

Appendix A The tests

The experiment is divided into pre-test, treatment and post-test. Treatment T1 will only contain pre-test and post-test, so they are named Part 1 and Part 2. Treatment T2 (Graphical integration guidance) and T3 (Running total and reflection) have three parts, so Part 1 is pre-test, Part 2 is their corresponding treatment and Part 3 is post-test. Carry out the experiment based on the helper guides in the following appendix.

The subject no. is usually tagged in alphanumeric (e.g. A1, B2) to identify them quickly.

These are equivalent:

A = T1 The base treatment

B = T2 Graphical integration guidance

C = T3 Running total and reflection

Part 1 [pre-test]

Subject No: _____

Dear participant,

Thank you for participating in this test. Your participation is very important for my master thesis project.

Instructions:

1. Please answer ALL questions, unless specifically instructed to skip a question. If you are uncertain about the meaning of a question, please ask the administrator for clarification.
2. The test consists of TWO (or THREE) parts. **Please raise your hand when you are asked to do so**, to continue the test.
- (3. When the administrator marks 'R' on your answer, it means your answer is right. If it is wrong, the administrator will show you the right answer.)

Your answers will not be coupled with your names, you remain anonymous. However, we do check that you have done your best before you receive 50 kroner for participating. For accounting purposes we need your signature on a separate sheet of paper.

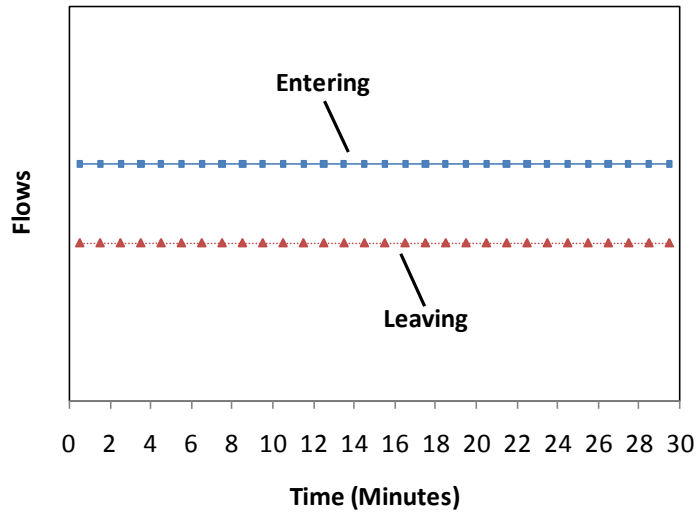
Thank you very much for participating and for doing your best!

Part 1 [pre-test]

Subject No: _____

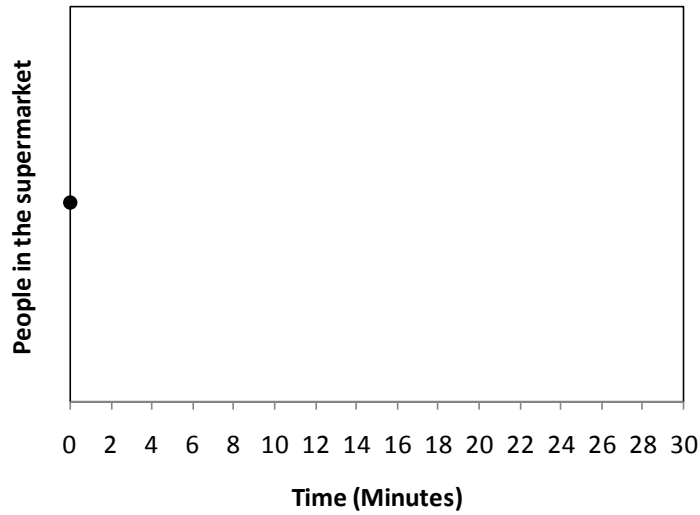
1.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.

In other words, draw a line or curve to show how the number of people in the supermarket changes over the 30 minute interval, starting from the black dot (●) in the space below.

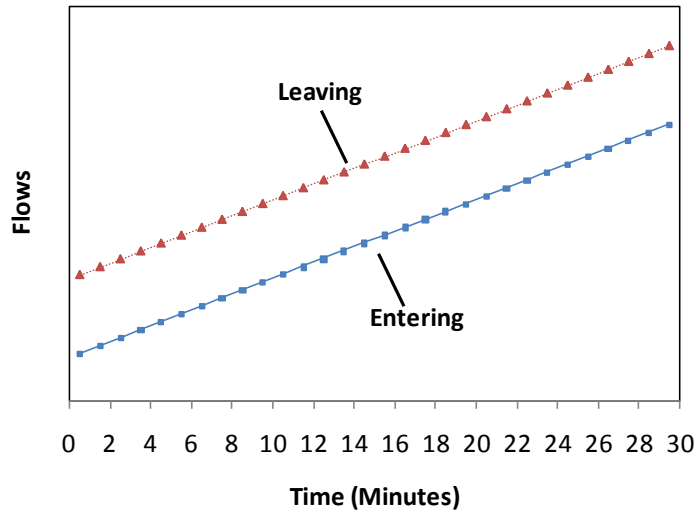


Part 1 [pre-test]

Subject No: _____

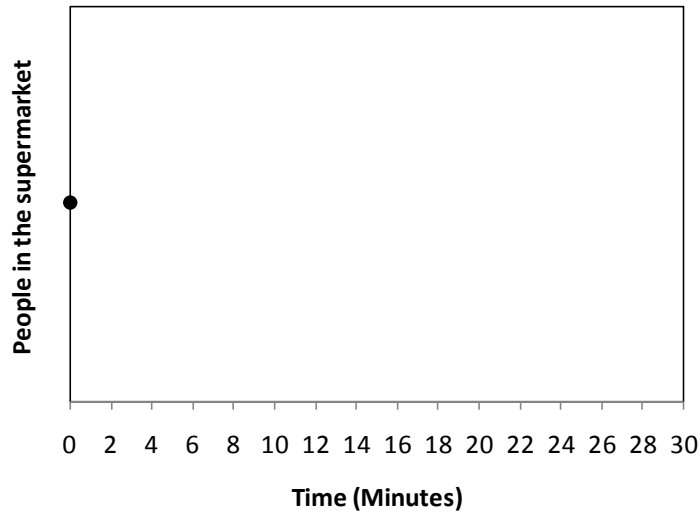
2.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



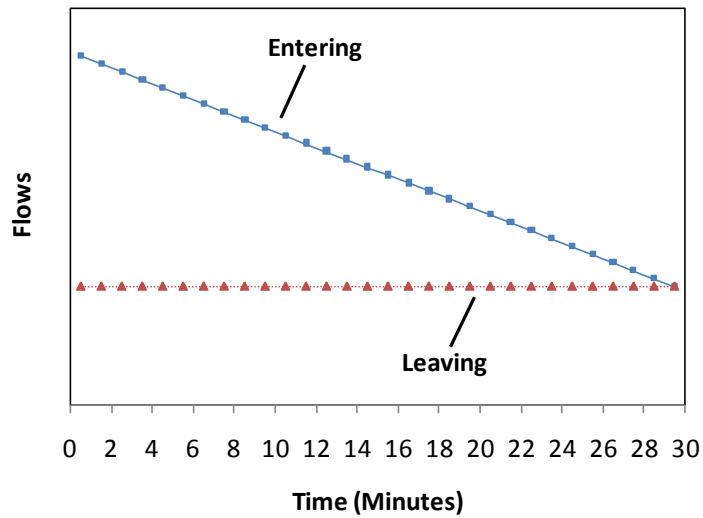
In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.

In other words, draw a line or curve to show how the number of people in the supermarket changes over the 30 minute interval, starting from the black dot (●) in the space below.



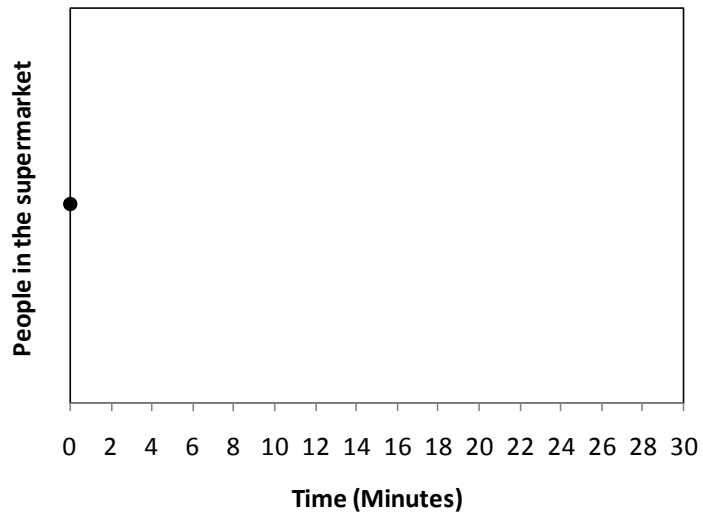
3.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.

In other words, draw a line or curve to show how the number of people in the supermarket changes over the 30 minute interval, starting from the black dot (●) in the space below.



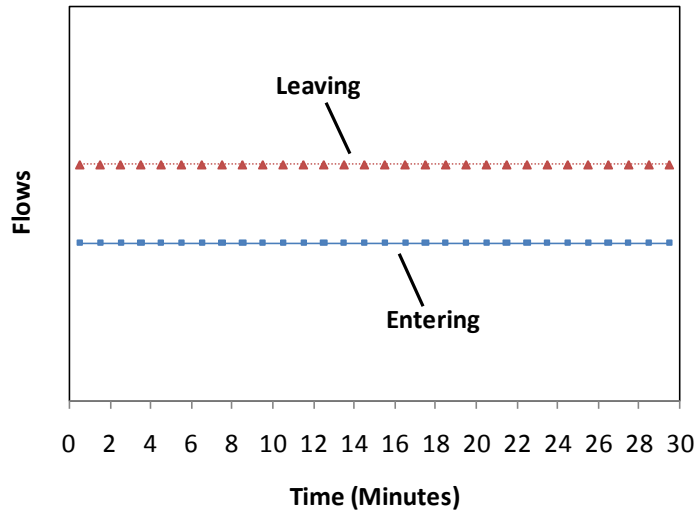
Please raise your hand after having completed these questions.

Part 2 or 3 [post-test]

Subject No: _____

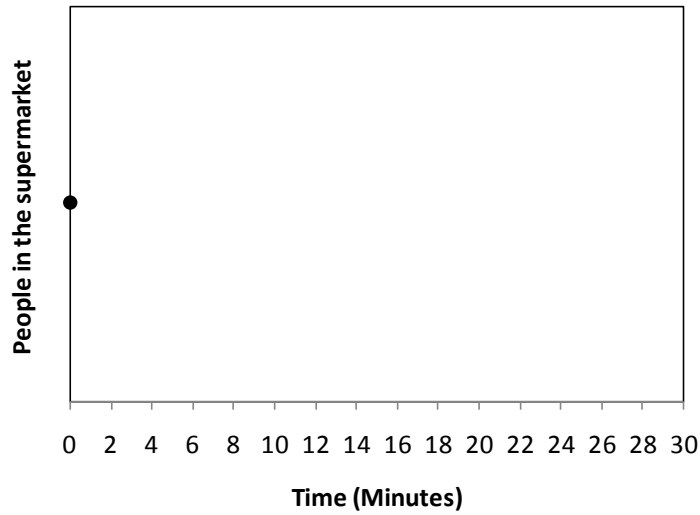
1.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.

In other words, draw a line or curve to show how the number of people in the supermarket changes over the 30 minute interval, starting from the black dot (●) in the space below.

