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Intro to AI

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Assignment 5 Written Responses

Question 1

Which Route should we pick? Show your work.

I complicated things a bit by trying to have minutes as my units instead of hours in the middle of my equations. I converted the units to hours next to my answers in bold.

Route	Length	Sandy	Smooth	Rocky
1	2 km	0.2	0.3	0.5
2	1.8 km	0.4	0.2	0.4
3	3.1 km	0.5	0.4	0.1
Speeds	-	3 km/h	5 km/h	2 km/h

1. $0.2 * (\frac{2}{3} * 60) + 0.3 * (\frac{\%}{\%} * 60) + 0.5 * (1 * 60)$

a. $(0.2 * 40) + (0.3 * 24) + (0.5 * 60) = 45.2 \text{ minutes.} \sim \mathbf{0.7533 \text{ hours.}}$

2. $0.4 * (1.8/3 * 60) + 0.2 * (1.8/5 * 60) + 0.4 * (1.8/2 * 60)$

a. $(0.4 * 36) + (0.2 * 21.6) + (0.4 * 54) = 40.32 \text{ minutes.} \sim \mathbf{0.672 \text{ hours.}}$

3. $0.5 * (3.1/3 * 60) + 0.4 * (3.1/5 * 60) + 0.1 * (3.1/2 * 60)$

a. $(0.5 * 62) + (0.4 * 37.2) + (0.1 * 93) = 55.18 \text{ minutes.} \sim \mathbf{0.91966 \text{ hours.}}$

Route 2 is the best.

Now which Route should we pick? Show your work.

Route 1 has a crater. 30% chance of adding 45 minutes.

Route 2 has a bridge. 60% chance of adding 60 minutes.

1. $45.2 + (0.3 * 45) = 58.7$ minutes. ~ **0.97833 hours.**
2. $40.32 + (0.6 * 60) = 76.32$ minutes. ~ **1.272 hours.**
3. 55.18 minutes. ~ **0.91966 hours.**

Route 3 is now the best.

Now suppose that we can use a satellite to find out whether the terrain in route 3 is smooth. Is this helpful? What is the value of this information? Expressed differently, how long are we willing to wait for this information from the satellite?

1. 58.7 minutes. ~ **0.97833 hours.**
2. 76.32 minutes. ~ **1.272 hours.**
3. 55.18 minutes. ~ **0.91966 hours.**
 - a. If Route 3 is Smooth: 37.2 minutes. ~**0.62 hours.**
 - b. This information could be helpful as it could either guarantee a new fastest route, or tell us that the estimated trip length of Route 3 is actually longer than Route 1's estimated trip length.
 - c. "Value" or Estimated time of Route Satellite:
 - i. $(0.4 * 37.2) + (0.6 * 58.7) = 50.1 + X$ minutes. X represents the time spent waiting for the satellite to retrieve the information. I used 58.7 because Route 1 would be the best option if the satellite told us that Route 3 is not smooth. ~ **0.835+(X/60) hours.**
 - d. If we know how long the satellite will take ahead of time, the maximum time that we would be willing to wait for this information is found by solving for this X when compared to the original value of Route 3:

i. $55.18 - 50.1 = 5.08$ minutes. ~ 0.08466 hours.

Now put this problem into ChatGPT. Is it able to solve it correctly? If not, where does it make mistakes?

ChatGPT's Response:

Which route should we pick?

To determine which route is the best option, we'll calculate the expected travel time for each route based on the probabilities and terrain conditions given.

Let's calculate the expected travel time for each route:

For Route 1:

- 20% chance of sandy terrain at 3 km/h

- 30% chance of smooth terrain at 5 km/h

- 50% chance of rocky terrain at 2 km/h

Expected travel time for Route 1:

$$(0.20 * 2 \text{ km}) / 3 \text{ km/h} + (0.30 * 2 \text{ km}) / 5 \text{ km/h} + (0.50 * 2 \text{ km}) / 2 \text{ km/h}$$

$$= (0.40/3) + (0.60/5) + (1.00/2)$$

$$\approx 0.1333 \text{ hours}$$

← No idea how it got this number.

