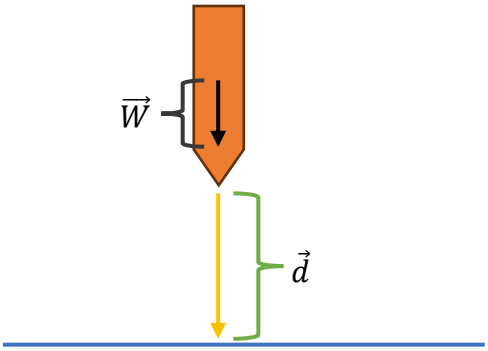
SOLVED IT!!!

1. How much work is done by the gravitational force when a 256kg pile driver falls 2.80m?

   Answer :

   Pertama gambarkan dulu skema dari *pile driver* berikut



   The formula of **Work Done** (W) is

$$W = \vec{F} \,.\vec{d}$$

   Note : this is the dot product of 2 vectors. So the conditions that must be met are:

$$\vec{F}.\vec{d} = |F||d| \cos\theta$$

   Gaya $\vec{F}$ yang dimiliki dari kasus di atas adalah

$$\overrightarrow{Weight} = \vec{w} = m.g = 256kg.\frac{9.8m}{s^2} = 2.508{,}8\ kgm/s^2$$

   Perpindahan atau *distance* $\vec{d} = 2{,}80m$ dan sudut antara gaya berat yang jatuh ke bawah dengan perpindahan jatuhnya mempunyai arah yang sama atau **SEJAJAR** dengan kata lain $\theta = 0°$. Jadi

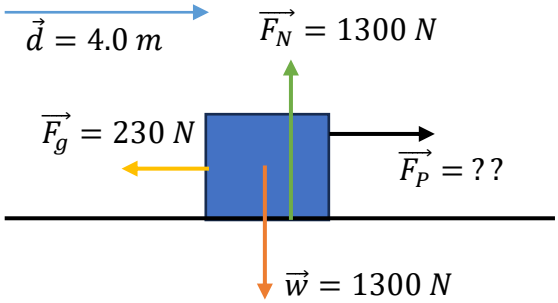
$$W = (2.508{,}8\ N)(2{,}80m) = 7.024{,}64\ Nm$$

   Perlu diingat bahwa W merupakan skalar hasil dari dot product.

2. A 1300-N crate rests on the floor. How much work is required to move it at a constant speed
   a. 4.0m along the floor against a friction force of 230N, and
   b. 4.0m vertically?

   Answer :

   a. Seperti biasa gambar skema menjadi



   Melihat gambar di atas, maka jika ingin dicari W dengan *speed* konstan maka

$$\sum F = m.\vec{a} \text{ dimana } \vec{a} = 0 \text{ atau konstan}$$

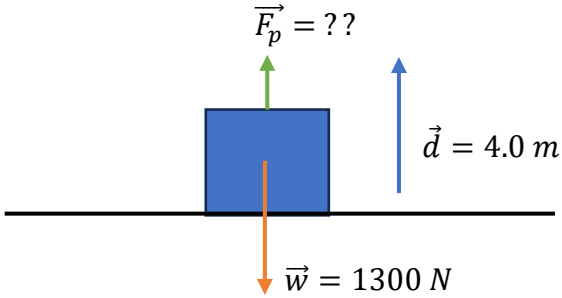
   Sehingga

$$\sum F_{x-axis} = \vec{F}_p - \vec{F}_g = 0 \rightarrow \overrightarrow{F_p} = \overrightarrow{F_g} = 230\ N$$

   Sehingga W untuk memindahkan adalah

$$W = \vec{F}.\vec{d} = (230\ N)(4.0\ m) = 920\ Nm$$

   b. Melakukan kembali skema gambar yang sedikit berbeda dimana



   Mengingat kembali $constant\ speed$ atau $\vec{a} = 0$ sehingga

$$\sum F_{y-axis} = 0 = \vec{w} - \vec{F}_p \rightarrow \vec{F}_p = \vec{w} = 1300\ \ N$$

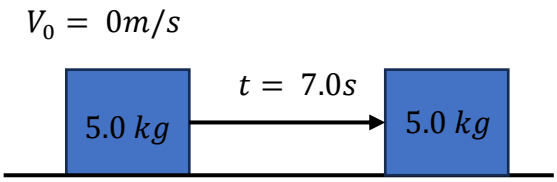
   Maka didapat untuk **Work Done** W sebagai berikut

$$W = \vec{F}.\vec{d} = (1300\ N)(4.0\ m) = 5.200\ Nm$$

3. A box of mass 5.0kg is accelerated from rest across a floor at a rate of $2.0m/s^2$ for 7.0s. Find the net work done on the box!

