EXAM B

1) A force of 160 N stretches a spring 0,050m from its equilibrium position. What is the spring constant? | 3 points |

SOLUTION:

$$F = k \cdot x \Rightarrow k = \frac{F}{x}$$

$$k = \frac{160\ N}{0,050\ m} = \boxed{3\,200\ N/m}$$

2) If a spring has a spring constant of 2 N/m and it is stretched 5 cm, what is the force applied? | 3 points |

SOLUTION:

$$x = 5\ cm \cdot \frac{1\ m}{100\ cm} = 0,05\ m$$

$$F = k \cdot x$$

$$F = 2\ N/m \cdot 0,05\ m = \boxed{0,1\ N}$$

3) If you use a spring whose constant is 32,67 N/m and hang a 4,9 N load from it, how far will it stretch? Convert your answer to cm. | 4 points |

SOLUTION:

$$F = k \cdot x \Rightarrow x = \frac{F}{k}$$

$$x = \frac{4,9\ N}{32,67\ N/m} = 0,15\ m \cdot \frac{100\ cm}{1\ m} = \boxed{15\ cm}$$

4) A 5 kg cart accelerates to 4,4 m/s². What is the force acting on the cart? | 3 points |

SOLUTION:

$F = m \cdot a$

$F = 5\,kg \cdot 4,4\,m/s^2 = $ 22 N

5) A force of 5,6 N acts on a 0,35 kg cart. What is the acceleration of the cart? | 3,5 points |

SOLUTION:

$F = m \cdot a \implies a = \dfrac{F}{m}$

$a = \dfrac{5,6\,N}{0,35\,kg} = $ 16 m/s²

6) Jonathan has an engine that can provide a force of 5,6 N. He wants to place the engine on a cart so it accelerates at 3,5 m/s². What should the combined mass of the cart and engine be to achieve this acceleration? | 3,5 points |

SOLUTION:

$F = m \cdot a \implies m = \dfrac{F}{a}$

$m = \dfrac{5,6\,N}{3,5\,m/s^2} = $ 1,6 kg

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7) A woman has a mass of 60 kg. How much does she weigh on Earth if the acceleration due to gravity is 10 m/s²? | 5 points |

SOLUTION:

$W = m \cdot g$

$W = 60\,kg \cdot 10\,m/s^2 = $ 600 N

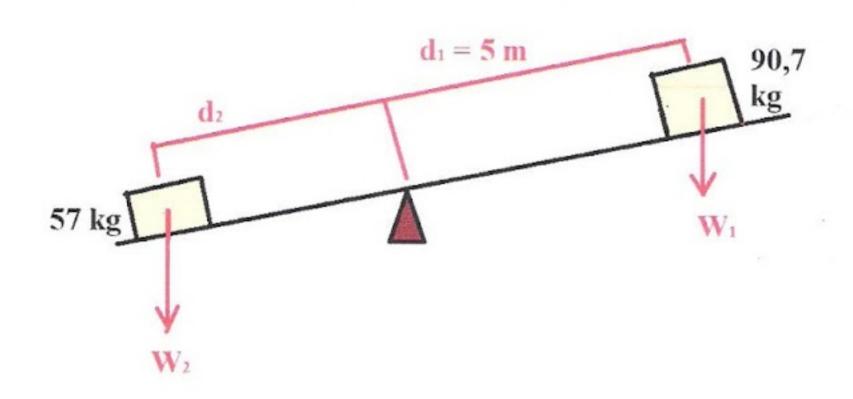8) An orange weighs about 1 N on Earth (g = 9,8 m/s²). What is the mass of the orange? | 5 points |

SOLUTION:

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

$$m = \frac{1\,N}{9,8\,m/s^2} = \boxed{0,102\,kg} \cdot \frac{1000\,g}{1\,kg} = \boxed{102\,g}$$

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9) Peter weighs 90,7 kg and is located on a seesaw 5 m from the fulcrum. How far from the fulcrum should Anna, whose mass is 57 kg, sit to balance the lever? | 10 points |

SOLUTION:

$$W_1 \cdot d_1 = W_2 \cdot d_2$$

$$90,7 \cdot 9,8 \cdot 5 = 57 \cdot 9,8 \cdot d_2$$

$$453,5 = 57d_2$$

$$\frac{453,5}{57} = d_2$$

$$\boxed{7,96\,m = d_2}$$