

AUTOMATIC LAYOUT OF METRO MAPS USING MULTICRITERIA OPTIMIZATION

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Abstract

Abstract goes here.

Acknowledgements

I would like to thank...

Chapter 1

Empirical Evaluation

1.1 Introduction

In the previous chapters, a number of aesthetic criteria for automatically drawing metro maps have been detailed, together with a method that combines these criteria in order to actually produce some automatically drawn metro maps. In order to validate these criteria and to show that the maps produced using this method are suitable, an empirical experiment involving a number of human subject performing route-planning tasks with a variety of different metro maps was devised.

1.2 Hypotheses

As introduced at the beginning of Chapter ??, a number of design principles have evolved throughout the history of the schematic metro map. When combined, these principles are thought to provide a map that is of greater quality than a map that doesn't follow the principles (for example, a geographic map of the metro system). Direct measurement of the quality of a map directly is hard (and is essentially what the multicriteria optimisation method aims to achieve!), so we

instead intended to indirectly measure the quality by asking human participants to perform common route-planning tasks and comparing their speed and accuracy.

We have three hypotheses:

1. Maps drawn according to a metro map metaphor are better than those that are not with respect to the time that it takes to use the map for route-planning.
2. Maps drawn according to a metro map metaphor are better than those that are not with respect to the accuracy of finding the optimal route.
3. People “prefer” maps that are drawn according to a metro map metaphor over those that are not.

In order to be able to verify these hypotheses, we devised methods that will allow us to measure the accuracy and the time that it takes for someone to use a map for simple route-planning tasks, as well as a method to illicit the preference of one map over another. We chose two different types of questions that would be posed in order to ascertain the suitability of a map for route-planning:

1. How many changes are required to get from *Station X* to *Station Y*?
2. How many stations do I go through to get from *Station X* to *Station Y*?

These questions were chosen on the basis that they are likely to require the most common route-planning tasks when people use metro maps.

We used maps of six different real-life metro systems:

1. Atlanta Metropolitan Area Rapid Authority (MARTA) Rail Map [?].
2. Bucharest Metro Map [?].
3. Mexico City *Sistema de Transporte Colectivo* Map [?].

Table 1.1: Characteristics of metro maps used in the empirical evaluation.

Map	Stations	Lines
Atlanta	39	2
Bucharest	45	3
Mexico City	175	11
Stockholm	102	3
Toronto	70	4
Washington D.C.	85	5

4. Stockholm *Tunnelbana* Map [?].
5. Toronto Transit Commission (TTC) Subway/RT Route Map [?].
6. Washington Metropolitan Area Transit Authority (WMATA) Metro System Map [?].

These maps differ in characteristics and complexity from a fairly simple two-line, centralised network in the case of Atlanta through to a complex, highly-interconnected, decentralised map in the case of Mexico City. Table 1.1 gives details of the characteristics in terms of number of stations (nodes) and lines of each map. Three variants of each map were used: one of which was a geographic representation of the stations, the second was a representation of the published map and the third was drawn using the method described earlier in this thesis. We also used the Recife metro map as a training map so that subjects had time to familiarise themselves with the procedure.

One of the problems in using published maps is that they all use different graphic design approaches. We decided that all three maps would be drawn using the same graphic design to remove any question of the way that features such as stations and lines are drawn making a difference to the subjects' route planning tasks. All 18 maps as used in the evaluation are shown in Appendix A: Section A.1.1 (Atlanta), Section A.1.2 (Bucharest), Section A.1.3 (Mexico City),

Table 1.2: Number of subjects in each experiment group.

Group	Number of subjects
A	13
B	15
C	15

Section A.1.4 (Stockholm), Section A.1.5 (Toronto) and Section A.1.6 (Washington D.C.).

1.3 Methodology

We conducted a number of experiments over a two-week period. A total of 43 subjects participated, nearly all of whom were Computer Science undergraduates. [★ How is this representative?] As a number of experiments were run, we attempted to ensure that each experiment was as identical as possible in order to reduce any potential external influences. We split the set of subjects into three groups which we called A, B and C and ensured that each group contained roughly the same number of subjects. The number of subjects in each group is shown in Table 1.2.

Each group would receive exactly the same questions and in exactly the same order but they would only see one variant of each map per group for each question. For example, for question a using the Atlanta map, all subjects in all groups are performing the same task but group A will be doing this with the normalised published map, group B will use the geographic map and group C will use the automatically drawn map. The purpose of this was to ensure that the possibilities of learning the map between questions - while not completely eliminated - can at least be reduced as much as possible.

In order to conduct the experiment, a software application was written which ensured a controlled environment when showing the maps. The application took

Figure 1.1: Screenshot of the software application used to conduct the empirical evaluation.

over the entire screen of the computer, ensuring that nothing else on the computer would distract the subjects. Interaction with the software during the tests was entirely with the mouse. Using a software application in this manner allowed us to time each question in the experiment accurately and also to automatically see whether they answered correctly or incorrectly and to collate the results. It also allowed the environment to be more closely controlled and ensured uniformity amongst each subject. A screenshot of the software application is shown in Figure 1.1.

The following procedure was used for each experiment:

1. Subjects were directed to a specific computer. They were told not to touch anything until directed. Each computer in the room had previously been configured for a specific groups' questions.
2. A preliminary script was read out. This script introduced the subjects to the minimum amount of information that they needed in order to understand the questions asked of them in the experiment. To remove any potential ambiguity, explanations of terminology used were provided in the script, including *Metro Map*, *station* and *line*. The script also mentioned that any stations joined by a line in a single colour are connected by direct services and that where two or more lines pass through a single station it is possible to change from one line to another. The script included examples of questions that the subjects would be answering and introduced them to the application interface. To do this, two sample questions are worked by demonstrating the application to the subjects using an overhead projector. The script placed emphasis on the need to get questions correct and subjects were asked not to rush the questions. The script informed the subjects that the questions would be timed and were told during which parts of each question that timing was measured. The full script is shown in Appendix A, Section A.2.1.
3. The subjects were told when they could commence answering with the software application. Everyone started at the same time and were presented questions for 20 minutes. We decided to limit the total duration of the test so that everyone started and finished at the same time. This way we could avoid any anxiety that could be caused by one subject finishing before another. We chose 20 minutes as being a more-than-ample time in which to answer the minimum number of questions that we needed. If a subject

managed to complete these questions they continued to be presented with questions until the 20 minutes was up. Each question proceeded in the following manner:

- (a) The map is shown together with the question. Timing of the subjects' answers started as soon as the map, question and potentials answers were shown.
 - (b) The subject selects their answer from a list of five potential answers by clicking on a radio button. They can change their mind at this point but they must have selected an answer before they could continue.
 - (c) When an answer is selected, the subject had to click on a button to continue. When this button was clicked, timing of that question stopped.
 - (d) The subject then selected their perception of the level of difficulty from a list of five options from "very hard" to "very easy". The subjects were able to rest at this point before continuing to the next question.
 - (e) The subject then clicks on another button in order to proceed to the next question.
4. After 20 minutes had elapsed, the subjects were presented with a screen that showed them how many questions they got correct or incorrect. For any questions that they got incorrect, they were shown the correct answer as well as the answer that they gave.
 5. A second script was then read out which introduced the subjects to the questionnaire. The questionnaire was in two parts: the first involved viewing the three variants of each map on the overhead projector screen and them being asked to write down their preference for each variant from "most preferable" to "least preferable", the second involved answering four questions:

- (a) Have you seen any of the metro maps shown here before these tests?
If so, which ones?
 - (b) Which features of the metro map layout did you find most helpful when completing the tests?
 - (c) Which features of the metro map layout did you find least helpful when completeing the tests?
 - (d) Did you find about of the questions ambiguous?
6. The subjects were then rewarded with £5 for their time and were allowed to leave.

1.4 Results

★ Statistical results here. Reference raw results in Appendix. Highlight significant/insignificant results.

- ★ Charts?
- ★ Preference for particular map.
- ★ Highlight responses in questionnaire.
- ★

1.5 Analysis

- ★
- ★
- ★

1.6 Conclusion

★ Which hypotheses are confirmed? Which hypotheses are unconfirmed?

★ Any future investigation to assess other hypotheses or unconfirmed hypotheses.

★

Appendix A

Empirical Evaluation

A.1 Questions and Maps Used

A.1.1 Atlanta

- Geographic map (Figure A.1).
- Normalised published map (Figure A.2).
- Automatically-drawn map (Figure A.3).

Table A.1: Atlanta questions.

Number	Question	Answer Options	Answer
1.a	How many stations do you pass through to get from ‘Bankhead’ to ‘Lenox’	{8, 9, 10, 11, 12}	10
1.b	How many stations do you pass through to get from ‘Vine City’ to ‘Midtown’	{4, 5, 6, 7, 8}	5
1.c	What is the minimum number of changes to get from ‘Indian Creek’ to ‘West Lake’	{0, 1, 2, 3, 4}	0
1.d	What is the minimum number of changes to get from ‘College Park’ to ‘Five Points’	{0, 1, 2, 3, 4}	0

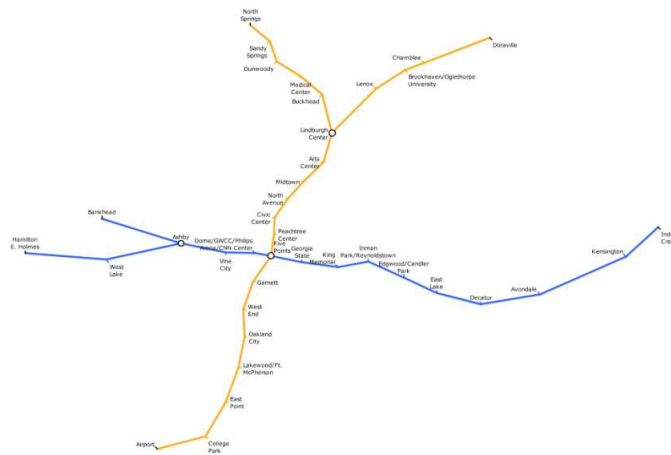


Figure A.1: Atlanta MARTA geographic map.

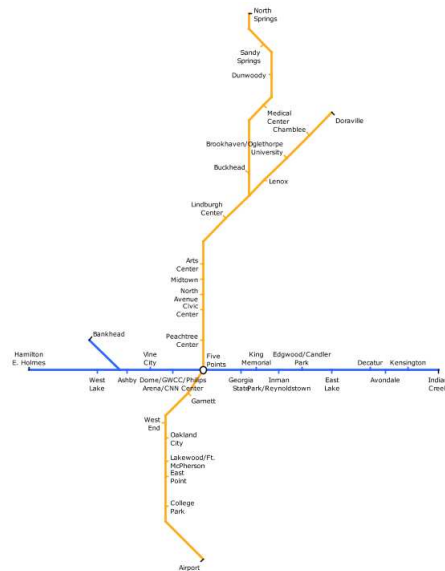


Figure A.2: Atlanta MARTA normalised published map.



Figure A.3: Atlanta MARTA automatically-drawn map.

A.1.2 Bucharest

- Geographic map (Figure A.4).
- Normalised published map (Figure A.5).
- Automatically-drawn map (Figure A.6).

Table A.2: Bucharest questions.

Number	Question	Answer Options	Answer
2.a	How many stations do you pass through to get from ‘Pacii’ to ‘Titan’	{9, 10, 11, 12, 13}	10
2.b	How many stations do you pass through to get from ‘Romana’ to ‘Piata Sudului’	{1, 2, 3, 4, 5}	5
2.c	What is the minimum number of changes to get from ‘Eroilor’ to ‘Iancului’	{0, 1, 2, 3, 4}	0
2.d	What is the minimum number of changes to get from ‘Eroii Revolutiei’ to ‘1 Mai’	{0, 1, 2, 3, 4}	2

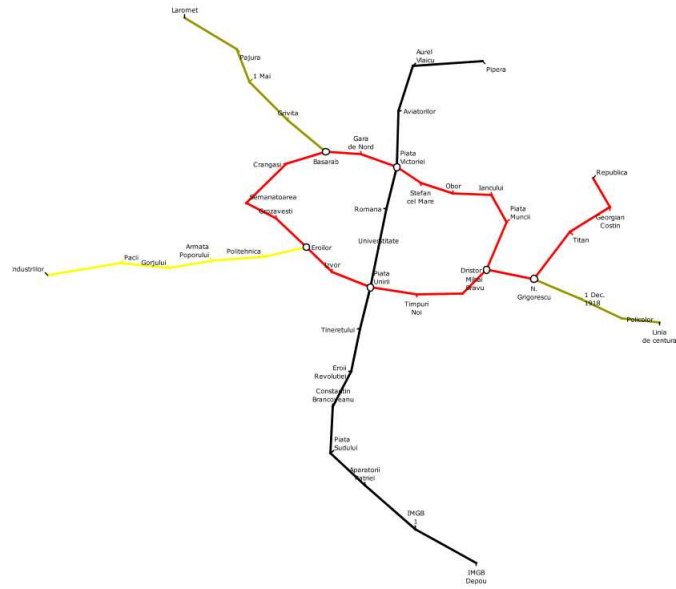


Figure A.4: Bucharest geographic map.

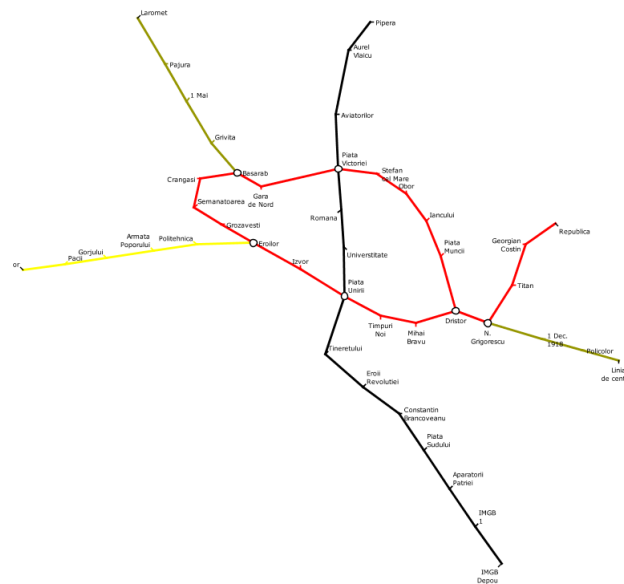


Figure A.5: Bucharest normalised published map.



Figure A.6: Bucharest automatically-drawn map.

A.1.3 Mexico City

- Geographic map (Figure A.7).
- Normalised published map (Figure A.8).
- Automatically-drawn map (Figure A.9).

Table A.3: Mexico City questions.

Number	Question	Answer Options	Answer
3.a	How many stations do you pass through to get from ‘Balderas’ to ‘Consulado’	{4, 5, 6, 7, 8}	7
3.b	How many stations do you pass through to get from ‘Refineria’ to ‘Patriotismo’	{4, 5, 6, 7, 8}	6
3.c	What is the minimum number of changes to get from ‘Sevilla’ to ‘Aragon’	{0, 1, 2, 3, 4}	2
3.d	What is the minimum number of changes to get from ‘Martin Carrera’ to ‘	{0, 1, 2, 3, 4}	2

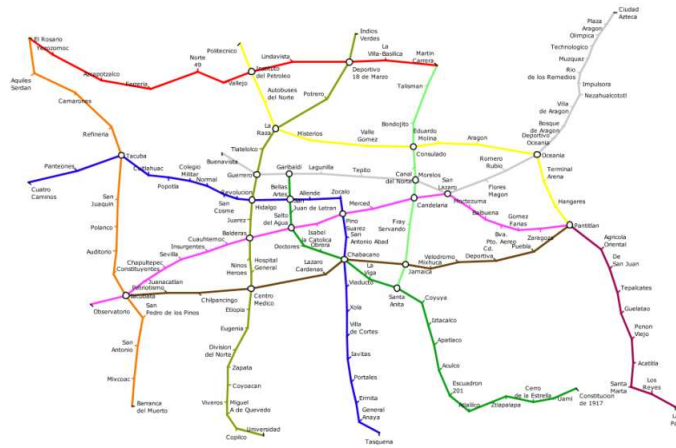


Figure A.7: Mexico City geographic map.

