Episode 19: Computer games and mechanics

Puzzle:
Susan the Hedgehog runs at 20cm/s across the screen while the run button is held down. Once the run button is released, she slows down with constant deceleration of 8.5cm/s^2. Will she stop within 32cm more of screen?

Solution:
The time taken to stop can be calculated by knowing that every second travelled, 8.5cm/s of speed is lost, so after 20/8.5=2.35 seconds, speed will be zero. We can approximate this deceleration by imagining Susan is travelling at 20cm/s for 1 second, 11.5cm/s for 1 second and 3cm/s for the remaining 0.35 seconds until she stops. This will cover more distance than the actual motion does (as your speed is lower than this for most of the time), but will cause you to travel only 31.6cm - so you will definitely stop within 32cm.

(In actual fact, the distance taken to stop will be 23.53cm, because your speed continues to decrease at a constant rate for the whole time. In order to work this out, you need to use a little calculus!)