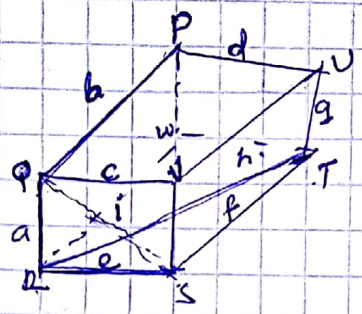
Question 1



State the Single Vector

(a) $\vec{PQ} + \vec{RQ} = PQ = -\vec{b}$ and $RQ = \vec{a}$

$\vec{PQ} + \vec{RQ} = \vec{a} - \vec{b} = \vec{RP}$

(b) $\vec{RT} - \vec{UT}$

let $\vec{RT} = \vec{r}$ and $\vec{UT} = \vec{g}$

$\vec{RT} - \vec{UT} = \vec{r} - -\vec{g} = \vec{r} + \vec{g} = \vec{RU}$

(c) $\vec{QS} - \vec{PR}$

let $\vec{QS} = \vec{t}$ and $\vec{PR} = \vec{a}$

$\vec{QS} - \vec{PR} = \vec{t} + \vec{a} \Rightarrow \vec{PS}$

(d) $\vec{UV} - (\vec{WP} + \vec{QV})$

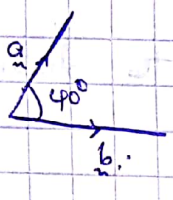
let $\vec{UV} = -\vec{s}$ and $\vec{WP} = \vec{z}$ and $\vec{QV} = \vec{c}$

$= -\vec{s} - (\vec{z} + \vec{c})$

$= -\vec{s} - \vec{z} + \vec{c} = \vec{PU}$

(2) Calculate $|2\vec{a} - \vec{b}|$ if $|\vec{a}| = 3$ $|\vec{b}| = 4$ and the angle btwn $\vec{a}$ and $\vec{b} = 40°$.

$a \cdot b = |a||b| \cdot \cos\theta$.



$a \cdot b = |a| \times |b| \cos\theta$.

$= \cos\theta = \dfrac{a \cdot b}{|a||b|}$

Magnitude of vector $a = 3$

Magnitude of vector $b = 4$

angle btwn a and $b = 40°$

Magnitude of $2\vec{a} - \vec{b} = |2\vec{a} - \vec{b}| = [(2a)^2 - (b)^2 + 2(2a)(-b)\cos 40]^{1/2}$

$\rightarrow |2\vec{a} - \vec{b}| = [(6)^2 + (4)^2 + 2(6)(+4)\cos 40$

$|2\vec{a} - \vec{b}| = [(6)^2 + (4)^2 - 2(6 \times 4)\cos 40$

$= 36 + 16 - 2 \times 6 \times 4 \times 0.7660$

$36 + 16 - 36.770$

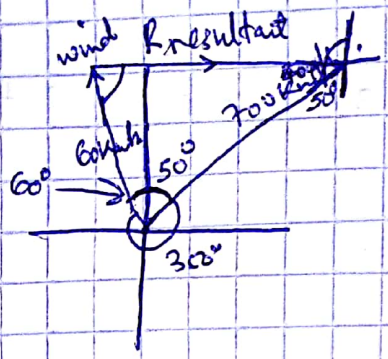
$(52 - 36.770)^{1/2}$

$= (15.23)^{1/2}$

$\sqrt{15.23} =$

$|2\vec{a} - \vec{b}| = 3.9$

(3)



(a) Determine the resultant velocity and the direction of the plane

$$|R| = 60^2 + 700^2 - 2(60 \times 700)\cos 60$$

$$|R|^2 = 493600 - 2(42000)\cos 60$$

$$493600 - 42000$$

$$|R| = \sqrt{451600}$$

$$|R| = 672.01 \text{ km/h}$$

$$\frac{\sin 60}{672.01} = \frac{\sin \theta}{60}$$

$$\sin\theta = \frac{60 \sin 60}{672.01}$$

$$\sin\theta = \frac{51.96}{672.01}$$

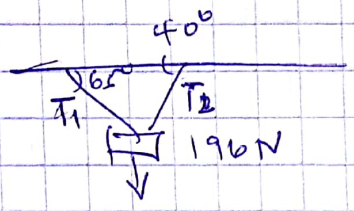
$$\theta = \sin^{-1}\frac{51.96}{672.01}$$

$$\theta = 4.43^\circ$$

Resultant speed = 672.01 km/h.

Direction of the plane = N 94.43 W

Question 4 · A mass experiencing a force of gravity of 196 N is being held by two ropes attached to the ceiling with the given angles. Determine the Tension of Each rop.



$= T_{1x} + T_{2x} = -T_1 \cos 65 + T_2 \cos 50$

$-T_1(0.4226) + T_2(0.7660) = 0$

$\frac{0.4226 T_1}{0.4226} = \frac{0.7660 T_2}{0.4226}$

$T_1 = \frac{0.7660\, T_2}{0.4226}$

$T_1 = 1.8126 T_2$

$F_{net} = T_{1y} + T_{2y}$

$T_1 \sin 65 + T_2 \sin 40 - 1920.8N = 0$

$0.9063 T_1 + 0.6427 T_2 = 1920.8N$

$1.8126(0.9063 T_2 + 0.6427 T_2 = 1920.8$

$1.6427 T_2 + 0.6427 T_2 = 1920.8$

$\frac{2.2854 T_2}{2.2854} = \frac{1920.8}{2.2854}$

$T_2 = 840.44\ N$

$T_1 = 1.8126 T_2$

$T_1 = 840.44 \times 1.8126$

$T_1 = 1523.38N$