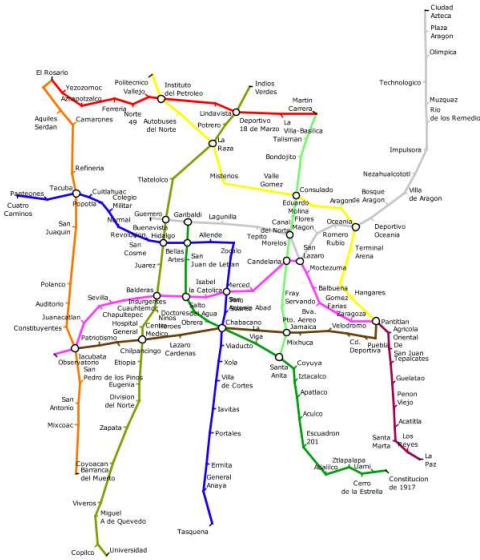


Figure A.8: Mexico City normalised published map.

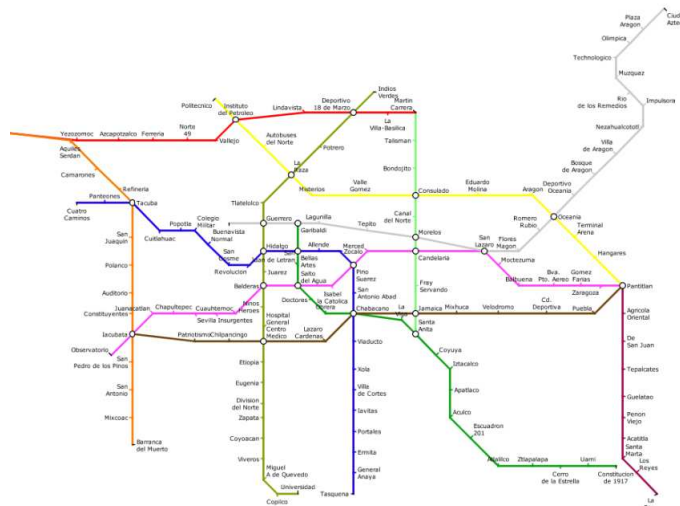


Figure A.9: Mexico City automatically-drawn map.

A.1.4 Stockholm

- Geographic map (Figure A.10).
- Normalised published map (Figure A.11).
- Automatically-drawn map (Figure A.12).

Table A.4: Stockholm questions.

Number	Question	Answer Options	Answer
4.a	How many stations do you pass through to get from ‘Stora Mossen’ to ‘Karlplan’	{6, 7, 8, 9, 10}	10
4.b	How many stations do you pass through to get from ‘Liljeholmen’ to ‘Kungsträdgården’	{2, 3, 4, 5, 6}	6
4.c	What is the minimum number of changes to get from ‘Kista’ to ‘T-Centralen’	{0, 1, 2, 3, 4}	0
4.d	What is the minimum number of changes to get from ‘Bergamossen’ to ‘Axelsburg’	{0, 1, 2, 3, 4}	1

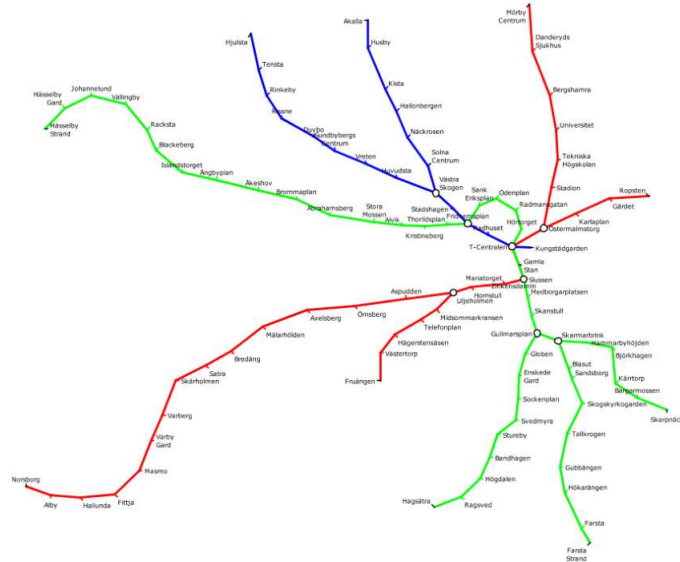


Figure A.10: Stockholm geographic map.



Figure A.11: Stockholm normalised published map.

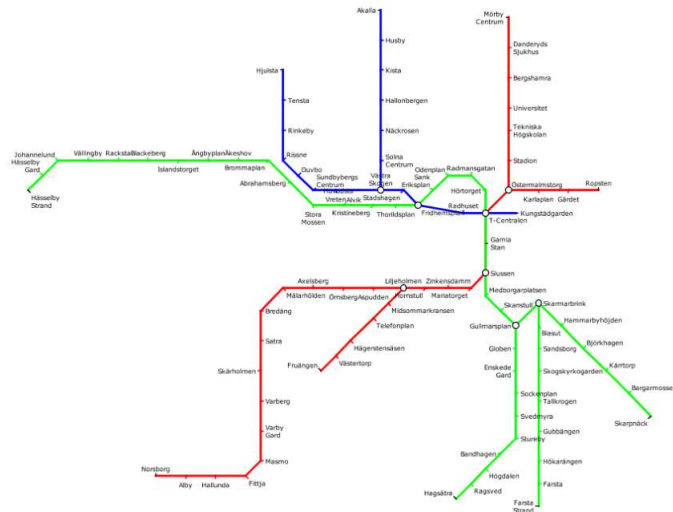


Figure A.12: Stockholm automatically-drawn map.

A.1.5 Toronto

- Geographic map (Figure A.13).
- Normalised published map (Figure A.14).
- Automatically-drawn map (Figure A.15).

Table A.5: Toronto questions.

Number	Question	Answer Options	Answer
5.a	How many stations do you pass through to get from ‘Dupont’ to ‘Chester’	{6, 7, 8, 9, 10}	7
5.b	How many stations do you pass through to get from ‘Lansdowne’ to ‘York Mills’	{10, 11, 12, 13, 14}	14
5.c	What is the minimum number of changes to get from ‘Bayview’ to ‘Union’	{0, 1, 2, 3, 4}	1
5.d	What is the minimum number of changes to get from ‘Midland’ to ‘Dundas’	{0, 1, 2, 3, 4}	2



Figure A.13: Toronto geographic map.

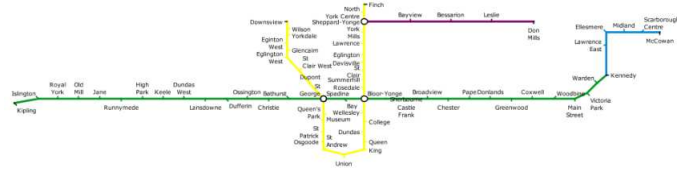


Figure A.14: Toronto normalised published map.

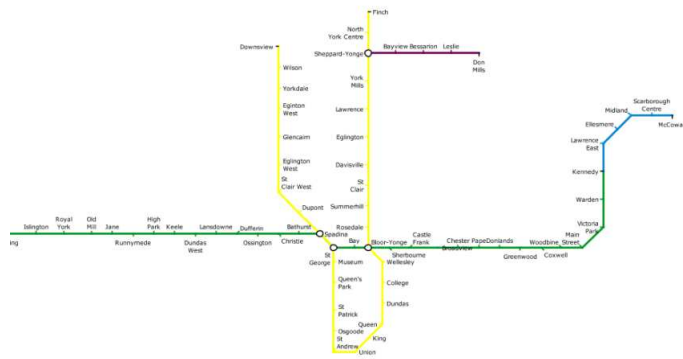


Figure A.15: Toronto automatically-drawn map.

A.1.6 Washington D.C.

- Geographic map (Figure A.16).
- Normalised published map (Figure A.17).
- Automatically-drawn map (Figure A.18).

Table A.6: Washington questions.

Number	Question	Answer Options	Answer
6.a	How many stations do you pass through to get from ‘Pentagon’ to ‘Court House’	{1, 2, 3, 4, 5}	2
6.b	How many stations do you pass through to get from ‘Cleveland Park’ to ‘Federal Triangle’	{4, 5, 6, 7, 8}	4
6.c	What is the minimum number of changes to get from ‘Metro Center’ to ‘Takoma’	{0, 1, 2, 3, 4}	0
6.d	What is the minimum number of changes to get from ‘Largo Town Center’ to ‘Eisenhower Ave.’	{0, 1, 2, 3, 4}	2

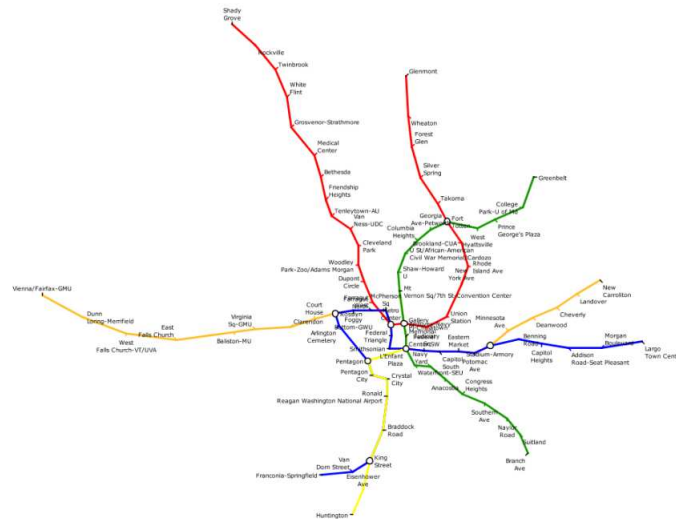


Figure A.16: Washington D.C. geographic map.

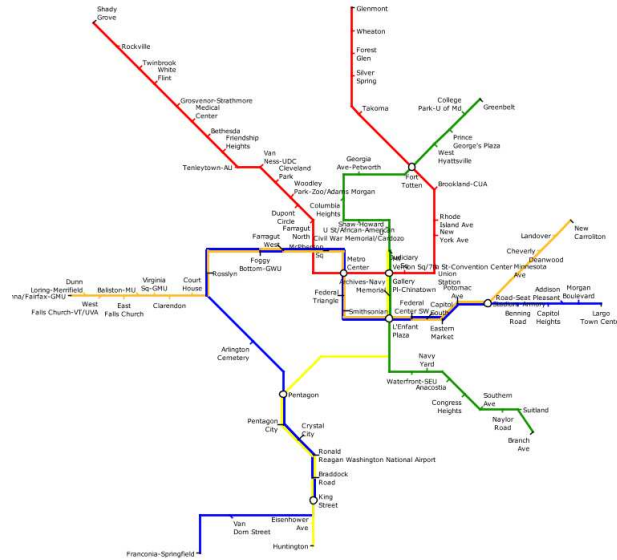


Figure A.17: Washington D.C. normalised published map.

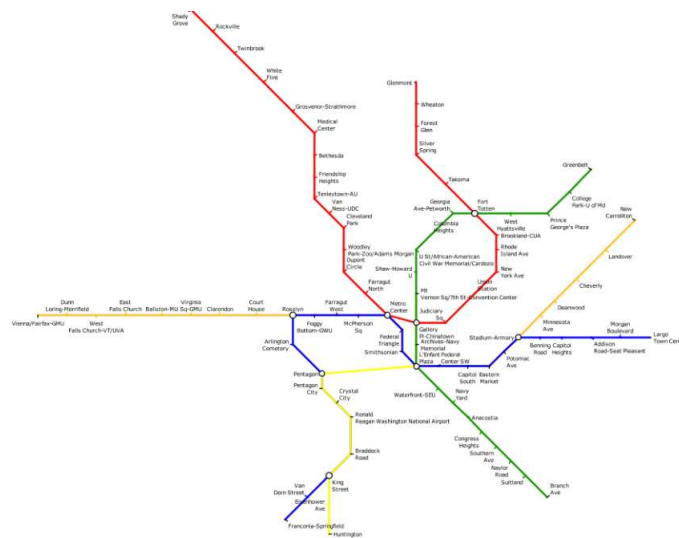


Figure A.18: Washington D.C. automatically-drawn map.

A.2 Associated Material

As a number of sessions of the empirical experiment were run at different times, it was essential that each session was as similar as possible. The following scripts and handouts were standard across all sessions.

A.2.1 Preliminary Script

This script was read aloud to candidates before they started the experiment.

[The test software should be shown on the projector]

Please do not start using a computer until told to do so. During this test, do not talk, or attempt to see what other participants are answering. If you have a query, please raise your hand.

Although we ask for your login so that we can collate the data, the results of this test and questionnaire will be anonymized.

You will be presented with a sequence of metro map diagrams. The test will pose a question for each map which requires an answer to be selected. The question will require you to plan a route between two stations on the map.

You will first need to enter your login, level of study, year of study, age and gender and click OK. Do not do this yet, you will be told when to start the test.

[Enter login test level of study Undergraduate, year of study 2, Age 25, Gender Male, then press OK. Press Start]

A metro map is used to depict the interconnections on a public transport system so that the user is able to plan and undertake a specific journey. Stations are represented by circles which are labelled with the name of the station. A line in a single colour indicates which stations are connected by direct services. Where two or more lines pass through a single station you are able to change from one line to the other. See an example of a metro map on the projector.

When you start the test, you will be shown a metro map in the main part of the screen [Point to map]. The question will be shown in the top-right corner [Point to question] with a selection of answers below [Point to answers].

The questions that will be asked will involve planning a journey between two stations. The stations will be highlighted on the map in order that you can identify them more easily [Point to highlighted stations].

Once you have worked out the route for the question, click the button next to the answer in the list shown before clicking the Go button.

In this case the question is How many changes are required to get from 'Shopping' to 'Barro'. I can see that you need to change once from one coloured line to another [point on screen]. So I click 1 [Click option 1]. Then I click GO [Click GO].

After each question you need to give an indication of the difficulty of the question. To do this, select the appropriate option from the list from very easy to very hard. Then click the OK button.

The period between clicking Go and answering the difficulty question are an opportunity to rest, if you need to do so, as timing does not start again until the OK button is clicked.

[Click Average then OK]

This next question asks me How many stations do I go through to get from Areoporto to Santa Luzia. With this sort of question, you do not count the end stations, only the stations in-between. Counting the stations, including the station that requires me to change I get an answer of 9[Point at each intermediate station, counting]. [Click option 9, then Go]

Please do not rush the questions, and take some effort to get the questions correct. Whilst we are measuring the time it takes to complete each answer, we do not mind if you dont complete all the questions.

You will be presented with questions for 20 minutes. After this time is up you will be shown how many questions you got correct as well the answers to any questions that you got incorrect.

At the end of the test, do not log off.

After the test, you need to complete a short questionnaire

Enter your details and press OK then the start button to begin the test now.

A.2.2 Postliminary Script

This script was read out after the interactive part of the experiment had concluded.

