

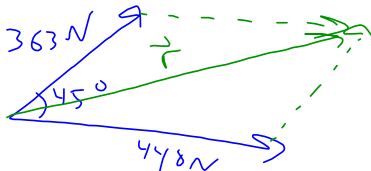
MCV4U

Lesson 7

geometric
Sums of 2 Forces

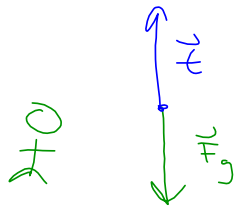
~~Forces, Work, Tension, & Torque~~

A crate is being pulled by 2 ATVs. The tow ropes make angles of 45° to each other, and the ATVs are pulling with forces of 363 N and 448 N, respectively. Find the resultant force.



Tension – force exerted by a string or cable or similar object. (Opposite of compression force)

Simple Example – A student weighing 70 kg, hangs from a vertical rope in the gym. What is the tension in the rope?



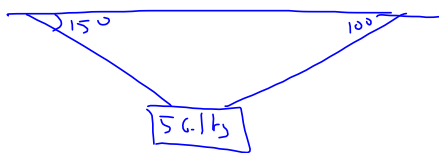
$$|F_g| = 9.8 \text{ N/kg} \times 70 \text{ kg} = 686 \text{ N}$$

$$|T| = 686 \text{ N}$$

Harder Example

A sign with a mass of 56.1 kg is supported by 2 wires attached to a horizontal pole. The angle of depression of the wire on the left is 15° and the angle of depression of the wire on the right is 10° . Determine the tension in each wire.

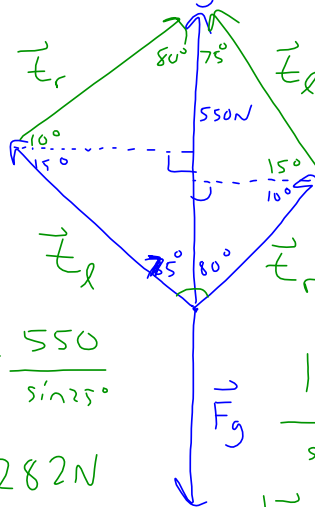
"picture"



$$56.1 \text{ kg} \times 9.8 \text{ N/kg}$$

$$|F_g| = 550 \text{ N}$$

force diagram



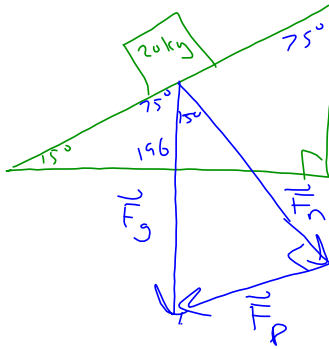
$$\frac{|T_l|}{\sin 80^\circ} = \frac{550}{\sin 75^\circ}$$

$$|T_l| = 1282 \text{ N}$$

$$\frac{|T_r|}{\sin 75^\circ} = \frac{550}{\sin 25^\circ}$$

$$|T_r| = 1257 \text{ N}$$

A 20 kg trunk is resting on a ramp inclined at an angle of 15°. Calculate the components of the force of gravity on the trunk that are parallel and perpendicular to the ramp.



$$|\vec{F}_g| = 20 \text{ kg} \times 9.8 \text{ N/kg} \\ = 196 \text{ N}$$

$$\cos 15^\circ = \frac{|\vec{F}_n|}{196}$$

$$|\vec{F}_n| = 196 \cos 15^\circ \\ \approx 189 \text{ N}$$

↑
pushes into the
ramp

$$\sin 15^\circ = \frac{|\vec{F}_p|}{196}$$

$$|\vec{F}_p| = 196 \sin 15^\circ \\ \approx 51 \text{ N}$$

↑
force acting to
slide down ramp

Text page 142 #4, 6a, 9, 12 (equilibrium means forces balance out, no net force), 14, 15, 18