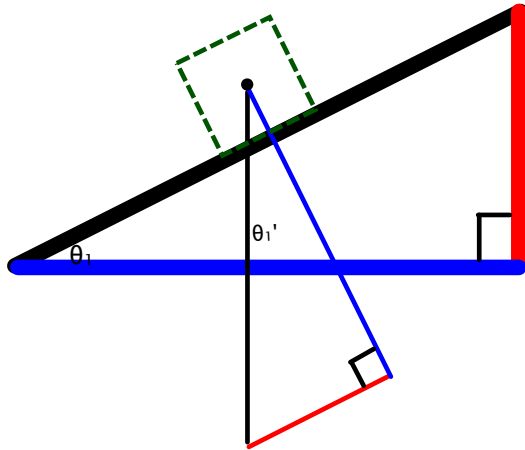


Ramps and Similar triangles



red_{big} parallel to black_{small}

red_{small} parallel to black_{big}

blue_{small} perpendicular to black_{big}

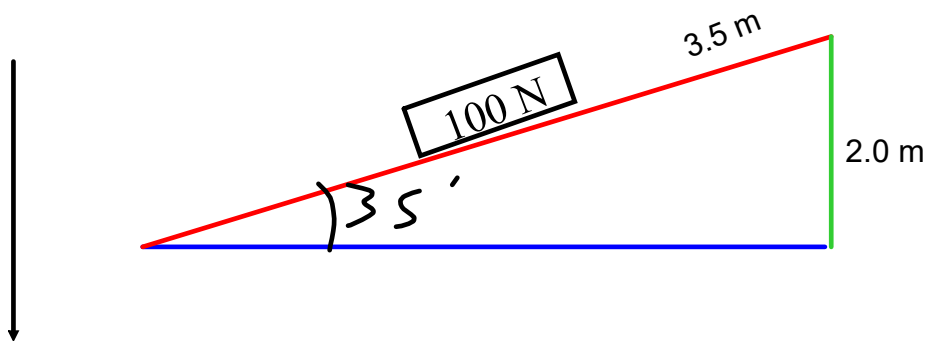
blue_{big} perpendicular to black_{small}

\therefore similar triangles

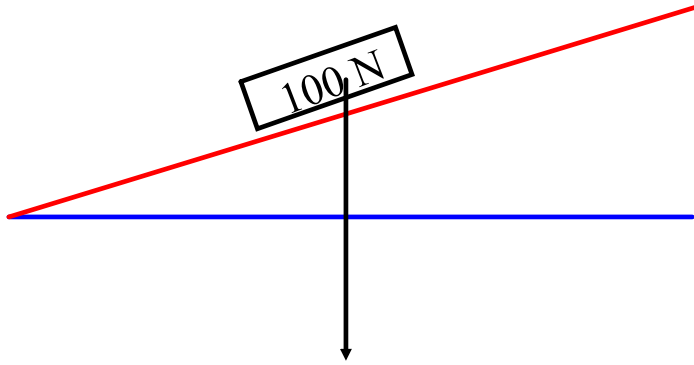
$\therefore \theta_1 = \theta_1'$

rotate blue to parallel
flip left/right

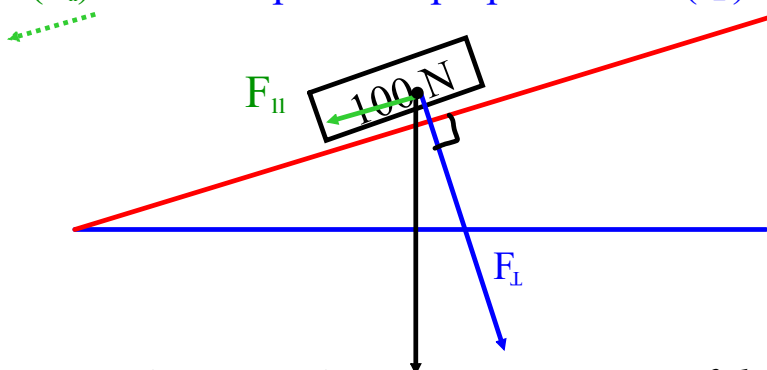
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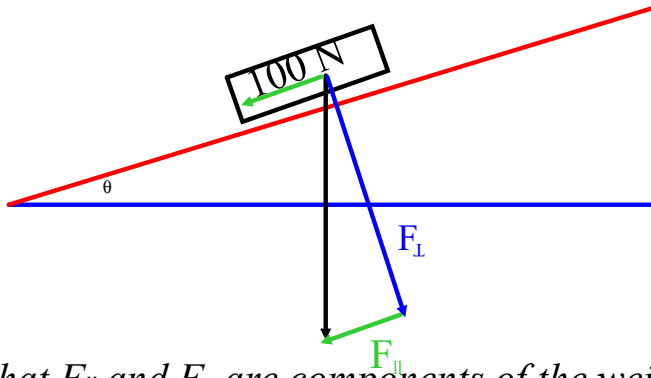