[The first slide should be showing on the projector]

[Hand out 1 questionnaire and 1 pen to each participant]

Please first fill in your login on the sheet in front of you, and then look up at the projector screen. You will be shown three metro maps at a time. Please decide which of these maps would be best for navigating a metro map system. As each slide is shown, write down 1, 2 or 3 in the spaces below, where 1 is the most preferable map and 3 is the least preferable map

I will count down from 5 before showing the next set of metro maps

[Count down 5,4,3,2,1 then show the next slide]

[Wait for a minute and then count down 5,4,3,2,1 for each slide, until the end of the presentation appears]

Please now take 5 minutes to fill in questions 1,2,3 and 4 by hand.

[Wait for 5 minutes and then start handing out five pound notes, getting signatures and handing out debriefing scripts. The experiment is now over, and you can answer questions about the tasks].

A.2.3 Concluding Handout

This text was given to candidates after they had completed the questionnaire and before they left the experiment.

Thank you for participating in this research

You were presented with a number of maps which were drawn using three different techniques. One version was drawn using the geographic layout of stations; the second version was drawn from a published map of the network; the final version was drawn using an automatic method which balances aesthetic criteria to try and find an optimal layout.

The purpose of this research is to qualify some design aesthetics for automatically laying out metro maps and to see if our automated method is good at producing comprehensible diagrams.

The idea is that being able to automatically produce metro maps might improve their use for navigating metro networks. In addition, being able to automatically generate the such maps could lead to them being more widely used for many other application areas.

We would appreciate it if you did not discuss this experiment with other students in the university. These experiments will be continuing through the last two weeks of term, and having subjects who have prior knowledge of what the tests are about makes the data less useful.

Thank you again for your contribution.

A.3 Results

A.3.1 Route Planning Tasks

Table A.7:

Candidate	Group	Map ^a	Question	Map Type ^b	Answer ^c	Given Answer	Correct?	Ease	Time (s)
abd3	C	1	a	F	10	11	FALSE	3 38579	38.58
aa206	C	1	a	F	10	10	TRUE	2 24063	24.06
abbc2	C	1	a	F	10	10	TRUE	0 26579	26.58
ad241	A	1	a	P	10	10	TRUE	1 17922	17.92
amf23	B	1	a	G	10	10	TRUE	2 16812	16.81
ap290	B	1	a	G	10	9	FALSE	2 17703	17.7
apr5	B	1	a	G	10	10	TRUE	2 27738	27.74
as304	A	1	a	P	10	10	TRUE	1 17062	17.06
asg4	A	1	a	P	10	10	TRUE	3 24296	24.3
cav3	A	1	a	P	10	10	TRUE	2 27860	27.86
cb252	C	1	a	F	10	10	TRUE	3 32446	32.45
cb90	B	1	a	G	10	10	TRUE	2 26486	26.49
cc84	C	1	a	F	10	10	TRUE	2 25655	25.66
cg79	A	1	a	P	10	10	TRUE	2 16923	16.92
cw89	A	1	a	P	10	10	TRUE	1 17798	17.8
dab21	C	1	a	F	10	10	TRUE	2 18687	18.69
dg81	B	1	a	G	10	11	FALSE	2 28813	28.81
dk53	B	1	a	G	10	10	TRUE	0 38893	38.89
dpg4	C	1	a	F	10	10	TRUE	1 16562	16.56
ed29	C	1	a	F	10	10	TRUE	2 19752	19.75
emw7	A	1	a	P	10	10	TRUE	1 21173	21.17
gc31	B	1	a	G	10	10	TRUE	2 15312	15.31

continued on next page^a1 = Atlanta; 2 = Bucharest; 3 = Mexico City; 4 = Stockholm; 5 = Toronto; 6 = Washington D.C.^bG = geographic layout; P = normalised published layout; F = automatically-drawn layout^c1 = very easy ... 5 = very hard

continued from previous page

Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
her7	A	1	a	P	10	10	TRUE	2 21576	21.58
jh293	B	1	a	G	10	9	FALSE	1 26284	26.28
jjp2	C	1	a	F	10	10	TRUE	1 14829	14.83
jmhd2	B	1	a	G	10	9	FALSE	1 20000	20
jt56	A	1	a	P	10	10	TRUE	0 34313	34.31
le38	B	1	a	G	10	9	FALSE	2 18053	18.05
mjb50	A	1	a	P	10	10	TRUE	2 14939	14.94
mjb25	C	1	a	F	10	10	TRUE	3 19249	19.25
mm349	A	1	a	P	10	10	TRUE	2 11198	11.2
mm360	C	1	a	F	10	10	TRUE	2 13486	13.49
mt63	B	1	a	G	10	11	FALSE	2 17391	17.39
ni29	B	1	a	G	10	10	TRUE	0 27562	27.56
opm2	C	1	a	F	10	10	TRUE	3 13391	13.39
pc52	C	1	a	F	10	11	FALSE	3 18110	18.11
ps99	B	1	a	G	10	9	FALSE	2 32547	32.55
rslr2	A	1	a	P	10	10	TRUE	2 15198	15.2
sh68	A	1	a	P	10	12	FALSE	4 15828	15.83
shm6	B	1	a	G	10	10	TRUE	0 18971	18.97
tcb3	B	1	a	G	10	11	FALSE	2 18281	18.28
tpc4	C	1	a	F	10	10	TRUE	3 20020	20.02
ves4	C	1	a	F	10	10	TRUE	1 19895	19.9
abd3	C	1	b	G	5	5	TRUE	2 30657	30.66
aa206	C	1	b	G	5	5	TRUE	2 18190	18.19
abbc2	C	1	b	G	5	5	TRUE	3 13161	13.16
ad241	A	1	b	F	5	4	FALSE	4 11047	11.05
amf23	B	1	b	P	5	5	TRUE	2 16359	16.36

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
ap290	B	1	b	P	5	5	TRUE	0 10891	10.89
apr5	B	1	b	P	5	5	TRUE	1 13720	13.72
as304	A	1	b	F	5	5	TRUE	1 9000	9
asg4	A	1	b	F	5	5	TRUE	2 20578	20.58
cav3	A	1	b	F	5	5	TRUE	2 19454	19.45
cb252	C	1	b	G	5	5	TRUE	2 17199	17.2
cb90	B	1	b	P	5	5	TRUE	2 23626	23.63
cc84	C	1	b	G	5	5	TRUE	2 10812	10.81
cg79	A	1	b	F	5	5	TRUE	2 11594	11.59
cw89	A	1	b	F	5	5	TRUE	2 12204	12.2
dab21	C	1	b	G	5	5	TRUE	1 17984	17.98
dg81	B	1	b	P	5	5	TRUE	1 17172	17.17
dk53	B	1	b	P	5	5	TRUE	1 12103	12.1
dpg4	C	1	b	G	5	5	TRUE	1 19910	19.91
ed29	C	1	b	G	5	5	TRUE	2 15892	15.89
emw7	A	1	b	F	5	5	TRUE	1 12123	12.12
gc31	B	1	b	P	5	5	TRUE	1 9234	9.23
her7	A	1	b	F	5	8	FALSE	2 19341	19.34
jh293	B	1	b	P	5	5	TRUE	1 13236	13.24
jip2	C	1	b	G	5	5	TRUE	2 9797	9.8
jmhd2	B	1	b	P	5	5	TRUE	0 15500	15.5
jt56	A	1	b	F	5	5	TRUE	1 19208	19.21
le38	B	1	b	P	5	5	TRUE	2 10572	10.57
mjb50	A	1	b	F	5	5	TRUE	3 15559	15.56
mjb25	C	1	b	G	5	5	TRUE	3 18296	18.3
mm349	A	1	b	F	5	5	TRUE	2 10029	10.03

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
mm360	C	1	b	G	5	5	TRUE	2 10366	10.37
mt63	B	1	b	P	5	5	TRUE	1 10560	10.56
ni29	B	1	b	P	5	5	TRUE	0 14410	14.41
opm2	C	1	b	G	5	5	TRUE	2 13250	13.25
pc52	C	1	b	G	5	5	TRUE	1 9579	9.58
ps99	B	1	b	P	5	5	TRUE	3 12694	12.69
rslr2	A	1	b	F	5	5	TRUE	4 12978	12.98
sh68	A	1	b	F	5	8	FALSE	4 10406	10.41
shm6	B	1	b	P	5	5	TRUE	0 8288	8.29
tcb3	B	1	b	P	5	5	TRUE	1 6792	6.79
tpc4	C	1	b	G	5	5	TRUE	1 12992	12.99
ves4	C	1	b	G	5	5	TRUE	1 15991	15.99
abd3	C	1	c	F	0	0	TRUE	2 13687	13.69
aa206	C	1	c	F	0	1	FALSE	2 25266	25.27
abbc2	C	1	c	F	0	0	TRUE	2 26763	26.76
ad241	A	1	c	P	0	0	TRUE	1 13688	13.69
amf23	B	1	c	G	0	0	TRUE	0 24875	24.88
ap290	B	1	c	G	0	0	TRUE	0 25625	25.63
apr5	B	1	c	G	0	0	TRUE	1 16643	16.64
as304	A	1	c	P	0	0	TRUE	1 12078	12.08
asg4	A	1	c	P	0	0	TRUE	1 11969	11.97
cav3	A	1	c	P	0	1	FALSE	0 13610	13.61
cb252	C	1	c	F	0	0	TRUE	3 35592	35.59
cb90	B	1	c	G	0	1	FALSE	3 86957	86.96
cc84	C	1	c	F	0	0	TRUE	2 18686	18.69
cg79	A	1	c	P	0	0	TRUE	1 9454	9.45

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
cw89	A	1	c	P	0	0	TRUE	1 8781	8.78
dab21	C	1	c	F	0	0	TRUE	1 22610	22.61
dg81	B	1	c	G	0	1	FALSE	3 44188	44.19
dk53	B	1	c	G	0	1	FALSE	1 29710	29.71
dpg4	C	1	c	F	0	0	TRUE	2 44858	44.86
ed29	C	1	c	F	0	1	FALSE	1 25580	25.58
emw7	A	1	c	P	0	0	TRUE	0 32595	32.6
gc31	B	1	c	G	0	0	TRUE	1 15125	15.13
her7	A	1	c	P	0	0	TRUE	2 30732	30.73
jh293	B	1	c	G	0	0	TRUE	2 51584	51.58
jjp2	C	1	c	F	0	0	TRUE	0 15250	15.25
jmhd2	B	1	c	G	0	2	FALSE	0 12219	12.22
jt56	A	1	c	P	0	0	TRUE	0 11532	11.53
le38	B	1	c	G	0	0	TRUE	2 23151	23.15
mjb50	A	1	c	P	0	0	TRUE	1 18001	18
mjg25	C	1	c	F	0	0	TRUE	2 28921	28.92
mm349	A	1	c	P	0	0	TRUE	1 14540	14.54
mm360	C	1	c	F	0	0	TRUE	1 14082	14.08
mt63	B	1	c	G	0	0	TRUE	0 13298	13.3
ni29	B	1	c	G	0	1	FALSE	1 35027	35.03
opm2	C	1	c	F	0	0	TRUE	1 18578	18.58
pc52	C	1	c	F	0	0	TRUE	2 21219	21.22
ps99	B	1	c	G	0	1	FALSE	2 33626	33.63
rslr2	A	1	c	P	0	0	TRUE	2 14058	14.06
sh68	A	1	c	P	0	0	TRUE	1 9844	9.84
shm6	B	1	c	G	0	0	TRUE	0 17449	17.45

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
tcb3	B	1	c	G	0	0	TRUE	2 15735	15.74
tpc4	C	1	c	F	0	0	TRUE	1 19626	19.63
ves4	C	1	c	F	0	0	TRUE	1 11978	11.98
abd3	C	1	d	G	0	0	TRUE	0 9532	9.53
aa206	C	1	d	G	0	0	TRUE	2 14953	14.95
abbc2	C	1	d	G	0	0	TRUE	3 31438	31.44
ad241	A	1	d	F	0	0	TRUE	0 13813	13.81
amf23	B	1	d	P	0	0	TRUE	0 10031	10.03
ap290	B	1	d	P	0	0	TRUE	0 11390	11.39
apr5	B	1	d	P	0	0	TRUE	0 18939	18.94
as304	A	1	d	F	0	0	TRUE	1 10938	10.94
asg4	A	1	d	F	0	0	TRUE	1 10312	10.31
cav3	A	1	d	F	0	0	TRUE	0 11000	11
cb252	C	1	d	G	0	0	TRUE	1 19540	19.54
cb90	B	1	d	P	0	0	TRUE	0 29939	29.94
cc84	C	1	d	G	0	0	TRUE	0 10577	10.58
cg79	A	1	d	F	0	0	TRUE	0 7641	7.64
cw89	A	1	d	F	0	0	TRUE	2 11282	11.28
dab21	C	1	d	G	0	0	TRUE	0 11922	11.92
dg81	B	1	d	P	0	0	TRUE	0 15047	15.05
dk53	B	1	d	P	0	1	FALSE	1 17280	17.28
dpg4	C	1	d	G	0	0	TRUE	1 19548	19.55
ed29	C	1	d	G	0	0	TRUE	2 14533	14.53
emw7	A	1	d	F	0	0	TRUE	0 13578	13.58
gc31	B	1	d	P	0	0	TRUE	1 11547	11.55
her7	A	1	d	F	0	0	TRUE	1 17263	17.26

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
jh293	B	1	d	P	0	0	TRUE	0 14768	14.77
jip2	C	1	d	G	0	0	TRUE	0 8735	8.74
jmh2	B	1	d	P	0	0	TRUE	0 16984	16.98
jt56	A	1	d	F	0	0	TRUE	0 14007	14.01
le38	B	1	d	P	0	0	TRUE	2 13164	13.16
mjb50	A	1	d	F	0	0	TRUE	1 16081	16.08
mjg25	C	1	d	G	0	0	TRUE	1 15203	15.2
mm349	A	1	d	F	0	0	TRUE	1 10466	10.47
mm360	C	1	d	G	0	0	TRUE	1 14399	14.4
mt63	B	1	d	P	0	0	TRUE	0 6000	6
ni29	B	1	d	P	0	0	TRUE	0 14457	14.46
opm2	C	1	d	G	0	0	TRUE	0 13000	13
pc52	C	1	d	G	0	0	TRUE	0 10844	10.84
ps99	B	1	d	P	0	0	TRUE	3 19811	19.81
rslr2	A	1	d	F	0	0	TRUE	2 13122	13.12
sh68	A	1	d	F	0	0	TRUE	1 20562	20.56
shm6	B	1	d	P	0	0	TRUE	0 18543	18.54
tcb3	B	1	d	P	0	0	TRUE	0 5734	5.73
tpc4	C	1	d	G	0	0	TRUE	0 13726	13.73
ves4	C	1	d	G	0	0	TRUE	0 12758	12.76
abd3	C	2	a	G	10	10	TRUE	2 32375	32.38
aa206	C	2	a	G	10	9	FALSE	2 37407	37.41
abbc2	C	2	a	G	10	9	FALSE	3 24210	24.21
ad241	A	2	a	F	10	10	TRUE	2 41595	41.6
amf23	B	2	a	P	10	10	TRUE	2 15032	15.03
ap290	B	2	a	P	10	10	TRUE	1 13813	13.81

