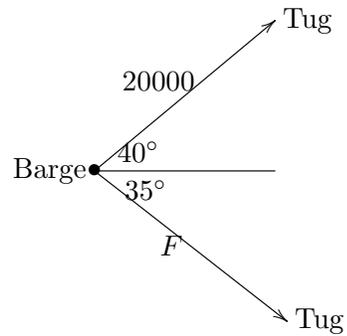


## Force is a vector

1. The picture shows two tugs pulling a barge. If one pulls with 20000 Newtons of force what force should the other tug pull with to keep the barge going straight to the right.



**Answer:** We need the vertical components of the forces to cancel.

$$\text{So, } 20000 \sin(40^\circ) = F \sin(35^\circ) \Rightarrow F = \frac{20000 \sin(40^\circ)}{\sin(35^\circ)} \approx 22413.32.$$

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