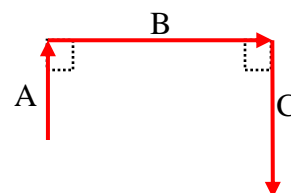


You may answer as many questions as you like. Show as much work as you need. Partial credit will only be given when work is shown and can be understood by the teacher. Please give all final answers in **three** significant figures. Your grade will be calculated thusly:

$$\frac{\text{points achieved}}{\text{points attempted}} * 100 = \text{your score}$$

The numbers in parentheses after the problem indicate how many points the problem is worth. (W## H##) There are problems with only How? points.

1. A soccer player runs the pattern shown. The magnitudes of the vectors are $A = 7.00$ m, $B = 17.0$ m and $C = 18.0$ m. What is the resulting displacement vector? Give direction with respect to vector A. (W0 H20)



2. A fire helicopter is flying at 28.0 m/s East with a load of water. If the helicopter is flying at an altitude of 75 m how long, time, before the fire does it need to drop the water to hit the fire? (W10 H10)

3. Deb kicks a soccer ball at a velocity of 22.0 m/s at an angle of 62.0° to the horizontal. How far away does the ball land? (W5 H15)

4. Add $46.0\hat{i} + 17.0\hat{j} + 42.0\hat{k}$ to $27.0\hat{i} - 21.0\hat{j} + 15.0\hat{k}$ (W0 H10)

5. While trapped on a rocky tropical island Sara wants to try and get a message out in a bottle. The edges of this island are cliffs that are 62.8 m high. The problem with dropping the bottle is that at the bottom of the cliffs are rocks that extend out 43.4 m from the cliff face. How fast horizontally does Sara need to throw the bottle to have it just clear the rocks below? (W5 H15)

6. You are in your canoe that you can paddle at 4.00 m/s in still water. You are attempting to cross a river that is 56.5 m wide and has a current of 1.75 m/s. If you need to get directly across the river at what angle with respect to where you want to go do you need to point your canoe? (H10 W20)

7. Ken is battling Ryan using cannons at $200.$ m. Ken has the higher ground, 8.75 m up. If Ken's cannon will fire at 56.0° to the horizontal at what speed does the cannonball need to leave the cannon to hit Ryan's cannon? (W5 H25)

8. You are back in your canoe but this time you have brought a friend to help so now you can travel at 6.25 m/s in still water when both of you paddle. The river you want to cross this time is 75.0 m wide and has a current of 3.00 m/s. How long does it take you to travel to a point across the river if you aim directly across the river? (W5 H15)

9. You are walking up a flight of stairs at 1.70m/s while on a train that is traveling at 7.3m/s . If the stairs make an angle of 48.0° with the horizontal and face forwards what is your velocity with respect to the ground? (W10 H10)

10. Add 65.6N South to 41.4N West. (W0 H10)

11. You are standing on the roof of one building that is 20.0 m tall. The next building is 15.0 m tall and separated from this first building by an alley 6.00 m wide. How fast do you need to run off the building you are on to land on the next building's roof? (H5 W15)

12. Heather is doing her favorite pastime of cliff diving. The cliffs that she is on today are 75.0 meters high. If she pushes off at an angle of 40.0° to the horizontal with a velocity of 7.00 m/s , how far from the base of the cliffs does she hit the water? (W5 H15)