

EFFECT OF WIND ON AN AIRPLANE

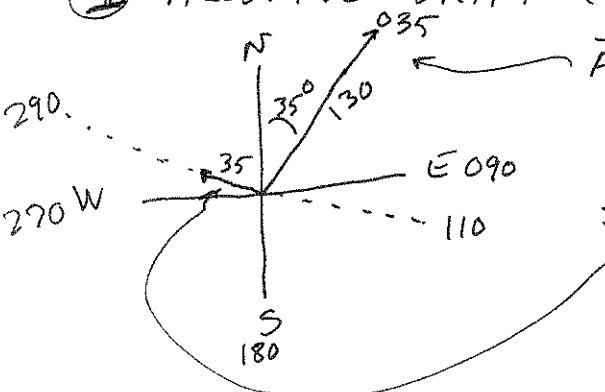
ASSUME: AIRSPEED 130 kt, DESIRED TRACK 035, WIND 110 AT 35 KTS

TERMS: "HEADING" IS THE DIRECTION YOU'RE POINTING

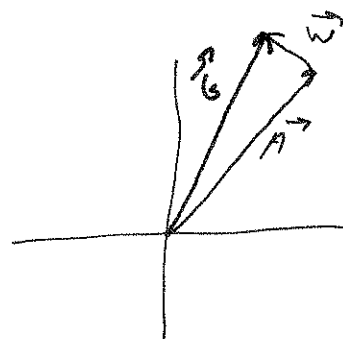
"COURSE" IS THE DIRECTION OF YOUR TRACK OVER THE GROUND

"WIND 110" MEANS WIND FROM THE EAST-SOUTH-EAST GOING W.N.W

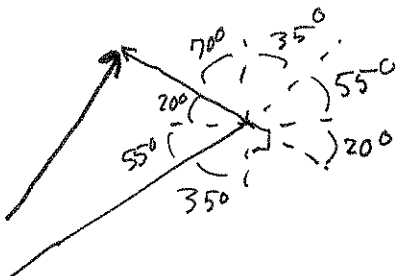
① ALLOWING DRIFT (NO CORRECTION), USING TRIG



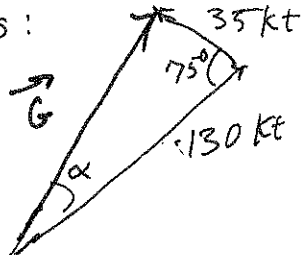
① ADD $\vec{A} + \vec{W} = \vec{G}$ LIKE THIS:



② FIND SOME ANGLES



③ THE TRIANGLE IS:



④ LAW OF COSINES:

$$|\vec{G}|^2 = 130^2 + 35^2 - 2(130)(35) \cos 75^\circ = 15769.97466896$$

so $|\vec{G}| = 125.5777$ KTS, THE GROUND SPEED

⑤ BY LAW OF SINES, $\arcsin \frac{35 \sin 75^\circ}{125.5777} = \alpha = 15.617^\circ$ (THE DRIFT, TO THE LEFT)

⑥ THE AIRPLANE'S COURSE IS $035 - 15.617 = 019.35$ (BEARING FROM NORTH)

⑦ NET RESULT: 125.5777 kt IN THE DIRECTION 019.35

NEXT, SAME PROBLEM BUT WITH COMPONENTS

II ALLOWING DRIFT, NO CORRECTION, USING G COMPONENTS

$$\vec{A} = 130 \langle \cos 55^\circ, \sin 55^\circ \rangle = \langle 74.565, 106.4898 \rangle$$

(NOTE: 035 CLOCKWISE FROM NORTH IS 55° COUNTERCLOCKWISE FROM X-AXIS)

$$\vec{W} = 35 \langle \cos 160^\circ, \sin 160^\circ \rangle = \langle -32.889, 11.9707 \rangle$$

(WIND FROM 110 IS GOING IN THE DIRECTION OF 1290 FROM NORTH, WHICH IS 160° FROM X-AXIS)

$$\vec{G} = \vec{A} + \vec{W} = \langle 41.676, 118.4605 \rangle \text{ BY ADDING COMPONENTS}$$

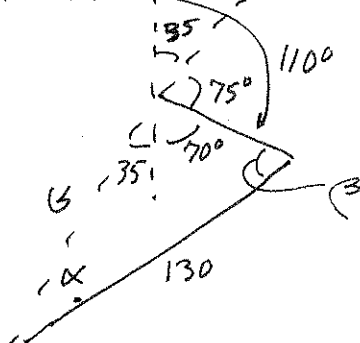
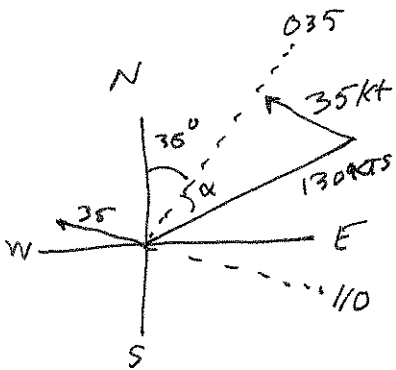
$$|\vec{G}| = \sqrt{41.676^2 + 118.4605^2} = 125.5777 \text{ kts}$$

$$\text{DIRECTION: } \arctan \frac{118.4605}{41.676} = \arccos \frac{41.676}{125.5777} = 70.6176 \text{ FROM X-AXIS}$$

$$\text{FROM NORTH: } 90 - 70.6176 = 19.38, \text{ BEAR IN } 019.38 \text{ AS BEFORE}$$

III NEXT, CORRECTING

FOR DRIFT, BY TRIG (STEER α TO THE RIGHT OF DESIRED COURSE)



BY LAW OF SINES, $\frac{35}{\sin \alpha} = \frac{130}{\sin 105^\circ}$, $\alpha = \arcsin \left(\frac{35 \sin 105^\circ}{130} \right) = 15.073^\circ$

HEADING SHOULD BE $035 + \alpha = 035 + 15.073 = 050.0734$

TO GET GROUND SPEED, FIND THE ANGLE β

$$180 - 35 - 70 - 15.073 = 59.9266$$

RESULT: THEN $\frac{130}{\sin 105^\circ} = \frac{G}{\sin 59.9266} \Rightarrow G = 116.468 \text{ kt}$

TO CORRECT, FLY HEADING 050.0734 AT 130KT AND YOU WILL TRACK COURSE 035 AT 116.468 KT GROUND SPEED