

YEAR 12 *Trial Exam Paper* 2020

APPLIED COMPUTING: SOFTWARE DEVELOPMENT

Written examination

Reading time: 15 minutes

Writing time: 2 hours

STUDENT NAME:

QUESTION AND ANSWER BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	20	20	20
B	5	5	20
C	13	13	60
			Total 100

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers and one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

Materials supplied

- Question and answer book of 31 pages
- Detachable insert containing a case study for Section C in the centrefold
- Answer sheet for multiple-choice questions

Instructions

- Detach the insert from the centre of this book during reading time.
- Write your **name** in the space provided above and on the multiple-choice answer sheet.
- All written responses must be in English.

At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.
- You may keep the detached insert.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

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SECTION A – Multiple-choice questions**Instructions for Section A**

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

Francine has created a Gantt chart to help monitor her project. In the Gantt chart, there is a task (Task B) that has another task directly before it (Task A). Task B cannot begin until Task A is complete.

What type of task is Task B?

- A. a milestone
- B. a predecessor
- C. a parallel task
- D. a dependent task

Question 2

Lily is writing non-functional requirements for her new system. She writes a statement about the system that says, 'the system will be cross-platform'.

This type of non-functional requirement relates to

- A. usability.
- B. reliability.
- C. portability.
- D. maintainability.

Question 3

Sasha has just received a large data set from a client. She wants to make sure that the data is intact and is a truthful representation of the context in which it was collected.

This aspect of data integrity is best described as

- A.** relevance.
- B.** accuracy.
- C.** authenticity.
- D.** reasonableness.

Question 4

Xander is writing programming code that will consider a set of logical statements. Depending on the outcome of those statements, a portion of code will be executed.

This type of processing is best described as

- A.** a function.
- B.** a condition.
- C.** a statement.
- D.** an instruction.

Use the following information to answer Questions 5–7.

```
Algorithm X(array a)
Begin
  h ← NONE
  For each element In a Do
    If h = NONE Then
      h ← element
    Else if element.value > h.value Then
      h ← element
    End if
  End for
  Return h
End
```

Question 5

Which control structure best describes the line ‘**FOR EACH** element **IN** a **DO**’ in the pseudocode?

- A. iteration
- B. selection
- C. sequence
- D. condition

Question 6

In the pseudocode, the data structure that best describes ‘element’ is

- A. a dictionary.
- B. a method.
- C. a record.
- D. an array.

Question 7

If the pseudocode is implemented using a programming language, it would be guaranteed to return the

- A. last value element within the array.
- B. first value element within the array.
- C. lowest value element within the array.
- D. highest value element within the array.

Question 8

Hiko is designing an intelligent robot that will clean both horizontal and vertical surfaces in family homes. When the robot reaches a barrier such as a wall or ceiling, it needs to modify its wheel structure so it can traverse the next horizontal or vertical surface.

The most appropriate and efficient data type to use when returning the information to the robot as to whether it has reached a barrier or not is

- A. integer.
- B. Boolean.
- C. character.
- D. floating point.

Question 9

Amanda is writing an algorithm that uses partitioning and a pivot to recursively order the elements of an array until the array is sorted.

This type of sorting algorithm is known as

- A. selection.
- B. binary.
- C. linear.
- D. quick.

Question 10

Hattie owns a chicken farm that sells chicks and eggs to customers across Victoria. She stores all of her customer and sales data in spreadsheets but is moving to a new database system soon. She plans to transfer all of her data to the new system on 1 July 2020, the start of the new financial year. Once she transfers all of her data to the new system, she wants to archive her spreadsheet data as CSV files so she can move them to offsite storage. The new system will also allow her to export her data to CSV files so she can archive her data at the end of each financial year.

Which one of the following file names would be the most effective for Hattie to use when she archives her spreadsheet files?