$$F_{\parallel} = F_p$$

$$F_{\perp} = F_N$$

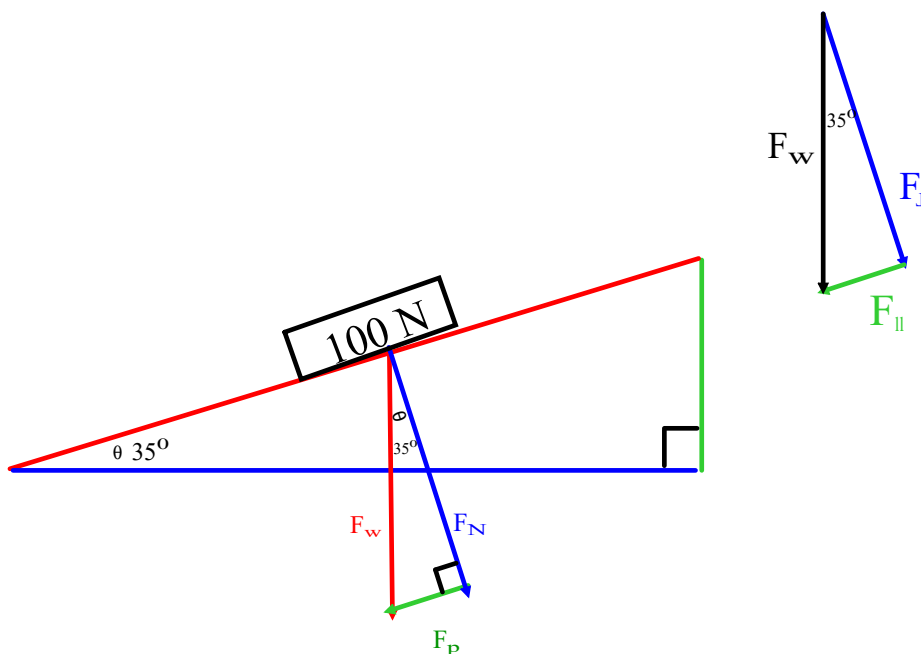
Note that F_{\parallel} and F_{\perp} are components of the weight of the box (100N) F_w and together make a point diagram with F_w as the resultant. To add the components vectorally you would move the tail of F_{\parallel} down to the head at the head of F_{\perp} so you obey the rules of vector addition.

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↓



$$F_p = \sin 35^\circ(100 \text{ N})$$

$$F_N = \cos 35^\circ(100 \text{ N})$$

$$F_p = 57 \text{ N}$$

$$F_N = 82 \text{ N}$$

A 6.6 kg box is placed on a ramp that is 3.4 m long and 1.1 m high. What is the part of its weight parallel to the ramp and perpendicular to the ramp?

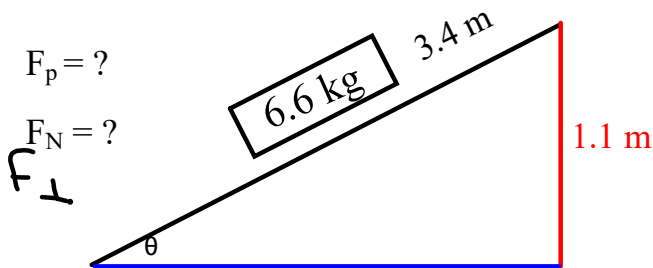
$$m = 6.6 \text{ kg}$$

$$d = 3.4 \text{ m}$$

$$h = 1.1 \text{ m}$$

$$F_p = ?$$

$$F_N = ?$$



1) List data (*convert if necessary*)