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
apr5	B	2	a	P	10	10	TRUE	2 29503	29.5
as304	A	2	a	F	10	10	TRUE	2 34095	34.1
asg4	A	2	a	F	10	10	TRUE	3 66825	66.83
cav3	A	2	a	F	10	10	TRUE	2 34360	34.36
cb252	C	2	a	G	10	9	FALSE	3 37264	37.26
cb90	B	2	a	P	10	10	TRUE	2 31548	31.55
cc84	C	2	a	G	10	10	TRUE	3 21749	21.75
cg79	A	2	a	F	10	10	TRUE	3 39017	39.02
cw89	A	2	a	F	10	10	TRUE	1 13329	13.33
dab21	C	2	a	G	10	9	FALSE	1 15563	15.56
dg81	B	2	a	P	10	10	TRUE	2 16609	16.61
dk53	B	2	a	P	10	10	TRUE	0 57441	57.44
dpg4	C	2	a	G	10	10	TRUE	2 43826	43.83
ed29	C	2	a	G	10	9	FALSE	2 13532	13.53
emw7	A	2	a	F	10	10	TRUE	3 28844	28.84
gc31	B	2	a	P	10	10	TRUE	2 13203	13.2
her7	A	2	a	F	10	10	TRUE	3 50807	50.81
jh293	B	2	a	P	10	10	TRUE	2 13720	13.72
jjp2	C	2	a	G	10	9	FALSE	1 23656	23.66
jmhd2	B	2	a	P	10	10	TRUE	2 23531	23.53
jt56	A	2	a	F	10	10	TRUE	0 45080	45.08
le38	B	2	a	P	10	10	TRUE	2 16725	16.73
mjb50	A	2	a	F	10	11	FALSE	3 25425	25.43
mjg25	C	2	a	G	10	9	FALSE	3 18765	18.77
mm349	A	2	a	F	10	10	TRUE	3 35234	35.23
mm360	C	2	a	G	10	10	TRUE	2 18104	18.1

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
mt63	B	2	a	P	10	10	TRUE	2 11438	11.44
ni29	B	2	a	P	10	11	FALSE	0 51632	51.63
opm2	C	2	a	G	10	9	FALSE	2 37016	37.02
pc52	C	2	a	G	10	10	TRUE	3 23766	23.77
ps99	B	2	a	P	10	10	TRUE	2 12970	12.97
rslr2	A	2	a	F	10	10	TRUE	2 10454	10.45
sh68	A	2	a	F	10	10	TRUE	2 12188	12.19
shm6	B	2	a	P	10	10	TRUE	0 21254	21.25
tcb3	B	2	a	P	10	11	FALSE	2 18172	18.17
tpc4	C	2	a	G	10	10	TRUE	3 16732	16.73
ves4	C	2	a	G	10	9	FALSE	1 22768	22.77
abd3	C	2	b	P	5	5	TRUE	1 13375	13.38
aa206	C	2	b	P	5	5	TRUE	2 17331	17.33
abbc2	C	2	b	P	5	5	TRUE	3 18775	18.78
ad241	A	2	b	G	5	5	TRUE	0 9812	9.81
amf23	B	2	b	F	5	5	TRUE	2 10015	10.02
ap290	B	2	b	F	5	5	TRUE	2 10625	10.63
apr5	B	2	b	F	5	5	TRUE	2 27347	27.35
as304	A	2	b	G	5	5	TRUE	1 15110	15.11
asg4	A	2	b	G	5	5	TRUE	2 22171	22.17
cav3	A	2	b	G	5	5	TRUE	1 9265	9.27
cb252	C	2	b	P	5	5	TRUE	1 20679	20.68
cb90	B	2	b	F	5	5	TRUE	2 32689	32.69
cc84	C	2	b	P	5	5	TRUE	1 20233	20.23
cg79	A	2	b	G	5	5	TRUE	2 9641	9.64
cw89	A	2	b	G	5	5	TRUE	2 14251	14.25

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
dab21	C	2	b	P	5	5	TRUE	0 9828	9.83
dg81	B	2	b	F	5	5	TRUE	1 21172	21.17
dk53	B	2	b	F	5	5	TRUE	2 16968	16.97
dpg4	C	2	b	P	5	5	TRUE	1 26044	26.04
ed29	C	2	b	P	5	5	TRUE	2 13595	13.6
emw7	A	2	b	G	5	3	FALSE	3 25307	25.31
gc31	B	2	b	F	5	5	TRUE	1 8297	8.3
her7	A	2	b	G	5	5	TRUE	1 34797	34.8
jh293	B	2	b	F	5	5	TRUE	1 10860	10.86
jip2	C	2	b	P	5	5	TRUE	1 10048	10.05
jmhd2	B	2	b	F	5	5	TRUE	0 14203	14.2
jt56	A	2	b	G	5	5	TRUE	2 18395	18.4
le38	B	2	b	F	5	4	FALSE	2 8951	8.95
mjb50	A	2	b	G	5	5	TRUE	2 21573	21.57
mjg25	C	2	b	P	5	5	TRUE	1 10671	10.67
mm349	A	2	b	G	5	5	TRUE	3 32849	32.85
mm360	C	2	b	P	5	5	TRUE	1 14696	14.7
mt63	B	2	b	F	5	5	TRUE	1 12670	12.67
ni29	B	2	b	F	5	5	TRUE	0 30664	30.66
opm2	C	2	b	P	5	5	TRUE	1 16516	16.52
pc52	C	2	b	P	5	5	TRUE	1 7375	7.38
ps99	B	2	b	F	5	5	TRUE	2 9587	9.59
rslr2	A	2	b	G	5	5	TRUE	3 9995	10
sh68	A	2	b	G	5	5	TRUE	4 20250	20.25
shm6	B	2	b	F	5	5	TRUE	0 10270	10.27
tcb3	B	2	b	F	5	5	TRUE	1 7792	7.79

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
tpc4	C	2	b	P	5	5	TRUE	1 19565	19.57
ves4	C	2	b	P	5	5	TRUE	1 11884	11.88
abd3	C	2	c	G	0	0	TRUE	1 12750	12.75
aa206	C	2	c	G	0	0	TRUE	2 26016	26.02
abbc2	C	2	c	G	0	0	TRUE	2 22146	22.15
ad241	A	2	c	F	0	0	TRUE	0 14126	14.13
amf23	B	2	c	P	0	0	TRUE	1 19094	19.09
ap290	B	2	c	P	0	0	TRUE	0 22813	22.81
apr5	B	2	c	P	0	0	TRUE	1 34254	34.25
as304	A	2	c	F	0	0	TRUE	1 12953	12.95
asg4	A	2	c	F	0	0	TRUE	1 29656	29.66
cav3	A	2	c	F	0	0	TRUE	1 12828	12.83
cb252	C	2	c	G	0	0	TRUE	3 48669	48.67
cb90	B	2	c	P	0	0	TRUE	2 52502	52.5
cc84	C	2	c	G	0	2	FALSE	3 23827	23.83
cg79	A	2	c	F	0	0	TRUE	1 8032	8.03
cw89	A	2	c	F	0	0	TRUE	1 18673	18.67
dab21	C	2	c	G	0	0	TRUE	0 9640	9.64
dg81	B	2	c	P	0	0	TRUE	2 35501	35.5
dk53	B	2	c	P	0	3	FALSE	2 45700	45.7
dpg4	C	2	c	G	0	0	TRUE	2 27765	27.77
ed29	C	2	c	G	0	0	TRUE	1 19205	19.21
emw7	A	2	c	F	0	0	TRUE	1 17859	17.86
gc31	B	2	c	P	0	0	TRUE	1 22515	22.52
her7	A	2	c	F	0	0	TRUE	2 44151	44.15
jh293	B	2	c	P	0	1	FALSE	3 42817	42.82

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
jjp2	C	2	c	G	0	0	TRUE	1 10875	10.88
jmhd2	B	2	c	P	0	2	FALSE	1 12765	12.77
jt56	A	2	c	F	0	0	TRUE	0 10422	10.42
le38	B	2	c	P	0	0	TRUE	2 34986	34.99
mjb50	A	2	c	F	0	0	TRUE	1 12673	12.67
mjg25	C	2	c	G	0	0	TRUE	2 19406	19.41
mm349	A	2	c	F	0	0	TRUE	1 16617	16.62
mm360	C	2	c	G	0	0	TRUE	1 9413	9.41
mt63	B	2	c	P	0	0	TRUE	0 11032	11.03
ni29	B	2	c	P	0	0	TRUE	0 38601	38.6
opm2	C	2	c	G	0	0	TRUE	1 18125	18.13
pc52	C	2	c	G	0	0	TRUE	2 23594	23.59
ps99	B	2	c	P	0	0	TRUE	1 12625	12.63
rslr2	A	2	c	F	0	0	TRUE	3 24248	24.25
sh68	A	2	c	F	0	0	TRUE	1 9234	9.23
shm6	B	2	c	P	0	1	FALSE	0 14496	14.5
tcb3	B	2	c	P	0	0	TRUE	2 14719	14.72
tpc4	C	2	c	G	0	0	TRUE	1 29346	29.35
ves4	C	2	c	G	0	0	TRUE	0 7277	7.28
abd3	C	2	d	P	2	3	FALSE	1 15890	15.89
aa206	C	2	d	P	2	2	TRUE	2 23313	23.31
abbc2	C	2	d	P	2	2	TRUE	2 20604	20.6
ad241	A	2	d	G	2	2	TRUE	0 15094	15.09
amf23	B	2	d	F	2	2	TRUE	2 15813	15.81
ap290	B	2	d	F	2	2	TRUE	1 10141	10.14
apr5	B	2	d	F	2	2	TRUE	2 24581	24.58

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
as304	A	2	d	G	2	2	TRUE	1 13797	13.8
asg4	A	2	d	G	2	2	TRUE	2 31265	31.27
cav3	A	2	d	G	2	2	TRUE	3 37782	37.78
cb252	C	2	d	P	2	2	TRUE	2 26703	26.7
cb90	B	2	d	F	2	3	FALSE	2 42455	42.46
cc84	C	2	d	P	2	2	TRUE	2 27951	27.95
cg79	A	2	d	G	2	2	TRUE	2 17313	17.31
cw89	A	2	d	G	2	2	TRUE	2 9548	9.55
dab21	C	2	d	P	2	2	TRUE	1 15188	15.19
dg81	B	2	d	F	2	2	TRUE	1 19297	19.3
dk53	B	2	d	F	2	3	FALSE	1 15238	15.24
dpg4	C	2	d	P	2	2	TRUE	2 44143	44.14
ed29	C	2	d	P	2	2	TRUE	2 23815	23.82
emw7	A	2	d	G	2	2	TRUE	2 25594	25.59
gc31	B	2	d	F	2	2	TRUE	1 14047	14.05
her7	A	2	d	G	2	2	TRUE	3 56598	56.6
jh293	B	2	d	F	2	2	TRUE	1 14548	14.55
jip2	C	2	d	P	2	2	TRUE	0 11375	11.38
jmhd2	B	2	d	F	2	2	TRUE	1 21187	21.19
jt56	A	2	d	G	2	2	TRUE	0 22128	22.13
le38	B	2	d	F	2	2	TRUE	2 19927	19.93
mjb50	A	2	d	G	2	2	TRUE	2 19704	19.7
mjb25	C	2	d	P	2	2	TRUE	2 22343	22.34
mm349	A	2	d	G	2	2	TRUE	2 19560	19.56
mm360	C	2	d	P	2	2	TRUE	2 14508	14.51
mt63	B	2	d	F	2	2	TRUE	2 20048	20.05

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
ni29	B	2	d	F	2	2	TRUE	2 35457	35.46
opm2	C	2	d	P	2	2	TRUE	1 16719	16.72
pc52	C	2	d	P	2	3	FALSE	2 21625	21.63
ps99	B	2	d	F	2	2	TRUE	3 21407	21.41
rslr2	A	2	d	G	2	2	TRUE	2 14230	14.23
sh68	A	2	d	G	2	2	TRUE	2 16500	16.5
shm6	B	2	d	F	2	2	TRUE	0 16233	16.23
tcb3	B	2	d	F	2	2	TRUE	1 11750	11.75
tpc4	C	2	d	P	2	2	TRUE	2 13540	13.54
ves4	C	2	d	P	2	2	TRUE	1 19521	19.52
abd3	C	3	a	P	7	8	FALSE	2 25187	25.19
aa206	C	3	a	P	7	7	TRUE	2 76922	76.92
abbc2	C	3	a	P	7	6	FALSE	3 22821	22.82
ad241	A	3	a	G	7	7	TRUE	0 22188	22.19
amf23	B	3	a	F	7	7	TRUE	2 14406	14.41
ap290	B	3	a	F	7	6	FALSE	2 20641	20.64
apr5	B	3	a	F	7	7	TRUE	2 23112	23.11
as304	A	3	a	G	7	7	TRUE	2 17735	17.74
asg4	A	3	a	G	7	7	TRUE	3 28702	28.7
cav3	A	3	a	G	7	7	TRUE	2 29110	29.11
cb252	C	3	a	P	7	7	TRUE	4 23747	23.75
cb90	B	3	a	F	7	6	FALSE	2 26048	26.05
cc84	C	3	a	P	7	6	FALSE	3 17265	17.27
cg79	A	3	a	G	7	7	TRUE	3 25674	25.67
cw89	A	3	a	G	7	7	TRUE	1 16329	16.33
dab21	C	3	a	P	7	5	FALSE	1 26063	26.06

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
dg81	B	3	a	F	7	7	TRUE	2 37985	37.99
dk53	B	3	a	F	7	6	FALSE	2 59470	59.47
dpg4	C	3	a	P	7	6	FALSE	2 50612	50.61
ed29	C	3	a	P	7	7	TRUE	2 18549	18.55
emw7	A	3	a	G	7	7	TRUE	3 34970	34.97
gc31	B	3	a	F	7	7	TRUE	2 22000	22
her7	A	3	a	G	7	7	TRUE	2 33778	33.78
jh293	B	3	a	F	7	7	TRUE	2 54943	54.94
jip2	C	3	a	P	7	7	TRUE	1 34969	34.97
jmh2	B	3	a	F	7	7	TRUE	2 42171	42.17
jt56	A	3	a	G	7	8	FALSE	1 37191	37.19
le38	B	3	a	F	7	7	TRUE	2 15663	15.66
mjb50	A	3	a	G	7	7	TRUE	3 16893	16.89
mjc25	C	3	a	P	7	7	TRUE	3 18609	18.61
mm349	A	3	a	G	7	7	TRUE	3 29127	29.13
mm360	C	3	a	P	7	8	FALSE	2 16197	16.2
mt63	B	3	a	F	7	7	TRUE	3 39032	39.03
ni29	B	3	a	F	7	6	FALSE	0 25917	25.92
opm2	C	3	a	P	7	7	TRUE	2 19266	19.27
pc52	C	3	a	P	7	6	FALSE	3 24985	24.99
ps99	B	3	a	F	7	7	TRUE	3 13845	13.85
rslr2	A	3	a	G	7	5	FALSE	2 13028	13.03
sh68	A	3	a	G	7	7	TRUE	2 9313	9.31
shm6	B	3	a	F	7	6	FALSE	0 21191	21.19
tcb3	B	3	a	F	7	6	FALSE	1 15735	15.74
tpc4	C	3	a	P	7	7	TRUE	4 18031	18.03

