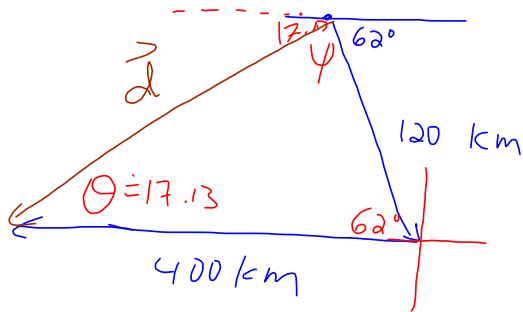


5. A bi-plane flies 120 km [E62°S] and then 400 km [W].
What is the total displacement of the bi-plane from its starting point?



$$|\vec{d}| = \sqrt{120^2 + 400^2 - 2(120)(400)\cos 62^\circ}$$

$$\approx 359.6258$$

$$\approx 359.626 \text{ km}$$

$$\frac{\sin \theta}{120} = \frac{\sin 62^\circ}{359.626}$$

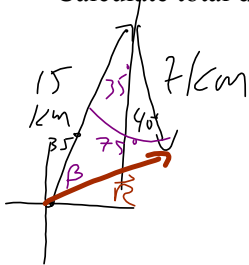
$$\theta = \sin^{-1}\left(120 \times \frac{\sin 62^\circ}{359.626}\right)$$

$$\approx 17.134$$

$$\approx 17.13^\circ$$

\therefore the displacement
is 359.626 km [W17.13°S]

7. A school bus travelled 15 km [N35°E] and then 7 km [S40°E]. Calculate total displacement for this trip.



$$|\vec{R}| = \sqrt{15^2 + 7^2 - 2(15)(7)\cos 75^\circ}$$

$$\approx 14.8205$$

$$\approx 14.821 \text{ km}$$

$$\frac{\sin \beta}{7} = \frac{\sin 75^\circ}{14.821}$$

$$\beta = \sin^{-1}\left(7 \times \frac{\sin 75^\circ}{14.821}\right)$$

$$\approx 27.143$$

$$\approx 27.14^\circ$$

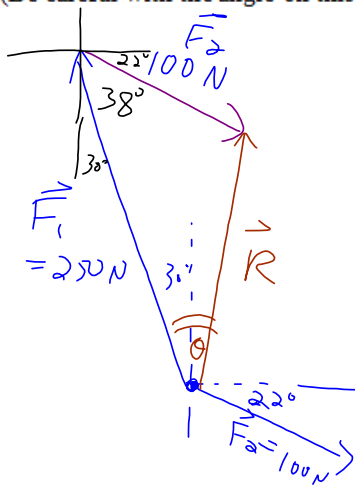
$$\theta = \beta + 35^\circ$$

$$= 27.14^\circ + 35^\circ$$

$$= 62.14^\circ$$

\therefore displacement is 14.821 km [N 62.14° E]

8. Find the resultant force of the forces: $\vec{F}_1 = 250 \text{ N [N30°W]}$ and $\vec{F}_2 = 100 \text{ N [E22°S]}$. (Be careful with the angle on this one)



$$|\vec{R}| = \sqrt{250^2 + 100^2 - 2(250)(100)\cos 38^\circ}$$

$$\approx 181.9325$$

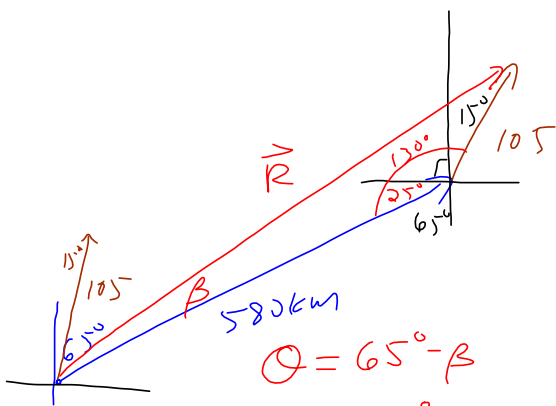
$$\approx 181.933 \text{ N}$$

$$\frac{\sin \theta}{100} = \frac{\sin 38^\circ}{181.933}$$

$$\theta = \sin^{-1}\left(\frac{100 \times \sin 38^\circ}{181.933}\right)$$

$$\approx 19.779$$

10. A jet is travelling 580 km/h on a bearing of 065° . A 105 km/h wind is blowing $[N15^\circ E]$. Determine the resultant speed and direction of the jet. Include a diagram.



$$\begin{aligned} \theta &= 65^\circ - \beta \\ &= 65^\circ - 7.08^\circ \\ &= 57.92 \end{aligned}$$

\therefore the jet's resultant is
652.470 km/h $[N 57.92^\circ E]$

$$\begin{aligned} |\vec{R}| &= \sqrt{580^2 + 105^2 - 2(580)(105)\cos 130^\circ} \\ &= 652.4695 \\ &= 652.470 \end{aligned}$$

$$\begin{aligned} \frac{\sin \beta}{105} &= \frac{\sin 130^\circ}{652.470} \\ \beta &= \sin^{-1}\left(105 \times \frac{\sin 130^\circ}{652.470}\right) \\ &= 7.081 \\ &= 7.08^\circ \end{aligned}$$