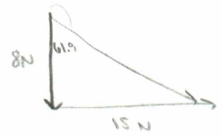
1. F_1 is a force of 8N pulling an object due South, and F_2 is a force of 15N pulling the object due East. Find the direction, measured clockwise from North) and the magnitude of the resultant force F_3. Include a vector diagram as part of your solution.

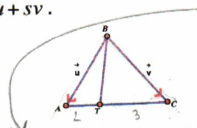


17 N

180 − 61.9 = 118.1°

or S 61.9° E

2. In the diagram below, AT:TC = 2:3. If $\overrightarrow{BA} = \vec{u}$ and $\overrightarrow{BC} = \vec{v}$, express the following in the form $r\vec{u} + s\vec{v}$.



$\overrightarrow{AB}$ $-\vec{u}$ $\vec{v}$

$\overrightarrow{CT}$ $-\vec{v} + \vec{u}$ $\overrightarrow{BT}$ $\frac{3}{5}\vec{u} + \frac{2}{5}\vec{v}$

$\overrightarrow{CT} = \overrightarrow{CB} + \overrightarrow{BA} + \overrightarrow{AT}$

$= -\vec{v} + \vec{u} + \frac{2}{5}(\vec{v} - \vec{u}) = \frac{3}{5}\vec{u} - \frac{3}{5}\vec{v}$

$\overrightarrow{BA} + \overrightarrow{AT}$

$\vec{u} + \frac{2}{5}(\vec{v} - \vec{u})$

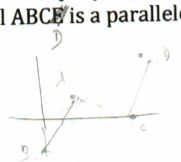
$\frac{3}{5}\vec{u} + \frac{2}{5}\vec{v}$

3. A plane is on a course of 200° at a speed of 520 mi/h. What are the north-south and east-west components of the plane's velocity vector?

N-S $520 \cos 200 = -488.6$ (South)

E-W $520 \sin 200 = -177$ (West)

4. Given the points A(2,4), B(0, –5) and C(7,0), find the coordinates of D(x,y) such that quadrilateral ABCD is a parallelogram.



$\overrightarrow{BA} = (2, 9)$

D (9, 9)

5. An object moves with constant velocity so that its position at time t is given by the equation (x,y) = (1,3) + t(2, -3).

a.) Find the objects velocity and speed.

Velocity (2, -3)

Speed $\sqrt{13}$

b.) Find a pair of parametric equations that correspond to the vector equation.

$x = 1 + 2t$

$y = 3 - 3t$

c.) When and where does the object cross the parabola $y = 2x^2 - 6x$?

$3 - 3t = 2(1+2t)^2 - 6(1+2t)$

$3 - 3t = 2(1 + 4t + 4t^2) - 6 - 12t$

$3 - 3t = 2 + 8t + 8t^2 - 6 - 12t$

$3 - 3t = 8t^2 - 4t - 4$

$0 = 8t^2 - t - 7$

$t = \frac{1 \pm \sqrt{1^2 - 4(8)(-7)}}{2(8)}$

$t = 1, -.875$

(3, 0) $(-\frac{3}{4}, 5\frac{5}{8})$

Given points A(−2,4) and B(1,1)

a.) Express $\overrightarrow{AB}$ in component form. (Is this different from $\overrightarrow{BA}$? If so, how?) opposite directions

$\overrightarrow{AB}$ $(3,-3)$

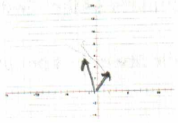
b.) Find the coordinates of the point P that is 2/3 of the way from A to B.

$2/3(3,-3) + (-2,4)$

$= (2,-2) + (-2,4) = (0,2)$

7. Given $\vec{u} = (2,3)$ *and* $\vec{v} = (-1,5)$

a.) Show on a vector diagram the vectors $\vec{u}, \vec{v}$ *and* $\overrightarrow{u+v}$.



$u+v = (1,8)$

b.) Evaluate $\|\vec{u}+2\vec{v}\|$.

$\|(2,3) + (-2,10)\|$

$\|(0,13)\| = 13$

c.) Find the angle between $\vec{u}$ *and* $\vec{v}$.

$\cos\theta = \frac{u \cdot v}{|u| \cdot |v|} = \frac{-2+15}{\sqrt{13} \cdot \sqrt{26}} = \frac{13}{18.4} = 45^\circ$

8. Line L has the equation (x,y)=(−7,3) + t(−2,4) and line M has the equation (x,y)=(5,6)+t(3,k)

a.) What value of k makes the lines parallel?

$\frac{4}{-2} = \frac{k}{3}$ $k = -6$

b.) What value of k makes the lines perpendicular?

$-2 \cdot 3 + 4 \cdot k = 0$

$-6 = -4k$ $k = 1.5$

c.) Find the pair of parametric equations of a line through (8,9) parallel to L.

$(x,y) = (8,9) + t(-2,4)$

$x = 8 - 2t$

$y = 9 + 4t$