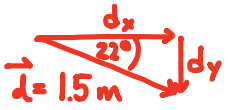
MORE VECTORS - SOLUTIONS

1. a)



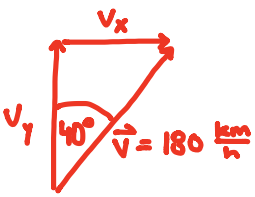
$d_x = 1.5 \cos 22°$

$= 1.4$ m EAST

$d_y = 1.5 \sin 22°$

$= 0.56$ m SOUTH

b)



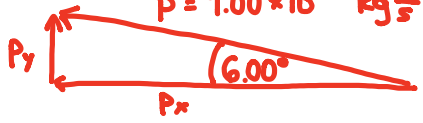
$V_x = 180 \sin 40°$

$= 115.7 \longrightarrow$ 120 km/h EAST

$V_y = 180 \cos 40°$

$= 137.9 \longrightarrow$ 140 km/h NORTH

c)



$P_x = 9.00 \times 10^4 \cos 6.00°$

$= 8.951 \times 10^4$

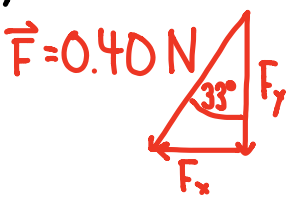
$\longrightarrow 8.95 \times 10^4$ kg m/s WEST

$P_y = 9.00 \times 10^4 \sin 6.00°$

$= 9.408 \times 10^3$

$\longrightarrow 9.41 \times 10^3$ kg m/s NORTH

d)



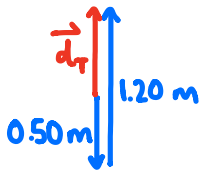
$F_x = 0.40 \sin 33°$

$= 0.22$ N WEST

$F_y = 0.40 \cos 33°$

$= 0.34$ N SOUTH

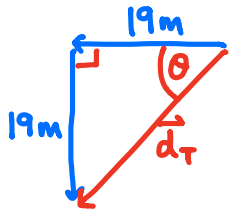
2. a) $\vec{d}_1 + \vec{d}_2 = \vec{d}_T$



$d_T = 1.20 - 0.50$

$= 0.70$ m NORTH

b) $\vec{d}_1 + \vec{d}_2 = \vec{d}_T$



$d_T^2 = 19^2 + 19^2$

$d_T = \sqrt{19^2 + 19^2}$

$= 26.87$ m

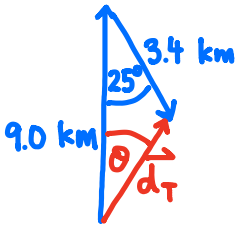
$\tan\theta = \frac{19}{19}$

$\theta = \tan^{-1}\left(\frac{19}{19}\right)$

$= 45°$

27 m 45° SOUTH OF WEST

c) $\vec{d}_1 + \vec{d}_2 = \vec{d}_T$



$d_T^2 = 9.0^2 + 3.4^2 - 2(9.0)(3.4)\cos 25°$

$= 37.0940$

$d_T = 6.0905$ km

$\frac{\sin\theta}{3.4} = \frac{\sin 25°}{6.0925}$

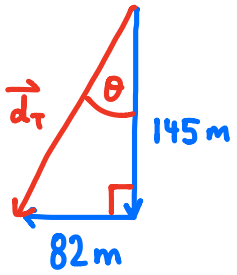
$\sin\theta = \frac{3.4\sin 25°}{6.0925}$

$\theta = \sin^{-1}\left(\frac{3.4\sin 25°}{6.0925}\right)$

$= 13.65$

6.1 km 14° EAST OF NORTH

d) $\vec{d}_1 + \vec{d}_2 = \vec{d}_T$



$d_T^2 = 145^2 + 82^2$

$d_T = \sqrt{145^2 + 82^2}$

$= 166.58$ m

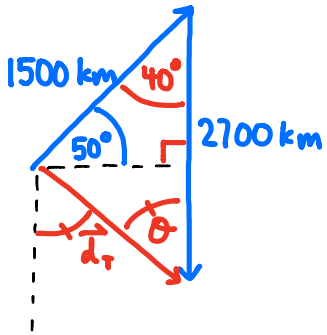
$\tan\theta = \frac{82}{145}$

$\theta = \tan^{-1}\left(\frac{82}{145}\right)$

$= 29.49°$

170 m 29° WEST OF SOUTH

e) $\vec{d}_1 + \vec{d}_2 = \vec{d}_T$



$d_T^2 = 1500^2 + 2700^2 - 2(1500)(2700)\cos 40°$

$= 3335040.01$

$d_T = 1826.21$ km

$\frac{\sin\theta}{1500} = \frac{\sin 40°}{1826.21}$

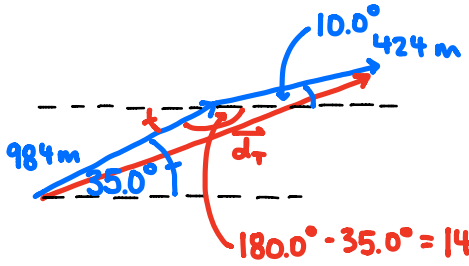
$\sin\theta = \frac{1500 \sin 40°}{1826.21}$

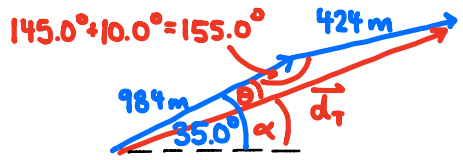
$\theta = \sin^{-1}\left(\frac{1500 \sin 50°}{1826.21}\right)$

