

SOLVING PROBLEMS WITH COMPUTERS

Computer science is more than just the study of different programming languages or hardware parts. In most computer science careers, specialists use computer science thinking techniques to solve problems and puzzles and achieve specific goals.

In this activity, you will be presented with a set of real-world problems and goals that computer programmers, computer animators, and more, challenge themselves with each day. For each problem, we will discuss it, brainstorm ideas for addressing it, and then watch a video that presents one possible solution.

PROBLEM A: ANIMATING RAPUNZEL'S HAIR

Although film animations were once hand-drawn, the entertainment industry has switched to using computers for drawing. While this works well for most objects, some challenges arose when animators were asked to create some more complicated structures. In Disney's *Tangled*, animators were asked to create the main character Rapunzel's unusually long, golden hair, which was much more complicated than any animated hair ever seen before.



1.) What techniques might be used to approach such a problem?

- observe actual hair movement / hair styles
- hair color - different conditions (lighting, etc)
- see how length affects it
- see how many strands a human head would have

- sketch it out
- texture
- colors/shades
- wind, gravity, water

2.) If you were tasked with animating hair, where would you start?

- ① observe people with varying hair lengths
- ② work with artist/illustrator
- ③ put observations on paper
- ④ work with computer programmer/ animator to get movement

sometimes same people & sometimes different

SOLUTION FROM VIDEO
While watching the video, answer the following questions:

- What steps did they use to approach the problem?
 - studied real hair (observations)
 - = expert had PHD in hair simulation (computer science)
 - = research physics of the hair, formulas for calculating weight
 - simulations (3D simulations with the 173 strands)
- Did they make any significant choices or compromises in animating the hair?
 - hair was 60-80 pounds (she couldn't carry that in real life)
 - friction on the ground - hair could get caught
 - affects movement
 - average head of hair has 100,000 strands (they animated 173)
- Could similar approaches be used elsewhere?
 - observe anything
 - = clothing
 - = grass
 - animations of falling, swimming, running
 - boats in water
 - face movement
 - explosions
 - food, animals
 - anything in space
 - any special effects with magic
 - weather
 - tree/leaves/movement independent