CS 462: Assignment 5 - question 1:

Mars Rover:
- over rocky terrain: 2km/h → rocky = 2km/h
- over sandy terrain: 3km/h → sandy = 3km/h
- over smooth terrain: 5km/h → smooth = 5km/h

Routes:
- Route 1: 2km long, 20% sandy ($\frac{2}{3}=0.66$ hours), 30% smooth ($\frac{2}{5}=0.4$ hours), 50% rocky ($\frac{2}{1}=1$ hours)
- Route 2: 1.8km long, 40% sandy ($\frac{1.8}{3}=0.6$ hours), 20% smooth ($\frac{1.8}{5}=0.36$ hours), 40% rocky ($\frac{1.8}{2}=0.9$ hours)
- Route 3: 3.1km long, 50% sandy ($\frac{3.1}{3}=1.03$), 40% smooth ($\frac{3.1}{5}=0.62$), 10% rocky ($\frac{3.1}{2}=1.55$)

Expected Utility:
- EU(route 1): $(0.2\times0.66)+(0.3\times0.4)+(0.5\times1)=0.752$ hours
- EU(route 2): $(0.4\times0.6)+(0.2\times0.36)+(0.4\times0.9)=0.672$ hours
- EU(route 3): $(0.5\times1.03)+(0.4\times0.62)+(0.1\times1.55)=0.918$ hours

We should pick route 2 because it gives us the shortest time (0.672 hours)

Additional Information:
- Route1: contains crator, 30% chance it's damaged which will add 45min
- Route2: contains bridge, 60% chance it's damaged which will add 1 hour.

- EU(route 1): $(0.2\times0.66)+(0.3\times0.4)+(0.5\times1)+(0.3\times0.75)=0.977$ hours
- EU(route 2): $(0.4\times0.6)+(0.2\times0.36)+(0.4\times0.9)+(0.6\times1)=1.272$ hours
- EU(route 3): $(0.5\times1.03)+(0.4\times0.62)+(0.1\times1.55)=0.918$ hours

Now, we should pick route 3 because it gives us the shortest time (0.918 hours)

Value of Information:

- EU(route 3): ~~aftermarket~~ $(0.5\times0.62)+(0.672\times0.5)=0.646$ hours
  - 0.62: time it takes to travel route 3 given smooth
  - 0.672: route(2)
- EU(route 3) w/additional info: $(0.5\times0.62)+(0.977\times0.5)=0.7985$ hours
  - 0.977: route(1)

Value without additional info: $0.672-0.646=0.026$ hours

value with additional info: $0.918-0.7985=0.1195$

So, with the additional information we should wait 0.1195 hours, while without the additional information we should wait 0.026 hours

Chat GPT: when Chat GPT was fed the same mars rover problem, it was able to solve the first question but not the subsequent ones. The biggest mistake it made was in it's calculations where it got the wrong values for expected utility. Without the additional information, it was able to pick route 2 as the shortest route, even with bad calculations. However, once additional information was presented, the calculations broke down and Chat GPT said route 2 was still the best route, despite route 3 having the best EU with the right calculations for the given additional information. Chat GPT was unable to extract the value of information, instead giving a list of considerations we should make that would make the satellite information useful.