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
ves4	C	3	a	P	7	7	TRUE	1 16835	16.84
abd3	C	3	b	F	6	6	TRUE	2 16891	16.89
aa206	C	3	b	F	6	6	TRUE	2 30977	30.98
abbc2	C	3	b	F	6	6	TRUE	3 19602	19.6
ad241	A	3	b	P	6	5	FALSE	0 11844	11.84
amf23	B	3	b	G	6	6	TRUE	1 15593	15.59
ap290	B	3	b	G	6	6	TRUE	2 12046	12.05
apr5	B	3	b	G	6	6	TRUE	1 16298	16.3
as304	A	3	b	P	6	6	TRUE	1 11859	11.86
asg4	A	3	b	P	6	6	TRUE	2 23046	23.05
cav3	A	3	b	P	6	6	TRUE	1 12422	12.42
cb252	C	3	b	F	6	6	TRUE	2 12252	12.25
cb90	B	3	b	G	6	6	TRUE	2 34392	34.39
cc84	C	3	b	F	6	6	TRUE	3 18249	18.25
cg79	A	3	b	P	6	6	TRUE	1 13704	13.7
cw89	A	3	b	P	6	6	TRUE	2 13516	13.52
dab21	C	3	b	F	6	8	FALSE	2 26547	26.55
dg81	B	3	b	G	6	6	TRUE	2 20406	20.41
dk53	B	3	b	G	6	6	TRUE	2 12415	12.42
dpg4	C	3	b	F	6	5	FALSE	2 41377	41.38
ed29	C	3	b	F	6	6	TRUE	2 12689	12.69
emw7	A	3	b	P	6	6	TRUE	1 17809	17.81
gc31	B	3	b	G	6	6	TRUE	2 9469	9.47
her7	A	3	b	P	6	7	FALSE	1 16954	16.95
jh293	B	3	b	G	6	6	TRUE	1 15939	15.94
jjp2	C	3	b	F	6	6	TRUE	1 17234	17.23

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
jmhd2	B	3	b	G	6	6	TRUE	1 12906	12.91
jt56	A	3	b	P	6	6	TRUE	1 16068	16.07
le38	B	3	b	G	6	6	TRUE	2 11498	11.5
mjb50	A	3	b	P	6	6	TRUE	2 11263	11.26
mjg25	C	3	b	F	6	6	TRUE	1 15734	15.73
mm349	A	3	b	P	6	6	TRUE	2 18483	18.48
mm360	C	3	b	F	6	6	TRUE	2 12802	12.8
mt63	B	3	b	G	6	6	TRUE	1 7436	7.44
ni29	B	3	b	G	6	6	TRUE	0 51387	51.39
opm2	C	3	b	F	6	6	TRUE	1 11813	11.81
pc52	C	3	b	F	6	6	TRUE	1 10563	10.56
ps99	B	3	b	G	6	6	TRUE	3 11711	11.71
rslr2	A	3	b	P	6	6	TRUE	3 11698	11.7
sh68	A	3	b	P	6	6	TRUE	3 11984	11.98
shm6	B	3	b	G	6	6	TRUE	0 15468	15.47
tcb3	B	3	b	G	6	6	TRUE	2 12211	12.21
tpc4	C	3	b	F	6	6	TRUE	3 17123	17.12
ves4	C	3	b	F	6	6	TRUE	1 13930	13.93
abd3	C	3	c	P	2	2	TRUE	3 27188	27.19
aa206	C	3	c	P	2	2	TRUE	3 129642	129.64
abbc2	C	3	c	P	2	1	FALSE	2 20675	20.68
ad241	A	3	c	G	2	1	FALSE	1 14047	14.05
amf23	B	3	c	F	2	1	FALSE	1 17562	17.56
ap290	B	3	c	F	2	2	TRUE	2 18234	18.23
apr5	B	3	c	F	2	1	FALSE	2 23768	23.77
as304	A	3	c	G	2	1	FALSE	1 14172	14.17

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
asg4	A	3	c	G	2	2	TRUE	2 21624	21.62
cav3	A	3	c	G	2	1	FALSE	1 11923	11.92
cb252	C	3	c	P	2	2	TRUE	2 51455	51.46
cb90	B	3	c	F	2	2	TRUE	3 45049	45.05
cc84	C	3	c	P	2	2	TRUE	1 24842	24.84
cg79	A	3	c	G	2	1	FALSE	2 23501	23.5
cw89	A	3	c	G	2	3	FALSE	2 13079	13.08
dab21	C	3	c	P	2	2	TRUE	1 22391	22.39
dg81	B	3	c	F	2	1	FALSE	1 36313	36.31
dk53	B	3	c	F	2	1	FALSE	0 28614	28.61
dpg4	C	3	c	P	2	1	FALSE	2 26906	26.91
ed29	C	3	c	P	2	2	TRUE	2 17595	17.6
emw7	A	3	c	G	2	1	FALSE	2 26407	26.41
gc31	B	3	c	F	2	1	FALSE	1 18937	18.94
her7	A	3	c	G	2	2	TRUE	2 37693	37.69
jh293	B	3	c	F	2	2	TRUE	2 42567	42.57
jjp2	C	3	c	P	2	1	FALSE	1 15484	15.48
jmhd2	B	3	c	F	2	2	TRUE	2 170637	170.64
jt56	A	3	c	G	2	1	FALSE	2 38485	38.49
le38	B	3	c	F	2	2	TRUE	2 40189	40.19
mjb50	A	3	c	G	2	1	FALSE	2 21893	21.89
mjg25	C	3	c	P	2	1	FALSE	2 23999	24
mm349	A	3	c	G	2	1	FALSE	2 28065	28.07
mm360	C	3	c	P	2	1	FALSE	1 13138	13.14
mt63	B	3	c	F	2	2	TRUE	2 41767	41.77
ni29	B	3	c	F	2	1	FALSE	0 30146	30.15

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
opm2	C	3	c	P	2	1	FALSE	2 22735	22.74
pc52	C	3	c	P	2	1	FALSE	2 33172	33.17
ps99	B	3	c	F	2	1	FALSE	1 19938	19.94
rslr2	A	3	c	G	2	1	FALSE	2 13903	13.9
sh68	A	3	c	G	2	2	TRUE	2 14656	14.66
shm6	B	3	c	F	2	2	TRUE	0 12781	12.78
tcb3	B	3	c	F	2	2	TRUE	2 22735	22.74
tpc4	C	3	c	P	2	1	FALSE	2 15123	15.12
ves4	C	3	c	P	2	1	FALSE	2 17928	17.93
abd3	C	3	d	F	2	3	FALSE	2 53734	53.73
aa206	C	3	d	F	2	3	FALSE	2 30957	30.96
abbc2	C	3	d	F	2	2	TRUE	3 30392	30.39
ad241	A	3	d	P	2	2	TRUE	0 15422	15.42
amf23	B	3	d	G	2	3	FALSE	1 14735	14.74
ap290	B	3	d	G	2	2	TRUE	2 18250	18.25
apr5	B	3	d	G	2	2	TRUE	2 19627	19.63
as304	A	3	d	P	2	2	TRUE	2 23250	23.25
asg4	A	3	d	P	2	2	TRUE	2 39764	39.76
cav3	A	3	d	P	2	1	FALSE	4 42126	42.13
cb252	C	3	d	F	2	2	TRUE	2 18370	18.37
cb90	B	3	d	G	2	3	FALSE	2 41798	41.8
cc84	C	3	d	F	2	2	TRUE	2 29717	29.72
cg79	A	3	d	P	2	3	FALSE	2 28735	28.74
cw89	A	3	d	P	2	2	TRUE	2 12923	12.92
dab21	C	3	d	F	2	2	TRUE	0 23954	23.95
dg81	B	3	d	G	2	2	TRUE	4 66032	66.03

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
dk53	B	3	d	G	2	4	FALSE	2 16001	16
dpg4	C	3	d	F	2	2	TRUE	1 46800	46.8
ed29	C	3	d	F	2	3	FALSE	2 36519	36.52
emw7	A	3	d	P	2	2	TRUE	2 33891	33.89
gc31	B	3	d	G	2	2	TRUE	1 14469	14.47
her7	A	3	d	P	2	2	TRUE	2 28403	28.4
jh293	B	3	d	G	2	3	FALSE	1 18908	18.91
jjp2	C	3	d	F	2	2	TRUE	0 24297	24.3
jmh2	B	3	d	G	2	2	TRUE	1 26874	26.87
jt56	A	3	d	P	2	2	TRUE	0 40946	40.95
le38	B	3	d	G	2	1	FALSE	2 27438	27.44
mjb50	A	3	d	P	2	2	TRUE	3 34380	34.38
mjg25	C	3	d	F	2	2	TRUE	1 26811	26.81
mm349	A	3	d	P	2	2	TRUE	2 25674	25.67
mm360	C	3	d	F	2	2	TRUE	3 19589	19.59
mt63	B	3	d	G	2	2	TRUE	3 26672	26.67
ni29	B	3	d	G	2	2	TRUE	2 67619	67.62
opm2	C	3	d	F	2	2	TRUE	1 21688	21.69
pc52	C	3	d	F	2	2	TRUE	2 12516	12.52
ps99	B	3	d	G	2	2	TRUE	3 21595	21.6
rslr2	A	3	d	P	2	3	FALSE	2 19082	19.08
sh68	A	3	d	P	2	2	TRUE	2 21608	21.61
shm6	B	3	d	G	2	2	TRUE	1 24927	24.93
tcb3	B	3	d	G	2	2	TRUE	3 19938	19.94
tpc4	C	3	d	F	2	2	TRUE	2 18923	18.92
ves4	C	3	d	F	2	2	TRUE	2 20333	20.33

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
abd3	C	4	a	F	10	10	TRUE	2 31125	31.13
aa206	C	4	a	F	10	7	FALSE	2 101923	101.92
abbc2	C	4	a	F	10	10	TRUE	4 21104	21.1
ad241	A	4	a	P	10	10	TRUE	0 15391	15.39
amf23	B	4	a	G	10	7	FALSE	2 16922	16.92
ap290	B	4	a	G	10	7	FALSE	3 14890	14.89
apr5	B	4	a	G	10	6	FALSE	2 23424	23.42
as304	A	4	a	P	10	9	FALSE	3 29188	29.19
asg4	A	4	a	P	10	7	FALSE	3 56169	56.17
cav3	A	4	a	P	10	9	FALSE	3 31798	31.8
cb252	C	4	a	F	10	7	FALSE	2 30897	30.9
cb90	B	4	a	G	10	7	FALSE	2 26720	26.72
cc84	C	4	a	F	10	7	FALSE	2 20358	20.36
cg79	A	4	a	P	10	9	FALSE	2 25689	25.69
cw89	A	4	a	P	10	7	FALSE	2 24439	24.44
dab21	C	4	a	F	10	10	TRUE	1 17828	17.83
dg81	B	4	a	G	10	7	FALSE	3 28360	28.36
dk53	B	4	a	G	10	7	FALSE	2 18361	18.36
dpg4	C	4	a	F	10	7	FALSE	1 41081	41.08
ed29	C	4	a	F	10	7	FALSE	2 19268	19.27
emw7	A	4	a	P	10	9	FALSE	2 16891	16.89
gc31	B	4	a	G	10	7	FALSE	2 23218	23.22
her7	A	4	a	P	10	8	FALSE	3 54396	54.4
jh293	B	4	a	G	10	7	FALSE	1 25596	25.6
jjp2	C	4	a	F	10	6	FALSE	1 13766	13.77
jmhd2	B	4	a	G	10	7	FALSE	2 31359	31.36

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
jt56	A	4	a	P	10	10	TRUE	2 34112	34.11
le38	B	4	a	G	10	7	FALSE	2 26032	26.03
mjb50	A	4	a	P	10	10	TRUE	3 15129	15.13
mjb25	C	4	a	F	10	7	FALSE	3 21249	21.25
mm349	A	4	a	P	10	10	TRUE	4 25098	25.1
mm360	C	4	a	F	10	7	FALSE	3 22905	22.91
mt63	B	4	a	G	10	7	FALSE	2 18141	18.14
ni29	B	4	a	G	10	7	FALSE	1 34719	34.72
opm2	C	4	a	F	10	7	FALSE	2 21423	21.42
pc52	C	4	a	F	10	7	FALSE	3 35720	35.72
ps99	B	4	a	G	10	8	FALSE	3 13939	13.94
rslr2	A	4	a	P	10	9	FALSE	3 18427	18.43
sh68	A	4	a	P	10	7	FALSE	2 23375	23.38
shm6	B	4	a	G	10	7	FALSE	0 15674	15.67
tcb3	B	4	a	G	10	7	FALSE	2 10704	10.7
tpc4	C	4	a	F	10	7	FALSE	3 18720	18.72
ves4	C	4	a	F	10	7	FALSE	2 27610	27.61
abd3	C	4	b	G	6	5	FALSE	2 17579	17.58
aa206	C	4	b	G	6	5	FALSE	2 16332	16.33
abbc2	C	4	b	G	6	4	FALSE	2 10885	10.89
ad241	A	4	b	F	6	6	TRUE	0 7438	7.44
amf23	B	4	b	P	6	6	TRUE	3 20313	20.31
ap290	B	4	b	P	6	6	TRUE	1 11000	11
apr5	B	4	b	P	6	6	TRUE	2 33207	33.21
as304	A	4	b	F	6	6	TRUE	2 19813	19.81
asg4	A	4	b	F	6	6	TRUE	2 12327	12.33

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
cav3	A	4	b	F	6	6	TRUE	2 15954	15.95
cb252	C	4	b	G	6	5	FALSE	3 25850	25.85
cb90	B	4	b	P	6	6	TRUE	4 82645	82.65
cc84	C	4	b	G	6	4	FALSE	2 10640	10.64
cg79	A	4	b	F	6	6	TRUE	2 10313	10.31
cw89	A	4	b	F	6	6	TRUE	1 9375	9.38
dab21	C	4	b	G	6	4	FALSE	0 16531	16.53
dg81	B	4	b	P	6	6	TRUE	3 23328	23.33
dk53	B	4	b	P	6	5	FALSE	1 10372	10.37
dpg4	C	4	b	G	6	5	FALSE	1 19471	19.47
ed29	C	4	b	G	6	5	FALSE	1 12408	12.41
emw7	A	4	b	F	6	6	TRUE	1 12216	12.22
gc31	B	4	b	P	6	6	TRUE	3 22500	22.5
her7	A	4	b	F	6	6	TRUE	2 33550	33.55
jh293	B	4	b	P	6	2	FALSE	2 26331	26.33
jip2	C	4	b	G	6	5	FALSE	1 8844	8.84
jmh2	B	4	b	P	6	6	TRUE	2 32078	32.08
jt56	A	4	b	F	6	6	TRUE	1 16225	16.23
le38	B	4	b	P	6	6	TRUE	2 9373	9.37
mjb50	A	4	b	F	6	6	TRUE	3 7483	7.48
mjb25	C	4	b	G	6	5	FALSE	3 11219	11.22
mm349	A	4	b	F	6	6	TRUE	3 10637	10.64
mm360	C	4	b	G	6	5	FALSE	2 11610	11.61
mt63	B	4	b	P	6	6	TRUE	2 14076	14.08
ni29	B	4	b	P	6	6	TRUE	4 65719	65.72
opm2	C	4	b	G	6	5	FALSE	1 15907	15.91

