Problem A: Traveling to the Moon

Part 1:
NASA is launching a rocket into space from Earth. This rocket burns its fuel for 5 minutes and then turns off its engines. At this point, the rocket keeps floating along through space at a speed of 10,000 m/s. What is the rocket's average acceleration during these first 5 minutes?

Part 2:
How far did the rocket travel during the first 5 minutes?

Part 3:
The Moon is approximately 380,000,000 meters from Earth.
At its final speed, how long will it take the rocket to reach the Moon? (You can neglect the first five minutes of the journey because it's not significant when you're talking about the entire distance)

Part 4:
The star nearest to us, called Alpha Centauri, is 41,000,000,000,000,000 meters away.
How long would the person have to be in hyper sleep to arrive at Alpha Centauri? (This is a real obstacle to NASA's plans of exploring other solar systems than our own!)

Part 5:
The rocket is halfway to the Moon when its pilot suddenly notices he forgot his camera! He radios a second rocket crew on Earth and tells them to bring his camera and meet him on the Moon when he lands. The second rocket can accelerate at 3 m/s^2 indefinitely.
Can this second rocket make it to the Moon before the first one lands?

Problem B: Stopping for Ms. Sage

Two students, Hugh and Mungus, are running in the hallway at 8 m/s. They both see Ms. Sage at the same time and skid to a halt. Hugh covers 4 meters before skidding to a halt. Mungus skids to a halt by accelerating at -10 m/s/s.

Part 1:
Based on the above information, who skids to a halt first?

Part 2:
When the first student skids to a halt, how fast is the other student still moving?

Part 3:
Let's say that Hugh and Mungus are running down the hallway at the **same speed.** They see Ms. Sage, and both come to a halt. Hugh covered 8 meters before skidding to a halt, and Mungus skids to a halt by accelerating at -4 m/s/s. If they come to a halt **at the same time,** how fast we they both running down the hallway?

Problem C: Lightening McQueen should change his tires

Lightening McQueen's tires blew out during a race, when he was 150 meters from the finish line, causing him to skid to the finish at a measly 5 m/s. His competitors, eventually catch up to him and pass the finish line at the same time he does, so it's a tie!

Part 1:
His competitors, Chick Hicks, and Doc Hudson, who changed their tires when they were supposed to, zipped along the race. Chick Hicks was driving at 45 m/s and Doc Hudson was driving at 48 m/s. How far behind were each of McQueen's competitors when his tires blew out?

Part 2:
McQueen decides to be smarter in the next race and change his tires. He pulls over 2500 meters from the finish line to change his tires. When he's 7 seconds away from returning to the track, Chick Hicks passes him at 50 m/s! When McQueen finishes changing his tires, he hits the accelerator and reaches his impressive speed of 60 m/s! If McQueen covers 240 meters while reaching his speed of 60 m/s, will he be able to beat Chick hicks to the finish line?
If yes, how many seconds did he win by?
If no, how many seconds did he lose by?

Problem D: Detective Bluto Mind-Pretzel on the Case

Bob's brakes on his 1000kg car broke, which led him to skidding across the street eventually coming to halt. Bob was going in a 45-mph zone (20.1 m/s), and the skid marks stretched 50 meters. If the coefficient of friction between the car and the street is 0.4, was Bob speeding before his tires broke?

Problem E: Interplanetary transport shuttle confusion.

You and your friends are going to the planet Vulcan for a birthday party. However, you're on a budget so you each board a cheaper interplanetary transport shuttle to get to Vulcan. The problem is, because this is a cheaper service, you all get dropped off on different planets. Frustratingly, you and your friends realize that trying to save money was a bad idea, and you all decide to pay a little bit more and take the more reliable transport company. You need to call the ITSS (Interplanetary Transport Shuttle Services) to pick you up from your planet and get you to Vulcan. However, you don't know what planet you're on!

However, you do have a handy book called "Hitchhiker's Guide to Planet's Gravitational Pull" and you know the following about each planet's acceleration due to gravity. Furthermore, you have a Pop up Popper toy so, you and your friends figure out a way to determine which planet you're on!

Determine which planet each person is on based on their dropper experiment!

Person	Maximum Height Reached	Time to reach maximum height
Tim Burr	17.5 meters	3.5 seconds
Tobe Lerone	30 meters	4.0 seconds
Jacqueline Hyde	4.5 meters	1.5 seconds
Amy Stake	7.5 meters	2.5 seconds

Planet	Gravity
Arrakis	2.4 m/s/s
Naboo	2.86 m/s/s
Caladan	3.75 m/s/s
Geidi Prime	4.0 m/s/s