

Chapter 3 Newton's First Law

Example Problems

3.2 Springs and Hooke's Law

E1. An ideal spring has a spring constant of 120 N/m, calculate how large of a force is needed to stretch the spring exactly 0.30 meters.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$F =$

$k =$

$\Delta x =$

a) _____ ← units

E2. A monkey hangs from a spring that is attached to the ceiling. The spring has a spring constant of 2.5 N/m and is stretched a total of 0.1 meters by the monkey, calculate the force pulling on the monkey and the mass of the monkey.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$F =$

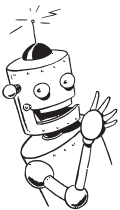
$k =$

$\Delta x =$

a) _____ ← units

b) _____ ← units

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E3. A spring with a constant of 600 N/m is used on a scale for weighing fish. If a fish placed on the scale stretches the spring 0.075 meters, what is the mass of a fish?

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$F =$

$k =$

$\Delta x =$

a) _____ ← units

E4. A monkey places a coconut on a scale and finds its weight to be 20 N. The weight of the coconut in the basket of the scale causes a spring to be stretched 0.25 meters, calculate the spring constant of the scale.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

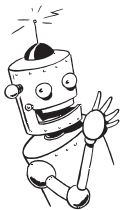
$F =$

$k =$

$\Delta x =$

a) _____ ← units

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E5. The spring in a pogo stick is compressed 0.12 meters when a 40 kg monkey stands on the pogo stick. Calculate the spring constant for the pogo stick's spring.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$F =$

$k =$

$\Delta x =$

a) _____ ← units

E6. If the spring constant of a pogo stick is 3500 N/m and the weight of a monkey on the pogo stick is 700 N, calculate by how much the pogo stick's spring will be compressed by the weight of the monkey.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

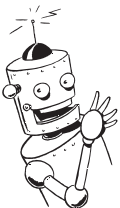
$F =$

$k =$

$\Delta x =$

a) _____ ← units

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E7. A spring ($k = 2.3 \text{ N/m}$) is attached to an object of mass = 10 kg. If the object is hung from the ceiling by this spring, how much would the spring be stretched?

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$F =$

$k =$

$\Delta x =$

a) _____ ← units

E8. A 8-kg mass stretches a spring 0.2-meters, how much more mass should be added to stretch the spring to exactly 0.5 meter?

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

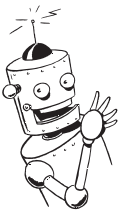
$F =$

$k =$

$\Delta x =$

a) _____ ← units

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Student Problems

3.2 Springs and Hooke's Law

1. A spring has a spring constant of 15.0 N/m, if you stretch the spring 0.30 meters horizontally, and hold it motionless, what force does the spring exert on your hand?

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$$F =$$

$$k =$$

$$\Delta x =$$

a) _____ ← units

2. A spring, having a spring constant of 400 N/m, is attached to the ceiling. A mass is suspended from the end of the spring causing the spring to stretch 0.08 meters. Calculate the weight and the mass of the object.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

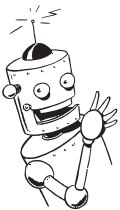
$$F =$$

$$k =$$

$$\Delta x =$$

a) _____ ← units

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3. A large gorilla, mass 65 kg, stands on a pogo-stick and compresses the pogo-stick's spring 0.18 meters. Calculate the spring constant for the pogo-stick's spring.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$F =$

$k =$

$\Delta x =$

a) _____ ← units

4. A 15 kg mass is placed on the end of a 0.20 meter spring hanging from the ceiling. If the spring stretches to a new length of 0.25 meters, calculate the spring constant.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

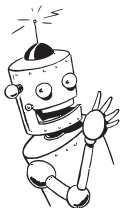
$F =$

$k =$

$\Delta x =$

a) _____ ← units

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5. A force of 32 N compresses a spring that has a spring constant of 400 N/m, calculate the new length of the spring if the starting length was 0.30 meters.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$F =$

$k =$

$\Delta x =$

a) _____ ← units

6. A 45 kg monkey stands on a bathroom scale to check his weight. Inside of the bathroom scale there is a spring that gets compressed by the weight of the monkey. The spring has a constant of 8,820 N/m, calculate the amount of compression for the spring as the monkey stands on the scale.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

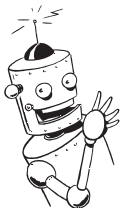
$F =$

$k =$

$\Delta x =$

a) _____ ← units

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7. A 45-kg monkey stands on a pogo-stick and compresses it's spring 0.15 meters. If the monkey's 15 kg pet lemur jumps on his back while the monkey is standing on the pogo-stick, calculate the new total distance the spring will be compressed.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$F =$

$k =$

$\Delta x =$

a) _____ ← units

8. A 5-kg mass stretches a spring 0.9 meters, how much more mass should be added to stretch the spring to exactly 1 meter?

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

$F =$

$k =$

$\Delta x =$

a) _____ ← units

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