- A. spreadsheet-2020-07-01.csv
- B. chickenCustSalesData.csv
- C. custEggSales-200701.csv
- D. sales-July-1-2020.csv

Question 11

Renata writes software that intercepts a data transmission and redirects it through another computer system. The data is then harvested for sensitive information and modified before being passed on to its original destination.

This type of software is best described as an example of

- A. a man-in the middle attack.
- B. cross-site scripting.
- C. social engineering.
- D. phishing.

Question 12

Sandra works at a private medical centre in rural Victoria, and she has also just finished a software development degree. She has been observing how frustrated her colleagues become when using the patient record program installed at the centre and she offers to build a new system to replace it. Her manager thinks this is a great idea and asks Sandra if she can implement it within three months. Sandra works over many weekends and evenings to finish the software on time.

Which key legislation does the medical centre **not** need to consider when installing and using the new software built by Sandra?

- A. *Privacy Act 1988*
- B. *Copyright Act 1968*
- C. *Health Records Act 2001*
- D. *Privacy and Data Protection Act 2014*

Use the following information to answer Questions 13 and 14.

```
1 Algorithm validateUser(string userName, string password)
2 Begin
3   ud ← open userDatabase
4   allUsers ← read all users from ud
5   If userName = "" Or password = "" Then
6     Return False
7   End if
8   Do
9     user ← get next user from allUsers
10    If user.userName = userName Then
11      If user.password = encrypt(password) Then
12        Return True
13      Else
14        Return False
15      End if
16    End if
17  While allUsers not empty
18  Return False
19 End
```

Question 13

What type of validation is being used in lines 5–7 of this algorithm?

- A. type checking
- B. range checking
- C. existence checking
- D. encryption checking

Question 14

The pseudocode has been implemented into a program and is currently being tested. The tester runs the program when there are no users in the user database.

The program will most likely

- A. throw a runtime error.
- B. throw a syntax error.
- C. not run at all.
- D. return False.

Question 15

Wende is a project manager who is managing a software development project for his company. His team plans elements of the project, designs what those elements will look like, develops and tests those elements, and then delivers those elements fully completed to the client. The client then evaluates whether the elements meet their needs, providing suggestions for further improvement. This process happens a number of times over the lifecycle of the project, with each set of elements providing more and more functionality to the client until the entire project is complete.

This type of software development model is best described as

- A. agile.
- B. spiral.
- C. iterative.
- D. waterfall.

Use the following information to answer Questions 16 and 17.

Daniel is collecting data as part of the analysis stage of a new system he is building for his local council. The system will allow people who live in the council area to book time to use exercise equipment that has recently been installed next to the council offices.

Question 16

Daniel wants to create a survey for local residents to complete that will help him design the user interface. He would like for the survey to have the minimum number of questions.

Which one of the following questions would be best for Daniel to ask to help him with his design?

- A. How often do you think you will use the exercise equipment?
- B. What time of day would you access the new equipment?
- C. Do you have any accessibility needs?
- D. How old are you?

Question 17

Daniel's council has placed some constraints on the project that he needs to account for when he builds the booking system.

Which one of the following constraints placed on Daniel is a technical constraint?

- A. The new system must be completed by the start of summer.
- B. Resident information must be encrypted to protect their privacy.
- C. Residents should be able to learn how to use the system quickly.
- D. Residents must come into the office to book using a touchscreen system.

Question 18

Winter recently arrived in Australia from the United States and was employed by a friend of hers, Tim, to do some data entry. Tim gives Winter a pile of employee reviews that she needs to go through to update each employee's work history in the system. This means that she has to load the employee, add in the date they had their review and then press save. An example is shown below.

Henrietta Smith, Review date: 03/04/2020

The software system requires that Winter enter dates using dropdowns for the day, month and year, where the months given are month names. When she enters the review date for Henrietta into the system, she enters the date as: 4, March, 2020.

Which factor of data integrity is being violated with Winter's data entry methods?

