

Rules:

- Rocky = 2 km/h
- Sandy = 3 km/h
- Smooth = 5km/h
- If crater walls damaged, go around
- If bridge damaged, repair

Routes:

1. 2km
 - 0.2 sandy
 - 0.3 smooth
 - 0.5 rocky
 - Crater
 - i. 0.3 damaged = +0.75h
2. 1.8 km
 - 0.4 sandy
 - 0.2 smooth
 - 0.4 rocky
 - Bridge
 - i. 0.6 damaged = +1h
3. 3.1km
 - 0.5 sandy
 - 0.4 smooth
 - 0.1 rocky

Questions:

1. The rover should choose Route 2 due to the better estimated times given their probabilities. Best case scenario is 0.672 h expected.
 - a. Route 1: 0.752 h expected
 - i. $0.2 * 2 \text{ km} / 3 \text{ km/h} = 0.132\text{h}$
 - ii. $0.3 * 2 \text{ km} / 5 \text{ km/h} = 0.12\text{h}$
 - iii. $0.5 * 2 \text{ km} / 2 \text{ km/h} = 0.5\text{h}$
 - b. Route 2: 0.672 h expected
 - i. $0.4 * 1.8 \text{ km} / 3 \text{ km/h} = 0.24\text{h}$
 - ii. $0.2 * 1.8 \text{ km} / 5 \text{ km/h} = 0.072\text{h}$
 - iii. $0.4 * 1.8 \text{ km} / 2 \text{ km/h} = 0.36\text{h}$
 - c. Route 3: 0.918 h expected
 - i. $0.5 * 3.1 \text{ km} / 3 \text{ km/h} = 0.515\text{h}$
 - ii. $0.4 * 3.1 \text{ km} / 5 \text{ km/h} = 0.248\text{h}$
 - iii. $0.1 * 3.1 \text{ km} / 2 \text{ km/h} = 0.155\text{h}$
2. The rover should now choose Route 3. The estimated time remains at 0.918 h expected.
 - a. Route 1: 0.977 h expected
 - i. $0.3 * (0.752 + 0.75) \text{ h} = 0.4506\text{h}$
 - ii. $0.7 * 0.752 \text{ h} = 0.5264$

- b. Route 2: 1.272 h expected
 - i. $0.6 * (0.672 + 1) \text{ h} = 1.0032\text{h}$
 - ii. $0.4 * 0.672 \text{ h} = 0.2688\text{h}$
- c. Route 3: 0.918 h expected
- 3. We should be willing to wait for the satellite data the difference between the EU of the new information, and the EU of the second best scenario. We should be willing to wait for 0.1785 h. This is approximately 10 minutes and 43 seconds.
 - a. $0.5 * (3.1 \text{ km} / 5 \text{ km/h}) + 0.5 * 0.977 \text{ h} = 0.7985$
 - b. Final EU: $0.977 \text{ h} - 0.7985 \text{ h} = 0.1785 \text{ h}$

4. ChatGPT's response:

"Let's analyze each route step by step and calculate the expected time for each route.

Initial Analysis:

Route 1:

- Length: 2 km
- Terrain:
 - Sandy (20%): 3 km/h
 - Smooth (30%): 5 km/h
 - Rocky (50%): 2 km/h

Route 2:

- Length: 1.8 km
- Terrain:
 - Sandy (40%): 3 km/h
 - Smooth (20%): 5 km/h
 - Rocky (40%): 2 km/h

Route 3:

- Length: 3.1 km
- Terrain:
 - Sandy (50%): 3 km/h
 - Smooth (40%): 5 km/h
 - Rocky (10%): 2 km/h

Calculating Time for Each Route:

Route 1:

$$[(0.2 \times 3) + (0.3 \times 5) + (0.5 \times 2)] = 0.6 + 1.5 + 1 = 3.1 \text{ \textit{hours}}$$

Route 2:

$$[(0.4 \times 3) + (0.2 \times 5) + (0.4 \times 2)] = 1.2 + 1 + 0.8 = 3 \text{ \textit{hours}}$$

Route 3:

$$\lfloor (0.5 \times 3) + (0.4 \times 5) + (0.1 \times 2) = 1.5 + 2 + 0.2 = 3.7 \text{ \textit{ hours}} \rfloor$$

Additional Information:

Route 1 (with crater):

- 30% chance of damage, adding 45 minutes (0.75 hours)

$$\lfloor 3.1 + (0.3 \times 0.75) = 3.35 \text{ \textit{ hours}} \rfloor$$

Route 2 (with bridge):

- 60% chance of damage, adding 1 hour

$$\lfloor 3 + (0.6 \times 1) = 3.6 \text{ \textit{ hours}} \rfloor$$

Final Decision:

Comparing the adjusted times:

- Route 1: 3.35 hours

- Route 2: 3.6 hours

- Route 3: 3.7 hours

Given the new information, **Route 1** is the best choice.

Satellite Information for Route 3:

If we can use a satellite to find out whether the terrain in Route 3 is smooth, it would be helpful. The value of this information depends on the time it takes to receive the information versus the potential time savings.

If the time to receive the satellite information is less than the difference in time between Route 3 and the next best option (Route 1 or Route 2), then it's worth waiting for the information. Otherwise, it's more efficient to make a decision based on the available data.

In this case, the time difference between Route 3 and Route 1 is 0.35 hours (3.7 - 3.35). If the satellite information takes less than 0.35 hours to arrive, it's beneficial; otherwise, it's not worth waiting for."

The numbers that ChatGPT used were partially correct. The first step demonstrated usage of the correct numbers, however it multiplied the probabilities by the speed. Instead you should find the cost in hours, dividing the distance by the speed, then multiply that by the probability. For the third part, it reasons and it explained the reasoning very human-like. ChatGPT also used the right approach, but again the numbers were wrong from previous steps. Because estimated hours had already been calculated, this step's calculations used the right formula, but produced the wrong result due to the incorrect calculation in step 1.