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
pc52	C	4	b	G	6	5	FALSE	1 9156	9.16
ps99	B	4	b	P	6	6	TRUE	2 25030	25.03
rslr2	A	4	b	F	6	6	TRUE	2 11307	11.31
sh68	A	4	b	F	6	6	TRUE	2 8438	8.44
shm6	B	4	b	P	6	6	TRUE	0 25911	25.91
tcb3	B	4	b	P	6	6	TRUE	3 28762	28.76
tpc4	C	4	b	G	6	5	FALSE	4 14121	14.12
ves4	C	4	b	G	6	4	FALSE	1 8635	8.64
abd3	C	4	c	F	0	0	TRUE	2 21704	21.7
aa206	C	4	c	F	0	1	FALSE	2 28204	28.2
abbc2	C	4	c	F	0	0	TRUE	3 20112	20.11
ad241	A	4	c	P	0	0	TRUE	0 10313	10.31
amf23	B	4	c	G	0	0	TRUE	1 9953	9.95
ap290	B	4	c	G	0	0	TRUE	2 10468	10.47
apr5	B	4	c	G	0	0	TRUE	1 16205	16.21
as304	A	4	c	P	0	0	TRUE	1 9438	9.44
asg4	A	4	c	P	0	0	TRUE	2 15327	15.33
cav3	A	4	c	P	0	0	TRUE	0 8313	8.31
cb252	C	4	c	F	0	1	FALSE	3 37823	37.82
cb90	B	4	c	G	0	0	TRUE	2 26095	26.1
cc84	C	4	c	F	0	0	TRUE	1 23311	23.31
cg79	A	4	c	P	0	0	TRUE	0 6969	6.97
cw89	A	4	c	P	0	0	TRUE	1 12063	12.06
dab21	C	4	c	F	0	0	TRUE	1 39438	39.44
dg81	B	4	c	G	0	1	FALSE	3 35938	35.94
dk53	B	4	c	G	0	2	FALSE	2 22386	22.39

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
dpg4	C	4	c	F	0	0	TRUE	2 21203	21.2
ed29	C	4	c	F	0	0	TRUE	2 22283	22.28
emw7	A	4	c	P	0	0	TRUE	1 11875	11.88
gc31	B	4	c	G	0	0	TRUE	1 13187	13.19
her7	A	4	c	P	0	0	TRUE	2 18065	18.07
jh293	B	4	c	G	0	0	TRUE	2 16861	16.86
jip2	C	4	c	F	0	1	FALSE	2 46328	46.33
jmhd2	B	4	c	G	0	0	TRUE	1 17437	17.44
jt56	A	4	c	P	0	0	TRUE	0 14562	14.56
le38	B	4	c	G	0	0	TRUE	2 16938	16.94
mjb50	A	4	c	P	0	0	TRUE	1 6579	6.58
mjb25	C	4	c	F	0	0	TRUE	2 17030	17.03
mm349	A	4	c	P	0	0	TRUE	1 9433	9.43
mm360	C	4	c	F	0	0	TRUE	1 6082	6.08
mt63	B	4	c	G	0	0	TRUE	0 9923	9.92
ni29	B	4	c	G	0	0	TRUE	1 31993	31.99
opm2	C	4	c	F	0	0	TRUE	1 10500	10.5
pc52	C	4	c	F	0	0	TRUE	2 26844	26.84
ps99	B	4	c	G	0	0	TRUE	1 11704	11.7
rslr2	A	4	c	P	0	0	TRUE	2 10828	10.83
sh68	A	4	c	P	0	0	TRUE	2 10656	10.66
shm6	B	4	c	G	0	0	TRUE	0 11377	11.38
tcb3	B	4	c	G	0	0	TRUE	2 16204	16.2
tpc4	C	4	c	F	0	0	TRUE	1 9862	9.86
ves4	C	4	c	F	0	0	TRUE	0 6902	6.9
abd3	C	4	d	G	1	3	FALSE	3 24797	24.8

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
aa206	C	4	d	G	1	1	TRUE	2 28323	28.32
abbc2	C	4	d	G	1	1	TRUE	3 21275	21.28
ad241	A	4	d	F	1	3	FALSE	2 13922	13.92
amf23	B	4	d	P	1	1	TRUE	2 37469	37.47
ap290	B	4	d	P	1	1	TRUE	2 16125	16.13
apr5	B	4	d	P	1	1	TRUE	2 57615	57.62
as304	A	4	d	F	1	1	TRUE	2 12578	12.58
asg4	A	4	d	F	1	1	TRUE	2 35233	35.23
cav3	A	4	d	F	1	1	TRUE	2 16110	16.11
cb252	C	4	d	G	1	2	FALSE	3 38268	38.27
cb90	B	4	d	P	1	2	FALSE	3 95473	95.47
cc84	C	4	d	G	1	1	TRUE	2 17249	17.25
cg79	A	4	d	F	1	1	TRUE	2 35205	35.21
cw89	A	4	d	F	1	1	TRUE	1 13828	13.83
dab21	C	4	d	G	1	1	TRUE	0 20047	20.05
dg81	B	4	d	P	1	1	TRUE	4 39938	39.94
dk53	B	4	d	P	1	2	FALSE	1 12134	12.13
dpg4	C	4	d	G	1	1	TRUE	1 17564	17.56
ed29	C	4	d	G	1	1	TRUE	2 14454	14.45
emw7	A	4	d	F	1	1	TRUE	2 15657	15.66
gc31	B	4	d	P	1	1	TRUE	3 39625	39.63
her7	A	4	d	F	1	1	TRUE	3 59894	59.89
jh293	B	4	d	P	1	1	TRUE	0 21065	21.07
jip2	C	4	d	G	1	1	TRUE	0 8672	8.67
jmh2	B	4	d	P	1	1	TRUE	1 48655	48.66
jt56	A	4	d	F	1	1	TRUE	0 12212	12.21

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
le38	B	4	d	P	1	1	TRUE	2 46443	46.44
mjb50	A	4	d	F	1	1	TRUE	3 31803	31.8
mjg25	C	4	d	G	1	4	FALSE	4 10375	10.38
mm349	A	4	d	F	1	1	TRUE	2 17984	17.98
mm360	C	4	d	G	1	1	TRUE	2 12132	12.13
mt63	B	4	d	P	1	1	TRUE	2 17672	17.67
ni29	B	4	d	P	1	0	FALSE	3 52162	52.16
opm2	C	4	d	G	1	1	TRUE	1 6594	6.59
pc52	C	4	d	G	1	1	TRUE	2 11875	11.88
ps99	B	4	d	P	1	2	FALSE	4 37663	37.66
rslr2	A	4	d	F	1	1	TRUE	2 12425	12.43
sh68	A	4	d	F	1	4	FALSE	4 28437	28.44
shm6	B	4	d	P	1	2	FALSE	2 20478	20.48
tcb3	B	4	d	P	1	2	FALSE	2 17313	17.31
tpc4	C	4	d	G	1	1	TRUE	2 10768	10.77
ves4	C	4	d	G	1	1	TRUE	1 16147	16.15
abd3	C	5	a	G	7	6	FALSE	2 17953	17.95
aa206	C	5	a	G	7	6	FALSE	2 20469	20.47
abbc2	C	5	a	G	7	7	TRUE	2 21619	21.62
ad241	A	5	a	F	7	6	FALSE	1 14110	14.11
amf23	B	5	a	P	7	6	FALSE	3 27141	27.14
ap290	B	5	a	P	7	6	FALSE	4 39750	39.75
apr5	B	5	a	P	7	6	FALSE	2 55240	55.24
as304	A	5	a	F	7	6	FALSE	3 23454	23.45
asg4	A	5	a	F	7	6	FALSE	2 24718	24.72
cav3	A	5	a	F	7	6	FALSE	2 26501	26.5

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
cb252	C	5	a	G	7	6	FALSE	4 45508	45.51
cb90	B	5	a	P	7	6	FALSE	2 70926	70.93
cc84	C	5	a	G	7	6	FALSE	3 25483	25.48
cg79	A	5	a	F	7	6	FALSE	1 11891	11.89
cw89	A	5	a	F	7	6	FALSE	1 11938	11.94
dab21	C	5	a	G	7	6	FALSE	4 54923	54.92
dg81	B	5	a	P	7	6	FALSE	3 27563	27.56
dk53	B	5	a	P	7	6	FALSE	3 96403	96.4
dpg4	C	5	a	G	7	6	FALSE	2 49143	49.14
ed29	C	5	a	G	7	6	FALSE	2 16626	16.63
emw7	A	5	a	F	7	6	FALSE	1 11954	11.95
gc31	B	5	a	P	7	6	FALSE	2 27422	27.42
her7	A	5	a	F	7	7	TRUE	2 27925	27.93
jh293	B	5	a	P	7	6	FALSE	2 36504	36.5
jjp2	C	5	a	G	7	6	FALSE	3 85126	85.13
jmhd2	B	5	a	P	7	10	FALSE	3 103139	103.14
jt56	A	5	a	F	7	6	FALSE	0 16336	16.34
le38	B	5	a	P	7	6	FALSE	2 25970	25.97
mjb50	A	5	a	F	7	6	FALSE	2 9305	9.31
mjg25	C	5	a	G	7	6	FALSE	3 22343	22.34
mm349	A	5	a	F	7	6	FALSE	2 24064	24.06
mm360	C	5	a	G	7	6	FALSE	2 9052	9.05
mt63	B	5	a	P	7	6	FALSE	4 68002	68
ni29	B	5	a	P	7	6	FALSE	2 33593	33.59
opm2	C	5	a	G	7	6	FALSE	4 47423	47.42
pc52	C	5	a	G	7	6	FALSE	4 71845	71.85

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
ps99	B	5	a	P	7	6	FALSE	4 20626	20.63
rslr2	A	5	a	F	7	6	FALSE	3 15166	15.17
sh68	A	5	a	F	7	6	FALSE	2 11422	11.42
shm6	B	5	a	P	7	6	FALSE	0 63356	63.36
tcb3	B	5	a	P	7	6	FALSE	3 32078	32.08
tpc4	C	5	a	G	7	6	FALSE	4 32102	32.1
ves4	C	5	a	G	7	6	FALSE	3 55079	55.08
abd3	C	5	b	P	14	12	FALSE	2 29750	29.75
aa206	C	5	b	P	14	11	FALSE	2 21390	21.39
abbc2	C	5	b	P	14	11	FALSE	4 21723	21.72
ad241	A	5	b	G	14	13	FALSE	2 9766	9.77
amf23	B	5	b	F	14	14	TRUE	2 15985	15.99
ap290	B	5	b	F	14	14	TRUE	3 18204	18.2
apr5	B	5	b	F	14	14	TRUE	2 13673	13.67
as304	A	5	b	G	14	13	FALSE	3 32626	32.63
asg4	A	5	b	G	14	13	FALSE	2 26234	26.23
cav3	A	5	b	G	14	13	FALSE	3 33517	33.52
cb252	C	5	b	P	14	14	TRUE	4 30735	30.74
cb90	B	5	b	F	14	13	FALSE	3 53221	53.22
cc84	C	5	b	P	14	13	FALSE	3 19123	19.12
cg79	A	5	b	G	14	13	FALSE	2 13251	13.25
cw89	A	5	b	G	14	13	FALSE	2 12563	12.56
dab21	C	5	b	P	14	13	FALSE	2 19500	19.5
dg81	B	5	b	F	14	14	TRUE	3 35750	35.75
dk53	B	5	b	F	14	13	FALSE	1 14442	14.44
dpg4	C	5	b	P	14	12	FALSE	3 27059	27.06

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
ed29	C	5	b	P	14	13	FALSE	3 20924	20.92
emw7	A	5	b	G	14	10	FALSE	2 16388	16.39
gc31	B	5	b	F	14	14	TRUE	3 15140	15.14
her7	A	5	b	G	14	13	FALSE	2 35420	35.42
jh293	B	5	b	F	14	14	TRUE	2 19658	19.66
jip2	C	5	b	P	14	13	FALSE	1 14906	14.91
jmhd2	B	5	b	F	14	14	TRUE	2 30077	30.08
jt56	A	5	b	G	14	13	FALSE	1 12368	12.37
le38	B	5	b	F	14	14	TRUE	2 14607	14.61
mjb50	A	5	b	G	14	13	FALSE	3 13934	13.93
mjb25	C	5	b	P	14	13	FALSE	3 20640	20.64
mm349	A	5	b	G	14	13	FALSE	2 13897	13.9
mm360	C	5	b	P	14	14	TRUE	2 15573	15.57
mt63	B	5	b	F	14	14	TRUE	2 13998	14
ni29	B	5	b	F	14	14	TRUE	0 29210	29.21
opm2	C	5	b	P	14	13	FALSE	1 14953	14.95
pc52	C	5	b	P	14	13	FALSE	2 17047	17.05
ps99	B	5	b	F	14	14	TRUE	3 12070	12.07
rslr2	A	5	b	G	14	13	FALSE	3 25285	25.29
sh68	A	5	b	G	14	13	FALSE	2 12281	12.28
shm6	B	5	b	F	14	14	TRUE	0 12159	12.16
tcb3	B	5	b	F	14	14	TRUE	3 15146	15.15
tpc4	C	5	b	P	14	13	FALSE	4 16780	16.78
ves4	C	5	b	P	14	13	FALSE	1 13945	13.95
abd3	C	5	c	G	1	1	TRUE	1 13422	13.42
aa206	C	5	c	G	1	1	TRUE	2 26438	26.44

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
abbc2	C	5	c	G	1	1	TRUE	2 13679	13.68
ad241	A	5	c	F	1	1	TRUE	1 9359	9.36
amf23	B	5	c	P	1	1	TRUE	1 7828	7.83
ap290	B	5	c	P	1	1	TRUE	2 10625	10.63
apr5	B	5	c	P	1	1	TRUE	2 13845	13.85
as304	A	5	c	F	1	1	TRUE	2 13156	13.16
asg4	A	5	c	F	1	1	TRUE	2 13406	13.41
cav3	A	5	c	F	1	1	TRUE	1 15110	15.11
cb252	C	5	c	G	1	1	TRUE	2 26814	26.81
cb90	B	5	c	P	1	2	FALSE	1 20767	20.77
cc84	C	5	c	G	1	1	TRUE	2 16515	16.52
cg79	A	5	c	F	1	1	TRUE	0 8375	8.38
cw89	A	5	c	F	1	1	TRUE	2 13782	13.78
dab21	C	5	c	G	1	1	TRUE	1 15001	15
dg81	B	5	c	P	1	1	TRUE	0 28985	28.99
dk53	B	5	c	P	1	2	FALSE	0 23311	23.31
dpg4	C	5	c	G	1	1	TRUE	1 21452	21.45
ed29	C	5	c	G	1	1	TRUE	1 13267	13.27
emw7	A	5	c	F	1	1	TRUE	1 8515	8.52
gc31	B	5	c	P	1	1	TRUE	1 10281	10.28
her7	A	5	c	F	1	1	TRUE	2 11010	11.01
jh293	B	5	c	P	1	1	TRUE	1 12923	12.92
jip2	C	5	c	G	1	1	TRUE	1 9797	9.8
jmhd2	B	5	c	P	1	1	TRUE	1 10125	10.13
jt56	A	5	c	F	1	1	TRUE	0 11375	11.38
le38	B	5	c	P	1	1	TRUE	2 22767	22.77

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
mjb50	A	5	c	F	1	1	TRUE	2 4438	4.44
mjg25	C	5	c	G	1	1	TRUE	2 11124	11.12
mm349	A	5	c	F	1	1	TRUE	2 8668	8.67
mm360	C	5	c	G	1	1	TRUE	1 9570	9.57
mt63	B	5	c	P	1	1	TRUE	1 13594	13.59
ni29	B	5	c	P	1	1	TRUE	0 21423	21.42
opm2	C	5	c	G	1	1	TRUE	2 7766	7.77
pc52	C	5	c	G	1	1	TRUE	2 11266	11.27
ps99	B	5	c	P	1	1	TRUE	2 12000	12
rslr2	A	5	c	F	1	1	TRUE	2 10829	10.83
sh68	A	5	c	F	1	1	TRUE	2 9109	9.11
shm6	B	5	c	P	1	1	TRUE	0 9283	9.28
tcb3	B	5	c	P	1	1	TRUE	1 8188	8.19
tpc4	C	5	c	G	1	1	TRUE	1 20354	20.35
ves4	C	5	c	G	1	1	TRUE	1 10244	10.24
abd3	C	5	d	P	2	3	FALSE	2 10641	10.64
aa206	C	5	d	P	2	1	FALSE	2 11866	11.87
abbc2	C	5	d	P	2	2	TRUE	3 12690	12.69
ad241	A	5	d	G	2	1	FALSE	2 7047	7.05
amf23	B	5	d	F	2	2	TRUE	2 11203	11.2
ap290	B	5	d	F	2	1	FALSE	2 21125	21.13
apr5	B	5	d	F	2	1	FALSE	1 15971	15.97
as304	A	5	d	G	2	1	FALSE	2 19219	19.22
asg4	A	5	d	G	2	2	TRUE	2 20327	20.33
cav3	A	5	d	G	2	1	FALSE	4 40172	40.17
cb252	C	5	d	P	2	2	TRUE	3 21319	21.32