- A. accuracy
- B. relevance
- C. authenticity
- D. reasonableness

Question 19

Rande needs to define some controls to put in place at his business to help protect business software and data. Rande wants to implement complexity requirements for logins, and lockouts for failed attempts.

These security controls are best described as

- A. version control.
- B. user authentication.
- C. password encryption.
- D. software update rules.

Question 20

Bridget is drawing a diagram to depict the interface between solutions, users and networks. The diagram she is currently working on describes how the user interacts with the system and includes references to external systems that contribute data to it.

The diagram that Bridget is drawing is a

- A. data flow diagram.
- B. use case diagram.
- C. context diagram.
- D. layout diagram.

SECTION B – Short-answer questions**Instructions for Section B**

Answer **all** questions in the spaces provided.

Question 1 (3 marks)

An online gaming site requires that users register with a valid username (consisting of any combination of letters, numbers and special characters), email address and date of birth. Users also have the option of entering a six-digit PIN (consisting of only numbers) to allow them to enter the in-site store.

Complete the table with the validation technique that would be required to ensure the data entered is valid for each of the following.

Description	Validation technique
checking that the date entered is between 1/1/1900 and today's date	
checking that the PIN has no letters entered	
checking that the email address is present	

Question 2 (2 marks)

Alyce manages a large software project for a multinational corporation. The project is running behind schedule and a senior programmer, Candice, suggests buying software modules from a third party rather than developing them in-house. Alyce is concerned about the third party having access to their private data, but cannot see an alternative to get the project back on schedule.

Suggest **two** ways to manage the risks from these software modules to the private data held by the corporation.

Question 3 (4 marks)

Version control is a software control used to protect software and data and is usually performed by the programmer or programming team. Software auditing is a process used to identify and minimise potential risks and is usually performed by an independent auditor.

- a.** Describe version control and explain how a programmer could use version control to protect software during development.

2 marks

- b.** Describe software auditing and explain one advantage of using an independent auditor to conduct a software audit on a piece of software during development.

2 marks

Question 4 (3 marks)

The progress of a project can be recorded using:

- adjustments to tasks and timeframes
- annotations
- logs.

Select **one** of these techniques and explain how it could be used to record the progress of a large software development project involving a team of four programmers.

Question 5 (8 marks)

Sachi is the IT administrator at West Hills Secondary College. The college has decided to implement a new system to upload lesson plans, teaching resource files, school protocols and historical records to the staff intranet rather than having the data sit on a shared staff drive. Lesson plans and unit plans are updated weekly. Assessments and school protocols, once created, are accessed yearly for revision or review. Some historical records have not been accessed in ten years. Sachi has decided to include both backup and archive strategies in his data management strategy for the handling of these files.

- a. In reference to the features of backups listed in the table below, propose and justify an appropriate backup strategy that Sachi could implement for this data.

4 marks

Feature of backups	Strategy and justification
timing of the backups	
location of the backups	

- b. In reference to the features of archives listed in the table below, propose and justify an appropriate archive strategy that Sachi could implement for this data.

4 marks

Feature of archives	Strategy and justification
timing of the archives	
location of the archives	

END OF SECTION B
TURN OVER

SECTION C – Case study**Instructions for Section C**

Please remove the insert from the centre of this book during reading time.

Use the case study provided in the insert to answer the questions in this section. Answers must apply to the case study.

Answer **all** questions in the spaces provided.

Question 1 (3 marks)

- a. Explain **one** goal Bella and/or Scott have when developing RoboMojo.

1 mark

- b. Explain **two** objectives Bella and/or Scott have when developing RoboMojo.

2 marks

Question 2 (2 marks)

Outline **two** constraints that Bella and Scott will need to consider before designing RoboMojo.

CONTINUES OVER PAGE

Question 3 (8 marks)

In order to complete the analysis, design and development stages within six months, Bella and Scott create a Gantt chart to manage their project. They decide to use fortnight (two week) blocks as their unit of time and plan to finish the project by the twelfth fortnight.

