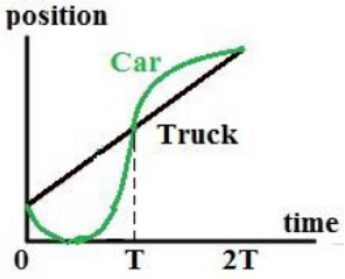
METÓDY RIEŠENIA FYZIKÁLNYCH ÚLOH 1 leto20 – Príklady 1

Cvičenie 20.2.2020

Príklad 1



For the entire time shown in the graph, which one of the following choices correctly describes the relationship between the average speed of the truck to that of the car?

(A) The truck's average speed is less than the average speed of the car.
(B) The truck's average speed is the same as the average speed of the car.
(C) The truck's average speed is greater than the average speed of the car.
(D) The truck's average speed is positive while the car's average speed is negative but of the same magnitude.
(E) A relationship cannot be determined without more information.

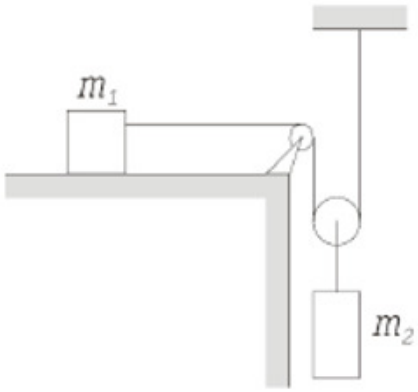
Which one of the following choices best describes the instants of time, t, at which the car and truck travel with the same speed?

(A) Only at times $t = 0, t = T$ and $t = 2T$.
(B) At one instant during the interval $0 < t < T$ and at one instant during the interval $T < t < 2T$.
(C) At two instants during the interval $0 < t < T$ and at one instant during the interval $T < t < 2T$.
(D) At one instant during the interval $0 < t < T$ and at two instants during the interval $T < t < 2T$.
(E) At two instants during the interval $0 < t < T$ and at two instants during the interval $T < t < 2T$.

Príklad 2

V nasledujúcom je vždy práve jedno riešenie úlohy správne. Nájdite ktoré to je bez toho, aby ste úlohu počítali.

Urcte zrychlenie telesa m_1 sustavy na obrzku. Trenie ani hmotnost kladky neuvazujte.



a. $a = \frac{m_1}{2m_1+m_2}g$
b. $a = \frac{2m_2}{4m_1+3m_2}g$
c. $a = \frac{2m_2}{4m_1+m_2}g$
d. $a = \frac{m_1-m_2}{2(m_1+m_2)}g$

Dve rovnake telesa s teplotami T_1, T_2 dame do tepelneho kontaktu a nechame ustalit. Aka bude ich vysledna teplota

a. $\sqrt{T_1T_2}$
b. $\frac{T_1T_2}{T_1+T_2}$
c. $\frac{T_1T_2}{T_1+2T_2}$
d. $\frac{1}{2}(T_1+T_2)$

Clovek hadze z okraja utesu vysokeho h kamen rychlostou v pod takym uhlom aby, aby doletel co najdalej. Ako daleko kamen doleti?

a. $D = \frac{gh^2}{v^2}$
b. $D = \frac{v^2}{g}\left(1+\frac{2gh}{v^2}\right)^2$
c. $D = \frac{v^2}{g}$
d. $D = \sqrt{\frac{v^2h}{g}}$
e. $D = \frac{v^2}{g}\left(1+\frac{2gh}{v^2}\right)$
f. $D = \frac{v^2}{g}\sqrt{1+\frac{2gh}{v^2}}$
g. $D = \frac{v^2}{g}\frac{1}{1+\frac{2gh}{v^2}}$
h. $D = \frac{v^2}{g}\frac{1}{1-\frac{2gh}{v^2}}$

Príklad 3

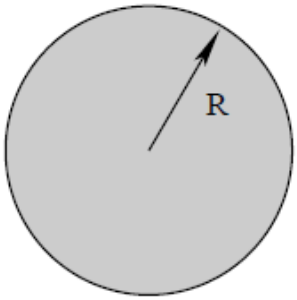
Príklad 9. Ukážte, že lagranžián

$$L = \frac{1}{12}m^2\dot{x}^4 + m\dot{x}^2V - V^2$$

pre časticu v jednom rozmere a potenciály $V(x)$ vedie na rovnaké pohybové rovnice ako $L = T - V$.

Príklad 4

1. A charged particle with charge q and mass m is given an initial kinetic energy K_0 at the middle of a uniformly charged spherical region of total charge Q and radius R. q and Q have opposite signs. The spherically charged region is not free to move. Throughout this problem consider electrostatic forces only.



   (a) Find the value of K_0 such that the particle will just reach the boundary of the spherically charged region.

   (b) How much time does it take for the particle to reach the boundary of the region if it starts with the kinetic energy K_0 found in part (a)?

Príklad 5

A wheel with spokes rolls on the ground. A stationary camera takes a picture of the wheel. Due to the nonzero exposure time of the camera, the spokes will generally appear blurred. At what location(s) in the picture does (do) the spoke(s) not appear blurred?

Note that 'not blurred' means that at some position(s) the spoke element seem not moving, but does not mean that the atoms of the spokes are not moving.

Príklad 6

1. Consider a rocket that has a constant fuel burn rate (i.e. mass consumption rate), α, and a constant exhaust velocity, u.

   (a) If the rocket starts from rest in free space by emitting mass, at what fraction of the initial mass is its momentum a maximum?

   (b) If the rocket launches from the surface of the Earth, what is the minimum u such that the rocket will lift off immediately after firing? What is the rocket's velocity in the early stages of the ascent? Assume a vertical assent.