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PA: 5231

Route Scheduling Part 1

11/10/22

1. What is the minimum cycle time? [10% of the grade]

First, we calculated running time in one direction:

12 miles / 18mph = 0.667 hours = 40 minutes

Multiplied by two for both directions.

40 minutes \* 2 = 80 minutes

The running time is added to the available layover time (calculated in part b) to determine the total minimum cycle time.

80 minutes + 10 minutes = 90 minutes

**The minimum cycle time is 90 minutes.**

1. What is the available layover time? [10%]

The minimum layover time per round trip is established at 10% of the round trip running time.

80 minutes \* 10% = 8 minutes of layover time minimum.

However, the available layover time should allow for cycle lengths compatible with the desired headways. The following calculations were considered:

(30 minutes \* 3 trips) – 80 minutes = 10 minutes of available layover time

(7.5 minutes \* 12 trips) – 80 minutes = 10 minutes of available layover time

(15 minutes \* 6 trips) – 80 minutes = 10 minutes of available layover time

**The available layover time is therefore 10 minutes**.

1. How many cars does rail operator need to buy? [10%]

At the most frequent headway of 7.5 minutes, the rail operator will need the most trains. We divide the cycle time by headway to determine the number of trains.

90 minutes / 7.5 minutes = 12 trains

There are two cars per train, so multiple by 2:

12 trains \* 2 cars/train = 24 cars

**The rail operator needs to buy 24 cars.**

1. Using the template, develop a master schedule for southbound and northbound and for weekday and weekend. Intermediate time points are not required. [10%]

The master schedule for weekday and weekend southbound and northbound trips are presented in the **attached excel document**. It can also be found [here](https://docs.google.com/spreadsheets/d/1zywGapxro4dPItbygoUPqWRbO8hQskVk/edit?usp=sharing&ouid=114623448854841168289&rtpof=true&sd=true).

1. Complete a blocking sheet for only one block, in which the train starts revenue service at 7:15 am on weekdays. Hint: The last revenue trip of a block has no layover time. [10%]

The block summary is available in the attached excel document referenced in part d, but is also presented below in **Table 1**.

**Table 1: Blocking Sheet for 7:15 AM Weekdays Revenue Service**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Southbound | | | | Northbound | | | |  |
| Block # | Pull Out | Trip # | Depart Maple Grove | Arrive Target Field | Available for Next Trip | Trip # | Depart Target Field | Arrive Maple Grove | Available for Next trip | Pull In |
| 7815 | 4:05:00 |  |  |  |  | 7815-1 | 4:15:00 | 4:55:00 | 5:00:00 |  |
|  |  | 7815-4 | 6:30:00 | 7:10:00 | 7:15:00 | 7815-5 | 7:15:00 | 7:55:00 | 8:00:00 |  |
|  |  | 7815-6 | 8:00:00 | 8:40:00 | 8:45:00 | 7815-7 | 8:45:00 | 9:25:00 | 9:30:00 |  |
|  |  | 7815-8 | 9:30:00 | 10:10:00 | 10:15:00 | 7815-9 | 10:15:00 | 10:55:00 | 11:00:00 |  |
|  |  | 7815-10 | 11:00:00 | 11:40:00 | 11:45:00 | 7815-11 | 11:45:00 | 12:25:00 | 12:30:00 |  |
|  |  | 7815-12 | 12:30:00 | 13:10:00 |  |  |  |  |  | 13:20:00 |

1. Complete the block summary recap of all blocks. [10%]

The block summary is available in the attached excel document referenced in parts d and e, but can also be seen below in **Table 1**.