Task	Duration (fortnights)	1	2	3	4	5	6	7	8	9	10	11	12
Research available components.	1												
Develop software requirements specification (SRS).	1												
Write algorithms.	2												
Write evaluation criteria.	1												
Refine algorithms.	1												
Write robot software.	2												
Write voice-recognition database.	1												
Test software.	2												
Install software on robot and test.	2												

- a. Complete the Gantt chart using the information provided. 2 marks
- b. Using the diamond symbol (◆), indicate milestones to represent the completion of the analysis stage and the design stage on the Gantt chart above. 2 marks
- c. For each task listed below, describe the consequences for the project if the task takes an extra fortnight. 2 marks
- Write evaluation criteria.

- Test software.

- d.** Bella and Scott are concerned about the project running over time and decide to run the tasks 'Test software' and 'Install software on robot and test' concurrently.

Describe **two** potential problems that could arise from this decision.

2 marks

Question 4 (3 marks)

Bella and Scott have to come up with a naming convention for various solution elements, such as variables in the program. Each has written a possible naming convention, for which example variables have been provided below.

Variable description	Bella's naming convention	Scott's naming convention
the speed of RoboMojo in metres per second	speed_m_per_s	fpSpd
the angle for RoboMojo to turn in degrees	angle_degrees	intAng
an indicator of whether RoboMojo's internal debris collector is full	is_collector_full	bFull

- a.** Outline **one** advantage of each naming convention.

2 marks

- b.** Recommend **one** of the two naming conventions. Justify your recommendation.

1 mark

Question 5 (3 marks)

Bella starts to plan for the internal database of spoken commands. The spoken commands will need to be searched to find the correct command.

- a.** Explain why a binary search is not suitable for this set of commands.

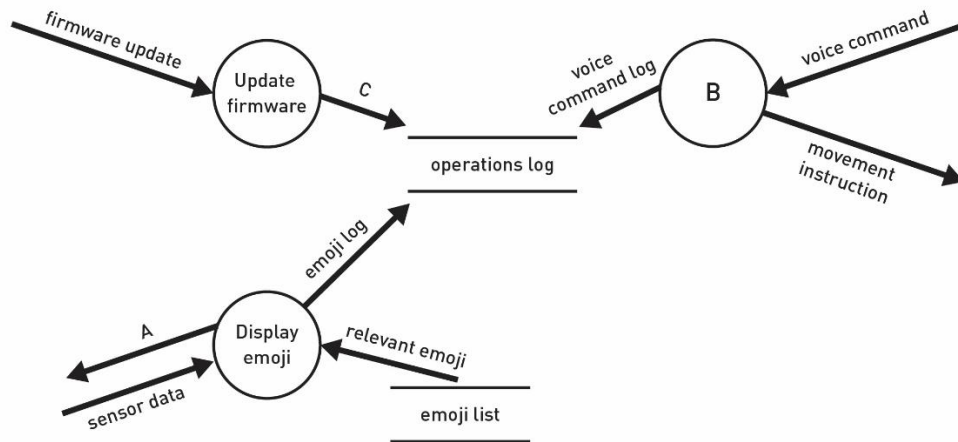
1 mark

- b.** Identify an appropriate search method and briefly describe how it would search for a voice command such as 'return to the base station'.

2 marks

Question 6 (5 marks)

Bella creates a context diagram (shown as Figure 1 in the insert) and data flow diagram for the RoboMojo operating system. A partial version of the data flow diagram is shown below.



- a. Using the data flow diagram, identify the following as either entities, processes, data flows or data stores.

2 marks

update firmware	
emoji list	

- b. Complete the data flow diagram by writing the correct labels for A, B and C in the spaces provided below.

