Critical Thinking & Problem Solving 06. Advanced Problem Solving Techniques

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Absence:

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Major:

Information Technology

Study Program:

Informatic Engineering

exercise

Combination Problems Mathematical, Probability and Decision Trees There are two ways I go to work, both involve a two-part journey.

• I can cycle to the bus stop; it usually takes 5 minutes, or 15 minutes if the railroad crossing is closed on the road, which happens on 10%of occasions.

• A bus takes an average of 5 minutes to arrive. I took the first bus, which may have been a slow bus that took 30 minutes or a fast bus that took 15 minutes. Chances of I get a slow bus is 20%.

• Or, I could drive to the Park and Ride parking lot.

• Driving normally takes 15 minutes, but about half the time there is a traffic jam and it takes 20 minutes.

• When I get to Park and Ride, sometimes I get the bus right away, but there's a 60% chance I'll have to wait 10 minutes for the next bus.

• The bus took 10 minutes to take me to work.

1 What is my shortest time to start work?

2 On average, what is my best option for going to work and how much time do I need?

3 What is the probability that the first trip option takes 40 minutes or more?

Answer

1. The shortest time I can get to work is approximately 25 minutes. 5 minutes is used to cycle to the bus stop, then another 5 minutes to wait for the bus. Then take the fast bus with a duration of 15 minutes. So 25 minutes is obtained from 5 minutes + 5 minutes + 15 minutes. It can be less than 25 minutes if the fast bus comes immediately so that I don't have to wait anymore.
2. Average use of a bicycle :

   1. No trains pass + fast bus + waiting for bus.

   5 minutes + 5 minutes + 15 minutes = 25 minutes

   Chance of getting a fast bus and chance of no trains passing.

   80 x 90 / 100 = 72%

   Total = 25 minutes x 72% = 18 minutes

   2. No train passing + slow bus + waiting for bus.

   5 minutes + 30 minutes + 5 minutes = 40 minutes

   Chance of getting a slow bus and chance of no train passing.

20 x 90 / 100 = 18%

Total = 40 minutes x 18% = 7.2 minutes

3. Passing train + fast bus + waiting for bus.

15 + 15 + 5 = 35 minutes

Chance of getting a fast bus and chance of trains passing.

80 x 10 / 100 = 8%

Total = 35 minutes x 8% = 2.8 minutes

4. Train passes + slow bus + waiting for bus.

15 + 30 + 5 = 50 minutes

Chance of getting a slow bus and chance of a train passing.

20 x 10 / 100 = 2%

Total = 50 minutes x 2% = 1 minute

Average use of a bicycle = 18 minutes + 7.2 minutes + 2.8 minutes + 1 minute = 29 minutes

Average driving = 5 minutes + 10.5 minutes + 6 minutes + 12 minutes = 33.5 minutes

So, the best option for commuting to work is to use a bicycle with a travel time of 29 minutes.

3. Using a bicycle:

1. No passing train + slow bus + waiting for the bus.

5 minutes + 30 minutes + 5 minutes = 40 minutes

Chance of getting a slow bus and chance of no train passing.

20 x 90 / 100 = 18%

2. Passing train + slow bus + waiting for bus.

15 minutes + 30 minutes + 5 minutes = 50 minutes

Chance of getting a slow bus and chance of a train passing.

20 x 10 / 100 = 2%

Probability = 18% + 2% = 20%

So the probability that the first travel option takes approximately 40 minutes is 20%.