

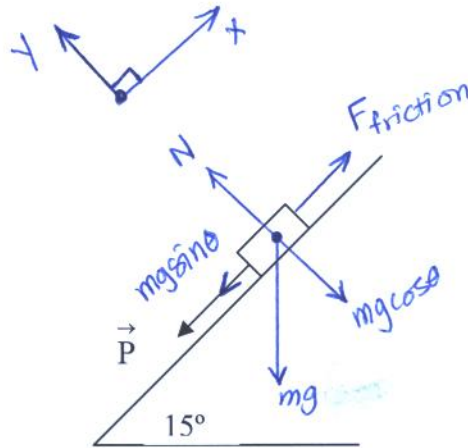
Physics 101- Chapter 6

Quiz No. 3

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A force \vec{P} , is parallel to a surface incline 15° above the horizontal, acts on 45 N block, as shown in the figure. The coefficients of friction for the block and surface are $\mu_s = 0.5$ and $\mu_k = 0.34$. If the block is initially at rest, determine the magnitude and direction of the frictional force acting on the block for magnitudes of \vec{P} :

- 1- 5 N
- 2- 8 N
- 3- 15 N



$$1- \sum F_y = 0$$

$$N - mg \cos \theta = 0$$

$$N = mg \cos \theta \quad \text{--- (1)}$$

But: $f_{s, \max} = \mu_s N$

$$f_{s, \max} = 0.5 \times 43.5 = 21.7 \text{ N}$$

Notice:

$$m = \frac{W}{g} = \frac{45}{9.8} = 4.6 \text{ kg}$$

$$\sum F_x = 0$$

$$F_{\text{friction}} - P - mg \sin \theta = 0$$

$$F_{\text{friction}} = P + mg \sin \theta$$

When $P = 5 \text{ N} \Rightarrow F_{\text{friction}} = 17 \text{ N}$, which is clearly allowed since it ^{is} less than $f_{s, \max}$

2 - When $P = 8 \text{ N} \Rightarrow F_{\text{friction}} = 20 \text{ N}$, which still allowed since it is less than $f_{s, \max}$

3 - When $P = 15 \text{ N} \Rightarrow F_{\text{friction}} = 27 \text{ N}$, which is not allowed since it is larger than $f_{s, \max}$. It is kinetic friction, not static friction.

Therefore: $f_{\text{kinetic}} = \mu_k N = 0.34 \times 43.5 = 15 \text{ N}$