3 marks

A _____

B _____

C _____

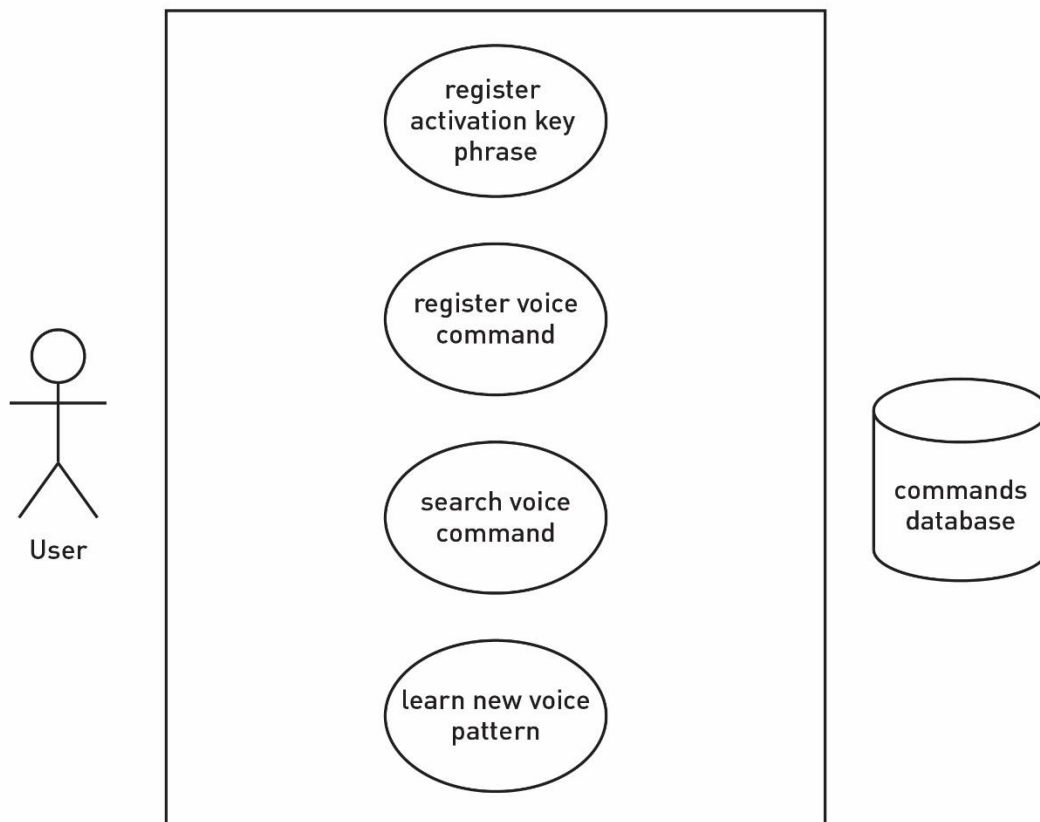
Question 7 (5 marks)

In order to represent the functional requirements related to RoboMojo's voice-activation processes, Bella decides to draw a use case diagram. The functional requirements to be represented are as follows:

- registering a voice command (this includes registering the activation key phrase, 'Hey, RoboMojo')
- searching the internal command database for a matching phrase
- learning a new voice pattern – to do this, the user must interact with RoboMojo's control panel and then read the corresponding phrases in order (e.g. 'Stop', 'Return to base', 'Go to the next room').

The partial use case diagram is below. Bella has decided to represent the commands database outside the system boundary.

Complete the use case diagram below by showing all associations.



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Question 8 (11 marks)

Scott finds some open-source software that will work with the sensors that detect and identify the material sucked up by RoboMojo. The software has already had a number of variables programmed into it, which Scott puts into a data dictionary and plans to write to a file, part of which is in the example below.

```
<material>
  <isLiquid>False</isLiquid>
  <thickness>0.47</thickness>
  <mass>0.172</mass>
  <timestamp>13:15:19</timestamp>
  <datestamp>20-Jul-2020</datestamp>
</material>
```

- a. Complete the partial data dictionary below by identifying the most appropriate data type or data structure for each proposed variable.