$= 31.87°$

1800 km 32° EAST OF SOUTH

f) $\vec{d}_1 + \vec{d}_2 = \vec{d}_T$





$d_T^2 = 984^2 + 424^2 - 2(984)(424)\cos 155.0°$

$= 1904284.219$

$d_T = 1379.96 \text{ m}$

$\frac{\sin\theta}{424} = \frac{\sin 155.0°}{1379.96}$

$\sin\theta = \frac{424\sin 155.0°}{1379.96}$

$\theta = \sin^{-1}\left(\frac{424\sin 155.0°}{1379.96}\right)$

$= 7.461°$

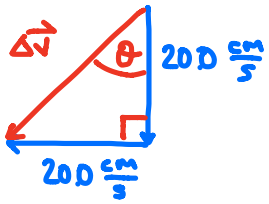
$\alpha = 35.0° - 7.461°$

$= 27.5°$

1380 m 27.5° NORTH OF EAST

3. $\Delta\vec{v} = \vec{v}_f - \vec{v}_i$

$\Delta\vec{v} = \vec{v}_f + (-\vec{v}_i)$



$(\Delta v)^2 = 20.0^2 + 20.0^2$

$\Delta v = \sqrt{20.0^2 + 20.0^2}$

$= 28.28 \frac{cm}{s}$

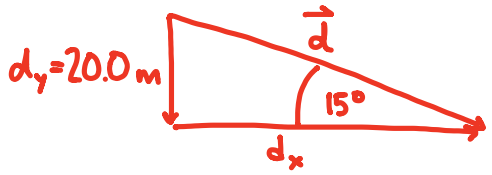
$\tan\theta = \frac{20.0}{20.0}$

$\theta = \tan^{-1}\left(\frac{20.0}{20.0}\right)$

$= 45.0°$

28.3 $\frac{cm}{s}$ 45.0° WEST OF SOUTH

4.

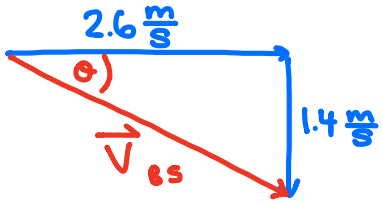


$$\sin 15° = \frac{20.0}{d}$$

$$d = \frac{20.0}{\sin 15°}$$

$$= 77\ m$$

5. $\vec{V}_{BW} + \vec{V}_{WS} = \vec{V}_{BS}$



$$V_{BS}^2 = 2.6^2 + 1.4^2$$

$$V_{BS} = \sqrt{2.6^2 + 1.4^2}$$

$$= 2.953\ \frac{m}{s}$$

$$\tan\theta = \frac{1.4}{2.6}$$

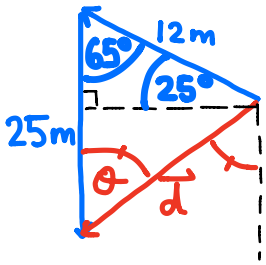
$$\theta = \tan^{-1}\left(\frac{1.4}{2.6}\right)$$

$$= 28.30°$$

$3.0\ \frac{m}{s}$ $28°$ SOUTH OF EAST

6. $\vec{d} = \vec{x}_f - \vec{x}_i$

$\vec{d} = \vec{x}_f + (-\vec{x}_i)$



$$d^2 = 12^2 + 25^2 - 2(12)(25)\cos 65°$$

$$= 515.43$$

$$d = 22.7031\ m$$

$$\frac{\sin\theta}{12} = \frac{\sin 65^\circ}{22.7031}$$

$$\sin\theta = \frac{12\sin 65^\circ}{22.7031}$$

$$\theta = \sin^{-1}\left(\frac{12\sin 65^\circ}{22.7031}\right)$$

$$= 28.62^\circ$$

22 m 29° WEST OF SOUTH

7. $\vec{V}_{PA} + \vec{V}_{AG} = \vec{V}_{PG}$

$$V_{AG}^2 = 210^2 + 190^2 - 2(210)(190)\cos 10.0$$

$$= 1612.34$$

$$V_{AG} = 40.15397 \frac{km}{h}$$

$$\frac{\sin\theta}{210} = \frac{\sin 10.0^\circ}{40.15397}$$

$$\sin\theta = \frac{210\sin 10.0^\circ}{40.15397}$$

$$\theta = \sin^{-1}\left(\frac{210\sin 10.0^\circ}{40.15397}\right)$$

$$= 65.25^\circ \text{ OR } 114.75^\circ$$

OBTUSE

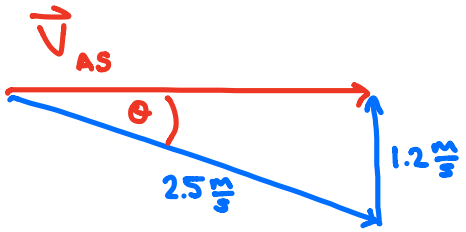
$180^\circ - 65.25^\circ$

$\alpha = 114.75^\circ - 90^\circ$

$= 24.75^\circ$

40 km/h 25° EAST OF NORTH

8. $\vec{v}_{AW} + \vec{v}_{WS} = \vec{v}_{AS}$



$\sin\theta = \frac{1.2}{2.5}$

$\theta = \sin^{-1}\left(\frac{1.2}{2.5}\right)$

$= 29°$ SOUTH OF EAST