MODELOFF™

Financial Modeling World Championships 2017

Round 2 Section 2 - Case Study Information Pack

Section 2: Late Again

Relates to Questions 14-25

45 Marks available in this Section - Estimated time is 50-75 minutes

INSTRUCTIONS

You are employed by a local provider of heavy rail passenger services called ModelOff Trains ("MOT"). You have been provided 5 weekdays of data on train performance and need to conduct analysis on the data for senior management at MOT. There are three parts to the required analysis:

Part 1) Create a full schedule of all 840 data points that MOT collect daily (questions 14 - 15).

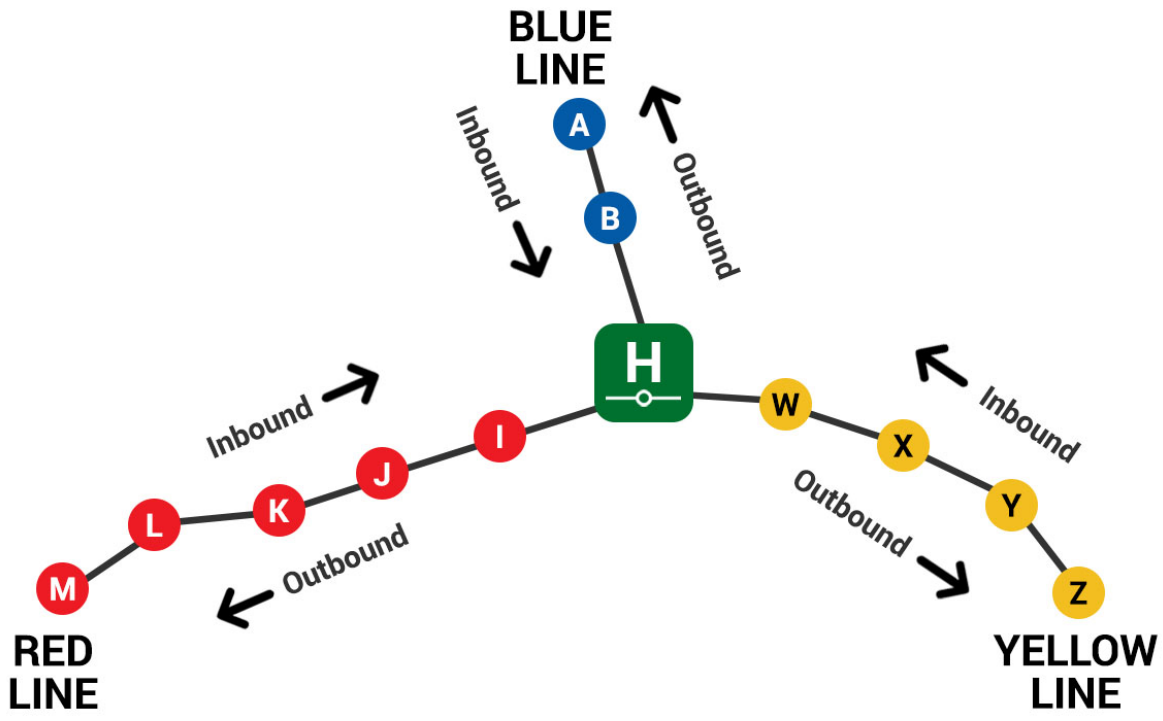
Part 2) Clean up the data provided from the MOT systems (of the actual time) into a form usable for analysis
(questions 16 - 19).

Part 3) Answer certain questions put to you by MOT senior management (questions 20 - 24).

It is recommended that you read the questions for all parts before beginning your modeling.

BACKGROUND

The rail network has 3 lines. These are the Blue line (3 stations), Red line (6 stations) and Yellow line (5 stations). All stations feed a central transport hub known as 'H'. Travel occurs in both directions with two sets of tracks per line (one track inbound, one track outbound). Travel towards 'H' is referred to as Inbound and traffic away from it as Outbound. The rail network is shown in the diagram below.



SCHEDULE

The weekday schedule for all three lines is provided below (and is contained in the provided Excel workbook).