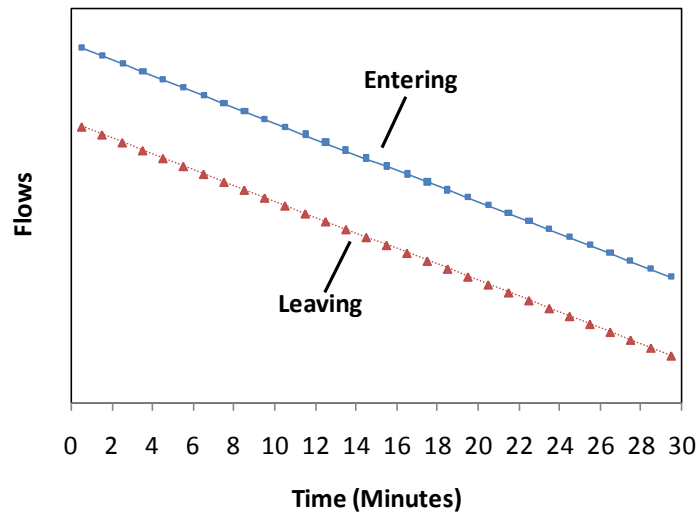


Part 2 or 3 [post-test]

Subject No: _____

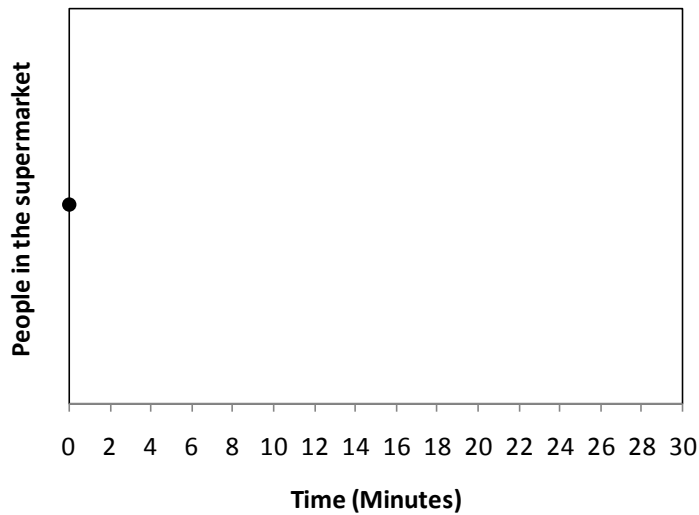
2.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



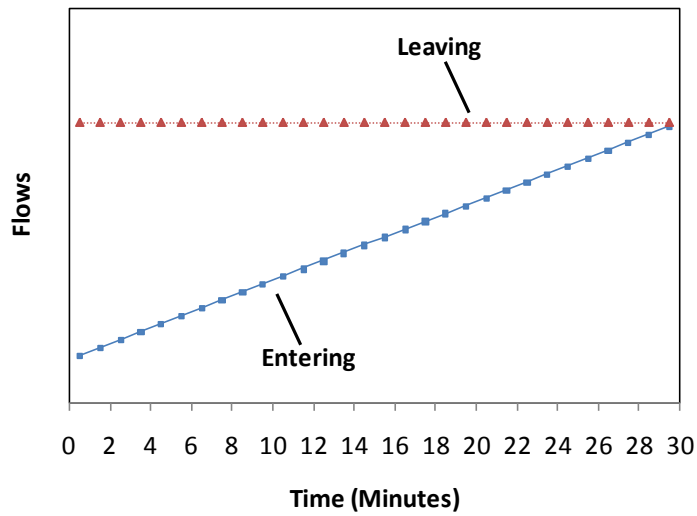
In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.

In other words, draw a line or curve to show how the number of people in the supermarket changes over the 30 minute interval, starting from the black dot (●) in the space below.



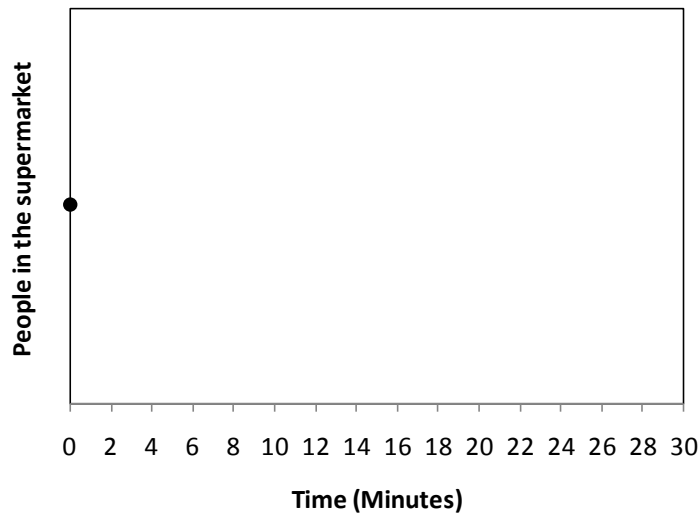
3.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.

In other words, draw a line or curve to show how the number of people in the supermarket changes over the 30 minute interval, starting from the black dot (●) in the space below.



Part 2 or 3 [post-test]

Subject No: _____

Gender: Male Female

Age: _____

Educational background: Natural Sciences, Technology, Engineering or Mathematics
 Social Sciences Humanities
 Other: _____

Is English your native language? Yes No

Have you done or learned about this kind of task before? Yes No

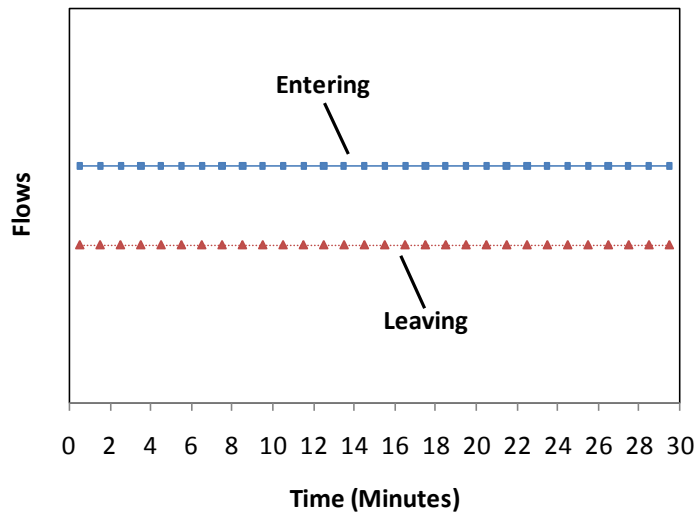
Do you think your educational background has prepared you for this kind of task? Yes No

Please write down any comment you may have about this experiment, and your participation in it.

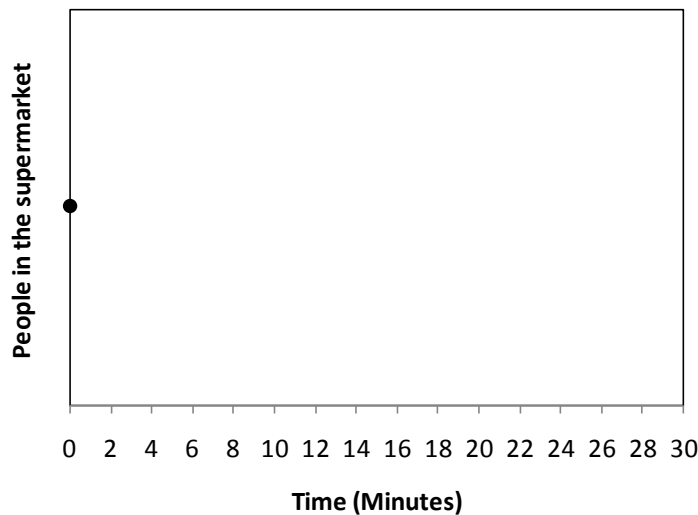
Please bring the completed test to the experiment leader to get your payment and to sign your name for having received the money. Again thanks so much for participating.

1.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



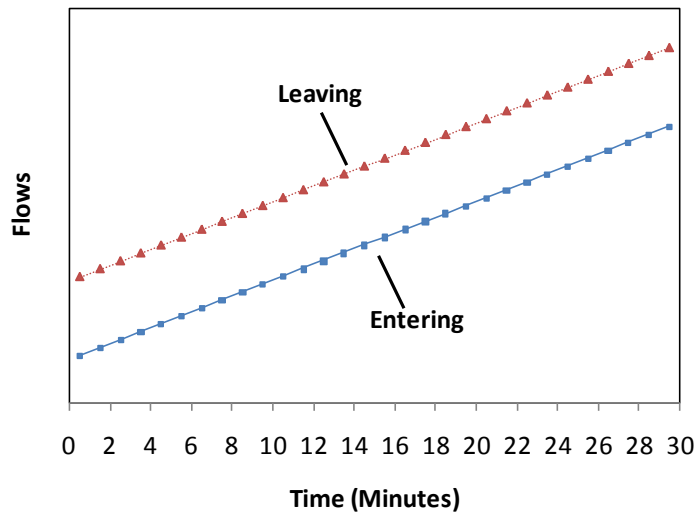
- Which flow is larger? Entering larger than leaving Leaving larger than entering Both same
- In what direction will the number of people in the supermarket change? Increase Decrease No change
- (Skip this if no change) How will the change in the number of people be? increase or decrease at a faster and faster rate increase or decrease at a slower and slower rate increase or decrease at a constant rate
- In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.



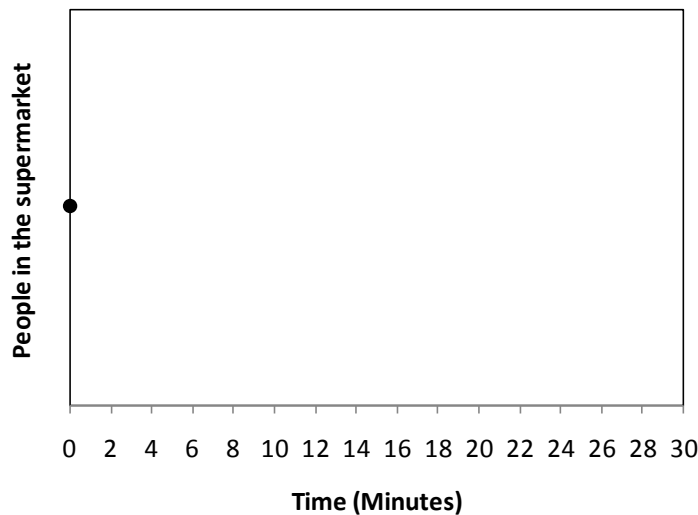
Please raise your hand after having completed this question. Do not continue to the next question before administrator has commented on your answer.

2.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



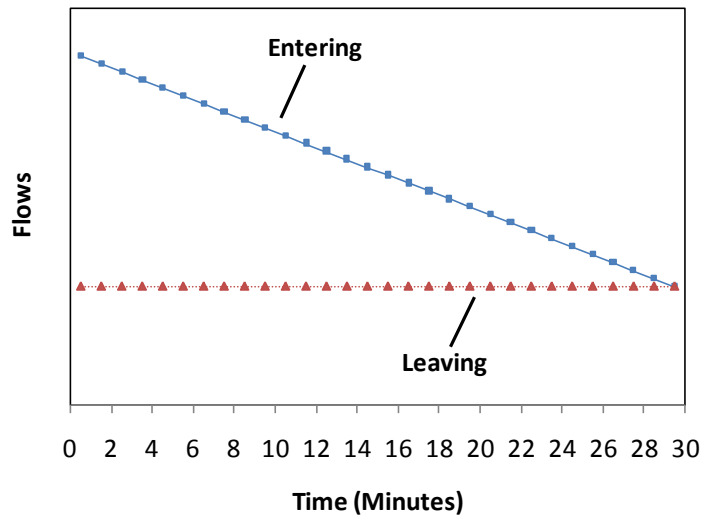
- Which flow is larger? Entering larger than leaving Leaving larger than entering Both same
- In what direction will the number of people in the supermarket change? Increase Decrease No change
- (Skip this if no change) How will the change in the number of people be? increase or decrease at a faster and faster rate increase or decrease at a slower and slower rate increase or decrease at a constant rate
- In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.



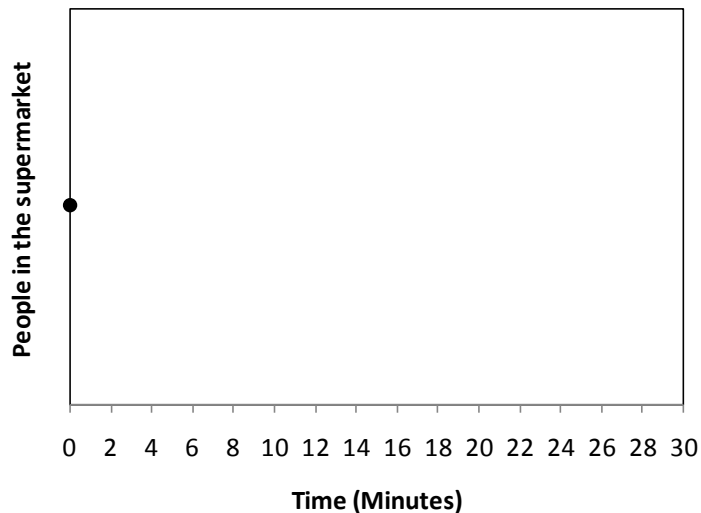
Please raise your hand after having completed this question. Do not continue to the next question before administrator has commented on your answer.

