FORCES EXAM 2nd ESO E

NAME AND SURNAME_____

EXAM A

1) What is the force required to stretch a spring whose constant value is 175 N/m by an amount of 30 cm? 3 points

SOLUTION:

$$x = 30\ cm \cdot \frac{1\ m}{100\ cm} = 0{,}3\ m$$

$F = k \cdot x$ (Hooke's Law)

$$F = 175\ N/\cancel{m} \cdot 0{,}3\ \cancel{m} = 52{,}5\ N$$

2) What is the spring constant of a spring if a force of 196 N is applied and causes a compression of 2,3 m? 4 points

SOLUTION:

$F = k \cdot x$ (Hooke's Law) $\Longrightarrow k = \frac{F}{x}$

$$k = \frac{196\ N}{2{,}3\ m} = 85{,}2\ N/m$$

3) What will be the extension of a spring whose constant is 35 N/m if the load hanging from it weighs 63 N? 3 points

SOLUTION:

$F = k \cdot x$ (Hooke's Law) $\Longrightarrow x = \frac{F}{k}$

$$x = \frac{63\ \cancel{N}}{35\ \cancel{N}/m} = 1{,}8\ m$$

FORCES EXAM 2nd ESO E

NAME AND SURNAME_____

4) The Space Shuttle has a liftoff mass of 2041000 kg and accelerates at a rate of 16 m/s^2 . Calculate the force (thrust) that is accelerating the Space Shuttle. 3 points

SOLUTION:

F = m · a (Newton's 2nd Law of Motion)

$$F = 2\,041\,000\,kg \cdot 16\,m/s^2 = 32\,656\,000\,N$$

5) A runner has a mass of 89 kilograms. He produces a force of 84 Newtons between the ground and his running shoes. How fast does he accelerate? 3,5 points

SOLUTION:

F = m · a (Newton's 2nd Law of Motion) $\Rightarrow a = \frac{F}{m}$

$$a = \frac{84\,N}{89\,kg} = 0{,}94\,m/s^2$$

6) A rocket accelerates at 56 m/s^2 with the force (thrust) of 44800 N. What is the mass of the rocket? 3,5 points

F = m · a (Newton's 2nd Law of Motion) $\Rightarrow m = \frac{F}{a}$

$$m = \frac{44\,800\,N}{56\ m/s^2} = 800\,kg$$

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7) How much would a 100 kg man weigh on the Earth if the acceleration due to gravity is 9,81 m/s^2? 5 points

SOLUTION:

W = m · g

FORCES EXAM 2nd ESO E

NAME AND SURNAME_____

$W = 100\ kg \cdot 9{,}81\ m/s^2 = 981\ N$

8) A space ship has a mass of 9 000 kg. The space ship is launched from Earth and lands on a distant planet where it has a weight of 390 000 N. What is the acceleration of gravity on this planet? 5 points

SOLUTION:

$W = m \cdot g \Rightarrow g = \frac{W}{m}$

$$g = \frac{390\,000\ N}{9\,000\ kg} = 43{,}3\ m/s^2$$

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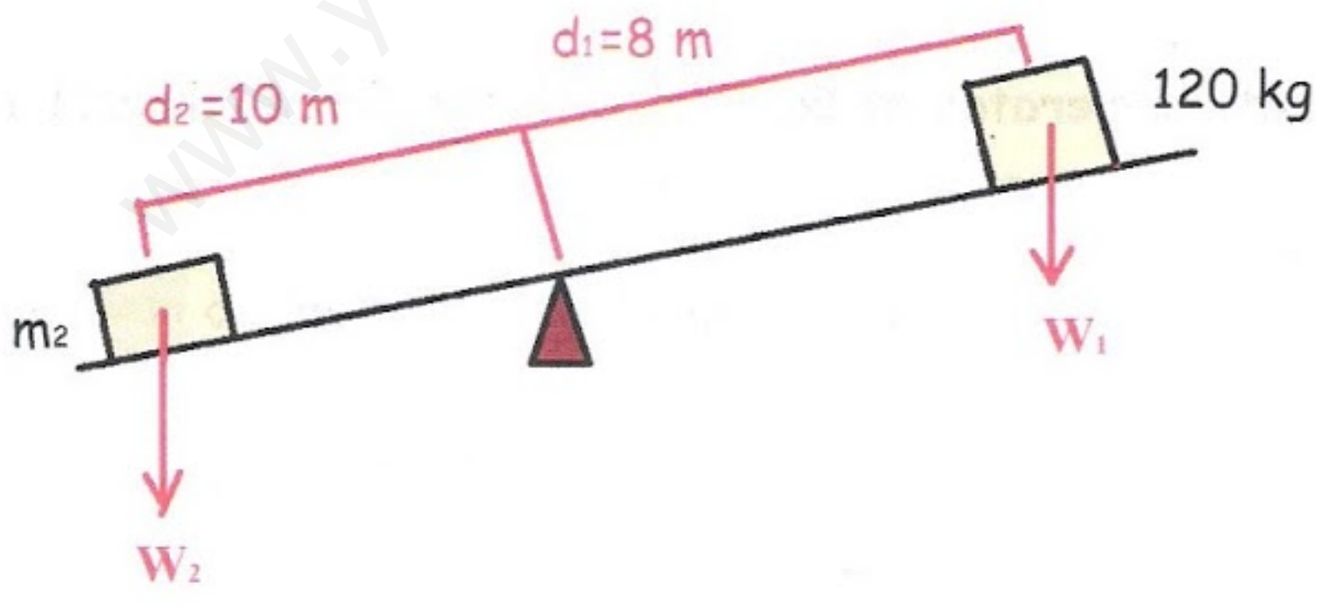
9) A 120 kg mass is located 8 m from the fulcrum of a lever. How much mass at a distance of 10 m on the opposite side of the fulcrum would balance it? 10 points

SOLUTION:



$$F_1 \cdot d_1 = F_2 \cdot d_2$$

$$120\ kg \cdot 9{,}81\ m/s^2 \cdot 8\ m = m_2 \cdot 9{,}81\ m/s^2 \cdot 10\ m$$

$$120 \cdot 8 = m_2 \cdot 10$$

$$m_2 = \frac{120 \cdot 8}{10} = 96\ kg$$