**Table 1: Block Summary Recap**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Block No | Pull out | First revenue time | Last revenue time | Pull in | Platform hours |
| 7801 | 4:05 | 4:15 | 12:25 | 12:40 | 8:35 |
| 7802 | 3:50 | 4:00 | 12:55 | 13:05 | 9:15 |
| 7803 | 5:50 | 6:00 | 14:55 | 15:05 | 9:15 |
| 7804 | 7:05 | 7:15 | 16:10 | 16:20 | 9:15 |
| 7805 | 7:35 | 7:45 | 16:40 | 16:50 | 9:15 |
| 7806 | 8:05 | 8:15 | 17:10 | 17:20 | 9:15 |
| 7807 | 13:00 | 13:10 | 21:25 | 21:35 | 8:35 |
| 7808 | 12:50 | 13:00 | 21:55 | 22:05 | 9:15 |
| 7809 | 15:30 | 15:40 | 23:55 | 0:05 | 8:35 |
| 7810 | 16:05 | 16:15 | 22:15 | 22:25 | 6:20 |
| 7811 | 16:35 | 16:45 | 22:40 | 22:50 | 6:15 |
| 7812 | 21:20 | 21:30 | 2:40 | 2:50 | 5:30 |
| 7813 | 23:50 | 0:00 | 2:55 | 3:05 | 3:15 |
| 7814 | 21:50 | 22:00 | 2:25 | 2:35 | 4:45 |
| 7815 | 4:05:00 | 4:15:00 | 13:10:00 | 13:20:00 | 9:15:00 |
| 7816 | 3:50:00 | 4:00:00 | 12:55:00 | 13:05:00 | 9:15:00 |
| 7817 | 4:20:00 | 4:30:00 | 13:25:00 | 13:35:00 | 9:15:00 |
| 7818 | 6:50:00 | 7:00:00 | 15:55:00 | 16:05:00 | 9:15:00 |
| 7819 | 6:57:30 | 7:07:30 | 9:17:30 | 9:27:30 | 2:30:00 |
| 7820 | 7:12:30 | 7:22:30 | 9:32:30 | 9:42:30 | 2:30:00 |
| 7821 | 7:20:00 | 7:30:00 | 16:25:00 | 16:35:00 | 9:15:00 |
| 7822 | 7:27:30 | 7:37:30 | 9:02:30 | 9:12:30 | 1:45:00 |
| 7823 | 6:57:30 | 7:07:30 | 9:17:30 | 9:27:30 | 2:30:00 |
| 7824 | 7:05:00 | 7:15:00 | 16:10:00 | 16:20:00 | 9:15:00 |
| 7825 | 7:12:30 | 7:22:30 | 9:32:30 | 9:42:30 | 2:30:00 |
| 7826 | 7:27:30 | 7:37:30 | 9:02:30 | 9:12:30 | 1:45:00 |
| 7827 | 13:05:00 | 13:15:00 | 18:25:00 | 18:35:00 | 5:30:00 |
| 7828 | 12:50:00 | 13:00:00 | 17:25:00 | 17:35:00 | 4:45:00 |
| 7829 | 13:20:00 | 13:30:00 | 22:25:00 | 22:35:00 | 9:15:00 |
| 7830 | 14:57:30 | 15:07:30 | 18:47:30 | 18:57:30 | 4:00:00 |
| 7831 | 15:12:30 | 15:22:30 | 19:02:30 | 19:12:30 | 4:00:00 |
| 7832 | 15:27:30 | 15:37:30 | 18:32:30 | 18:42:30 | 3:15:00 |
| 7833 | 14:57:30 | 15:07:30 | 18:47:30 | 18:57:30 | 4:00:00 |
| 7834 | 15:50:00 | 16:00:00 | 22:40:00 | 22:50:00 | 7:00:00 |
| 7835 | 15:12:30 | 15:22:30 | 19:02:30 | 19:12:30 | 4:00:00 |
| 7836 | 15:27:30 | 15:37:30 | 18:32:30 | 18:42:30 | 3:15:00 |
| 7837 | 16:20:00 | 16:30:00 | 23:10:00 | 23:20:00 | 7:00:00 |
| 7838 | 16:05:00 | 16:15:00 | 22:10:00 | 22:20:00 | 6:15:00 |
| 7839 | 17:20:00 | 17:30:00 | 22:40:00 | 22:50:00 | 5:30:00 |
| 7840 | 18:20:00 | 18:30:00 | 22:10:00 | 22:20:00 | 4:00:00 |
| 7841 | 22:20:00 | 22:30:00 | 2:55:00 | 3:05:00 | 4:45:00 |
| 7842 | 22:50:00 | 23:00:00 | 2:40:00 | 2:50:00 | 4:00:00 |
| 7843 | 23:20:00 | 23:30:00 | 2:25:00 | 2:35:00 | 3:15:00 |