3.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



- Which flow is larger? Entering larger than leaving Leaving larger than entering Both same
- In what direction will the number of people in the supermarket change?
 Increase Decrease No change
- (Skip this if no change) How will the change in the number of people be?
 increase or decrease at a faster and faster rate increase or decrease at a slower and slower rate
 increase or decrease at a constant rate
- In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.



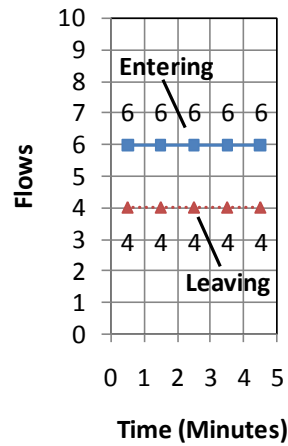
Please raise your hand after having completed this question. Do not continue to the next question before administrator has commented on your answer.

Part 2 [treatment for T3]

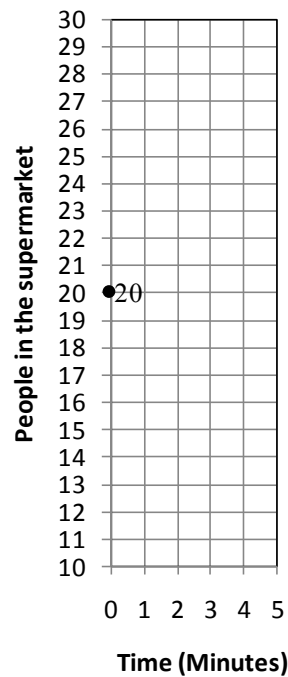
Subject No: _____

1.

The graph below shows the number of people **entering** and **leaving** a supermarket each minute over a 5 minute period.



In the space below, graph the number of people in the supermarket over the 5 minute interval. The dot shows that at time zero there are 20 people in the supermarket. Calculate how the number of people in the supermarket develops from minute to minute and plot the numbers accurately in the graph.



Please raise your hand after having completed this question. Do not continue before administrator has commented on your answer.

Part 2 [treatment for T3]

Subject No: _____

Now check your answer to Part 1 Question 1.

Note that the entering and leaving graphs in Part 1 Question 1 and Part 2 Question 1 are the same. If your answer to Part 1 Question 1 is different, it must be **wrong**.

- i. (Skip this if your answer to Part 1 Question 1 was right)
Why should the number of people in the supermarket **increase**?

- ii. (Skip this if your answer to Part 1 Question 1 was right)
Why should the number of people increase **at a constant rate**?

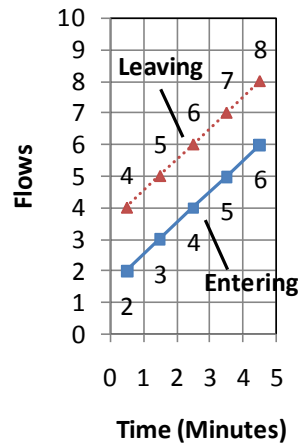
Continue to the next question after having completed the question.

Part 2 [treatment for T3]

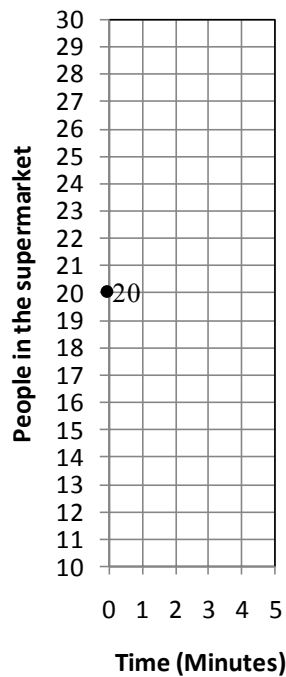
Subject No: _____

2.

The graph below shows the number of people **entering** and **leaving** a supermarket each minute over a 5 minute period.



In the space below, graph the number of people in the supermarket over the 5 minute interval. The dot shows that at time zero there are 20 people in the supermarket. Calculate how the number of people in the supermarket develops from minute to minute and plot the numbers accurately in the graph.



Please raise your hand after having completed this question. Do not continue before administrator has commented on your answer.

Part 2 [treatment for T3]

Subject No: _____

Now check your answer to Part 1 Question 2.

Note that the entering and leaving graphs in Part 1 Question 2 and Part 2 Question 2 are the same. If your answer to Part 1 Question 2 is different, it must be **wrong**.

- i. (Skip this if your answer to Part 1 Question 2 was right)
Why should the number of people in the supermarket **decrease**?

- ii. (Skip this if your answer to Part 1 Question 2 was right)
Why should the number of people decrease **at a constant rate**?

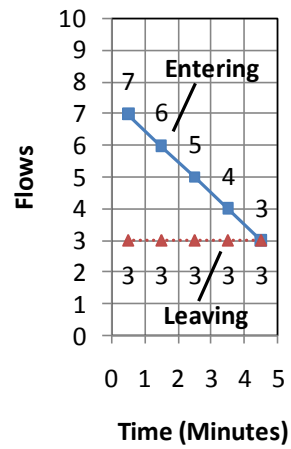
Continue to the next question after having completed the question.

Part 2 [treatment for T3]

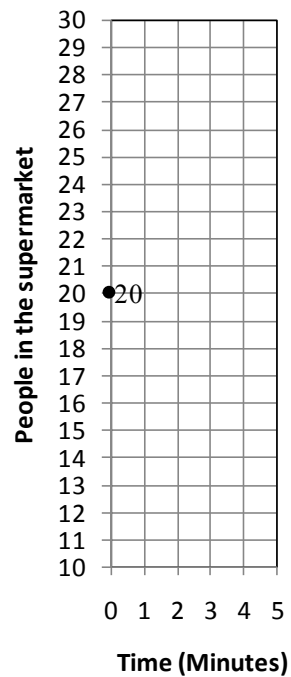
Subject No: _____

3.

The graph below shows the number of people **entering** and **leaving** a supermarket each minute over a 5 minute period.



In the space below, graph the number of people in the supermarket over the 5 minute interval. The dot shows that at time zero there are 20 people in the supermarket. Calculate how the number of people in the supermarket develops from minute to minute and plot the numbers accurately in the graph.



Please raise your hand after having completed this question. Do not continue before administrator has commented on your answer.

Part 2 [treatment for T3]

Subject No: _____

Now check your answer to Part 1 Question 3.

Note that the entering and leaving graphs in Part 1 Question 3 and Part 2 Question 3 are the same. If your answer to Part 1 Question 3 is different, it must be **wrong**.

- i. (Skip this if your answer to Part 1 Question 3 was right)
Why should the number of people in the supermarket **increase**?

- ii. (Skip this if your answer to Part 1 Question 3 was right)
Why should the number of people increase **at a slower and slower rate**?

Please raise your hand after having completed the question.

Appendix B Helper guides

The experiment requires a number of well-trained helpers to help on carrying out the procedure. Each helper will be trained in one particular treatment and took care of assigned subjects from that treatment (e.g. A1-A5). Treatment T1 (the base treatment) is just giving pre-test and post-test one at a time, therefore no helper guide is needed. Try to source helpers who are familiar with graphical integration to help on treatment T2 (Graphical integration guidance) and T3 (Running total and reflection). It is advisable to get helpers who are more used to qualitative thinking to be trained on treatment T2 while those who are good at calculation (quantitative) in charge of treatment T3.

To train helpers, first let the helper read the helper guide of his or her treatment. Then carry out the treatment with the helper (the helper is the participant) so that he or she can comprehend the helper guide better. Since practice makes perfect, create opportunity for helper to practise (e.g. rehearsal with other helpers being the participants) and monitor the steps helper carried out. Correct it if it is wrong.

Well-trained helpers are the important element of this experiment. Please recruit and plan out in advance.

Helper Guide (for treatment B Graphical integration guidance)

Objective:

To help subjects learn graphical integration.

The test papers are divided into 3 parts:

1. Part 1 – 3 graphical integration questions
2. Part 2 – 3 graphical integration guidance questions
3. Part 3 – 3 graphical integration questions

Things needed to prepare:

Blue pens for subjects, red pen for yourself. Test papers (Part 1, 2 and 3) with Subject No. filled.

Subjects:

Each **well-trained** helper should be able to take care of 5 assigned subjects (e.g. B1, B2, B3, B4 and B5) at the same time.

Duty:

When your assigned subject **raise hand**, approach the subject, based on the condition, take the corresponding action:

Condition	Action
Subject complete Part 1	Take away Part 1, hand in Part 2.
Subject complete Part 2 question (2 times per subject)	<ol style="list-style-type: none">1. Check the subject's answer.2. Then take out subject's Part 1 question and check.3. Direct subject move to next question by turn to next page.
Subject complete Part 2 Question 3	<ol style="list-style-type: none">1. Check the subject's answer.2. Then take out subject's Part 1 question and check.3. Take away all papers, hand in Part 3.

Experiment flow from single subject perspective
(**Helper actions are marked as bold red color**):

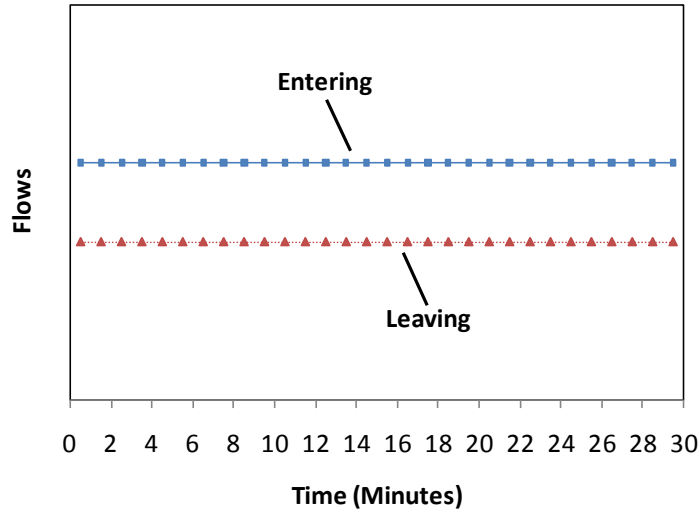
1. Experiment leader place Part 1 on table before start, then assign the subject to helper (e.g. B1-B5). **Helper takes the corresponding subjects' Part 2 and 3 tests.**
 - Experiment leader read out general instruction, clarify if any question.
 - Experiment start, subjects doing Part 1.
2. Subject completed Part 1 and raise hand.



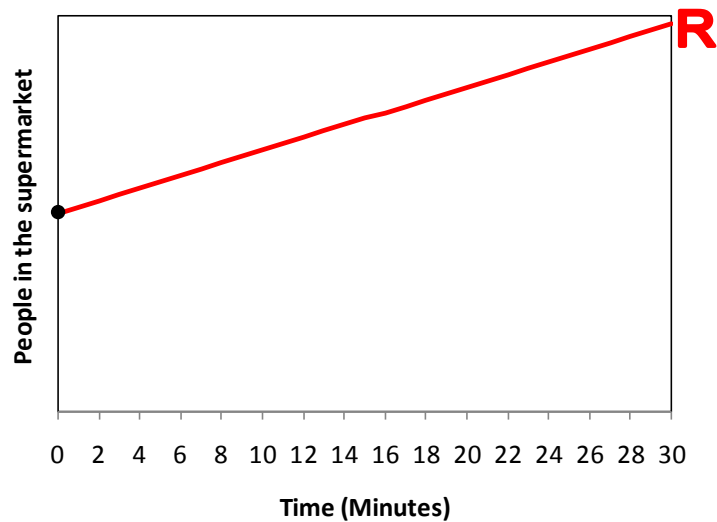
- i. **Take away Part 1, hand in Part 2.**

3. Subject completed Part 2 Question 1 and raise hand.
 i. **Check Part 2 Question 1 (Please refer page 51-52 on how to check them. Below shows the right answer).**

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.

