A dollar and a penny

- A student makes the following argument: "I can prove a dollar equals a penny. Since a dime (10 cents) is one-tenth of a dollar, I can write:

$$10¢ = 0.1\ \$$$

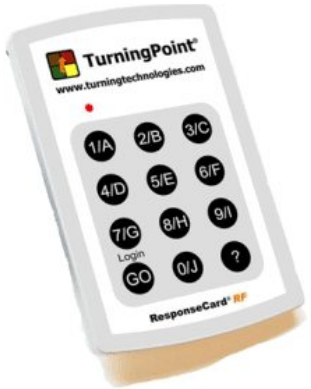
- Square both sides of the equation. Since squares of equals are equal,

$$100\ ¢ = 0.01\ \$.$$

- Since $100\ ¢ = 1\ \$$ and $0.01\ \$ = 1\ ¢$ it follows that $1\$ = 1\ ¢$."
- What's wrong with the argument?

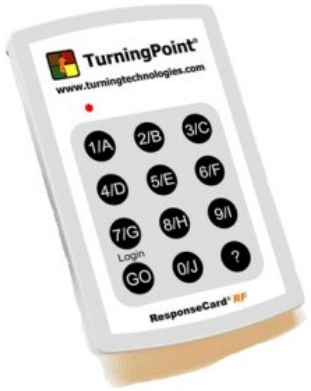
Stuck?
Try it with
10 cm = 0.1 m

A student measures distance x to be 5 meters and area A to be 25 ft^2. Discuss with neighbors which of the following are true; then vote for all that are true.



1. $[x^2] = [A]$
2. $[5x] = A$
3. $x^2 = [A]$
4. $x^2 = A$
5. None of the above

As part of an exam a few years ago, a student wrote the following derivation of a final result. Without knowing the problem, but knowing the dimensions of each quantity shown along the bottom can you determine:



Is equation D correct?

1. Yes
2. No
3. Can't tell

$$A.\quad Mgh = \tfrac{1}{2}Mv^2 + \tfrac{1}{2}I\omega^2$$

$$B.\quad Mgh = \tfrac{1}{2}Mv^2 + \tfrac{1}{2}\left(MR^2\right)\omega^2$$

$$C.\quad Mgh = \tfrac{1}{2}Mv^2 + \tfrac{1}{2}\left(MR^2\right)\left(\frac{v^2}{R}\right)^2$$

$$D.\quad gh = \tfrac{1}{2}v^2 + \tfrac{1}{2}v^4$$

Given that equation D is NOT correct, can you tell which is the first line that has an error?

$[M]$=M $[g]$=L/T^2 $[h]$=L $[\omega]$=/T $[v]$=L/T $[R]$=L $[I]$=ML^2