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
cb90	B	5	d	F	2	1	FALSE	1 19610	19.61
cc84	C	5	d	P	2	2	TRUE	1 15499	15.5
cg79	A	5	d	G	2	2	TRUE	2 34283	34.28
cw89	A	5	d	G	2	2	TRUE	2 15220	15.22
dab21	C	5	d	P	2	1	FALSE	4 28641	28.64
dg81	B	5	d	F	2	2	TRUE	4 20048	20.05
dk53	B	5	d	F	2	1	FALSE	0 15955	15.96
dpg4	C	5	d	P	2	2	TRUE	2 38863	38.86
ed29	C	5	d	P	2	1	FALSE	1 13329	13.33
emw7	A	5	d	G	2	1	FALSE	1 19060	19.06
gc31	B	5	d	F	2	1	FALSE	1 16499	16.5
her7	A	5	d	G	2	1	FALSE	3 26687	26.69
jh293	B	5	d	F	2	2	TRUE	2 29504	29.5
jip2	C	5	d	P	2	2	TRUE	4 19438	19.44
jmhd2	B	5	d	F	2	1	FALSE	1 14672	14.67
jt56	A	5	d	G	2	2	TRUE	3 47098	47.1
le38	B	5	d	F	2	1	FALSE	2 8823	8.82
mjb50	A	5	d	G	2	1	FALSE	3 25261	25.26
mjb25	C	5	d	P	2	1	FALSE	1 17343	17.34
mm349	A	5	d	G	2	2	TRUE	3 23084	23.08
mm360	C	5	d	P	2	2	TRUE	2 10366	10.37
mt63	B	5	d	F	2	2	TRUE	3 19434	19.43
ni29	B	5	d	F	2	1	FALSE	0 17049	17.05
opm2	C	5	d	P	2	2	TRUE	2 15594	15.59
pc52	C	5	d	P	2	2	TRUE	3 25875	25.88
ps99	B	5	d	F	2	2	TRUE	3 10415	10.42

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
rslr2	A	5	d	G	2	1	FALSE	1 9042	9.04
sh68	A	5	d	G	2	1	FALSE	3 22203	22.2
shm6	B	5	d	F	2	2	TRUE	2 25583	25.58
tcb3	B	5	d	F	2	1	FALSE	2 10338	10.34
tpc4	C	5	d	P	2	1	FALSE	1 10800	10.8
ves4	C	5	d	P	2	2	TRUE	2 23674	23.67
abd3	C	6	a	P	2	1	FALSE	1 12343	12.34
aa206	C	6	a	P	2	2	TRUE	2 55767	55.77
abbc2	C	6	a	P	2	3	FALSE	0 28706	28.71
ad241	A	6	a	G	2	1	FALSE	2 10875	10.88
amf23	B	6	a	F	2	2	TRUE	1 15610	15.61
ap290	B	6	a	F	2	1	FALSE	1 16031	16.03
apr5	B	6	a	F	2	2	TRUE	0 20752	20.75
as304	A	6	a	G	2	2	TRUE	3 14969	14.97
asg4	A	6	a	G	2	1	FALSE	1 22047	22.05
cav3	A	6	a	G	2	1	FALSE	1 12266	12.27
cb252	C	6	a	P	2	5	FALSE	4 61130	61.13
cb90	B	6	a	F	2	2	TRUE	1 24766	24.77
cc84	C	6	a	P	2	2	TRUE	3 12234	12.23
cg79	A	6	a	G	2	2	TRUE	1 8969	8.97
cw89	A	6	a	G	2	2	TRUE	2 13923	13.92
dab21	C	6	a	P	2	5	FALSE	4 72845	72.85
dg81	B	6	a	F	2	2	TRUE	0 16125	16.13
dk53	B	6	a	F	2	2	TRUE	0 21709	21.71
dpg4	C	6	a	P	2	2	TRUE	2 48096	48.1
ed29	C	6	a	P	2	1	FALSE	1 11407	11.41

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
emw7	A	6	a	G	2	1	FALSE	1 10797	10.8
gc31	B	6	a	F	2	2	TRUE	1 7125	7.13
her7	A	6	a	G	2	2	TRUE	1 16639	16.64
jh293	B	6	a	F	2	2	TRUE	1 33332	33.33
jip2	C	6	a	P	2	5	FALSE	4 102064	102.06
jmhd2	B	6	a	F	2	2	TRUE	1 16968	16.97
jt56	A	6	a	G	2	1	FALSE	0 15163	15.16
le38	B	6	a	F	2	1	FALSE	2 18724	18.72
mjb50	A	6	a	G	2	5	FALSE	2 12942	12.94
mjb25	C	6	a	P	2	5	FALSE	4 42420	42.42
mm349	A	6	a	G	2	1	FALSE	1 20558	20.56
mm360	C	6	a	P	2	5	FALSE	4 76186	76.19
mt63	B	6	a	F	2	2	TRUE	1 9110	9.11
ni29	B	6	a	F	2	2	TRUE	1 14520	14.52
opm2	C	6	a	P	2	2	TRUE	2 28032	28.03
pc52	C	6	a	P	2	3	FALSE	4 82627	82.63
ps99	B	6	a	F	2	2	TRUE	1 27299	27.3
rslr2	A	6	a	G	2	1	FALSE	4 9939	9.94
sh68	A	6	a	G	2	1	FALSE	2 8203	8.2
shm6	B	6	a	F	2	2	TRUE	0 10177	10.18
tcb3	B	6	a	F	2	2	TRUE	1 6313	6.31
tpc4	C	6	a	P	2	2	TRUE	3 28643	28.64
ves4	C	6	a	P	2	1	FALSE	0 10900	10.9
abd3	C	6	b	F	4	4	TRUE	2 11922	11.92
aa206	C	6	b	F	4	4	TRUE	2 14942	14.94
abbc2	C	6	b	F	4	4	TRUE	3 20475	20.48

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
ad241	A	6	b	P	4	4	TRUE	2 9751	9.75
amf23	B	6	b	G	4	4	TRUE	3 20047	20.05
ap290	B	6	b	G	4	4	TRUE	3 15328	15.33
apr5	B	6	b	G	4	4	TRUE	3 26394	26.39
as304	A	6	b	P	4	4	TRUE	2 19485	19.49
asg4	A	6	b	P	4	4	TRUE	2 27390	27.39
cav3	A	6	b	P	4	5	FALSE	4 28438	28.44
cb252	C	6	b	F	4	4	TRUE	1 23359	23.36
cb90	B	6	b	G	4	4	TRUE	3 54487	54.49
cc84	C	6	b	F	4	4	TRUE	1 13937	13.94
cg79	A	6	b	P	4	4	TRUE	3 12688	12.69
cw89	A	6	b	P	4	4	TRUE	2 14016	14.02
dab21	C	6	b	F	4	4	TRUE	0 9422	9.42
dg81	B	6	b	G	4	4	TRUE	3 25516	25.52
dk53	B	6	b	G	4	4	TRUE	2 31145	31.15
dpg4	C	6	b	F	4	4	TRUE	1 24389	24.39
ed29	C	6	b	F	4	4	TRUE	2 12970	12.97
emw7	A	6	b	P	4	4	TRUE	3 22527	22.53
gc31	B	6	b	G	4	4	TRUE	3 8484	8.48
her7	A	6	b	P	4	4	TRUE	2 28177	28.18
jh293	B	6	b	G	4	4	TRUE	1 21690	21.69
jjp2	C	6	b	F	4	4	TRUE	1 6782	6.78
jmhd2	B	6	b	G	4	5	FALSE	4 21296	21.3
jt56	A	6	b	P	4	4	TRUE	2 27211	27.21
le38	B	6	b	G	4	6	FALSE	2 20122	20.12
mjb50	A	6	b	P	4	4	TRUE	3 14012	14.01

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
mjg25	C	6	b	F	4	4	TRUE	2 10343	10.34
mm349	A	6	b	P	4	4	TRUE	2 11884	11.88
mm360	C	6	b	F	4	4	TRUE	1 10486	10.49
mt63	B	6	b	G	4	4	TRUE	4 34823	34.82
ni29	B	6	b	G	4	5	FALSE	1 34388	34.39
opm2	C	6	b	F	4	4	TRUE	1 11704	11.7
pc52	C	6	b	F	4	4	TRUE	1 11875	11.88
ps99	B	6	b	G	4	4	TRUE	2 11508	11.51
rslr2	A	6	b	P	4	4	TRUE	3 12900	12.9
sh68	A	6	b	P	4	5	FALSE	4 16469	16.47
shm6	B	6	b	G	4	4	TRUE	0 21115	21.12
tcb3	B	6	b	G	4	4	TRUE	2 12211	12.21
tpc4	C	6	b	F	4	4	TRUE	3 18045	18.05
ves4	C	6	b	F	4	4	TRUE	0 11713	11.71
abd3	C	6	c	P	0	0	TRUE	2 20484	20.48
aa206	C	6	c	P	0	0	TRUE	2 32125	32.13
abbc2	C	6	c	P	0	0	TRUE	0 17247	17.25
ad241	A	6	c	G	0	0	TRUE	1 11234	11.23
amf23	B	6	c	F	0	0	TRUE	0 7016	7.02
ap290	B	6	c	F	0	2	FALSE	3 14125	14.13
apr5	B	6	c	F	0	0	TRUE	1 13596	13.6
as304	A	6	c	G	0	0	TRUE	2 22406	22.41
asg4	A	6	c	G	0	0	TRUE	3 36358	36.36
cav3	A	6	c	G	0	0	TRUE	1 12969	12.97
cb252	C	6	c	P	0	0	TRUE	2 29912	29.91
cb90	B	6	c	F	0	0	TRUE	2 36002	36

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
cc84	C	6	c	P	0	1	FALSE	2 22655	22.66
cg79	A	6	c	G	0	0	TRUE	1 12094	12.09
cw89	A	6	c	G	0	0	TRUE	1 14579	14.58
dab21	C	6	c	P	0	0	TRUE	0 15235	15.24
dg81	B	6	c	F	0	0	TRUE	1 31281	31.28
dk53	B	6	c	F	0	2	FALSE	1 32632	32.63
dpg4	C	6	c	P	0	0	TRUE	1 21483	21.48
ed29	C	6	c	P	0	0	TRUE	2 19548	19.55
emw7	A	6	c	G	0	0	TRUE	1 12328	12.33
gc31	B	6	c	F	0	0	TRUE	1 12734	12.73
her7	A	6	c	G	0	2	FALSE	2 16922	16.92
jh293	B	6	c	F	0	4	FALSE	2 28909	28.91
jip2	C	6	c	P	0	0	TRUE	1 8047	8.05
jmh2	B	6	c	F	0	0	TRUE	1 16656	16.66
jt56	A	6	c	G	0	0	TRUE	0 11594	11.59
le38	B	6	c	F	0	0	TRUE	2 9481	9.48
mjb50	A	6	c	G	0	0	TRUE	1 18361	18.36
mjg25	C	6	c	P	0	0	TRUE	2 11890	11.89
mm349	A	6	c	G	0	0	TRUE	1 13354	13.35
mm360	C	6	c	P	0	0	TRUE	2 12966	12.97
mt63	B	6	c	F	0	0	TRUE	1 10266	10.27
ni29	B	6	c	F	0	0	TRUE	0 16631	16.63
opm2	C	6	c	P	0	0	TRUE	1 13407	13.41
pc52	C	6	c	P	0	0	TRUE	1 14641	14.64
ps99	B	6	c	F	0	0	TRUE	1 13734	13.73
rslr2	A	6	c	G	0	0	TRUE	4 14324	14.32

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
sh68	A	6	c	G	0	0	TRUE	2 11781	11.78
shm6	B	6	c	F	0	0	TRUE	4 7767	7.77
tcb3	B	6	c	F	0	0	TRUE	1 12750	12.75
tpc4	C	6	c	P	0	0	TRUE	1 13580	13.58
ves4	C	6	c	P	0	0	TRUE	1 22097	22.1
abd3	C	6	d	F	1	2	FALSE	2 25094	25.09
aa206	C	6	d	F	1	2	FALSE	2 28089	28.09
abbc2	C	6	d	F	1	1	TRUE	2 24042	24.04
ad241	A	6	d	P	1	1	TRUE	0 15719	15.72
amf23	B	6	d	G	1	1	TRUE	2 11938	11.94
ap290	B	6	d	G	1	2	FALSE	2 23719	23.72
apr5	B	6	d	G	1	1	TRUE	2 14033	14.03
as304	A	6	d	P	1	1	TRUE	4 27485	27.49
asg4	A	6	d	P	1	1	TRUE	4 79264	79.26
cav3	A	6	d	P	1	0	FALSE	1 17422	17.42
cb252	C	6	d	F	1	1	TRUE	2 31541	31.54
cb90	B	6	d	G	1	1	TRUE	2 46268	46.27
cc84	C	6	d	F	1	1	TRUE	3 26452	26.45
cg79	A	6	d	P	1	1	TRUE	2 31127	31.13
cw89	A	6	d	P	1	1	TRUE	2 23361	23.36
dab21	C	6	d	F	1	2	FALSE	2 22219	22.22
dg81	B	6	d	G	1	1	TRUE	4 41626	41.63
dk53	B	6	d	G	1	2	FALSE	2 20524	20.52
dpg4	C	6	d	F	1	1	TRUE	2 32347	32.35
ed29	C	6	d	F	1	3	FALSE	2 20439	20.44
emw7	A	6	d	P	1	1	TRUE	2 34134	34.13

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Candidate	Group	Map	Question	Map Type	Answer	Given Answer	Correct?	Ease	Time (s)
gc31	B	6	d	G	1	1	TRUE	1 17734	17.73
her7	A	6	d	P	1	1	TRUE	2 31694	31.69
jh293	B	6	d	G	1	1	TRUE	1 20518	20.52
jjp2	C	6	d	F	1	1	TRUE	1 13141	13.14
jmhd2	B	6	d	G	1	1	TRUE	1 14281	14.28
jt56	A	6	d	P	1	1	TRUE	2 20957	20.96
le38	B	6	d	G	1	1	TRUE	2 22847	22.85
mjb50	A	6	d	P	1	1	TRUE	4 57179	57.18
mjg25	C	6	d	F	1	1	TRUE	2 15937	15.94
mm349	A	6	d	P	1	1	TRUE	3 48227	48.23
mm360	C	6	d	F	1	1	TRUE	3 13070	13.07
mt63	B	6	d	G	1	1	TRUE	2 14513	14.51
ni29	B	6	d	G	1	1	TRUE	2 35457	35.46
opm2	C	6	d	F	1	1	TRUE	1 23594	23.59
pc52	C	6	d	F	1	1	TRUE	2 15078	15.08
ps99	B	6	d	G	1	1	TRUE	3 11227	11.23
rslr2	A	6	d	P	1	2	FALSE	4 18663	18.66
sh68	A	6	d	P	1	1	TRUE	4 24047	24.05
shm6	B	6	d	G	1	1	TRUE	1 19167	19.17
tcb3	B	6	d	G	1	1	TRUE	2 11446	11.45
tpc4	C	6	d	F	1	2	FALSE	2 21083	21.08
ves4	C	6	d	F	1	1	TRUE	2 22690	22.69

A.3.2 Design Preferences

Table A.8: Design Preferences: Geographic Map. “1” represents the design that the candidate felt was most preferable and “3” represents the least preferable map.