For Route 2:

- 40% chance of sandy terrain at 3 km/h

- 20% chance of smooth terrain at 5 km/h

- 40% chance of rocky terrain at 2 km/h

Expected travel time for Route 2:

$$(0.40 * 1.8 \text{ km}) / 3 \text{ km/h} + (0.20 * 1.8 \text{ km}) / 5 \text{ km/h} + (0.40 * 1.8 \text{ km}) / 2 \text{ km/h}$$

$$= (0.72/3) + (0.36/5) + (0.72/2)$$

≈ 0.24 hours

← Again.

For Route 3:

- 50% chance of sandy terrain at 3 km/h

- 40% chance of smooth terrain at 5 km/h

- 10% chance of rocky terrain at 2 km/h

Expected travel time for Route 3:

$$(0.50 * 3.1 \text{ km}) / 3 \text{ km/h} + (0.40 * 3.1 \text{ km}) / 5 \text{ km/h} + (0.10 * 3.1 \text{ km}) / 2 \text{ km/h}$$

$$= (1.55/3) + (1.24/5) + (0.155/2)$$

≈ 0.5167 hours

← I'm sure it has something to do with units.

Now, let's compare the expected travel times for each route:

- Route 1: Approximately 0.1333 hours

- Route 2: Approximately 0.24 hours

- Route 3: Approximately 0.5167 hours

Based on these calculations, Route 1 is the quickest option with the shortest expected travel time.

So, initially, we should pick Route 1.

← With its weird solutions, true.

Now which route should we pick?

Now, let's consider the additional information about Route 1 and Route 2:

- Route 1 contains a crater with a 30% chance that the wall is damaged, which could add 45 minutes (0.75 hours) to the journey.

- Route 2 contains a bridge with a 60% chance that it's damaged, which could add 1 hour (1.0 hours) to the journey.

We need to factor in the possibility of these delays when choosing the route.

For Route 1 with the damaged crater wall:

Expected travel time for Route 1 with damage:

$$0.1333 \text{ hours} + (0.30 * 0.75 \text{ hours})$$

$$= 0.1333 \text{ hours} + 0.225 \text{ hours}$$

$$\approx 0.3583 \text{ hours}$$

← But it added the right amount of hours here.

For Route 2 with the damaged bridge:

Expected travel time for Route 2 with damage:

$$0.24 \text{ hours} + (0.60 * 1.0 \text{ hours})$$

$$= 0.24 \text{ hours} + 0.6 \text{ hours}$$

$$= 0.84 \text{ hours}$$

← And here.

Now, let's compare the expected travel times with potential delays:

- Route 1 (with damage consideration): Approximately 0.3583 hours

- Route 2 (with damage consideration): Approximately 0.84 hours

- Route 3: Approximately 0.5167 hours (no additional information)

Considering the potential delays, Route 1 is still the quicker option, even with the possibility of a damaged crater wall. Therefore, we should pick Route 1.

← Not wrong reasoning.

Is satellite information helpful?

Now, let's consider the satellite information for Route 3. Knowing whether the terrain in Route 3

is smooth can be valuable, as it can significantly affect the travel time.

← True.

The expected travel time for Route 3 without the satellite information is approximately 0.5167

hours. If we can use a satellite to determine whether the terrain in Route 3 is smooth before

making a decision, we can avoid potential delays and make a more informed choice.

The value of this information depends on how long we are willing to wait for the satellite data. If

the satellite data can be obtained quickly and the delay is minimal, it is advisable to wait for the

information because it can potentially make Route 3 the fastest option if it turns out to be smooth. However, if waiting for the satellite data significantly delays the mission, it may be better to choose one of the other routes.

← Okay, so calculate it?

In summary, the value of the satellite information depends on the time it takes to obtain it and the potential impact on the travel time. If the delay is reasonable, waiting for the satellite data can be helpful in making the best choice.

← Avoided calculations, but its reasonings seem “human”.

- a. ChatGPT was not able to solve this problem correctly. Its calculations were almost correct, but I am confused how its addition in the end got screwed up as its answers were nowhere near the right numbers. It is possible that it got confused by the units? Although, it did properly add the time from the additional information on Routes 1 and 2. It was still overall wrong with Route 1 remaining as the fastest route. Also, its conclusion for if the satellite information would be useful was missing some information. It stuck to deductive reasoning rather than trying to mathematically see if the satellite would be helpful. ChatGPT did not even answer the whole question.