

Part 4: Utility

Rocky ter: $2 \text{ km/h} \Rightarrow 30 \text{ min/km}$

Sandy ter: $3 \text{ km/h} \Rightarrow 20 \text{ min/km}$

Smooth ter: $5 \text{ km/h} \Rightarrow 12 \text{ min/km}$

1) Which Route?

Formula: Route len * (Prob of ter * Time for ter)

$$\text{Route 1: } 5 \text{ km} * (0.5 * 30) + (0.2 * 20) + (0.3 * 12) \\ = 113 \text{ min}$$

$$\text{Route 2: } 7 \text{ km} * (0.4 * 30) + (0.4 * 20) + (0.2 * 12) \\ = 156.8$$

$$\text{Route 3: } 6 \text{ km} * (0.1 * 30) + (0.5 * 20) + (0.4 * 12) \\ = 106.8 \text{ min}$$

In this case we should take route #3

2) Take answers from route #1

$$\text{Route 1: } 5 \text{ km} * (0.5 * 30) + (0.2 * 20) + (0.3 * 12) \\ = 113 \text{ min} \\ \Rightarrow 113 + (0.3 * 15) + (0.7 * -20) \\ = 103.5$$

$$\text{Route 3: } 6 \text{ km} * (0.1 * 30) + (0.5 * 20) + (0.4 * 12) \\ = 106.8 \text{ min} \\ \Rightarrow 106.8 + (0.6 * 40) + (0.4 * 0) \\ = 130$$

Now, route 1 seems to be the best.

3) If route 2 is NOT rocky

First

$$\text{New Sandy Prob: } 40 / (40 + 20) = 0.67$$

$$\text{New Smooth Prob: } 20 / (40 + 20) = 0.33$$

$$7 \text{ km} * ((0.67 * 20) + (0.33 * 12))$$

$$= 121.52 \text{ min}$$

4) Second

$$P(\text{Rocky}) = 0.4 \Rightarrow P(\neg \text{Rocky}) = 0.6$$

5) Third: if the Gutsite tells us route 2 is risky, we take #1

Route # 1 = 103.5 min

↓
103.5 + waiting time for Gutsite

6) Forth:

our options:

take route 1 now = 103.5 min

wait ~~if~~ NOT risky = 121.52 + wait time

wait ~~if~~ Risky = 103.5 min + waiting

60% if Route 2 is not risky = (121.52 + time waiting)

40% if Route 2 is risky = (103.5 + time waiting)

So, if we wait:

$$(0.6 * (121.52 + x)) + (0.4 * (103.5 + x))$$

if we don't wait:

103.5 min

So,

$$(0.6 * (121.52 + x)) + (0.4 * (103.5 + x)) = 103.5$$

$$\Rightarrow x = -10.812$$

↙
This means we should not wait at all, because waiting only negatively impacts us