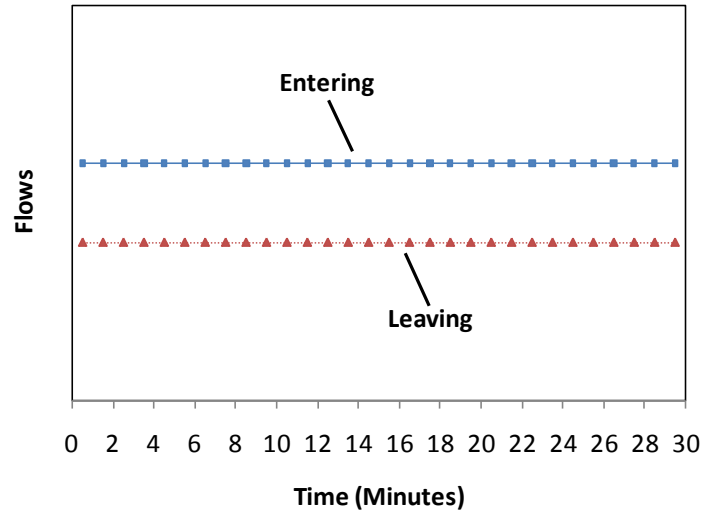


- a. Which flow is larger? Entering larger than leaving **R** Leaving larger than entering Both same
- b. In what direction will the number of people in the supermarket change?
 Increase **R** Decrease No change
- c. (Skip this if no change) How will the change in the number of people be?
 increase or decrease at a faster and faster rate increase or decrease at a slower and slower rate
 increase or decrease at a constant rate **R**
- d. In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.



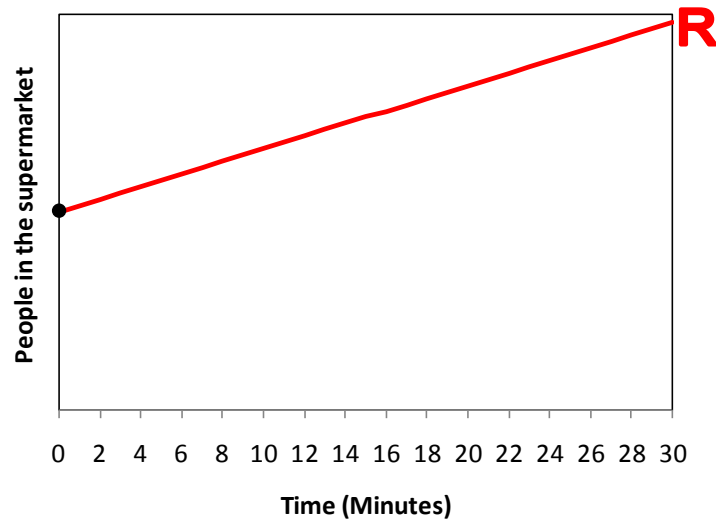
ii. Take out subject's Part 1 Question 1 and check his/her answer by referring to Part 2 Question 1 right answer.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.

In other words, draw a line or curve to show how the number of people in the supermarket changes over the 30 minute interval, starting from the black dot (●) in the space below.

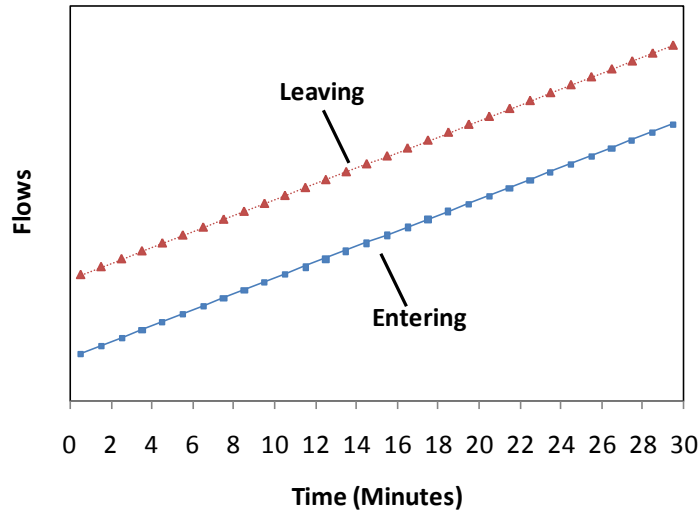


iii. Direct subject move to Part 2 Question 2.

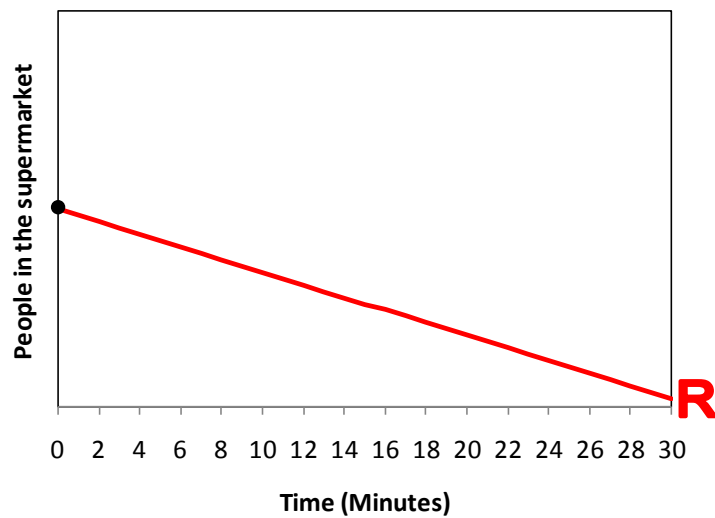
4. Subject completed Part 2 Question 2 and raise hand.

i. Check Part 2 Question 2.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.

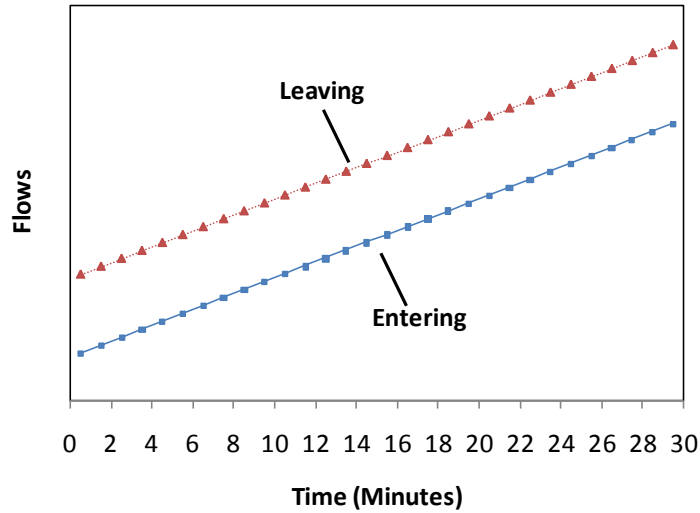


- a. Which flow is larger? Entering larger than leaving Leaving larger than entering Both same **R**
- b. In what direction will the number of people in the supermarket change?
 Increase Decrease **R** No change
- c. (Skip this if no change) How will the change in the number of people be?
 increase or decrease at a faster and faster rate increase or decrease at a slower and slower rate
 increase or decrease at a constant rate **R**
- d. In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.



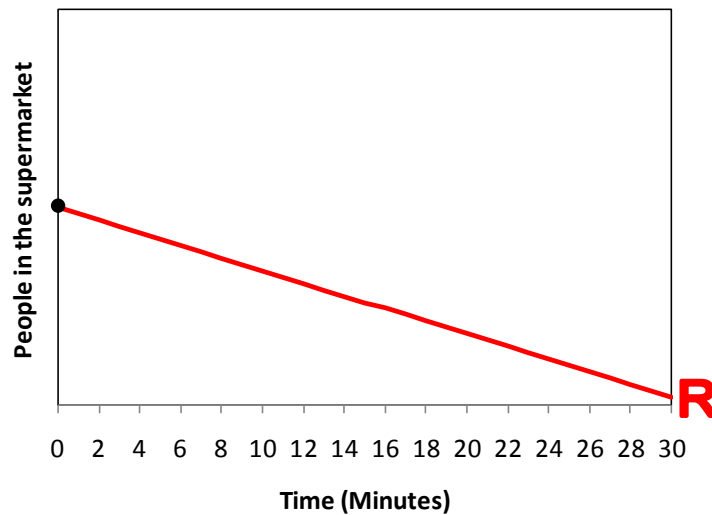
ii. Take out subject's Part 1 Question 2 and check his/her answer by referring to Part 2 Question 2 right answer.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.

In other words, draw a line or curve to show how the number of people in the supermarket changes over the 30 minute interval, starting from the black dot (●) in the space below.



iii. Direct subject move to Part 2 Question 3.

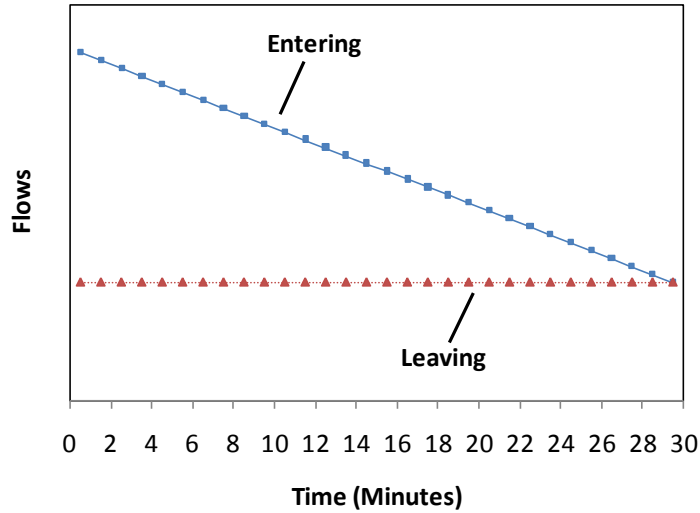
5. Subject completed Part 2 Question 3 and raise hand.

i. **Check Part 2 Question 3:**

Subject can circle, check, cross or other marking to indicate their answer.

If it is right, mark 'R', else circle the right answer.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.

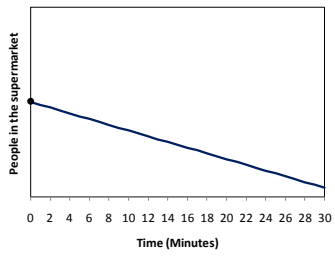


- a. Which flow is larger? Entering larger than leaving Leaving larger than entering Both same **R**
- b. In what direction will the number of people in the supermarket change?
 Increase **R** Decrease No change
- c. (Skip this if no change) How will the change in the number of people be?
 increase or decrease at a faster and faster rate increase or decrease at a slower and slower rate
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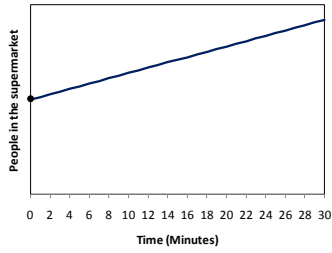
All these drawing are considered right:

<p>Direction right, shape right</p>	<p>Less steep and becomes flat sooner, but its direction and shape are still right</p>	<p>Steeper also OK, as long as its direction and shape are still right</p>
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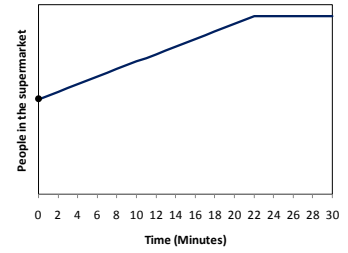
All these are wrong:



Direction already wrong

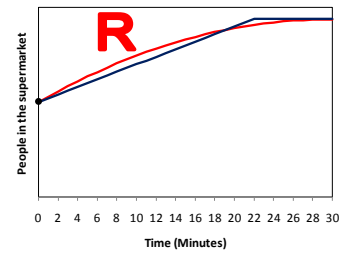
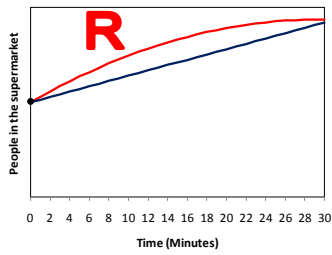
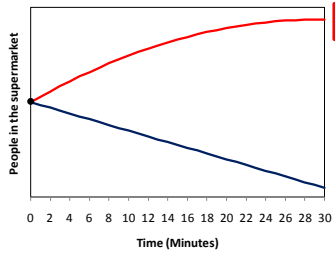


