Physics 12: 2D Vectors Review

1. Find the x and y components of the following vectors:

a. 120N [32.0o S of E] b. 11.10m [19.0o above +x] c. 65m/s [11o W of N] d. 1254km [63o below +x] e. 0.677m/s2 [14o above –x]

2. Write the following vectors in standard notation.

a. dx=-22m ; dy=11m b. vx=4.2m/s ; vy=6.3m/s c. Fy=-139N ; Fx=222N

d. ax=0.75m/s2 left ay=1.25m/s2 up e. (92, -140)m f. 95N**x** + -44N**y**

3. Consider the following displacement vectors, then solve the questions below.

42m

29o

39m

36m

# A B C

a. **A+B** b. **B+A**

c. **A+C**  d. **B+C**

e. **A-B**  f. **B-A**

g. **B-C** h. **A-C**

4. **F1**=99.6N [22.2o above –x] ; **F2**=-54.0N **x** ; **F3=**37.1N [73.2o above +x]

Find the sum of these 3 forces.

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5. **vo**=12m/s [59o below +x], **v**=9.5m/s [13o below +x], t=0.74s

a. Find Δ**v** b. Find (average velocity) c. Find **d**

6. If **M**=220m [39o below –x], **B**=330m [67o above –x] and **T**=440m/s [51o below +x]

a. Find **M**+**B** b. Find 4**M**+3**B** c. Find 2**M-B** d. Find **T**+**M**

7. Two children, Habematha and Grundsoo, are swimming across a 10.0m wide river. The current in the river is 1.0m/s North. Both children can swim at a speed of 1.50m/s in still water. Habemetha maintains a heading due west and swims to the other side. Grundsoo swims such that she travels due west across the river.

a. Draw a diagram that shows the proper vector addition and label the velocity of the water to the ground, the velocity of each child relative to the water and the velocity of each child relative to the ground.

b. Find each child’s velocity relative to the ground.

c. Find the time for each child to swim across the river.

d. What is Grundsoo’s heading?

e. Find the velocity of Habematha relative to Grundsoo.

8. An airplane is flying at 220km/h [66o N of E] relative to the air. The wind is blowing at 18m/s [74o S of E]. Find the velocity of the plane relative to the ground.

9. Consider the following equation: This is Isaac Newton’s famous Law of Gravitation. Use this equation to determine the proper units for the constant of proportionality, G, in terms of base mks units: meters, kilograms and seconds.

10. The S.I. unit for power is the Watt (W). A Watt is equal to a Joule per second (J/s); 1W=1J/s. From this we can note that 1J =1Ws. One Joule is a very small amount of energy and so, often the much larger kilowatthour (kWh) is used. Convert 5.0kWh into Joules.

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