $\tan 28^\circ = \frac{37}{x} \quad x = \underline{69.59^\circ} \quad \sin 28^\circ = \frac{37}{z} \quad z = \underline{78.81}$

4) L of C  $x = \underline{156.17}$  L of S  $a = \underline{33.65^\circ}$

5)  $\theta = 102^\circ$  L of S  $a = \underline{143.67}$  L of S  $b = \underline{170.82}$

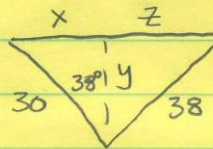
6) L of S  $a = \underline{98.33^\circ}$   $b = 43.67^\circ$  L of S  $x = \underline{31.41}$

7) L of C  $a = \underline{107.12^\circ}$

8) a)  $\sin a = \frac{40'}{150'}$   $a = 15.47^\circ$  b)  $x^2 + 40^2 = 150^2 \quad x = \underline{144.57'}$

9)  $\tan 42^\circ = \frac{h}{150'}$   $h = \underline{135.06'}$

10)  $A = b \cdot h \quad h = 35' \sin \theta \quad A = \underline{1819.92 \text{ sf}}$

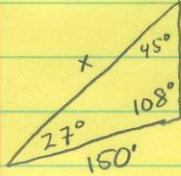
11)   $x = 30 \sin 38^\circ \quad y^2 + z^2 = 38^2$   
 $x^2 + y^2 = 30^2 \quad x + z = \underline{48.22 \text{ km}}$

12) L of S  $h = \underline{144.98'}$

13)  $a = 73^\circ \quad x = \underline{214.56} \quad y = \underline{192.54}$

14) Dist = 12.29 nmi

15) L of C 11.42 mi

16)  L of S  $x = 202.38'$

17)  $y = 168 \sin 17^\circ$ ,  $x = 168 \cos 17^\circ$   $A = \frac{100 + 100 + y}{2} \cdot x$

$A = \underline{20011.59}$

18)  $\theta_1 = -155^\circ$ ,  $\theta_2 = 73^\circ$ ,  $\theta_3 = -28^\circ$ ,  $\theta_4 = -142^\circ$   $D = 3053.94'$   
 $\theta = -30.49^\circ$  Dir Home = N  $59.51^\circ$  W

19)  $\theta_1 = 17^\circ$ ,  $\theta_2 = 135^\circ$ ,  $\theta_3 = -175^\circ$   $D = 4577.59'$  Dir Home S  $40.8^\circ$  E  
 $A = 17464715 \text{ sf} = 0.63 \text{ sq-mi}$

20)  $(x, y) = (12.36, 8.34) \text{ mi}$