Direction right, but shape wrong



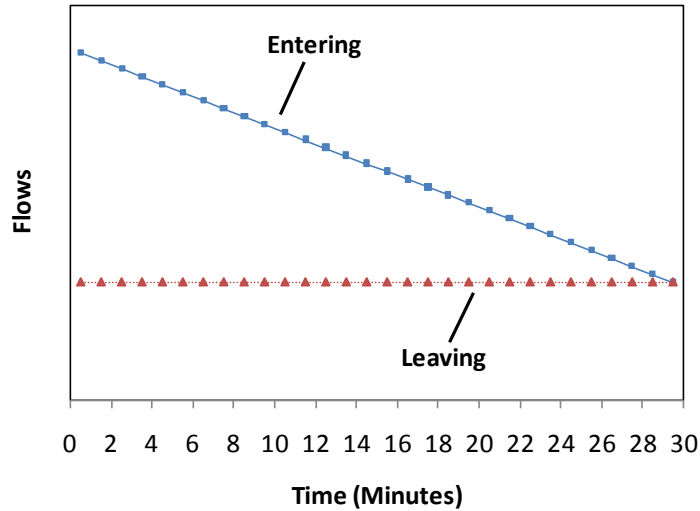
Shape is still not right (curve, not lines)

To check them:



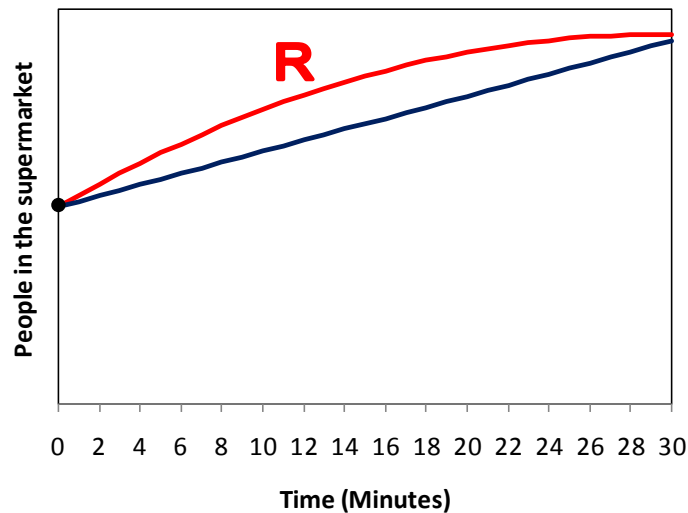
ii. Take out subject's Part 1 Question 3 and check his/her answer by referring to Part 2 Question 3 right answer.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.

In other words, draw a line or curve to show how the number of people in the supermarket changes over the 30 minute interval, starting from the black dot (●) in the space below.

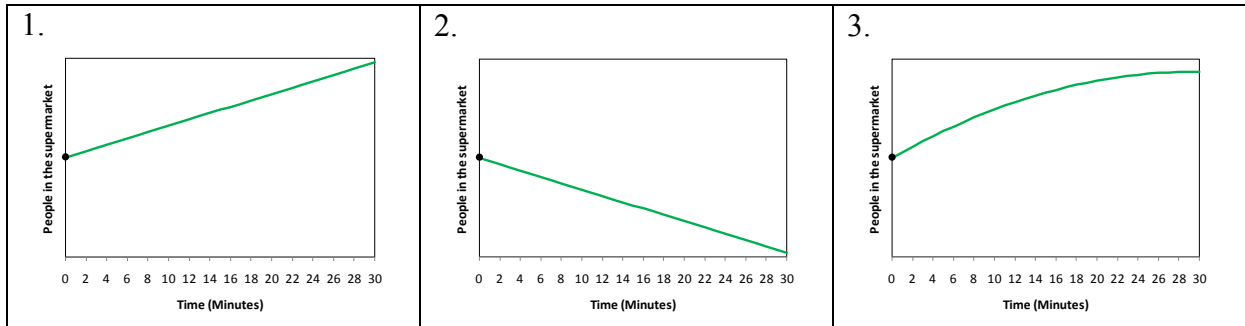


6. Take away all papers, hand in Part 3. Viola! It's done. Thanks for helping me carry out the treatment!

- i. Subject completed Part 3, leave seat and bring the completed test to the experiment leader.

Summary

In summary, right answers for each question (print out this page if you need it to help you check the questions, but **don't let subjects to see it**):



Any question? Please ask me if you need any clarification so that you can help me to carry out this experiment smoothly.

Helper Guide (for treatment C Running total and reflection)

Objective:

To help subjects learn graphical integration by exploiting their ability to calculate running total (keep a running tally of stock and add or subtract the flows at each point of time).

The test papers are divided into 3 parts:

1. Part 1 – 3 graphical integration questions
2. Part 2 – 3 * (running total + reflective) questions
3. Part 3 – 3 graphical integration questions

Basic idea:

1. First, let subjects try graphical integration questions in Part 1 – what is their **expected answer**?
2. Then, in Part 2, ask subjects to calculate running total – what is the **right answer**?
3. Subjects should be surprised if their expected answer is different from the right answer, and hopefully they can figure out **why** during reflection.
4. Lastly, give subjects another set of graphical integration questions (Part 3) to see if they have learned.

Things needed to prepare:

Blue pens for subjects, red pen for yourself. Test papers (Part 1, 2 and 3) with Subject No. filled, Part 1 and 2 should be 1 page per sheet. Staple Part 2.

Subjects:

Each **well-trained** helper should be able to take care of 3 assigned subjects (e.g. C1, C2 and C3) at the same time.

Duty:

When your assigned subject **raise hand**, approach the subject, based on the condition, take the corresponding action:

Condition	Action
Subject complete Part 1	Take away Part 1, hand in Part 2.
Subject complete Part 2 plotting (3 times per subject)	<ol style="list-style-type: none">1. Take away previous Part 1 question, if any (see below).2. Check the plotting.3. Then take out subject's Part 1 question and check.4. Direct subject continue by turn to next page.5. Leave Part 1 question with the subject for reflection (will collect it next checking, see above).
Subject complete Part 2 all questions	Take away all papers, hand in Part 3. (Now you should have subject's all Part 1 and Part 2 questions)

Experiment flow from single subject perspective
(**Helper actions are marked as bold red color**):

1. Experiment leader place Part 1 on table before start, then assign the subject to helper (e.g. C1-C5). **Helper takes the corresponding subjects' Part 2 and 3 tests.**
 - Experiment leader read out general instruction, clarify if any question.
 - Experiment start, subjects doing Part 1.
2. Subject completed Part 1 and raise hand.

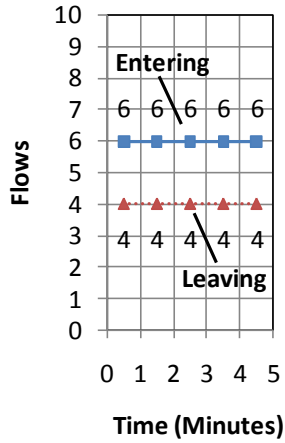


- i. **Take away Part 1, hand in Part 2.**

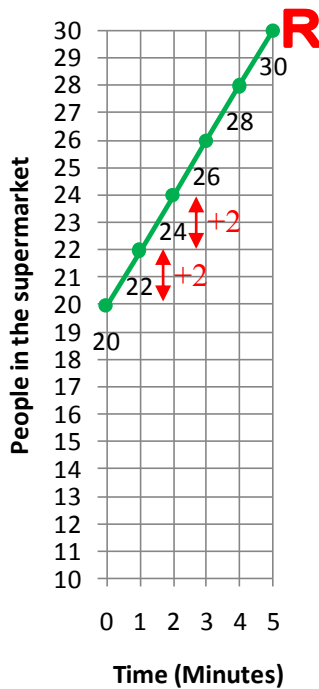
3. Subject completed Part 2 Question 1 and raise hand.

i. Check Part 2 Question 1 plotting (Please refer page 63-64 on how to check it. Below shows the right answer).

The graph below shows the number of people **entering** and **leaving** a supermarket each minute over a 5 minute period.

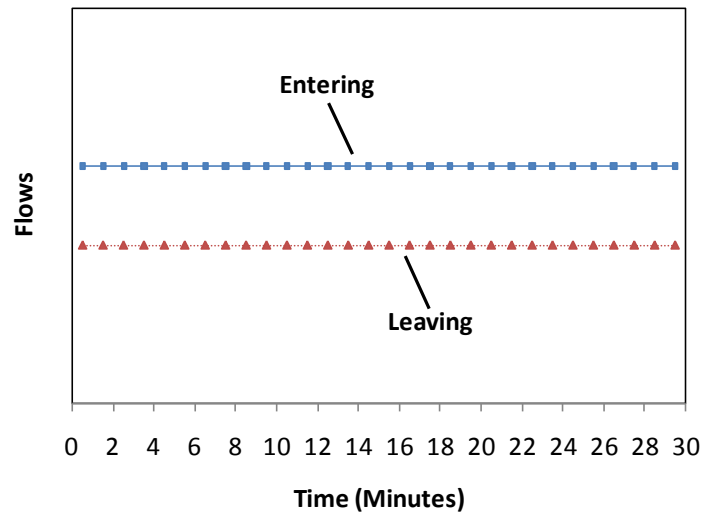


In the space below, graph the number of people in the supermarket over the 5 minute interval. The dot shows that at time zero there are 20 people in the supermarket. Calculate how the number of people in the supermarket develops from minute to minute and plot the numbers accurately in the graph.



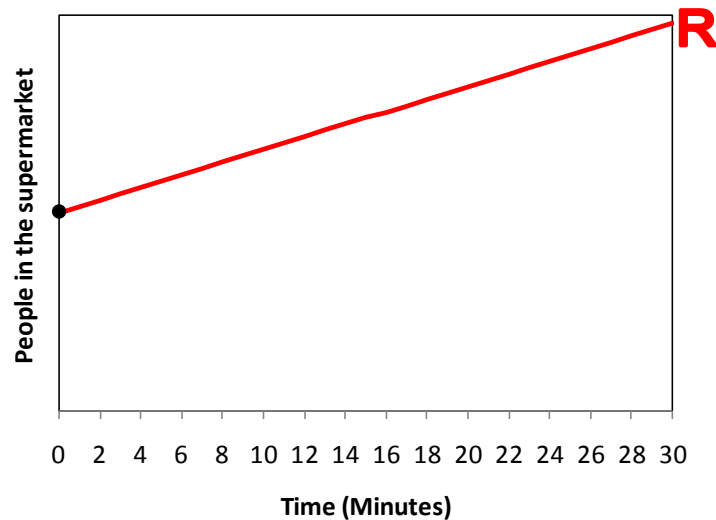
- ii. Take out subject's Part 1 Question 1 and check his/her answer by referring to Part 2 Question 1 right answer (Please refer page 65-66 on how to check it. Below shows the right answer).

The graph below shows the number of people entering and leaving a supermarket over a 30 minute period.



In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.

In other words, draw a line or curve to show how the number of people in the supermarket changes over the 30 minute interval, starting from the black dot (●) in the space below.



iii. Direct subject continue next page. Leave Part 1 question with subject for reflection (They can skip these reflective queries if their answer to Part 1 Question 1 was right).

Now check your answer to Part 1 Question 1.

Note that the entering and leaving graphs in Part 1 Question 1 and Part 2 Question 1 are the same. If your answer to Part 1 Question 1 is different, it must be **wrong**.

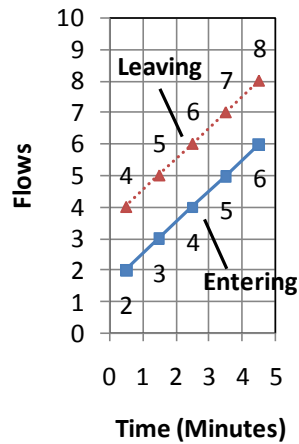
- i. (Skip this if your answer to Part 1 Question 1 was right)
Why should the number of people in the supermarket **increase**?

