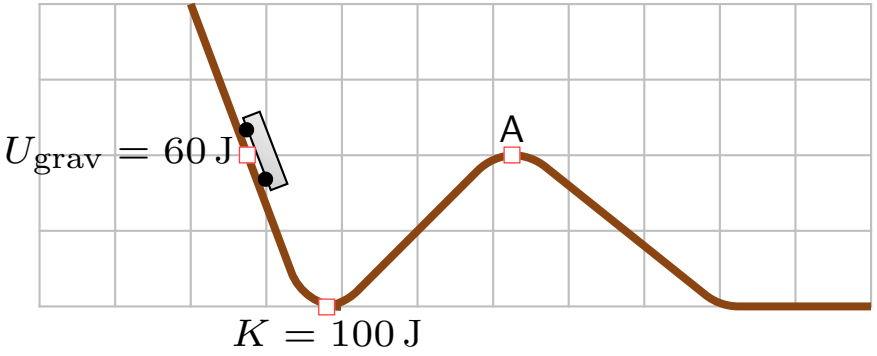
Question 1

A cart slides along a track as illustrated. The reference $y = 0$ is taken at the lowest point on the track. Various energies are shown at the indicated points.

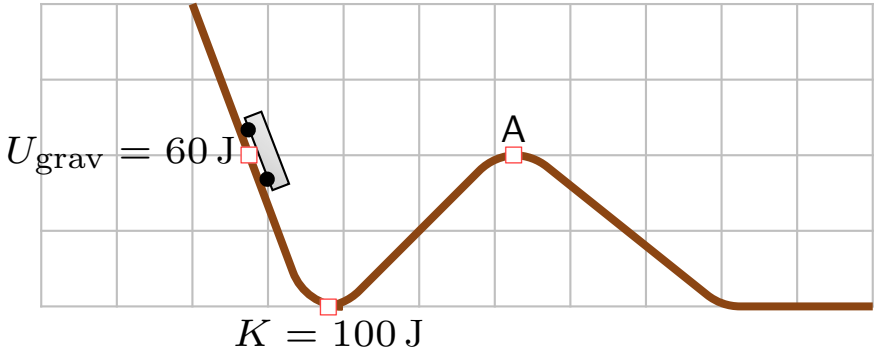


Which of the following is true regarding the total energy of the cart?

1. $E = 40\,\text{J}$
2. $E = 60\,\text{J}$
3. $E = 100\,\text{J}$
4. $E = 160\,\text{J}$

Question 2

A cart slides along a track as illustrated. The reference $y = 0$ is taken at the lowest point on the track. Various energies are shown at the indicated points.

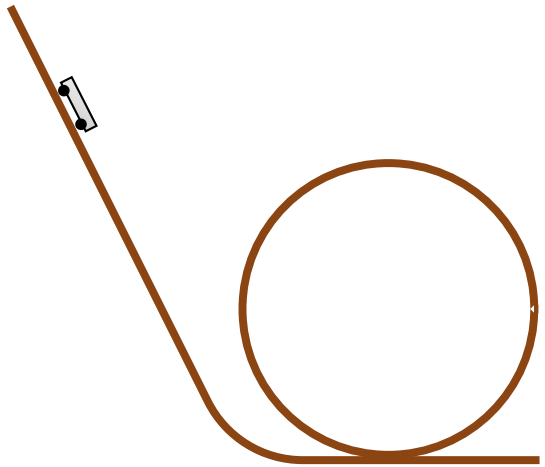


Which of the following is true at point A?

1. $U_{\text{grav}} = 100\,\text{J}$ $K = 0\,\text{J}$
2. $U_{\text{grav}} = 100\,\text{J}$ $K = 60\,\text{J}$
3. $U_{\text{grav}} = 60\,\text{J}$ $K = 0\,\text{J}$
4. $U_{\text{grav}} = 60\,\text{J}$ $K = 40\,\text{J}$
5. $U_{\text{grav}} = 40\,\text{J}$ $K = 60\,\text{J}$

Question 3

A roller coaster cart is released from rest on a ramp. The cart approaches a loop with radius R.



What is the *minimum* height from which the cart must be released if it is to complete the loop without falling?

1. Less than R.
2. Exactly R.
3. Between R and $2R$.
4. Exactly $2R$.
5. Larger than $2R$.

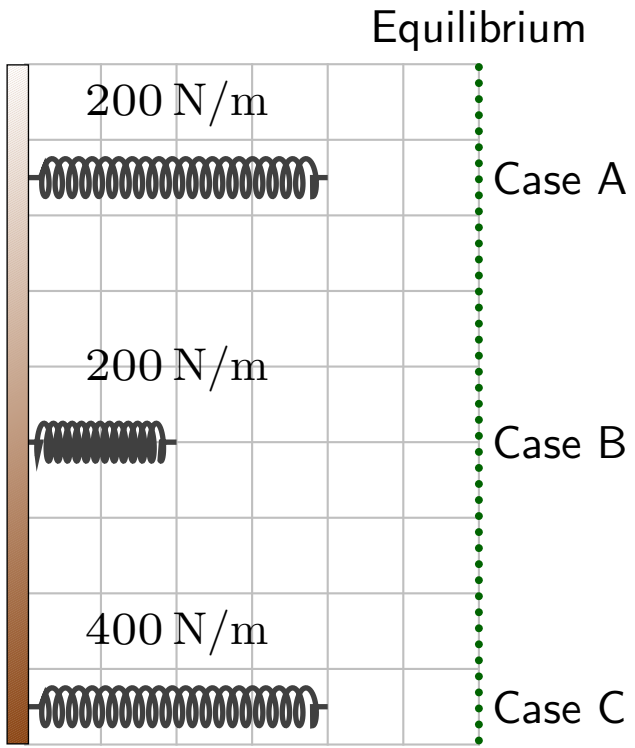
Warm Up Question 1

A dog takes a ride in two different elevators. The first elevator lifts the dog though height $20\,\mathrm{m}$ at a constant speed; this takes $3\,\mathrm{s}$. The second elevator also lifts the the dog though height $20\,\mathrm{m}$ at a constant speed; this takes $9\,\mathrm{s}$. How does the power delivered in lifting the dog for the second elevator compare to that of the first? Explain your answer.

1. Second elevator gives $1/3$ power. Takes three times as long.
2. Same. Force is the same.
3. Same. Distance is the same.

Question 4

Various springs, with spring constants indicated, are held compressed from their equilibrium (relaxed) positions as illustrated.



The springs uncompress. Which of the following best represents the rank of the works done by the springs from the initial state to their relaxed positions?

1. $W_{\mathrm{A}} = W_{\mathrm{B}} = W_{\mathrm{C}}$
2. $W_{\mathrm{A}} < W_{\mathrm{B}} = W_{\mathrm{C}}$
3. $W_{\mathrm{A}} < W_{\mathrm{B}} < W_{\mathrm{C}}$
4. $W_{\mathrm{A}} < W_{\mathrm{C}} < W_{\mathrm{B}}$