

Vector Worksheet #2

1. Write the vector $(6, -3)$ as a linear combination of \vec{i} and \vec{j}
2. Write $\vec{t} = (-18, -9)$ as a linear combination of $\vec{u} = (1, -2)$ and $\vec{v} = (6, 3)$
3. Write $\vec{t} = (-3, 1)$ as a linear combination of $\vec{u} = (-1, 5)$ and $\vec{v} = (5, 1)$
4. Write $\vec{t} = (1, 9)$ as a linear combination of $\vec{u} = (1, 3)$ and $\vec{v} = (2, -3)$
5. Find a vector with norm 10 and in the opposite direction of $\vec{u} = (-2, 5)$
6. Find a vector with same magnitude as $\vec{u} = (-2, 5)$ but in the opposite direction of \vec{u}
7. A pilot wants his groundspeed to be 260 mph on a bearing of 180° . An east wind is blowing at 65 mph. What should his airspeed and heading be so that the wind will blow him back onto his intended course?
8. Find the volume of the parallelepiped whose edges are $\vec{u} = (-3, 2, 6)$, $\vec{v} = (4, -1, 5)$, and $\vec{w} = (-2, 2, 7)$.
9. Points A(2, 5, 6), B(5, -2, 1) and C(8, 2, 6) are given. Find a vector perpendicular to the plane ABC going through point A.
10. Find the area of the parallelogram whose consecutive sides are the vectors $(-5, 7, 2)$ and $(3, 4, 1)$
11. Find the angle between the vectors $(-4, 5, 6)$ and $(1, -2, 1)$.
12. A plane takes off from Lake Arrowhead airport traveling 300 mph on a bearing of 100 degrees. A south wind is blowing (toward the north) at 25 miles per hour. Find the groundspeed and true course of the plane.
13. A pilot is flying at 168 mph. She wants her flight path to be on a bearing of 57° . The wind is blowing from the north at 37.1 miles per hour. On what bearing should she fly to have the wind blow her plane on to course?
14. A plane is headed due south with an airspeed of 192 mph. A wind from a heading of 78° is blowing at 23 mph. Find the groundspeed and resulting bearing of the plane.

Answers:

1. $6\vec{i} - 3\vec{j}$	2. $\vec{t} = -3\vec{v}$	3. $\vec{t} = \frac{4}{13}\vec{u} - \frac{7}{13}\vec{v}$	4. $\vec{t} = \frac{7}{3}\vec{u} - \frac{2}{3}\vec{v}$	5. $\left(\frac{20}{\sqrt{29}}, \frac{-50}{\sqrt{29}}\right)$
6. $(2, -5)$	7. 268 mph @ 165.96°	8. 11	9. $(-15, -30, 33)$ (or any scalar multiple of this)	10. 42.46
11. 111.85°	12. 296.7 mph, 95.24°	13. 46.33°	14. 198.06 mph, 186.5°	