SRI Education

Who's in the room?

- Please introduce yourselves in the chat window.
- Name, location, and…
  - Number of years teaching ECS?
  - New to CS teaching?
  - Teach/taught other subjects? Science? Math?
  - Are there particular Unit 4 or Cumulative Assessment items you would like to see discussed?
  - Anything else you'd like to share ☺

SRI International

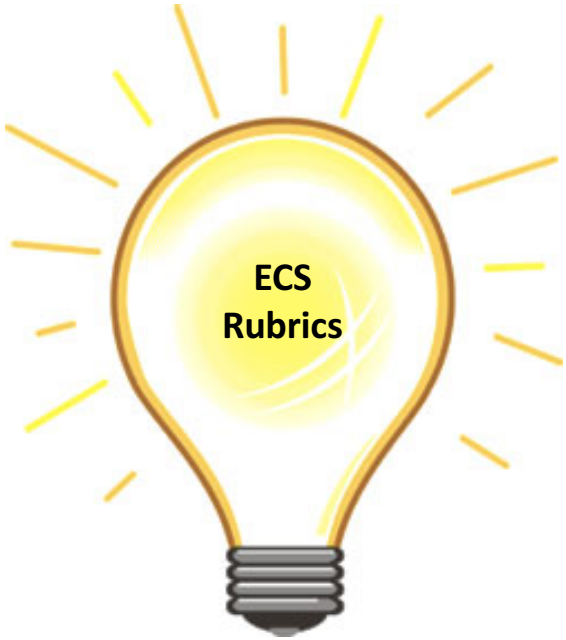
Center for Technology in Learning

SRI Education

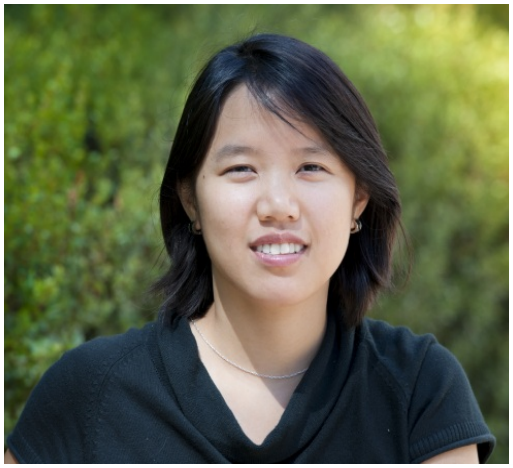
Principled Assessment of Computational Thinking

January 31, 2017

Exploring Computer Science



Daisy Rutstein



Michelle Huynh

Agenda

- Overview of the rubrics
- Unit 4 Discussion
  - Item 1
  - Item 3
  - Item 4
- Cumulative Assessment Discussion
  - Item 2
  - Item 4
- Questions

ECS Assessments

- 5 sets: End-of-Unit (1-4) & Cumulative
- Aligned to ECS curriculum; CSTA Standards
- Provide evidence of students' "Knowledge, Skills, and Attributes" (KSAs)
- Focused on Computational Thinking ***Practices***

Assessment in the **service of learning** (NOT accountability) that provide teachers with the evidence they need to draw inferences of what students understand, know, and are able to do.

ECS Rubrics and Scoring Guides

- Quick Scoring Guide
  - Overview of points

Total points for the Cumulative Assessment (Units 1-4): **18 points**

Task #	Points	Rubric
Task 1: Description of Computer Science Total points: **2 points** Learning Objective • *While this item does not address a specific Learning Objective, it addresses the overarching theme of understanding computer science as a discipline.*		
1	2 points	• 2 points for providing an appropriate example of a general concept within computer science. These are concepts that are covered in multiple ECS units (e.g., problem solving, designing and developing creative solutions). OR • 1 point for providing an appropriate example of a specific concept or skill within computer science. These would generally be covered in only one ECS unit (e.g., programming, web design, data analysis, learning about how computers work). OR • 0 points for only identifying tools or products (e.g., programs, codes, data, robots) instead of identifying the action relating to computer science (e.g., problem solving, programming, data analysis) OR for not meeting any of the requirements described above.

- Detailed Scoring Guide
  - More details on the points for each of the questions
  - Clarification notes
  - Example responses

Unit 4 Rubric Overview

Updates to Unit 4

- Assessment had minor changes from last year's version
  - Task order changed (task 4 was moved to become task 3)
  - Task 1 has minor changes to the algorithm provided, and one of the explanations was removed
  - Task 2 had a change in the format for the response, now includes a more scaffolded response format
  - Task 3 (previously 4) had changes to the prompt, and starter code for the students
  - Task 4 had changes to the code provided to the student and minor changes to some of the prompts
- The rubric is similar to last years, with a few changes to reflect the updates

Unit 4, Item 1

1. **For a class assignment, Gabriela and Lucia both created an algorithm that has a dog run laps on the screen.**

Gabriela's algorithm	Lucia's algorithm

• **Step 1:** Ask how many laps the dog should run. Go to Step 2.
• **Step 2:** Check the number entered.
  ▪ **Step 2a:** If the number entered is less than 2, then the dog says "Not enough laps." Then skip to Step 5.
  ▪ **Step 2b:** If the number entered is greater than 200, then the dog says "Too many laps." Then skip to Step 5.
  ▪ **Step 2c:** If the number entered is greater than or equal to 2 AND less than 100, then skip to Step 3.
  ▪ **Step 2d:** If the number entered is between 100 and 200 (including 100 and 200), then skip to Step 4.
• **Step 3:** The dog runs the number of laps entered. Skip to Step 5.
• **Step 4:** The dog runs **half** of the number of laps entered. Go to Step 5.
• **Step 5:** The program ends.
	• **Step 1:** Ask how many laps the dog should run. Go to Step 2
	• **Step 2:** Check the number entered.
	  ▪ **Step 2a:** If the number entered is less than 2, then the dog says "Not enough laps." Then skip to Step 4.
	  ▪ **Step 2b:** If the number entered is NOT less than 2, then move to Step 3.
	• **Step 3:** The dog runs the number of laps entered. Go to Step 4.
	• **Step 4:** The program ends.