- iii. (Skip this if your answer to Part 1 Question 1 was right)
Why should the number of people increase **at a constant rate**?

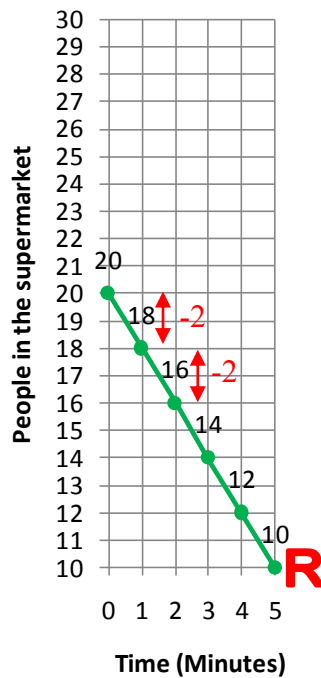
Continue to the next question after having completed the question.

4. Subject completed reflective queries (they can skip if their answer to Part 1 Question 1 was right) and Part 2 Question 2 plotting and raise hand.
i. Check Part 2 Question 2 plotting.

The graph below shows the number of people **entering** and **leaving** a supermarket each minute over a 5 minute period.

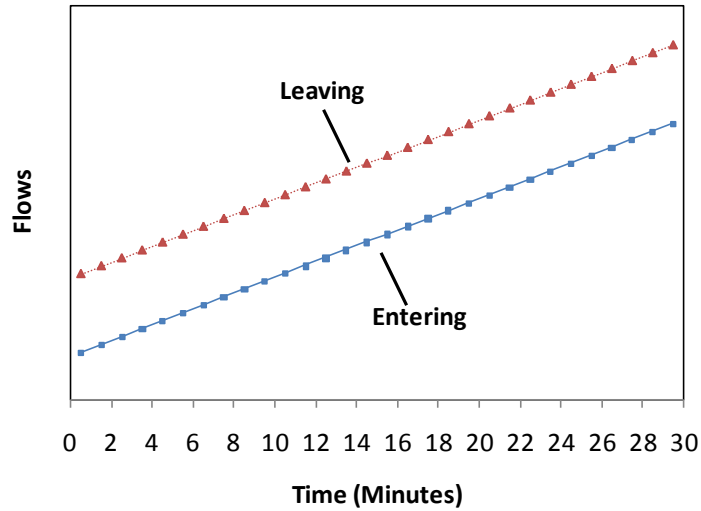


In the space below, graph the number of people in the supermarket over the 5 minute interval. The dot shows that at time zero there are 20 people in the supermarket. Calculate how the number of people in the supermarket develops from minute to minute and plot the numbers accurately in the graph.



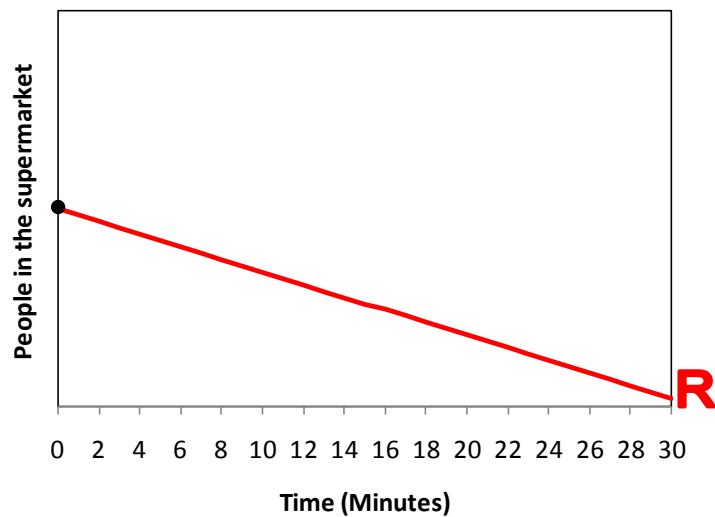
ii. Take out subject's Part 1 Question 2 and check his/her answer by referring to Part 2 Question 2 right answer.

The graph below shows the number of people **entering** and **leaving** a supermarket over a 30 minute period.



In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.

In other words, draw a line or curve to show how the number of people in the supermarket changes over the 30 minute interval, starting from the black dot (●) in the space below.



iii. Direct subject continue next page. Leave Part 1 question with subject for reflection (They can skip these reflective queries if their answer to Part 1 Question 2 was right).

Now check your answer to Part 1 Question 2.

Note that the entering and leaving graphs in Part 1 Question 2 and Part 2 Question 2 are the same. If your answer to Part 1 Question 2 is different, it must be **wrong**.

- ii. (Skip this if your answer to Part 1 Question 2 was right)
Why should the number of people in the supermarket **decrease**?

- iv. (Skip this if your answer to Part 1 Question 2 was right)
Why should the number of people decrease **at a constant rate**?

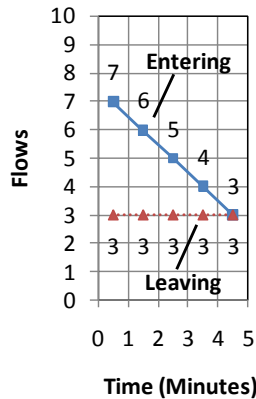
Continue to the next question after having completed the question.

5. Subject completed reflective queries (they can skip if their answer to Part 1 Question 2 was right) and Part 2 Question 3 plotting and raise hand.

i. Check Part 2 Question 3 plotting.

- Many times subjects know how to calculate running total and plot accurately, but not doing so because they want to finish it quickly. So we will check their plotting and feedback to them, to urge them to answer more carefully. Most will get the next plotting right.

The graph below shows the number of people entering and leaving a supermarket each minute over a 5 minute period.

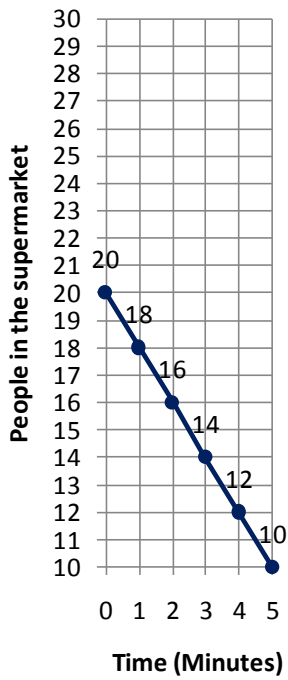


In the space below, graph the number of people in the supermarket over the 5 minute interval. The dot shows that at time zero there are 20 people in the supermarket. Calculate how the number of people in the supermarket develops from minute to minute and plot the numbers accurately in the graph.

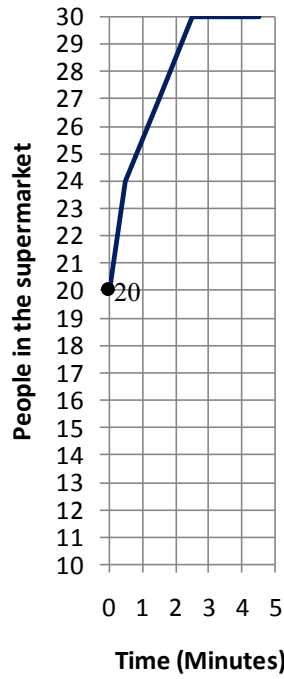
All these plotting are considered right:

<p style="text-align: center;">Perfect answer</p>	<p style="text-align: center;">No number no point also OK, as long as it pass all points</p>	<p style="text-align: center;">No line or plot in the middle also OK, just make sure all points are right</p>
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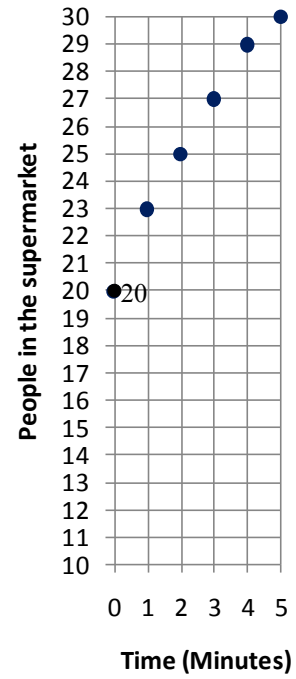
All these are wrong:



Totally wrong

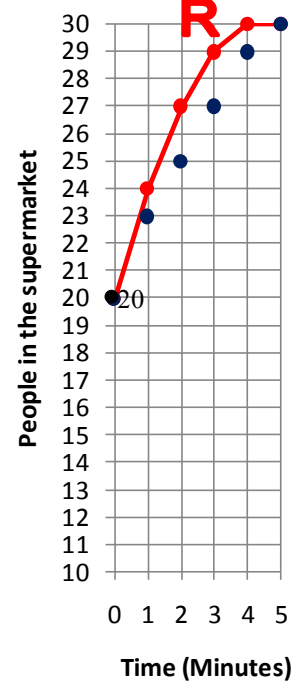
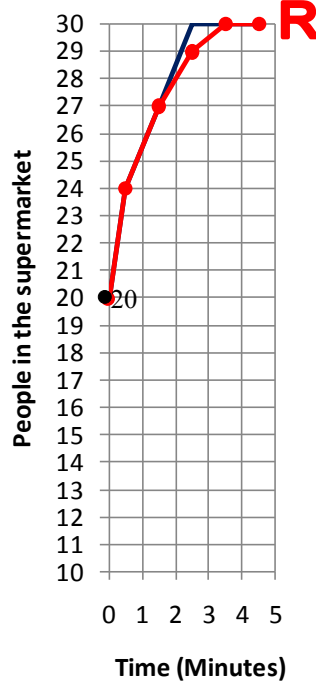
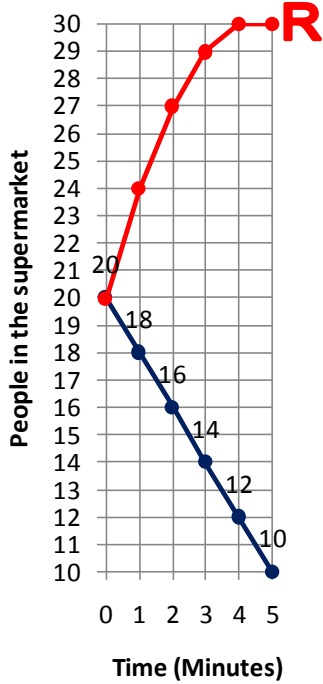


Points at Min 2.5 and 3.5 are wrong



All points are inaccurate, distorted the shape

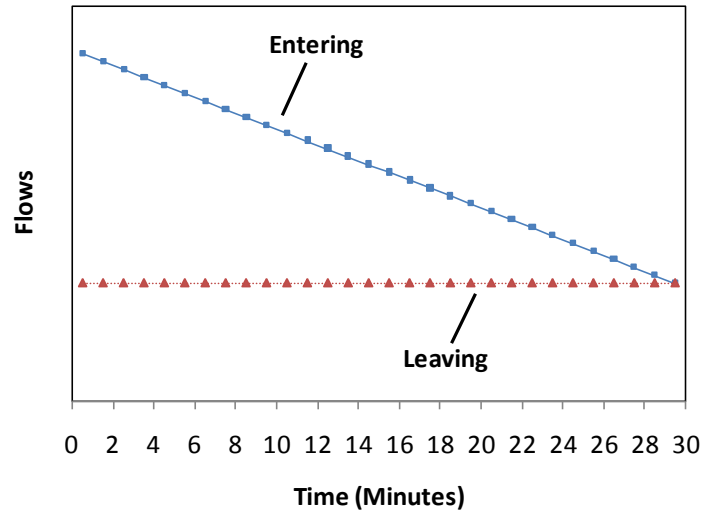
To check them:



If subject plot in the middle, we also plot the right answer in the middle, so as not to confuse the subject

- ii. Take out subject's Part 1 Question 3 and check his/her answer by referring to Part 2 Question 3 right answer.
- Sometimes subjects don't know how to compare Part 1 and Part 2. So we take out subject's Part 1 drawing and check it by referring to Part 2 right answer.

The graph below shows the number of people entering and leaving a supermarket over a 30 minute period.

