ConcepTest 7.2 KE and PE

You and your friend both solve a problem involving a skier going down a slope, starting from rest. The two of you have chosen different levels for y = 0 in this problem. Which of the following quantities will you and your friend agree on?

1) only B

2) only C

3) A, B and C

- 4) only A and C
- 5) only B and C

A) skier's PE B) skier's change in PE C) skier's final KE

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only C
A, B and C
only A and C
only B and C

A) skier's PE

B) skier's change in PE

C) skier's final KE

The gravitational PE depends upon the reference level, but the *difference* DPE does not! The work done by gravity must be the same in the two solutions, so DPE and DKE should be the same.

Follow-up: Does anything change *physically* by the choice of *y* = 0?

ConcepTest 7.4 Elastic Potential Energy

How does the work required to stretch a spring 2 cm compare with the work required to stretch it 1 cm?

- 1) same amount of work
- 2) twice the work
- 3) 4 times the work
- 4) 8 times the work

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4) 8 times the work

The elastic potential energy is $1/2 k x^2$. So in the second case,

the elastic PE is 4 times greater than in the first case. Thus,

the work required to stretch the spring is also 4 times greater.

ConcepTest 7.6 Down the Hill

Three balls of equal mass start from rest and roll down different ramps. All ramps have the same height. Which ball has the greater speed at the bottom of its ramp?



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All of the balls have the same initial gravitational PE,

since they are all at the same height (PE = mgh). Thus, when they get to the bottom, they all have the same final KE, and hence the same speed (KE = $1/2 mv^2$).

Follow-up: Which ball takes longer to get down the ramp?

ConcepTest 7.8b Water Slide II

Paul and Kathleen start from rest at the same time on frictionless water slides with different shapes. Who makes it to the bottom first?

- 1) Paul
- 2) Kathleen
- 3) both the same



ConcepTest 7.8b Water Slide II

Paul and Kathleen start from rest at the same time on frictionless water slides with different shapes. Who makes it to the bottom first?



Even though they both have the same *final velocity*, Kathleen is at a lower height than Paul for most of her ride. Thus she always has a *larger velocity* during her ride and therefore arrives earlier!



ConcepTest 7.9 Cart on a Hill

A cart starting from rest rolls down a hill and at the bottom has a speed of 4 m/s. If the cart were given an initial push, so its initial speed at the top of the hill was 3 m/s, what would be its speed at the bottom?

1) 4 m/s

2) 5 m/s

3) 6 m/s

4) 7 m/s

5) 25 m/s

ConcepTest 7.9 Cart on a Hill

A cart starting from rest rolls down a hill and at the bottom has a speed of 4 m/s. If the cart were given an initial push, so its initial speed at the top of the hill was 3 m/s, what would be its speed at the bottom?



When starting from rest, the cart's PE is changed into KE:

When starting from 3 m/s, the final KE is:

- = 1/2 m(3)² + 1/2 m(4)²
- = 1/2 m(25)

= <u>1/2 m(5)</u>²