There are four periods each day when service is provided (AM, Mid, PM and Evening). The frequency within each period is provided. For example, for the Red Inbound AM service, the first train departs M at 7am and runs every 20 minutes. Therefore services will depart M at 7:00am, 7:20am, 7:40am, 8:00am, 8:20am and 8:40am. The first Mid service departs at 9:00am.

The times listed are the scheduled departure times from each station (with the exception of the last stop on each line, which is the scheduled arrival time).

Red - Inbound

	Frequency (mins)	M	L	K	J	I	H
AM	20	7:00 AM	7:10 AM	7:17 AM	7:23 AM	7:29 AM	7:33 AM
Mid	30	9:00 AM	9:10 AM	9:17 AM	9:23 AM	9:29 AM	9:33 AM
PM	40	5:00 PM	5:10 PM	5:17 PM	5:23 PM	5:29 PM	5:33 PM
Evening	60	7:00 PM	7:10 PM	7:17 PM	7:23 PM	7:29 PM	7:33 PM
Final service		11:00 PM	11:10 PM	11:17 PM	11:23 PM	11:29 PM	11:33 PM

Red - Outbound

	Frequency (mins)	H	I	J	K	L	M
AM	40	7:00 AM	7:04 AM	7:10 AM	7:16 AM	7:23 AM	7:33 AM
Mid	30	9:00 AM	9:04 AM	9:10 AM	9:16 AM	9:23 AM	9:33 AM
PM	20	5:00 PM	5:04 PM	5:10 PM	5:16 PM	5:23 PM	5:33 PM
Evening	60	7:00 PM	7:04 PM	7:10 PM	7:16 PM	7:23 PM	7:33 PM
Final service		11:00 PM	11:04 PM	11:10 PM	11:16 PM	11:23 PM	11:33 PM

Yellow - Inbound

	Frequency (mins)	Z	Y	X	W	H
AM	20	7:00 AM	7:12 AM	7:20 AM	7:25 AM	7:28 AM
Mid	30	9:00 AM	9:12 AM	9:20 AM	9:25 AM	9:28 AM
PM	40	5:00 PM	5:12 PM	5:20 PM	5:25 PM	5:28 PM
Evening	60	7:00 PM	7:12 PM	7:20 PM	7:25 PM	7:28 PM
Final service		11:00 PM	11:12 PM	11:20 PM	11:25 PM	11:28 PM

Yellow - Outbound

	Frequency (mins)	H	W	X	Y	Z
AM	40	7:00 AM	7:03 AM	7:08 AM	7:16 AM	7:28 AM
Mid	30	9:00 AM	9:03 AM	9:08 AM	9:16 AM	9:28 AM
PM	20	5:00 PM	5:03 PM	5:08 PM	5:16 PM	5:28 PM
Evening	60	7:00 PM	7:03 PM	7:08 PM	7:16 PM	7:28 PM
Final service		11:00 PM	11:03 PM	11:08 PM	11:16 PM	11:28 PM

Blue - Inbound

	Frequency (mins)	A	B	H
AM	20	7:00 AM	7:16 AM	7:24 AM
Mid	30	9:00 AM	9:16 AM	9:24 AM
PM	40	5:00 PM	5:16 PM	5:24 PM
Evening	60	7:00 PM	7:16 PM	7:24 PM
Final service		11:00 PM	11:16 PM	11:24 PM

Blue - Outbound

	Frequency (mins)	H	B	A
AM	40	7:00 AM	7:08 AM	7:24 AM
Mid	30	9:00 AM	9:08 AM	9:24 AM
PM	20	5:00 PM	5:08 PM	5:24 PM
Evening	60	7:00 PM	7:08 PM	7:24 PM
Final service		11:00 PM	11:08 PM	11:24 PM

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PART 1 – FULL TRAIN SCHEDULE (QUESTIONS 14 – 15)

Based on the schedule information provided, complete a full list of all 840 stops scheduled to occur in one day.

