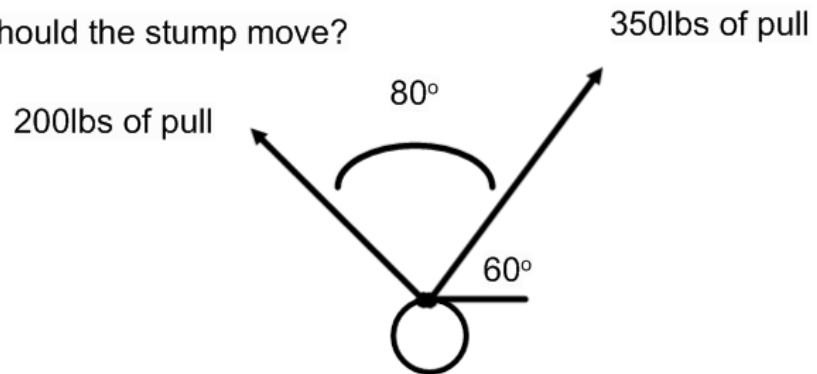


1

A farmer is trying to pull out a tree stump.
Two mules are pulling on the stump, as per the picture.
How much force are they applying to the stump?

In which direction should the stump move?



2

A Ultralight pilot tries to land at the airport on a hot day.
Unfortunately, he runs into an updraft from the tarmac and a headwind.
In a huge coincidence the force of his engine and gravity trying to land him, and the head wind, and the updraft all perfectly offset and for a moment he sits perfectly still.

Without the wind, his engine and gravity would be moving him at a speed of 20mph descending at a 25° angle to the ground.
The updraft is vertical. The headwind is towards him, perfectly horizontal.
What is the speed of the headwind and the updraft?

$$1) v = 200(\cos(140^\circ)i + \sin(140^\circ)j)$$

$$w = 350(\cos(60^\circ)i + \sin(60^\circ)j)$$

$$V = -153.2089i + 128.5575j$$

$$W = 175i + 303.1089j$$

$$\text{Total} = 21.7911i + 431.6664j$$

$$T = 432.2161(\cos(87.1101^\circ)i + \sin(87.1101^\circ)j)$$

It moves along an 87.1101 degree line.

$$2) \text{ His flight: } V = 20(\cos(205^\circ)i + \sin(205^\circ)j)$$

$$\text{ Head wind: } H = M_H(\cos(0^\circ)i + \sin(0^\circ)j)$$

$$\text{ Updraft: } U = M_U(\cos(90^\circ)i + \sin(90^\circ)j)$$

$$V = -18.1262i - 8.4524j$$

$$H = M_Hi + 0j$$

$$U = 0i + M_Uj$$

$$V + H + U = 0i + 0j$$

$$-18.1262i - 8.4524j + M_Hi + 0j + 0i + M_Uj = 0$$

$$i \text{ equation: } -18.1262i + M_Hi = 0$$

$$j \text{ equation: } -8.4524j + M_Uj = 0$$

$$M_H = 18.1262 = \text{Speed of headwind.}$$

$$M_U = 8.4524 = \text{Speed of updraft}$$