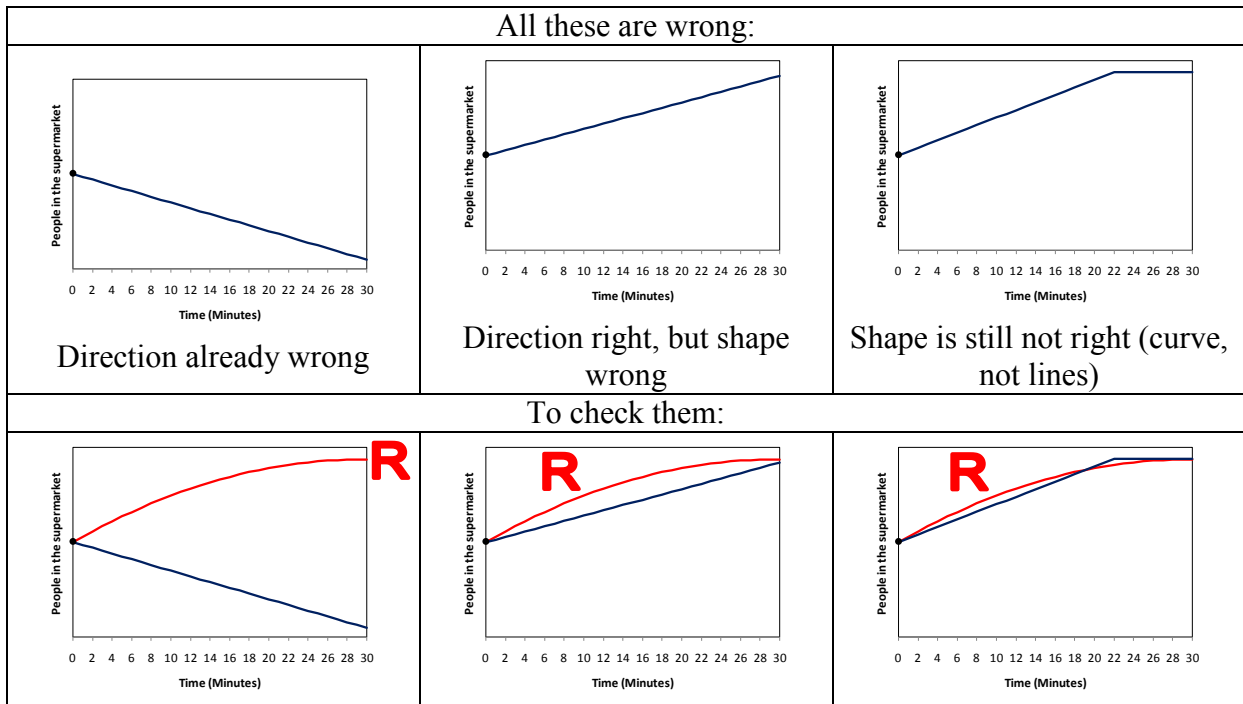


In the space below, graph the number of people in the supermarket over the 30 minute interval. You do not need to specify numerical values. The dot at time zero shows the initial number of people in the supermarket.

In other words, draw a line or curve to show how the number of people in the supermarket changes over the 30 minute interval, starting from the black dot (●) in the space below.

All these drawing are considered right:

<p style="text-align: center;">Direction right, shape right</p>	<p style="text-align: center;">Less steep and becomes flat sooner, but its direction and shape are still right</p>	<p style="text-align: center;">Steeper also OK, as long as its direction and shape are still right</p>
---	--	--



iii. Direct subject continue next page. Leave Part 1 question with subject for reflection (They can skip these reflective queries if their answer to Part 1 Question 3 was right).

Now check your answer to Part 1 Question 2.

Note that the entering and leaving graphs in Part 1 Question 2 and Part 2 Question 2 are the same. If your answer to Part 1 Question 2 is different, it must be **wrong**.

- iii. (Skip this if your answer to Part 1 Question 2 was right)
 Why should the number of people in the supermarket **decrease**?

- v. (Skip this if your answer to Part 1 Question 2 was right)
 Why should the number of people decrease **at a constant rate**?

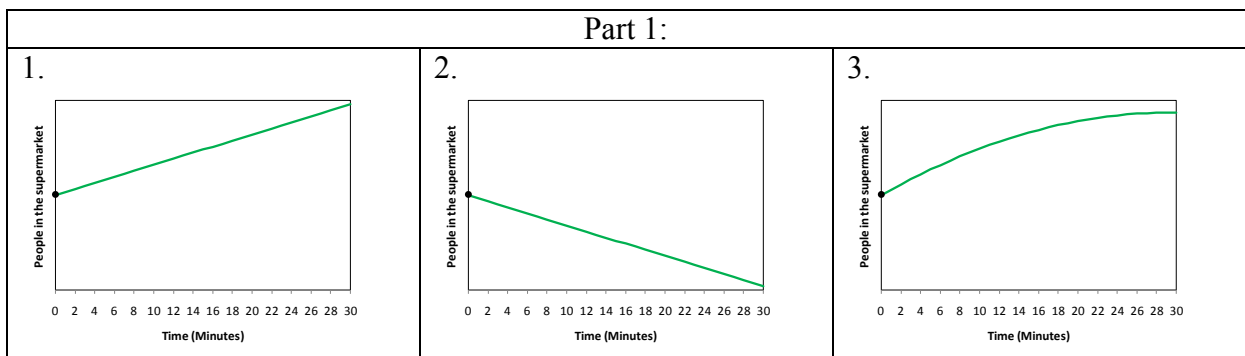
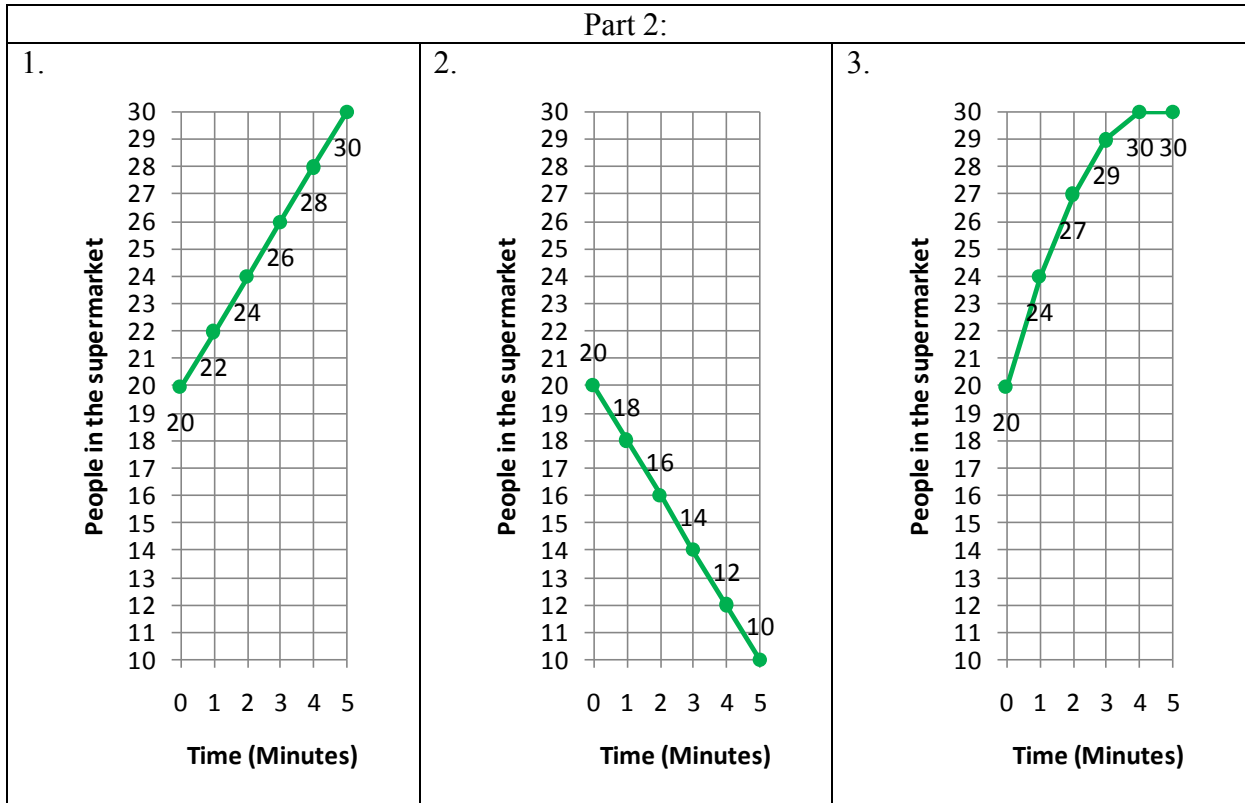
6. Subject completed reflective queries (they can skip if their answer to Part 1 Question 3 was right) and raise hand.

i. Take away all papers, hand in Part 3. Viola! It's done. Thanks for helping me carry out the treatment!

- Subject completed Part 3, leave seat and bring the completed test to the experiment leader.

Summary

In summary, right answers for each question (print out this page if you need it to help you check the questions, but **don't let subjects to see it**):



Any question? Please ask me if you need any clarification so that you can help me to carry out this experiment smoothly.

Appendix C Data

Demography data

Empty cell indicates missing value.

Subject	Treatment	Gender	Age	Background	EnglishNative	TaskBefore	EducationPrepared
A1	1	2	21	SocialSciences	0	0	1
A2	1	2	19	SocialSciences	0	0	0
A3	1	1	21	SocialSciences	0	0	0
A4	1	2	20	SocialSciences	0	0	0
A5	1	2	19		0	0	0
A6	1	2	20	SocialSciences	0	0	0
A7	1	2	22	SocialSciences	0	1	0
A8	1	2	21	SocialSciences	0	0	0
A9	1	2	20	Psychology	0	0	0
A10	1	2	20	SocialSciences	0	0	0
A11	1	2	21	SocialSciences	0	0	0
A12	1	2	20	Humanities	0	0	1
B1	2	2	21	HighSchool	0	0	0
B2	2	2	20	SocialSciences	0	0	0
B4	2	2	37	Economy	0	0	0
B5	2	2	23	SocialSciences	0	0	0
B6	2	2	21	SocialSciences	0	0	1
B7	2	1	21	SocialSciences	0	0	0
B8	2	2	21	SocialSciences	0	0	0
B9	2	2	20	SocialSciences	0	0	0
B10	2	1	20	SocialSciences	0	0	0
C2	3	1	21	SocialSciences	0	0	0
C4	3	2	20	SocialSciences	0	0	0
C5	3	2	20	SocialSciences	0	0	0
C6	3	2	38	SocialSciences	0	0	0
C8	3	2	20	SocialSciences	0	0	0
C9	3	2	20	SocialSciences	0	0	0
A13	1	1	20	SocialSciences	0	0	0
A14	1	2	20	SocialSciences	0	0	0
A15	1	2	22	SocialSciences	0	0	0
A17	1	1	19	SocialSciences	0	0	0
B11	2	2	21	SocialSciences	0	1	1
B12	2	2	19	SocialSciences	0	0	0
B13	2	1	26	SocialSciences	0	0	0

B15	2	2	22	Humanities	0	0	0
B16	2	1	21	SocialSciences	0	0	0
C10	3	1	21	SocialSciences	0	0	0
C11	3	2	20	SocialSciences	0	0	0
C12	3						
C14	3	1	20	SocialSciences	0	0	0
C17	3	1	24	SocialSciences	0	0	0
C18	3	2	21	SocialSciences	0	0	0
C19	3	2	21	SocialSciences	0	0	0
C20	3	2	21	SocialSciences	0	0	0
C21	3						
C22	3						

Pre-test data

Prefix ‘Pr’ stands for pre-test; suffix ‘D’ stands for direction; ‘S’ stands for shape; so ‘PrQ1D’ means “Pre-test Question 1 direction right?”. ‘PrQ1Cor’ means “Pre-test Question 1 correlate?”; ‘PrQ2CorIn’ means “Pre-test Question 2 correlate with inflow?”; ‘PrQ2CorNet’ means “Pre-test Question 2 correlate with net flow?”; ‘PrQ3CorP’ means “Pre-test Question 3 correlate positively?” and ‘PrQ3CorN’ means “Pre-test Question 3 correlate negatively?”.

