Vectors Worksheet #3

I. Resolve the following forces into component form:

1. 200 lbs. at 20° above horizontal
2. 312 mph on a bearing of 102°

II. Find:

a) The resultant of F_1 and F_2 in component form.
b) The magnitude and direction (as a bearing) of the resultant from (a)

3. $F_1 = (14,-5)$ $F_2 = (23,16)$
4. $F_1 = (-6,-30)$ $F_2 = (10,-4)$

III. Use the dot product formula $u \bullet v = \|u\|\|v\|\cos\theta$ to find the measure of the angle between **u** and **v**.

5. **u** = (4, −1, 12) **v** = (−5, 8, −6)
6. Find the angle between F_1 and F_2 in problem #4.
7. **u** = (18, 3) **v** = (5, −7)

IV. Use the vector cross product to find the area of the **triangle** ABC whose vertices are given. (Area of parallelogram = $\|u \times v\|$)

Hint: Resolve $\overrightarrow{AB}$ and $\overrightarrow{AC}$ into component form and find $\frac{1}{2}$ the area of the parallelogram.

8. A(−8, 13, 0) B(2, −11, 5) C(4, 9, 1)
9. A(4, −1, 6) B (5, 2, −4) C(1, 0, 6)

V. Find the volume of the parallelepiped whose edges are the vectors **u**, **v**, and **w**

10. **u** = (3, 2, 3) **v** = (−1, 4, 1) **w** = (−2, −2, −2)

VI. Write the vector **t** as a linear combination of $\vec{u} = (2,5)$ and $\vec{v} = (-3,2)$

11. **t** = (18, 7)
12. **t** = $\left(\frac{-3}{2},1\right)$

VII. Unit Vectors

13. Find the vector with length 18 in the same direction as **v** = $(-7,1,2)$. Verify that its length is 18.

14. At what bearing and speed would a pilot head if he wants to fly due north at 345 mph when a 40 mph west wind is blowing?

15. A Major League baseball diamond is a square having 90 ft. sides. If the pitcher stands 60 feet 6 inches from home plate, how far is he from 2nd base?

16. Jim can swim at a rate of 3 mph. If he heads for a point directly across a river in which the current is 10 mph, by how many degrees does the direction in which he actually swims differ from his intended direction? If the river is 32 yards wide, will he make it across before reaching the falls that are 112 yards downstream?

17. In a naval maneuver, two ships rendezvous at point A. One then proceeds east 10 miles and north 14 miles to point B. At what bearing should the second ship head to meet the first ship at point B?

Revised: 5/9/2008

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Answers:

1. (187.94, 68.40)	2. (305.18, −64.87)	3. 38.60 on a bearing of 73.44º
4. 34.23 on a bearing of 173.29º	5. 134.82º	6. 79.51 º
7. 63.92 º	8. 126.51 units^2	9. 16.58 units^2
10. 4 units^3	11. $\vec{t} = 3\vec{u} + 4\vec{v}$	12. $\vec{t} = \frac{1}{2}\vec{v}$
13. $\left(\frac{-42}{\sqrt{6}}, \frac{6}{\sqrt{6}}, \frac{12}{\sqrt{6}}\right)$	14. 347.3 mph, 353.4º	15. 66.8 ft. from 2nd base
16. 106.7 yards	17. 35.5º	

Revised: 5/9/2008