Physics 1 Unit 2 – Vectors and 2D motion Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

IB 1.3 Vectors and Scalars

**Vector Basics**

1. Represent 30° West of North in degrees.
2. Represent 0.45 radians in degrees.
3. If **A** = 47 m/s at 90° and **B =** 16 m/s at 220° find
4. 3**A**
5. **½ B**
6. **–A**
7. –5**B**

**Adding Vectors Graphically**

Using a sketch, add the following vectors graphically (qualitatively) using the parallelogram method. Give an estimate of the magnitude and direction of the resultant. You may get somewhat better results if you use a ruler and protractor. But we usually just sketch to get approximations.

1. **A** = 30 N at 200° and **B** = 50 N at 120°
2. **A** =20 m at 80° and **B** = 60 N at 320°

Add the following vectors graphically using the “triangle” method. Give an estimate of the magnitude and direction of the resultant.

1. **A =** 50 m/s at 40° and **B =** 125 m/s at 180°
2. **A =** 60 N at 45° and **B =** 80 N at 250° and **C =** 30 N at 120°

**Vector Components**

1. Find the horizontal and vertical components of 75.0 N at 65°
2. Find the x and y components of 12.0 N at 150°
3. Find the components of 25.0 N at 30° East of South
4. Determine the magnitude and direction for a vector whose components are Fx =45.6 N and Fy = 13.1 N.
5. Determine the magnitude and direction for a vector whose components are vx =3.25 m/s and vy = –1.35 m/s.
6. Determine the magnitude and direction for a vector whose components are sx = –67.2 m and sy = 92.3 m.

**Adding Vectors Analytically**

1. **A** = 30 N at 200° and **B** = 50 N at 120°
2. **A** =20 m at 80° and **B** = 60 N at 320°
3. **A =** 50 m/s at 40° and **B =** 125 m/s at 180°
4. **A =** 60 N at 45° and **B =** 80 N at 250° and **C =** 30 N at 120°
5. A plane heads east with a velocity of 52 m/s through a 12 m/s cross wind blowing the plane south. Find the magnitude and direction of the plane's resultant velocity (relative to due east).
6. An ambitious hiker walks 25 km west and then 35 km south in a day. Find the magnitude and direction of the hiker's resultant displacement (relative to due west).
7. A boat heads directly across a river with a velocity of 12 m/s. If the river flows at 6.0 m/s find the magnitude and direction of the boat's resultant velocity. (State the direction relative to an imaginary line drawn straight across the river.)
8. I went for a walk the other day. I went four avenues east (0.80 miles), then twenty-four streets south (1.20 miles), then one avenue west (0.20 miles), and finally eight streets north (0.40 miles).
   1. What distance did I travel?
   2. What's my resultant displacement (magnitude and direction relative to due east)?
9. A mountain climbing expedition establishes a base camp and two intermediate camps, A and B. Camp A is 11,200 m east of and 3,200 m above base camp. Camp B is 8,400 m east of and 1,700 m higher than Camp A. Determine the displacement between base camp and Camp B.