

Vector Bingo

1. $A = (8, -7)$ $B = (-7, -10)$ \vec{AB}
 $\langle -7-8, -10-(-7) \rangle = \langle -15, -3 \rangle$

2. $A = (7, 1)$ $B = (10, -5)$ \vec{BA}
 $\langle 7-10, 1-(-5) \rangle = \langle -3, 6 \rangle = -3i + 6j$

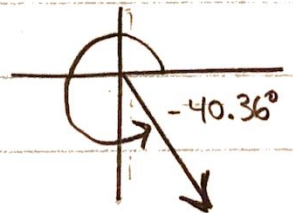
3. $u = \langle 1, -6 \rangle$ $v = \langle -7, -5 \rangle$ $-u + v$
 $-\langle 1, -6 \rangle + \langle -7, -5 \rangle = \langle -1, 6 \rangle + \langle -7, -5 \rangle = \langle -8, 1 \rangle$

4. $u = -9i$ $g = 3i + 4j$ $9u - 7g$
 $9(-9i) - 7(3i + 4j) = -81i - 21i - 28j = -102i - 28j$

5. $b = \langle -6, -2 \rangle$ $\|b\| = \sqrt{(-6)^2 + (-2)^2} = \sqrt{36 + 4} = \sqrt{40} = 2\sqrt{10}$

6. $-15i + 36j = \sqrt{(-15)^2 + (36)^2} = \sqrt{225 + 1296} = \sqrt{1521} = 39$

7. $20i - 17j$ $\tan \theta = \frac{-17}{20}$ $\theta = \tan^{-1}\left(\frac{-17}{20}\right)$
 $\theta = -40.36$ $360 - 40.36 = 319.64^\circ$



8. $\langle -10, \sqrt{69} \rangle$ $\tan \theta = \frac{\sqrt{69}}{-10}$ $\theta = \tan^{-1}\left(\frac{\sqrt{69}}{-10}\right)$
 $\theta = -39.72$ $180 - 39.72 = 140.28^\circ$



9. $u = \langle 24, -32 \rangle$ $\|u\| = \sqrt{(24)^2 + (-32)^2} = \sqrt{576 + 1024} = \sqrt{1600} = 40$
 $\frac{\langle 24, -32 \rangle}{40} = \left\langle \frac{24}{40}, \frac{-32}{40} \right\rangle = \left\langle \frac{3}{5}, -\frac{4}{5} \right\rangle$

10. $-13i + 6\sqrt{22}j$ $\|\vec{v}\| = \sqrt{(-13)^2 + (6\sqrt{22})^2} = \sqrt{169 + 792} = \sqrt{961} = 31$
 $\frac{-13i + 6\sqrt{22}j}{31} = \boxed{\frac{-13}{31}i + \frac{6\sqrt{22}}{31}j}$

11. $u = -7i$ $v = -4i + 5j$ $-7(-4) + 0(5) = \boxed{28}$

12. $u = \langle 8, 6 \rangle$ $v = \langle -6, 6 \rangle$ $8(-6) + 6(6) = -48 + 36 = \boxed{-12}$

13. $u = 3i + 6j$ $v = -3i + 5j$

$\cos \theta = \frac{3(-3) + 6(5)}{\sqrt{3^2 + 6^2} \sqrt{(-3)^2 + 5^2}}$ $\theta = \cos^{-1} \frac{21}{\sqrt{45} \sqrt{34}}$

$\cos \theta = \frac{-9 + 30}{\sqrt{45} \sqrt{34}}$

$\theta = 57.53^\circ$

14. $u = \langle -6, -9 \rangle$ $v = \langle 3, 3 \rangle$

$\cos \theta = \frac{-6(3) + -9(3)}{\sqrt{(-6)^2 + (-9)^2} \sqrt{(3)^2 + (3)^2}}$ $\theta = \cos^{-1} \frac{-45}{\sqrt{117} \sqrt{18}}$

$\cos \theta = \frac{-18 - 27}{\sqrt{117} \sqrt{18}}$

$\theta = 168.69^\circ$

15. $u = \langle 25, -15 \rangle$ $v = \langle 3, 5 \rangle$

$25(3) + -15(5) = 75 - 75 = \boxed{0}$

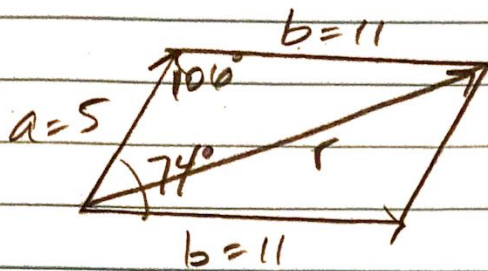
Yes! they are orthogonal (perpendicular)

16. $u = -9i - 2j$ $v = 3i - 4j$

$-9(3) + -2(-4) = -27 + 8 = \boxed{-19}$ No!