3 marks

Variable name	Data type / structure	Description
isLiquid		a value representing whether the material is liquid or not
thickness		the thickness in millimetres of a solid material such as a hair fibre
material		the entire description of a material, consisting of all data recorded

- b. Identify the file format used to create this file and describe one advantage of using this file format.

2 marks

Scott has written some initial pseudocode for the emoji selection module of the RoboMojo operating system. His pseudocode focuses on four different types of material at this stage.

- Water is the only liquid that Scott is using for the testing. RoboMojo should show a ‘crying’ emoji.
- Human hair has a thickness of 0.05 to 0.15 mm. RoboMojo should show a ‘smiling’ emoji.
- Pet hair has a thickness of 0.025 to 0.049 mm. RoboMojo should show a ‘tongue’ emoji.
- Dust is any substance with a thickness of less than 0.024 mm. RoboMojo should show a ‘sneezing’ emoji.

The function emojiDraw() is used to draw the relevant emoji in the LED lights on RoboMojo. No material with a thickness greater than 0.15 mm will be used in testing.

Scott’s pseudocode is shown below.

```

1 Begin
2   If isLiquid = True Then
3     emojiDraw("crying")
4   Else if thickness <= 0.15 Then
5     emojiDraw("smiling")
6   Else if thickness <= 0.049 Then
7     emojiDraw("tongue")
8   Else
9     emojiDraw("sneezing")
10  End if
11 End

```

- c. Complete the test table below to create three different tests that will each reach a different branch of the pseudocode.

3 marks

Test no.	Material	isLiquid	Thickness	Expected results	Actual results
1	water	True	0	‘crying’	‘crying’
2					
3					
4					

- d.** Describe the errors in the pseudocode that would cause the incorrect emoji to be displayed.

1 mark

- e.** Rewrite the lines of pseudocode that cause the error found in **part d.** so that the pseudocode will work correctly.

2 marks

Question 9 (6 marks)

Bella and Scott decide that RoboMojo should have an associated app to offer online support and allow features that cannot be installed on the RoboMojo device itself, such as connecting to the internet for firmware updates. They hire an app developer, Chen, to develop an app for them. Chen designs two possible app home screens, shown below.

Design A**Design B**

- a. Select **one** element from Design A that would make the app more efficient than using Design B. Explain why this element increases the efficiency of Design A.

2 marks

- b.** Select **one** element from Design A that would make the app more effective than using Design B. Explain why this element increases the effectiveness of Design A.

2 marks

- c.** Select **one** element from Design B that increases either the efficiency or effectiveness compared to Design A. Explain your decision.

2 marks

Question 10 (4 marks)

Bella and Scott must ensure that when developing RoboMojo they keep the influences of affordance, interoperability, marketability, security and usability in mind.

Using the information provided in the case study, select **one** feature of RoboMojo and explain how Bella and Scott are responding to the influences of the following.

- Usability

- Marketability

Question 11 (4 marks)

The RoboMojo device is limited in size and power capability, and Bella and Scott must consider both the storage medium and transmission technology used. Both Bella and Scott agree to use solid-state drives (SSD) instead of hard disk drives (HDD) for their storage media. In regard to transmission technology, Bella suggests using Bluetooth® while Scott suggests using wi-fi.

- a.** In relation to storage medium, identify **two** advantages that an SSD would have over an HDD in this situation.

2 marks

- b.** In relation to transmission technology, select and justify either Bluetooth® or wi-fi in this situation.

2 marks

Question 12 (4 marks)

One of the possible expansions for the RoboMojo unit is to add a camera that can photograph the floor space, allowing the user to check RoboMojo's progress via the app when they are not at home. These photos would be uploaded to the RoboMojo company website when the RoboMojo device docks into its recharge station. Bella and Scott have to consider the relevant legislation for this process.