PART 2 – CLEANING THE DATA (QUESTIONS 16 – 19)

Data has been provided for 5 weekdays (a total of 4,200 data points). Unfortunately, there are a variety of data input methods that can be used and as such the data needs to be put into a standardized format for meaningful analysis to be completed. Each data point is a single cell and contains three fields that must be extracted. These are:

1) **Date**. Between 6 and 10 November inclusive. There are two date formats used: for example, 6 November will be shown as either 6-Nov or 6/Nov.
2) **Time**. The actual departure time (or arrival time for the last stop on the line). This is always expressed in the same format and includes AM/PM.
3) **Station code.** This consists of three letters showing the line, direction of travel and the station the departure/arrival occurs at (using the first letter of each).
   For example, a departure on the **R**ed line on the **I**nbound direction from station **K** would have the 3 letter code **RIK**. Sometimes there are additional characters in this code (i.e. RIK or R:I:K or R-I-K or R/I/K).

Additionally, these three fields can occur in any order. There is always a single space separating each of the fields.

PART 3 – ANALYZING THE DATA (QUESTIONS 20 – 24)

Once the data is cleaned up, you can compare it against the schedule you calculated in Part 1 to answer these questions.

For Questions 14-18, 20-22, select your answer from a multiple choice list.
For Questions 19, 23- 24, you are required to type in your answer.

Prepare your model and then use it to answer the given questions.
When finished, please upload your workbook (Question 25).

QUESTIONS

Question 14

What is the total number of stops made on the Red line in a day? Include both Outbound and Inbound services, and include both the starting and ending station of each service. [3 marks]

A. 320

B. 325

C. 330

D. 335

E. 340

F. 345

G. 350

H. 355

I. 360

Question 15

For one day, what is the total number of stops scheduled for 23 minutes past the hour? [3 marks]

A. 31

B. 32

C. 33

D. 34

E. 35

F. 36

G. 37

H. 38

I. 39

Question 16

On the 6th November, the Red line Inbound was scheduled to arrive at station J at 8:43 a.m. When did this service actually arrive? [4 marks]

A. 8:42 a.m.

B. 8:43 a.m.

C. 8:44 a.m.

D. 8:45 a.m.

E. 8:46 a.m.

F. 8:47 a.m.

G. 8:48 a.m.

H. 8:49 a.m.

I. 8:50 a.m.

Question 17

What is the latest arrival time of any service over the 5 days? [4 marks]

A. 11:39 p.m.

B. 11:40 p.m.

C. 11:41 p.m.

D. 11:42 p.m.

E. 11:43 p.m.

F. 11:44 p.m.

G. 11:45 p.m.

H. 11:46 p.m.

I. 11:47 p.m.

Question 18

What is the earliest departure time of any service on the 9th of November? [4 marks]

A. 6:56 a.m.

B. 6:57 a.m.

C. 6:58 a.m.

D. 6:59 a.m.

E. 7:00 a.m.

F. 7:01 a.m.

G. 7:02 a.m.

H. 7:03 a.m.

I. 7:04 a.m.

Question 19

On the 8th of November, what was the total length of time (in minutes) of the first Outbound service on the Yellow line? [4 marks]

Question 20

What is the highest number of minutes that any departure/arrival was behind schedule? [4 marks]

A. 13

B. 14

C. 15

D. 16

E. 17

F. 18

G. 19

H. 20

I. 21

Question 21

On the 10th of November on the blue line, how many departures/arrivals were ahead of schedule? [4 marks]

A. 46

B. 47

C. 48

D. 49

E. 50

F. 51

G. 52

H. 53

I. 54

Question 22

Which of the following stops had the highest average difference between the scheduled arrival time and the actual arrival time over the 5 days? (Average is calculated as the mean of the differences, you should not take the absolute value of the differences) [5 marks]

A. RIH

B. ROM

C. YIH

D. YOZ

E. BIH

F. BOA

Question 23

How many departures and arrivals were exactly on schedule over the 5 days? [5 marks]

Question 24

What was the longest a trip took (in minutes) on the Yellow line in either direction over the 5 days? (i.e. from H-Z or Z-H) [5 marks]

Answers

14	I	360
15	E	35
16	F	8:47 a.m.
17	H	11.46 p.m.
18	B	6:57 a.m.
19	-	34
20	G	19
21	D	49
22	C	YIH
23	-	298
24	-	42