The 2 vectors are not perpendicular because they do not equal zero.

17.



$$180^\circ - 74^\circ = 106^\circ$$

$$r^2 = a^2 + b^2 - 2ab \cos R$$

$$r = \sqrt{5^2 + 11^2 - 2(5)(11)\cos 106^\circ}$$

$$r = 13,28$$

18.

$$b^2 = a^2 + r^2 - 2ar \cos B$$

$$11^2 = 5^2 + 13,28^2 - 2(5)(13,28)\cos B$$

$$121 = 201,3584 - 132,8 \cos B$$

$$\begin{array}{r} -201,3584 \\ -201,3584 \hline \end{array}$$

$$\begin{array}{r} -80,3584 \\ -132,8 \hline \end{array} = \begin{array}{r} -132,8 \cos B \\ -132,8 \hline \end{array}$$


$$\frac{80,3584}{132,8} = \cos B$$

$$B = \cos^{-1} \left(\frac{80,3584}{132,8} \right)$$

$$B = 52,76^\circ$$

19. $\frac{3}{4} \langle \cos 315^\circ, \sin 315^\circ \rangle$
 $\frac{3}{4} \langle \frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2} \rangle = \langle \frac{3}{4} \cdot \frac{\sqrt{2}}{2}, \frac{3}{4} \cdot -\frac{\sqrt{2}}{2} \rangle$
 $= \boxed{\langle \frac{3\sqrt{2}}{8}, -\frac{3\sqrt{2}}{8} \rangle}$

20. $8 \left(\cos \frac{5\pi}{6} i + \sin \frac{5\pi}{6} j \right)$
 $8 \left(-\frac{\sqrt{3}}{2} i + \frac{1}{2} j \right) = 8 \left(-\frac{\sqrt{3}}{2} \right) i + 8 \left(\frac{1}{2} \right) j$
 $= -4\sqrt{3} i + 4j = \boxed{\langle -4\sqrt{3}, 4 \rangle}$

21. $\langle 4, 4 \rangle$  $r = \sqrt{4^2 + 4^2} = \sqrt{16 + 16} = \sqrt{32} = 4\sqrt{2}$
 $r \langle \cos \theta, \sin \theta \rangle$ $\tan \theta = \frac{4}{4}$ $\theta = \tan^{-1}(1)$ $\theta = \frac{\pi}{4}$
 $4\sqrt{2} \langle \cos \frac{\pi}{4}, \sin \frac{\pi}{4} \rangle$

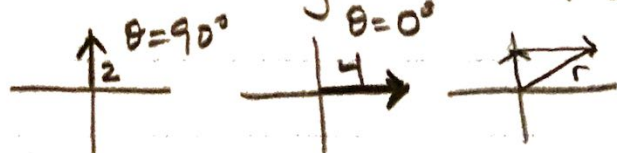
22. $3(\cos 35^\circ i + \sin 35^\circ j) - 4(\cos 175^\circ i + \sin 175^\circ j)$
 $\boxed{6.44i + 1.37j}$

23. $\|u\| = 6 \langle -2, 5 \rangle$

* Find the unit vector $\frac{\langle -2, 5 \rangle}{\sqrt{(-2)^2 + 5^2}} = \frac{\langle -2, 5 \rangle}{\sqrt{4 + 25}} = \frac{\langle -2, 5 \rangle}{\sqrt{29}}$
 $= \langle -\frac{2}{\sqrt{29}}, \frac{5}{\sqrt{29}} \rangle = \langle -\frac{2\sqrt{29}}{29}, \frac{5\sqrt{29}}{29} \rangle$

* Combine with magnitude $6 \langle -\frac{2\sqrt{29}}{29}, \frac{5\sqrt{29}}{29} \rangle = \boxed{\langle -\frac{12\sqrt{29}}{29}, \frac{30\sqrt{29}}{29} \rangle}$

24.



$2 \langle \cos 90^\circ, \sin 90^\circ \rangle + 4 \langle \cos 0^\circ, \sin 0^\circ \rangle$
 $= \langle 4, 2 \rangle$

magnitude = $\sqrt{4^2 + 2^2} = \sqrt{16 + 4} = \sqrt{20} \approx \boxed{4.47 \text{ km/hr}}$