- a.** Identify **one** potential risk to the RoboMojo owner that this situation creates.

1 mark

- b.** Identify the relevant legislation that Bella and Scott must consider.

1 mark

- c.** Describe **two** precautions that Bella and Scott must take to meet the legal obligations from the legislation identified in **part b.**

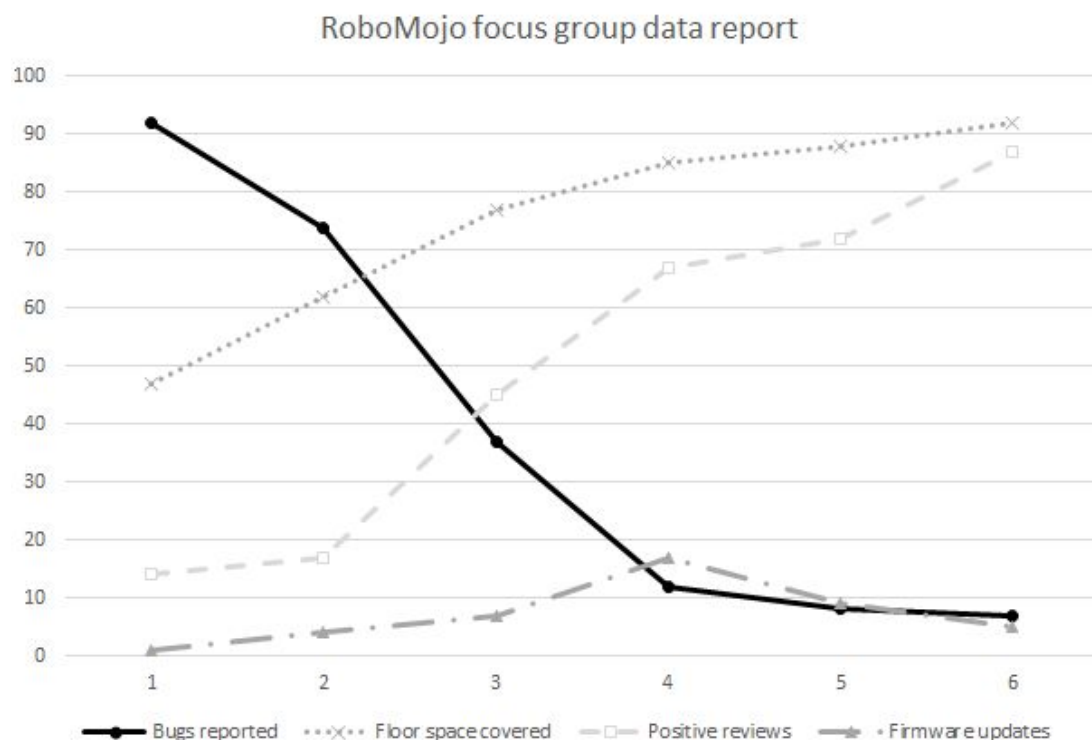
2 marks

Question 13 (2 marks)

As part of a test of the working system, Bella and Scott conduct a six-week trial of RoboMojo with a focus group of 100 households. The following data is collected from each household everyweek.

- whether the RoboMojo unit reported any bugs (this is presented as the number of households with bug reports, not the number of bugs)
- the percentage of floor space covered by the RoboMojo unit (presented as an average across all 100 households)
- a user review using one of the following responses: ‘positive’, ‘neutral’ or ‘negative’. Only the number of positive reviews has been presented
- the number of firmware updates presented as a total across all 100 households.

The data from the six-week trial is presented in the graph below.



Referring to the graph, suggest **two** pieces of evidence that show an increase in the effectiveness of the RoboMojo unit over the six-week trial.

END OF QUESTION AND ANSWER BOOK