Name: DISC: Score: / 20

Instructions:

|  |  |  |  |
| --- | --- | --- | --- |
| Q1 | Q2 | Q3 | Q4 |
|  |  |  |  |
| 10 | 10 | 5 | 5 |

* Do your own work.
* Answer the questions below in the space provided.
* Make sure you show all your work and any equations that you use.
* Please place a box around your answers.
* Remember to give the correct units with all numerical answers

1. You are an airplane pilot. You need to travel from San Francisco to Chicago, a 3000 km trip due East. There is a wind blowing 20 km/h *from* the North. It takes you 4 hours to make the trip. You want to know the air speed of your airplane.
   1. To keep your airplane heading East you must:

Selection:

* + 1. Stear the airplane into the wind (North).
    2. Stear the airplane with the wind (South).
    3. Stear the airplane due East
  1. Draw a vector diagram showing the velocities important in this problem. Include a coordinate system and labels for the vectors.

Diagram (coord. System = 0.5 pts):

Vector Lables:

* 1. Describe in your own words the steps you need to take to calculate the airspeed of the airplane.

Problem solving steps (2 pts):

* 1. Select the equation, or equations, you need from the list below. Then find the air speed, (remember: vectors!!!). (Hint: Write out the components of the airplane’s ground velocity, and the wind velocity )

Selection:

Solution (2 pts):

1. You are spinning a ball attached to a massless string of length in a circle.
   1. Draw a diagram of the motion of the ball including the vectors for the velocity and acceleration.

Diagram (2pts):

* 1. Let’s consider the circular motion of the ball:
     1. Does the ball move at constant *speed* (yes/no) ?

Yes/no:

Explanation (2 pts):

* + 1. For *uniform circular motion* the acceleration of a rotating object is If the ball moves at a constant *speed*, why is there an acceleration?
  1. The ball experiences a radial acceleration . What is the speed of the ball? (Use .)

Speed (2 pts):

* 1. The string is spontaneously cut at the point shown in the diagram below. Draw the path on the diagram representing the motion of the ball *after* the string has been cut. Include labels.

Diagram (2 pts):

R