   Answer :

   Seperti biasa menggambarkan dulu skema box tersebut bergerak



   Untuk mencari besar **Work Done** W dari $\vec{F}$ dan $\vec{d}$ maka

$$\vec{F} = m.\vec{a} = (5.0kg)(2.0m/s^2) = 10\ N$$

   Dan *distance* bisa dilihat dari waktu tempuh gerak linear

$$\vec{d} = \overrightarrow{V_0}t + \frac{1}{2}\vec{a}t^2 = 0 + \frac{1}{2}(2ms^{-2})(7.0s)^2 = 49m$$

   Maka

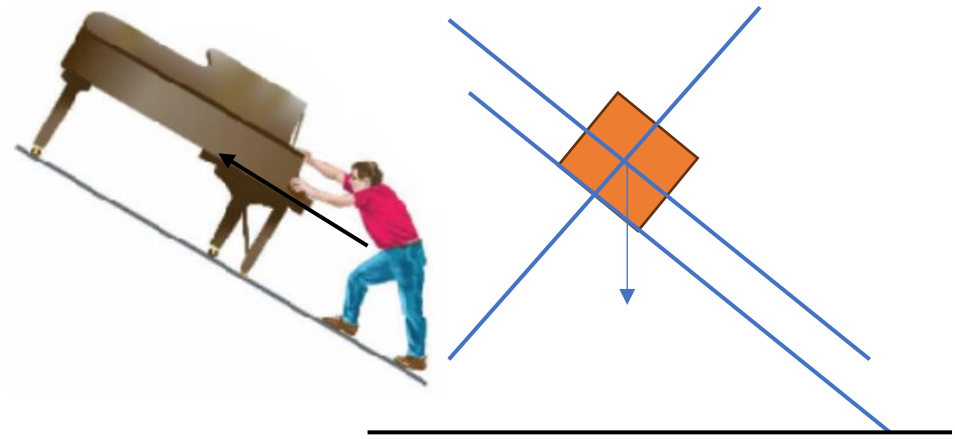
$$W = \vec{F}.\vec{d} = (10\ N)(49\ m) = 490\ Nm$$

4. A 330-kg piano slides 3.6m down a 28° incline and is kept from accelerating by a man who is pushing back on it parallel to the incline. The effective coefficient of friction μ is 0.40 and the force due to friction can be calculated by $F_g = \mu\vec{F}_N$ where is the normal force. Calculate:
   a. The force exerted by the man
   b. The work done by the man on the piano
   c. The work done by the friction force
   d. The work done by the force of gravity
   e. The net work done on the piano

   Answer :

   Pertama gambarkan dulu kejadiannya seperti apa

   a)



   a) Force yang dikeluarkan *human*

$$\sum F_x = 0 = \overrightarrow{W}\sin 28° - \overrightarrow{F_g} - \vec{F}_{human}$$

$$\vec{F}_{human} = \vec{w}\sin 28° - \overrightarrow{F_g}$$

$$= m.g\sin 28° - \mu\overrightarrow{F_n}$$

$$= mg\sin 28° - \mu(m.g\cos 28°)$$

$$\vec{F}_{human} = 1.519{,}820 - 1.143{,}346 = 376{,}473\ N$$

   b) $W_{human} = \vec{F}_{human}.\vec{d} = (376{,}5N)(3.6m) = 1.355{,}3\ Nm$

   c) $W_{friction} = \vec{F}_{friction}.\vec{d} = (1.143{,}346\ N)(3.6m) = 4.116\ Nm$

   d) $W_{gravity} = \vec{F}_{gravity}.\vec{d} = (1.519{,}820)(3.6m) = 5471{,}4\ Nm$

   e) $W_{total} = W_{gravity} + W_{friction} + W_{human} = 10.942{,}652\ Nm$