

The Squirrel Workout

Physical Science

Name _____
1 2 3 4 5 6 7 8

Nutty the squirrel loves to work out. For the following exercises, determine how much work Nutty does.



- 1) As a warm-up, Nutty takes his heavy weights and pushes them 35m across the floor at a constant speed. If he is pushing with 50 N of force, how much work did he do?

- 2) Our Squirrelly companion now takes out his barbells and lifts a 15N weight .3 meters over his head. How much work did he do in this situation?

- 3) The now sweaty squirrel holds his 15N weight over his head. While keeping the weight above his head, he runs a 100m dash in 22 seconds. How much work did he do?

- 4) Returning back, Nutty starts his stair workout. If his weight is 10N, and each flight of stairs is 4 meters, then how much work does he do in each situation:
 - a- run up two flights of stairs.

 - b- run up three flights, then back down one.

 - c- run up three flights of stairs.

- 5) A very tired Squirrel of 10N weight begins to do pushups to elevate himself .05m. How many pushups should he do to accomplish 5.0 J of work?

Power!

Physical Science

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Part I -- Changing the power

A weightlifter is using his tremendous muscles to lift a 40N barbell in 2 seconds, exerting 20 watts of power in the process. For each question, indicate how the power will change.

1) If the weightlifter now lifts the barbell twice as high in the same time period, how will his power change?

New Power

2) If the weightlifter lifts the weight in twice as much time, how will his power change?

New Power

3) If the weight is changed to become 4 times as massive, how will his power change?

New Power

4) If the weightlifter uses a weight that is $\frac{1}{2}$ as massive, and lifts it in $\frac{1}{2}$ the time, how will his power change?

New Power

5) If the weightlifter lifts the weight 3 times the original height in $\frac{1}{4}$ the original time, how will his power change?

New Power

6) List two ways to increase the weightlifter's power by 12 times (power = 240 watts).

Part II -- Conceptual...

7) A humongous sumo wrestler and a high school track star (who got second place in Freshman conference!) race up some stairs. The track star took 2 seconds, and got to the top first. But being the sore loser that he is, the sumo wrestler claims he used more power, so he should be the winner. Give the Sumo wrestler's explanation below.

8) You have a 100 hp engine, and a 200 hp engine: which will do more work?

Part III - Work (*well... not really work as in Joules, but work in the sense that you will be... nevermind*)

- 9) Walking down the street, a man was startled by a squirrel doing pushups. If he observes the 12N squirrel do 30 pushups (of height .07 m) in 20 seconds, how much power did the squirrel exert?
- 10) While working out, an athlete bench presses 600N 15 times in 20 seconds. a) If the distance the weight is raised in each repetition is 0.6 m, determine the power output of the athlete. b) What was the power output of the athlete?
- 11) A 550N student runs up stairs to a height of 5 m. If the student's power is 100 watts, how much time did it take?
- 12) A garbage man lifts a 110N can off the ground and walks it 30 meters to the dump. If it took 65 seconds, what is his power?
- 13) An athlete boasts to his friends that he can do 100 watts of work, no problem. Walking over to the dumbbells, he lifts a 53N weight 2 meters off the ground. How much time did it take him to lift the weight?
- 14) A machine is advertised as being able to lift any weight to a height of 3.4 meters in 2 seconds. However, the maximum power output of the machine is 1,000 watts. What is the maximum weight that the machine can lift?