Subject	PrQ1D	PrQ1S	PrQ1	PrQ1Cor	PrQ2D	PrQ2S	PrQ2	PrQ2CorIn	PrQ2CorNet	PrQ3D	PrQ3S	PrQ3	PrQ3CorP	PrQ3CorN
A1	0	1	FALSE	1	1	1	TRUE	0	0	0	0	FALSE	1	0
A2	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	1	0
A3	0	1	FALSE	1	0	1	FALSE	1	0	0	0	FALSE	0	0
A4	0	1	FALSE	1	0	1	FALSE	0	1	1	0	FALSE	0	1
A5	1	1	TRUE	0	0	0	FALSE	0	0	1	1	TRUE	0	0
A6	1	0	FALSE	0	1	0	FALSE	0	0	0	0	FALSE	1	0
A7	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	1	0
A8	0	1	FALSE	1	0	1	FALSE	1	0	1	0	FALSE	0	1
A9	1	1	TRUE	0	1	1	TRUE	0	0	1	1	TRUE	0	0
A10	0	1	FALSE	1	0	0	FALSE	0	0	0	0	FALSE	0	0
A11	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	1	0
A12	1	1	TRUE	0	0	1	FALSE	1	0	0	0	FALSE	1	0
B1	0	1	FALSE	1	1	1	TRUE	0	0	1	0	FALSE	0	1
B2	0	1	FALSE	1	1	1	TRUE	0	0	0	0	FALSE	1	0
B4	1	1	TRUE	0	0	1	FALSE	0	1	0	0	FALSE	1	0
B5	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	1	0
B6	1	1	TRUE	0	1	1	TRUE	0	0	0	1	FALSE	0	0
B7	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	0	0

B8	0	0	FALSE	0	0	0	FALSE	0	0	0	0	FALSE	0	1
B9	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	0	0
B10	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	1	0
C2	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	1	0
C4	0	1	FALSE	0	0	1	FALSE	0	1	0	0	FALSE	1	0
C5	1	1	TRUE	0	1	1	TRUE	0	0	1	1	TRUE	0	0
C6	1	1	TRUE	0	1	1	TRUE	0	0	0	0	FALSE	0	0
C8	0	1	FALSE	1	0	0	FALSE	1	0	0	0	FALSE	1	0
C9	0	1	FALSE	1	0	0	FALSE	1	0	1	0	FALSE	0	1
A13	0	1	FALSE	1	1	1	TRUE	0	0	0	0	FALSE	0	0
A14	0	1	FALSE	1	0	1	FALSE	1	0	0	0	FALSE	1	0
A15	0	1	FALSE	1	0	1	FALSE	0	1					
A17	0	0	FALSE	0	0	0	FALSE	0	0	0	0	FALSE	0	0
B11	1	1	TRUE	0	0	1	FALSE	0	1	0	0	FALSE	1	0
B12	0	1	FALSE	1	0	1	FALSE	1	0	0	0	FALSE	1	0
B13	0	1	FALSE	1	1	0	FALSE	0	0	1	0	FALSE	0	0
B15	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	1	0
B16	1	1	TRUE	0	1	1	TRUE	0	0	0	0	FALSE	1	0
C10	1	1	TRUE	0	0	1	FALSE	0	1	0	0	FALSE	1	0
C11	0	1	FALSE	1	0	1	FALSE	1	0	0	0	FALSE	1	0
C12	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	1	0
C14	0	0	FALSE	0	0	1	FALSE	1	0	0	0	FALSE	0	0
C17	1	0	FALSE	0	1	0	FALSE	0	0	0	0	FALSE	0	0
C18	0	1	FALSE	1	0	1	FALSE	1	0	0	0	FALSE	1	0
C19	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	1	0
C20	0	1	FALSE	1	0	1	FALSE	1	0	0	1	FALSE	0	0
C21	1	1	TRUE	0	0	1	FALSE	0	1	0	0	FALSE	1	0
C22	1	1	TRUE	0	1	1	TRUE	0	0	1	1	TRUE	0	0

Post-test data

Prefix 'Po' stands for post-test; the rest follows pre-test conventions.

Subject	PoQ1D	PoQ1S	PoQ1	PoQ1 Cor	PoQ2D	PoQ2S	PoQ2	PoQ2 CorIn	PoQ2 CorNet	PoQ3D	PoQ3S	PoQ3	PoQ3 CorP	PoQ3 CorN
A1	0	0	FALSE	1	1	1	TRUE	0	0	0	1	FALSE	0	0
A2	0	0	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	1	0
A3	0	1	FALSE	1	0	0	FALSE	0	0	0	0	FALSE	0	0
A4	0	1	FALSE	0	1	1	TRUE	0	0	0	0	FALSE	1	0
A5	1	1	TRUE	0	1	0	FALSE	0	0	1	1	TRUE	0	0
A6	1	1	TRUE	0	1	0	FALSE	0	0	0	0	FALSE	0	0
A7	0	1	FALSE	1	0	1	FALSE	1	0	0	0	FALSE	1	0
A8	0	1	FALSE	1	0	1	FALSE	1	0	0	0	FALSE	1	0

A9	1	1	TRUE	0	1	0	FALSE	0	0	1	1	TRUE	0	0
A10	1	1	TRUE	0	0	0	FALSE	0	0	0	0	FALSE	0	0
A11	1	1	TRUE	0	0	1	FALSE	0	1	0	0	FALSE	1	0
A12	1	1	TRUE	0	0	1	FALSE	1	0	0	1	FALSE	0	0
B1	1	1	TRUE	0	1	1	TRUE	0	0	0	0	FALSE	0	0
B2	1	1	TRUE	0	1	1	TRUE	0	0	1	1	TRUE	0	0
B4	1	1	TRUE	0	0	1	FALSE	1	0	0	0	FALSE	1	0
B5	1	1	TRUE	0	1	1	TRUE	0	0	0	0	FALSE	1	0
B6	0	1	FALSE	0	1	1	TRUE	0	0	1	1	TRUE	0	0
B7	1	1	TRUE	0	1	1	TRUE	0	0	0	0	FALSE	0	0
B8	0	1	FALSE	0	0	1	FALSE	0	1	0	0	FALSE	1	0
B9	1	1	TRUE	0	1	1	TRUE	0	0	1	1	TRUE	0	0
B10	1	1	TRUE	0	1	1	TRUE	0	0	1	1	TRUE	0	0
C2	1	1	TRUE	0	0	0	FALSE	1	0	0	0	FALSE	1	0
C4	0	1	FALSE	0	1	1	TRUE	0	0	1	0	FALSE	0	1
C5	1	1	TRUE	0	1	1	TRUE	0	0	1	0	FALSE	0	1
C6	1	1	TRUE	0	1	1	TRUE	0	0	0	1	FALSE	0	0
C8	0	0	FALSE	0	0	0	FALSE	0	0	0	0	FALSE	1	0
C9	1	1	TRUE	0	1	1	TRUE	0	0	0	0	FALSE	1	0
A13	1	1	TRUE	0	0	1	FALSE	0	1	1	1	TRUE	0	0
A14	0	1	FALSE	1	0	1	FALSE	1	0	0	0	FALSE	1	0
A15	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	0	0
A17	0	0	FALSE	0	0	0	FALSE	0	0	0	0	FALSE	0	0
B11	1	1	TRUE	0	1	1	TRUE	0	0	1	1	TRUE	0	0
B12	1	1	TRUE	0	1	1	TRUE	0	0	0	0	FALSE	0	0
B13	1	1	TRUE	0	1	1	TRUE	0	0	0	0	FALSE	0	0
B15	1	1	TRUE	0	1	1	TRUE	0	0	1	1	TRUE	0	0
B16	1	1	TRUE	0	0	1	FALSE	0	1	0	0	FALSE	0	0
C10	1	1	TRUE	0	0	1	FALSE	0	1	0	0	FALSE	1	0
C11	1	1	TRUE	0	1	1	TRUE	0	0	1	1	TRUE	0	0
C12	0	1	FALSE	1	0	1	FALSE	0	1	1	0	FALSE	0	1
C14	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	0	0
C17	0	0	FALSE	0	0	0	FALSE	0	0	0	0	FALSE	0	0
C18	0	1	FALSE	0	1	1	TRUE	0	0	0	0	FALSE	0	0
C19	0	1	FALSE	1	0	1	FALSE	0	1	0	0	FALSE	0	0
C20	1	1	TRUE	0	1	1	TRUE	0	0	1	1	TRUE	0	0
C21	1	1	TRUE	0	1	1	TRUE	0	0	1	1	TRUE	0	0
C22	1	1	TRUE	0	1	1	TRUE	0	0	1	1	TRUE	0	0

Treatment 2 Graphical integration guidance data

Following pre-test convention, ‘T2Q3dS’ means “Treatment 2 Question 3d shape right?”.

Besides right (0) or wrong (1), subject may intentionally give no response (2).

Subject	T2 Q1a	T2 Q1b	T2 Q1c	T2 Q1d D	T2 Q1d S	T2 Q1d	T2 Q2a	T2 Q2b	T2 Q2c	T2 Q2d D	T2 Q2d S	T2 Q2d	T2 Q3a	T2 Q3b	T2 Q3c	T2 Q3d D	T2 Q3d S	T2 Q3d
B1	1	1	1	1	1	TRUE	1	1	1	1	1	TRUE	1	1	0	0	0	FALSE
B2	1	1	1	1	1	TRUE	1	1	0	1	0	FALSE	1	1	0	1	1	TRUE
B4	0	0	2	0	1	FALSE	0	0	2	0	1	FALSE	0	0	1	0	0	FALSE
B5	1	1	2	1	1	TRUE	1	1	2	1	1	TRUE	0	0	2	0	0	FALSE
B6	1	1	0	1	1	TRUE	1	1	1	1	1	TRUE	1	1	1	1	0	FALSE
B7	0	0	2	0	1	FALSE	1	1	1	1	1	TRUE	1	0	1	0	1	FALSE
B8	0	0	2	0	1	FALSE	1	1	1	1	1	TRUE	1	0	1	1	0	FALSE
B9	0	0	2	0	1	FALSE	0	0	2	0	1	FALSE	1	0	1	0	0	FALSE
B10	1	1	1	1	1	TRUE	1	1	1	1	1	TRUE	1	0	0	0	0	FALSE
B11	1	1	1	1	1	TRUE	1	1	1	1	1	TRUE	1	1	1	0	0	FALSE
B12	1	1	1	1	1	TRUE	1	1	1	1	1	TRUE	1	0	0	0	0	FALSE
B13	1	1	1	1	1	TRUE	1	1	1	1	1	TRUE	1	1	1	1	0	FALSE
B15	2	2	2	0	1	FALSE	1	1	1	1	1	TRUE	1	1	1	1	1	TRUE
B16	1	1	1	0	1	FALSE	1	1	0	1	1	TRUE	1	0	0	1	0	FALSE

Treatment 3 Running total and reflection data

Suffix ‘Cal’ standards for calculation, so ‘T3Q2Cal’ means “Treatment 3 Question 2 calculation right?” and ‘T3Q2i’ means “Treatment 3 Question 2 reflective query i discover it?”. Besides right (0), wrong (1) or no response intentionally (2), subject can skip the queries because his/her answer in corresponding pre-test question was right (3). Value 4 indicates that there is no response probably because of the helper’s problematic checking.

Subject	T3Q1Cal	T3Q1i	T3Q1ii	T3Q2Cal	T3Q2i	T3Q2ii	T3Q3Cal	T3Q3i	T3Q3ii
C2	0	1	2	1	1	2	0	2	2
C4	0	1	0	0	3	3	0	1	1
C5	1	3	3	1	3	3	1	3	3
C6	1	3	3	1	3	3	1	1	1
C8	0	0	0	0	0	0	0	0	0
C9	1	1	1	1	1	1	0	0	1
C10	1	3	3	1	1	1	1	1	1
C11	1	1	1	0	1	1	1	1	1

C12	1	1	1	1	1	1	1	1	1
C14	1	1	2	1	1	2	1	1	2
C17	1	4	4	0	1	0	1	4	4
C18	0	1	1	1	1	1	0	1	1
C19	0	1	1	1	1	1	1	1	0
C20	1	1	0	1	1	0	1	1	1
C21	1	3	3	0	1	1	1	1	1
C22	1	3	3	1	3	3	1	3	3