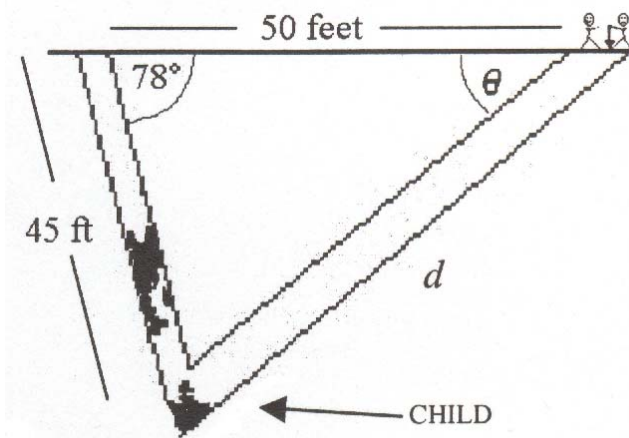


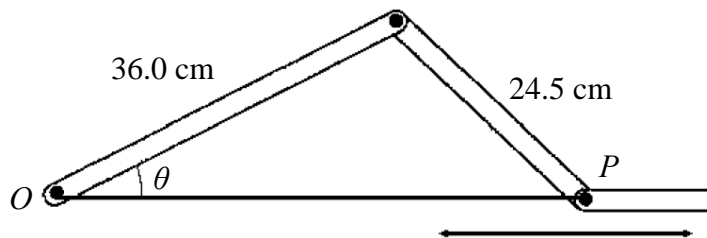
**WR 3: Law of Sines and Cosines to the Rescue**  
(30 points)

Name \_\_\_\_\_  
Section: 9:00 11:00 Group: \_\_\_\_\_

1. A child is trapped 45 feet down from an abandoned mine shaft that slants at an angle of  $78^\circ$  from the horizontal. (See figure.)
  - a. (4) At what angle should the tunnel be dug? \_\_\_\_\_
  - b. (4) If the tunnel can be dug at a rate of 3 ft/hr how many hours will it take to rescue the child? \_\_\_\_\_



2. The point  $P$  on the mechanism shown is driven back and forth horizontally.



- a. (4) If the minimum value of angle  $\theta$  is  $32.0^\circ$ , find the maximum distance  $OP$ .  
\_\_\_\_\_
- b. (2) What is the maximum value of angle  $\theta$ ? \_\_\_\_\_
- c. (4) What is the distance between extreme positions of  $P$ ? \_\_\_\_\_

3. Rescue the Princess (or not)

While having lunch at the Cantina, Darth Vader learns that Princess Leia is trapped in the Tobanna Gas Mine. The evil Lord Vader devises a plan.

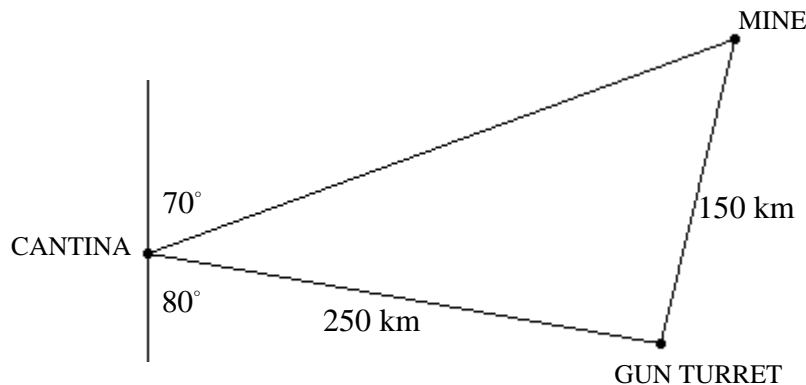
A deserted Gun Turret is 250 km from the Cantina in the direction  $S80^\circ E$ . Vader can reach the Gun Turret in a half hour, launch a laser missile, and blow up the gas mine – and with it, the Princess. Vader takes off to do the deadly deed. Note: the Gun Turret is 150 km from the Mine.

Unbeknownst to Vader, our hero Luke Skywalker overhears the plan. The Tobanna Gas Mine is in the direction  $N70^\circ E$  from the Cantina. Assume no telecommunications system. Also note that Luke's landspeeder can travel no faster than 500 km/hr.

( 4 pts) Complete the blanks:

LUKE: I only have a half hour before Leia gets fried.

*He draws the following figure on his napkin:*



By my calculations, Leia is about \_\_\_\_\_ km away.

*Show the calculations:*

This means that I have to travel \_\_\_\_\_ km/hr in my landspeeder to reach her in a half hour. Therefore, assuming the above figure is correct, . . .

Circle the scenario which would be an appropriate conclusion from the above analysis:

A. Luke: I can just reach her in time!

*(Luke drops some money on the table and races off to save Leia.)*

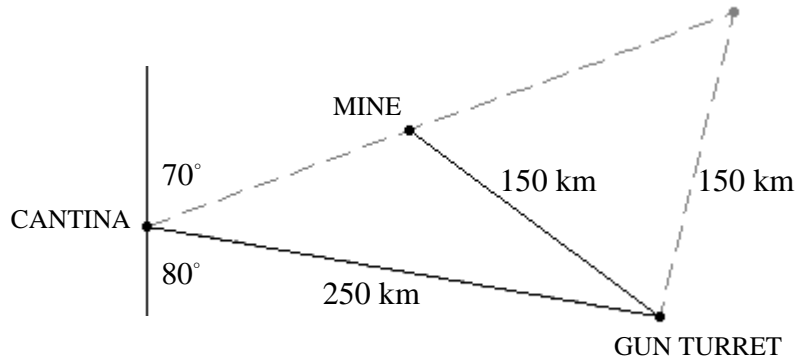
B. Luke: Drat! I'll never reach her in a half hour!

*(Luke orders another round of drinks to drown his sorrows.)*

(2 pts) Luke then hears a small voice inside his head – the voice of Obi Wan Kenobi:

Obi Wan: Luke! Remember the ambiguous case.

Luke immediately sees a new image appear on his napkin:



Luke: There could be more time than I thought!  
She might be only \_\_\_\_\_ km away!

1. (4 pts) Complete the blanks.

*A Half Hour Later:*

Vader: I've arrived at the Gun Turret, but there's ammo for only one missile.

I could set the bearing at N \_\_\_\_\_° E or N \_\_\_\_\_° W.

Show calculations below on how you arrived at these bearings:

I sense a presence in the Force at the bearing of \_\_\_\_\_

(PICK ONE: It's entirely up to you!)

2. (2 pts) Write an ending to the story on the back of this sheet in any way you would like. You may make it a happy ending or a sad one. Points will be awarded for creativity.