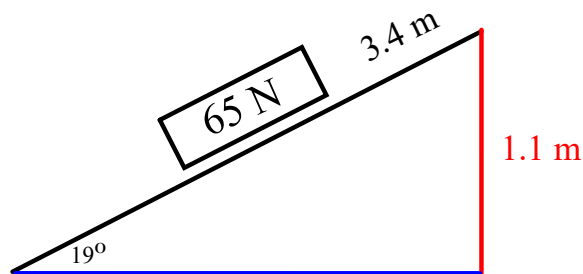
2) Draw diagram

$$\sin \theta = 1.1\text{m}/3.4 \text{ m}$$

$$\theta = 19^\circ$$

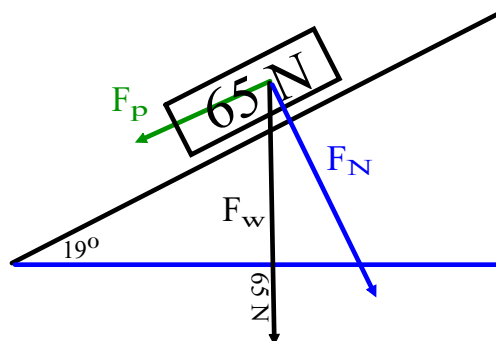
$$F_w = mg$$

$$F_w = 65 \text{ N}$$



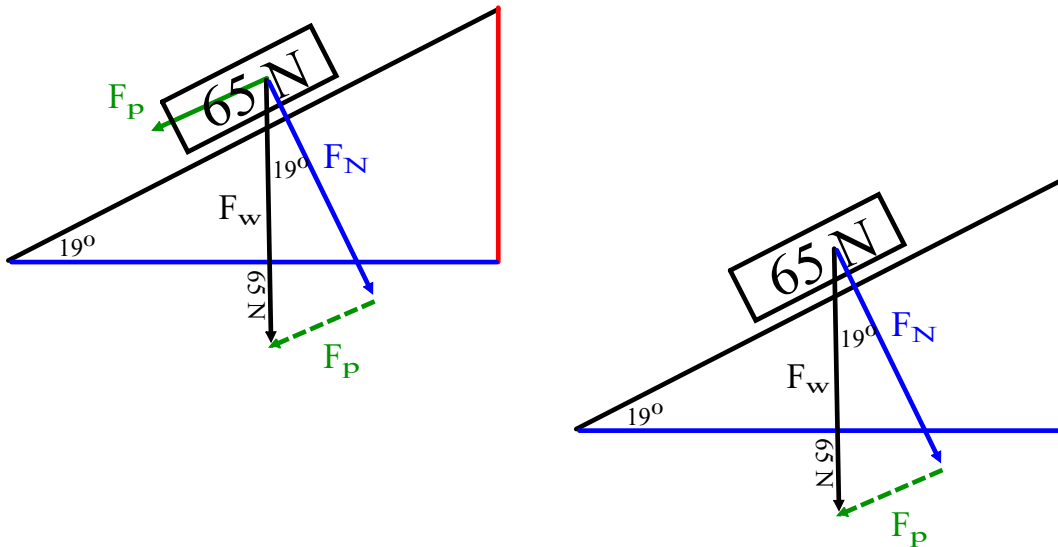
A 6.6 kg box is placed on a ramp that is 3.4 m long and 1.1 m high. What is the part of its weight parallel to the ramp and perpendicular to the ramp?

3) draw vectors representing acting components (point diagram)



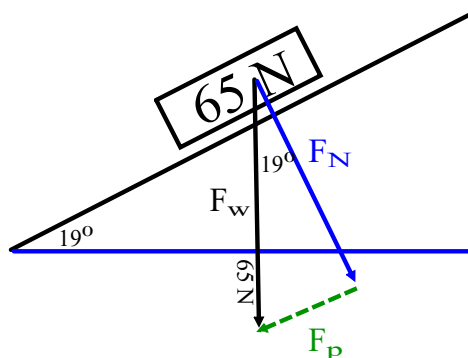
A 6.6 kg box is placed on a ramp that is 3.4 m long and 1.1 m high. What is the part of its weight parallel to the ramp and perpendicular to the ramp?

4) convert point diagram to a vector diagram



A 6.6 kg box is placed on a ramp that is 3.4 m long and 1.1 m high. What is the part of its weight parallel to the ramp and perpendicular to the ramp?

5) Solve for unknown components (vectors)

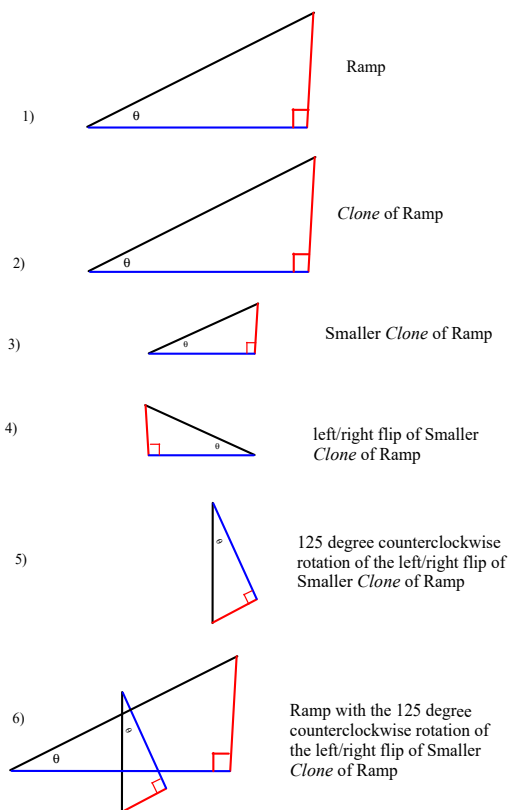


$$F_p = \sin 19^\circ(65 \text{ N})$$

$$F_p = 21 \text{ N}$$

$$F_N = \cos 19^\circ(65 \text{ N})$$

$$F_N = 61 \text{ N}$$



Note how the black part of the smaller ramp is the same as the weight of the box (100N) and the blue part is the same as the perpendicular component and the red part the same as the parallel component. Note that the two triangles are similar to each other- therefore there angles are the same!!!