

## Homework Problems

1. A small snowmobile has a 9000 W (12 hp) engine. It takes a force of 300. N to move a sled load of wood along a pond. How much time will it take to tow the wood across the pond if the distance is measured to be 850 m?

$$P = \frac{W}{t} = \frac{F \cdot d}{t}$$

$$t = \frac{F \cdot d}{P}$$

$$t = \frac{(300)(850)}{9000}$$

$$t = 28.3 \text{ sec}$$

Answer: 28.3 s

2. A winch, which is rated at 720 W, is used to pull an all-terrain vehicle (ATV) out of a mud bog for a distance of 2.3 m. If the average force applied by the winch is 1500 N, how long will the job take?

$$t = \frac{F \cdot d}{P} = \frac{(1500)(2.3)}{720}$$

$$t = 4.79 \text{ sec}$$

Answer: 4.8 s

3. What is your power output if you have a mass of 65 kg and you climb a 5.2 m vertical ladder in 10.4 s?

$$P = \frac{W}{t} = \frac{F \cdot d}{t} = \frac{mg \cdot d}{t} = \frac{(65)(10)(5.2)}{10.4}$$

$$P = 325 \text{ W}$$

Answer: 325 W

Use this space for summary and/or additional notes.

4. Jack and Jill went up the hill. (The hill was 23m high.) Jack was carrying a 21 kg pail of water. If Jack has a mass of 75 kg and he made the trip in 45 s, how much power did he apply?

$$P = \frac{F \cdot d}{t} = \frac{mg \cdot d}{t} = \frac{(96)(10)(23)}{45}$$

Answer: 490.7 W

$$P = 491 \text{ W}$$

5. Jill, who has a mass of 55 kg, made the same trip as Jack did in problem #3, but she took 10 seconds less. How much power did she apply?

$$P = \frac{mg \cdot d}{t} = \frac{(76)(10)(23)}{35}$$

Answer: 499.4 W

$$P = 499 \text{ W}$$

6. The maximum power output of a particular crane is 12 kW. What is the fastest time in which this crane could lift a 3500 kg crate to a height of 6.0 m?

$$P = \frac{\Delta E}{t} \quad t = \frac{\Delta E}{P} = \frac{mgh}{P} = \frac{(3500)(10)(6.0)}{12,000}$$

Answer: 17.5 s

$$t = 17.5 \text{ sec}$$

7. The maximum power output of a particular crane is P. What is the fastest time, t, in which this crane could lift a crate with mass m to a height h? (You may use your work from problem #6 above to guide your algebra.)

See problem 6

$$\text{Answer: } t = \frac{mgh}{P}$$

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