Candidate	Atlanta	Bucharest	Mexico	Stockholm	Toronto	Washington
apr5	3	2	2	3	3	3
aa206	3	2	3	3	3	3
abbc2	2	1	2	3	2	2
abd3	3	2	2	3	3	3
ad241	3	3	2	3	3	3
amf23	3	2	3	3	3	3
ap290	2	1	3	3	3	3
as304	3	2	2	3	3	3
asg4	2	2	2	3	2	3
cav3	3	2	2	2	2	3
cb252	3	2	2	3	2	3
cb90	3	3	2	3	3	3
cc84	1	3	3	1	2	3
cg79	3	2	2	3	2	3
cw89	1	3	2	3	1	3
dab21	2	3	2	3	2	3
dg81	3	2	2	3	3	3
dks3	3	3	3	3	3	3
dpg4	2	1	1	2	3	3
ed29	2	3	2	3	1	3
emw7	1	2	1	2	1	3
gc31	1	1	2	3	2	3
her7	2	1	2	3	1	3
jh293	1	2	2	2	3	3
jjp2	1	1	2	3	1	3
jmhd2	3	2	2	3	3	3
jt56	1	1	2	3	2	3
le38	2	1	2	3	2	2
mjb50	3	3	2	3	3	3
mjg25	3	3	2	3	3	3
mm349	3	2	2	2	2	3
mm360	2	2	2	3	2	3
mt63	2	1	2	2	2	2
ni29	3	3	2	3	3	3
opm2	3	2	3	2	2	3

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Candidate	Atlanta	Bucharest	Mexico	Stockholm	Toronto	Washington
pc52	3	2	2	2	2	3
ps99	1	2	2	1	2	3
rlsr2	3	2	2	3	2	3
sh68	3	2	2	3	2	3
shm6	3	3	2	3	2	3
tcb3	1	2	2	2	2	3
tpc4	1	3	2	3	3	3
ves4	3	2	2	3	3	3

Table A.9: Design Preferences: Normalised Published Map. “1” represents the design that the candidate felt was most preferable and “3” represents the least preferable map.

Candidate	Atlanta	Bucharest	Mexico	Stockholm	Toronto	Washington
apr5	2	3	3	1	2	1
aa206	1	3	2	1	1	2
abbc2	3	3	3	1	1	1
abd3	2	3	3	1	1	1
ad241	2	2	3	1	1	2
amf23	2	3	2	1	1	1
ap290	3	2	2	1	1	2
as304	1	3	3	2	2	2
asg4	3	3	3	2	3	2
cav3	1	3	3	1	3	2
cb252	2	3	3	1	3	2
cb90	2	2	3	1	1	2
cc84	3	2	2	3	3	2
cg79	2	3	3	1	3	2
cw89	2	1	3	1	3	1
dab21	1	2	3	1	3	2
dg81	2	3	3	2	1	2
dks3	2	2	2	1	1	1
dpg4	1	3	2	1	1	2
ed29	1	1	3	1	3	2
emw7	3	1	3	1	3	2
gc31	2	2	3	1	3	2
her7	3	2	3	1	3	2
jh293	3	3	3	1	2	2
jjp2	3	3	3	1	3	1
jmhd2	2	3	3	1	2	2

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Candidate	Atlanta	Bucharest	Mexico	Stockholm	Toronto	Washington
jt56	2	2	3	1	3	2
le38	1	3	3	2	1	3
mjb50	2	2	3	1	2	2
mjb25	1	2	3	1	1	1
mm349	2	3	3	1	3	2
mm360	1	1	3	1	3	2
mt63	1	2	3	1	3	3
ni29	1	2	3	1	1	1
opm2	1	3	2	1	3	2
pc52	2	3	3	1	3	2
ps99	3	3	3	2	3	2
rlsr2	2	3	3	1	3	2
sh68	2	3	3	2	3	2
shm6	2	2	3	1	3	2
tcb3	3	1	3	1	3	2
tpc4	2	2	3	1	2	1
ves4	2	3	3	1	1	2

Table A.10: Design Preferences: Automatically-Drawn Map. “1” represents the design that the candidate felt was most preferable and “3” represents the least preferable map.

Candidate	Atlanta	Bucharest	Mexico	Stockholm	Toronto	Washington
apr5	1	1	1	2	1	2
aa206	2	1	1	2	2	1
abbc2	1	2	1	2	3	3
abd3	1	1	1	2	2	2
ad241	1	1	1	2	2	1
amf23	1	1	1	2	2	2
ap290	1	3	1	2	2	1
as304	2	1	1	1	1	1
asg4	1	1	1	1	1	1
cav3	2	1	1	3	1	1
cb252	1	1	1	2	1	1
cb90	1	1	1	2	2	1
cc84	2	1	1	2	1	1
cg79	1	1	1	2	1	1
cw89	3	2	1	2	2	2
dab21	3	1	1	2	1	1
dg81	1	1	1	1	2	1

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Candidate	Atlanta	Bucharest	Mexico	Stockholm	Toronto	Washington
dks3	1	1	1	2	2	2
dpg4	3	2	3	3	2	1
ed29	3	2	1	2	2	1
emw7	2	3	2	3	2	1
gc31	3	3	1	2	1	1
her7	1	3	1	2	2	1
jh293	2	1	1	3	1	1
jjp2	2	2	1	2	2	2
jmhd2	1	1	1	2	1	1
jt56	3	3	1	2	1	1
le38	3	2	1	1	3	1
mjb50	1	1	1	2	1	1
mjg25	2	1	1	2	2	2
mm349	1	1	1	3	1	1
mm360	3	3	1	2	1	1
mt63	3	3	1	3	1	1
ni29	2	1	1	2	2	2
opm2	2	1	1	3	1	1
pc52	1	1	1	3	1	1
ps99	2	1	1	3	1	1
rlsr2	1	1	1	2	1	1
sh68	1	1	1	1	1	1
shm6	1	1	1	2	1	1
tcb3	2	3	1	3	1	1
tpc4	3	1	1	2	1	2
ves4	1	1	1	2	2	1

A.3.3 Questionnaire Feedback

Table A.11: Have you seen any of the metro maps shown here before these tests?
If so, which ones?

Candidate	Answer
apr5	N/A
aa206	None, but some layouts seemed familiar, like the london underground
abbc2	Yes Slide 6
abd3	Yes, I have seen some metro maps before the test. I have seen and used the New York Metro
ad241	No
amf23	No

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Candidate	Answer
ap290	No
as304	No
asg4	None
cav3	Yes, the one of the Mexico City subway system
cb252	Map C from slide 1, most familiar metro maps are straight lined, definite in shape
cb90	No
cc84	No
cg79	No
cw89	No
dab21	No
dg81	None
dk53	No, I dont use metro
dpg4	No
ed29	No
emw7	No
gc31	No
her7	No, never
jh293	No
jjp2	No
jmhd2	London Underground
jt56	Think so, London ones including DLR?
le38	No
mjb50	No
mjb25	No -Have seen the London Underground ones but do not remember them in the test
mm349	No
mm360	None
mt63	Briefly seen book of Metro maps, but not used/studied
ni29	None
opm2	Yes, alas I cannot remember which ones!
pc52	Can't remember!
ps99	No
rslr2	No. Very familiar with London Underground which is similar
sh68	None
shm6	I dont know
tcb3	No
tpc4	No
ves4	Washington DC

Table A.12: Which features of the metro map layout did you find most helpful when completing the tests?

Candidate	Answer
apr5	Simple non overlaying colours. Basic shapes with straight edges. Basic symetry/even distribution of station/rail. Well spaced out and easy to read train station names
aa206	One that was not too scattered, but had a defined straight and clear structure as it was easier to read
abbc2	s+8 line maps
abd3	The maps indicated the relevant stations which we needed to find
ad241	Straight lines, lines spread out for ease on eye
amf23	Clear naming and placement
ap290	Straight lines and colours
as304	Interchanges clearly marked
asg4	Geometrical symetry (straight lines); spacing between labels; highlighting end points
cav3	Uniformity, straight lines, labels not on top of each other
cb252	Definate and spaced out layouts with clear indication of colour and station points such as [inverted T stubby diagram]
cb90	Interchange Signs
cc84	Different colours, changes clearly pointed out
cg79	Having enough space between stations to make them distinct - some maps had overlapping text and lines which confused things.
cw89	Colour
dab21	Layout and colour
dg81	Circular nodes on interconnecting stations, sensible layout, sensible angles on lines, straight lines, sensible colours, lines not randomly joining
dk53	Straight lines and the fact that some metro maps had clear stations, not confusing
dpg4	The ones with biggest text and biggest ticks
ed29	Indentations representing stations
emw7	Different Colours
gc31	Colour coded tracks, clear circles on join stations
her7	Different colours for different lines is helpful; When the map was large and different stations were well spaced out and not placed close together, it was easier to answer the questions
jh293	The blue or red coloured lines (made it easier to see the stations)

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Candidate	Answer
jjp2	Clear images, the on which you could see the station stops
jmhd2	The small lines indicating a station was their. Also the bigger maps which didnt have station names overlapping were much better
jt56	. for stations, colours of different lines; circle for crossover stations
le38	Well spread with appropriate use of colour
mjb50	Large gaps between stations (so names dont overlap)
mjg25	Clear linear route layout, uncluttered
mm349	Metro maps with straight lines; metro maps with easily distinguishable colours; maps where overlapping lines had half one colour, half the other, such as the blue/orange line to suggest the line occupied the same tracks
mm360	Straight lines
mt63	Names of stations next to the markers on the lines
ni29	The colours indicating the lines
opm2	Circles for track interchange, some had a more 'sensible' layout
pc52	distance between station lables; straight routes not curly; colour coding of routes
ps99	clearly marked stations that were spaced out
rslr2	Stations spread out; Stations especially where lines cross not too close together; Maps with fewest line crossings/colours
sh68	When the lines could only be from lines at other angles made it harder. When station names were not near each other. If stations near one above one below [DIAGRAMS]
shm6	Maps normalized to straight lines (where possible); where the station and names were spaced out were most helpful but if there was a choice between a crowded straight line map and a cursive spaced out map, I favoured the spaced out map
tcb3	Enough spacing between station names; Clearly marked stations. Spacing between tracks
tpc4	Colour coding of line, compact text close to stations
ves4	Different symbols where lines meet

Table A.13: Which features of the metro map layout did you find least helpful when completing the tests?

Candidate	Answer
apr5	Curved lines representing routes. Squashed text and squashed track/lines into small areas. Overlayed colours for multiple tracks.

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Candidate	Answer
aa206	When there was more than three change connections and the routes did not have a clear straight grid map which made it difficult to read
abbc2	ones with all the curves
abd3	The maps were hard to read and would be better enlarged
ad241	All bundled together, not clear, station name writing overlaps
amf23	Messy naming and the misplaced change station
ap290	When names were too close together
as304	Yellow 'tick' marks against white background; Station names overalapping onto other station names; lines overlapping each other when going in the same direction
asg4	Vertical length
cav3	Labels that cant be read cuz they're on top of each other; lines changing colour without a hollow circle where they meet
cb252	When routes were the same colour and followed curved or jagged lines, and when route changes were not clearly indicated with a circle
cb90	untidy lines (not straight)
cc84	Unexplained changes, from one colour to the next
cg79	NULL
cw89	Size of map (when stations were too close to each other to distinguish between them)
dab21	Positioning of station names and station indicators
dg81	Poor space management, differently shaped station nodes, changes with no icon indication, poor choice of colours
dk53	The confusing lines
dpg4	Couldnt read some of them as text label obscured ticks or obscured other labels
ed29	stations with long names usually overwrite something
emw7	When the font was too small and the names were too close together
gc31	Cramp spacing between station writing, unclear ticks on tracks
her7	When the stations were placed too close together it was hard to distinguish between them, especially when they had long names which took up a lot of space on the map
jh293	The yellow coloured lines (made it harder to see the stations)
jjp2	Station names which ran into each other and overlapped

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Candidate	Answer
jmhd2	Overlapping station names. Very squashed maps were bad.
jt56	Close together station names, change of line colour with no circle to indicate line crossover
le38	The almost handdrawn metro maps without space between the stations. Even though this may not be precise but provides better navigation and understanding
mjb50	When line colours overlapped or "jumped" stations
mjb25	Station names overlapping
mm349	Metro maps where lines fully overlapped one lines. Maps where names overlapped the lines. Maps with bright colours, such as yellow
mm360	Yellow lines were hard to see on white background
mt63	Overlapping text with lines or other text
ni29	None
opm2	Colours were often hard to see clearly
pc52	overlapping lines; non-distinctive "change"-station symbols
ps99	Cramped maps where it was difficult to see stations or connections
rslr2	Station names not spread out or stations too close together; Some names not easy to read
sh68	When you could not see join for a line. Station names too close together
shm6	Being crowded, swapping line colours made it difficult and made me think changes were needed. Also, where interchange stations lacked a white circle made more difficult
tcb3	Places where two tracks follow the same route shown as an alternating line
tpc4	Overlapping text/stations; yellow-an-white station marks hard to see; text close to the stations
ves4	Station names overlapping

Table A.14: Did you find any of the questions ambiguous?

Candidate	Answer
apr5	No.
aa206	Do you count a change if the route . Has a same colour or do you always assume change lead to only one to one mapping
abbc2	Yes
abd3	No, the questions were clearly laid out
ad241	There were a few, but I dont remember which ones
amf23	No

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Candidate	Answer
ap290	No
as304	Not really
asg4	No
cav3	yes
cb252	None
cb90	No
cc84	Whether you have seen some metro maps. Might have seen some but not remembering them.
cg79	Several of the 'how many do you pass though' questions had multiple routes
cw89	No
dab21	Yes, some questions seemed impossible to answer given the answers provided. Because the route from A to B is not possible by train, e.g. routes dont connect
dg81	Some questions were potentially ambiguous, due to the variety of routes in some circumstances
dk53	No
dpg4	No
ed29	no
emw7	Yes, most of them
gc31	Yes, some tracks did not join
her7	No
jh293	No
jjp2	Yes, coloured lines which run into other colours without line change marks - why were these diff colours? Also lines which were the same colour with line change marks. Why change of line but no change of colour?
jmhd2	No
jt56	Yes
le38	Yes
mjb50	Some did not have the correct list of questions
mjb25	It was unclear if you had to change when two lines intersect but the route continues
mm349	No
mm360	There were often many routes with different numbers of stations to go by
mt63	Stora Massen to Karlaplan; Dupont to Chester; Pentagon to Court House
ni29	Yes, some of the questions were not clear

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Candidate	Answer
opm2	Some, as stations were not always clear
pc52	Yes, Q1, as we were not told to remember map layouts beforehand
ps99	When it asked for a number of changes on lines with multiple endings, what counts as a change?
rslr2	No
sh68	No
shm6	Many, especially the ones that were incorrect. The abiguous ones were the ones with inconsistent station and line labeling
tcb3	No
tpc4	No -Although some of the metro maps had yellow-an-white lines/stations - hard to read
ves4	No