

# Adding Force Vectors

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**Physics**

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### 1 Question 2

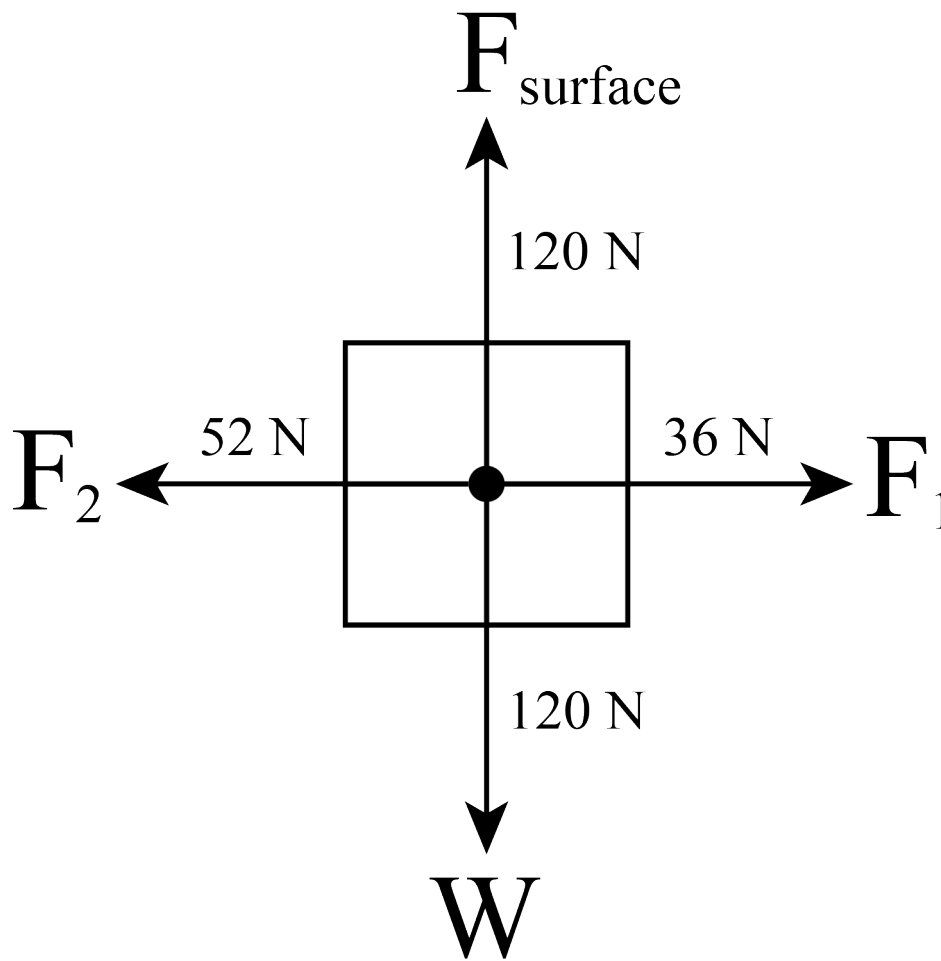


Figure 1: The cars data.

According to Figure 1, the net force is  $52 - 36 = 16$  N.

### 2 Question 4

The situation is illustrated in the image.

As shown in Figure 2, there are essentially two vectors. The first is  $\vec{A} = 3000\text{N}[W]$  and the second is  $\vec{B} = 2500\text{N}[W75^\circ S]$ . We are looking for the vector produced when  $\vec{A} + \vec{B}$ . Since  $\vec{A}$  is in one direction, we only need to concern ourselves with  $\vec{B}$ . We can decompose  $\vec{B}$  into a triangle with sides  $x$  and  $y$  and solve for these sides using trigonometry, as shown in Figure 3.

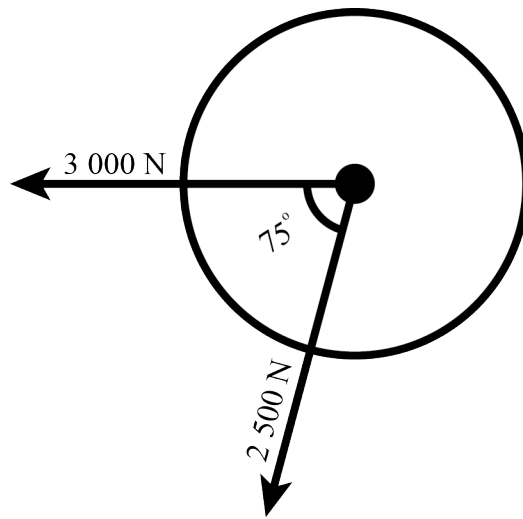


Figure 2: Tractor and Rocks Free Body Diagram

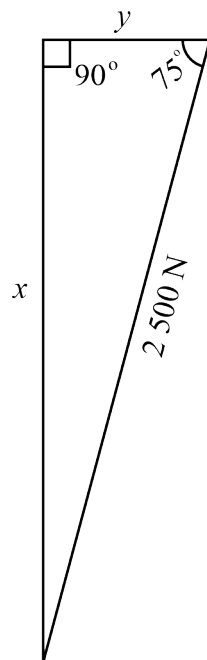


Figure 3: Trigonometry

$$\sin(75) = \frac{x}{2500} \quad (1)$$

$$= 2414.81 \quad (2)$$

$$(3)$$

$$\cos 75 = \frac{y}{2500} \quad (4)$$

$$= 647.05 \quad (5)$$

Now, we combine the decomposed  $\vec{B}$  with  $\vec{A}$ . The horizontal component is  $3000 + 647.05 = 3647.05\text{N}$  and the vertical is  $2414.81\text{N}$ . Now, we can solve for the hypotenuse,  $\Gamma$ , and the angle  $\theta$ , as shown in Figure 4.

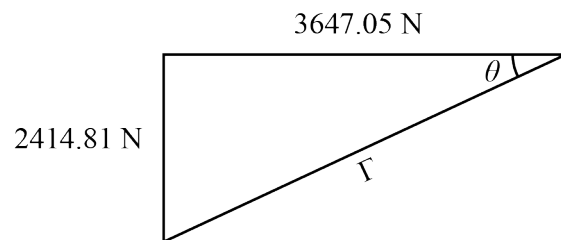


Figure 4: Solving for the hypotenuse and the missing angle

$$\Gamma = \sqrt{3647.05^2 + 2414.81^2} \quad (6)$$

$$= 4374.05 \quad (7)$$

$$\tan \theta = \frac{2414.81}{3647.05} \quad (8)$$

$$\theta = \tan^{-1} \left( \frac{2414.81}{3647.05} \right) \quad (9)$$

$$\approx 33.5^\circ \quad (10)$$

Therefore, the missing vector is  $\vec{V} = 4373.99 \text{ N}[W33.4^\circ S]$