Unit 4, Item 1

a) In Gabriela's algorithm, what is shown on the screen if the number entered is 120?

- ☐ Dog says "Not enough laps."
- ☐ Dog says "Too many laps."
- ☐ Dog runs 120 laps.
- ☐ Dog runs 60 laps.

b) In Lucia's algorithm, what is shown on the screen if the number entered is 120?

- ☐ Dog says "Not enough laps."
- ☐ Dog says "Too many laps."
- ☐ Dog runs 120 laps.
- ☐ Dog runs 60 laps.

You are the programmer for **Lucia's algorithm**.

c) Which step(s) in Lucia's algorithm would you program using the *If* structure block? Select all that apply.

If structure block:

- ☐ Step 1
- ☐ Step 2a
- ☐ Step 2b
- ☐ Step 3
- ☐ None of the steps

Unit 4, Item 1

d) Which step(s) in Lucia's algorithm would you program using the *Repeat Until* structure block? Select all that apply.

Repeat Until structure block:

- ☐ Step 1
- ☐ Step 2a
- ☐ Step 2b
- ☐ Step 3
- ☐ None of the steps

e) Using Gabriela's algorithm, can the dog run 150 laps?

- ☐ Yes
- ☐ No

Explain your answer.

Rubric: Unit 4, Items 1a, 1b

Rubric for Task 1a

Total points: **1 point**

- **1 point** for selecting:
  - ☐ Dog says "Not enough laps."
  - ☐ Dog says "Too many laps."
  - ☐ Dog runs 120 laps.
  - ☑ Dog runs 60 laps.

Rubric for Task 1b

Total points: **1 point**

- **1 point** for selecting:
  - ☐ Dog says "Not enough laps."
  - ☐ Dog says "Too many laps."
  - ☑ Dog runs 120 laps.
  - ☐ Dog runs 60 laps.

Rubric: Unit 4, Items 1c, 1d

Rubric for Task 1c

Total points: **1 point**

- **1 point** for selecting **ONLY** the correct steps in the algorithm (0.5 points for each correct selection):
  - ☐ Step 1
  - ☑ Step 2a
  - ☑ Step 2b
  - ☐ Step 3
  - ☐ None of the steps
  - **Note:** If the student selects any other steps aside from "Step 2a" or "Step 2b," the student receives 0 points.

Rubric for Task 1d

Total points: **1 point**

- **1 point** for selecting **ONLY** the correct step in the algorithm:
  - ☐ Step 1
  - ☐ Step 2a
  - ☐ Step 2b
  - ☑ Step 3
  - ☐ None of the steps

Rubric: Unit 4, Item 1e

Rubric for Task 1e

Total points: **2 points**

- **1 point** for selecting:
  - ☐ Yes
  - ☑ No
- **1 point** for providing an appropriate explanation indicating *why* the dog cannot run 150 laps (i.e., it would run half or not run at all).
  - Possible explanations for this scenario:
    - The dog cannot run 150 laps because for values entered between 100 and 200, the dog would only run half the number of laps. If 150 is entered, the dog would only run 75 laps.
    - The dog cannot run 150 laps because for values entered that are greater than 200, the dog only says "Too many laps" and does not run. If 300 is entered (to try to get 150 laps), the dog will not run.

Sample Responses: Unit 4, Item 1e

☐ Yes
☑ No

If I entered 150 in Gabriela's Algorithm, the dog will run half which is 75. Number between 100 and 200, the dog runs half.

☐ Yes
☑ No

Gabriela's algorithm won't allow numbers over 200, and if the teacher put in 150, the dog would run half these laps. The teacher can't put in 300, so the dog would run no laps.

☑ Yes
☐ No

Gabriela's algorithm is designed for long/big amount of laps. The dog will go 150 laps if the number entered is between 100-200.

Unit 4, Item 3

3. **Chantelle and Jasmine are programming an Opinion Game. The game will check to see if two players have the same opinion by comparing their ratings about a topic (e.g., movies, food). The two players rate a topic by entering a number from 1 to 5 where 1 means you "don't like it at all" and 5 means you "like it a lot."**

   The game works as follows:

   1. The players are asked to enter a topic to rate.
   2. The game asks Player 1 to rate the topic by entering a number from 1 to 5.
   3. Player 1 enters a number from 1 to 5.
   4. The game asks Player 2 to rate the topic by entering a number from 1 to 5.
   5. Player 2 enters a number from 1 to 5.
   6. The game then tells the players if the two ratings match or not.

   Example: Two players might rate vanilla ice cream by each entering a number from 1 to 5. One person rates it as a 3 while the other person rates it as a 5. The game tells them that they don't agree.

Unit 4, Item 3

a) The program is started for you below. Write the rest of the program in the space provided by writing out which Scratch blocks you would use. Make sure your program addresses ALL of the steps listed above. You may use the Scratch Reference Guide below.

Unit 4, Item 3

b) Name one variable used in the program you wrote in part (a).

Variable: _____

What is one possible value for this variable? _____

Why would you use the variable in the program instead of the value?

c) What is the name of the Scratch block you would use to make the game play for 20 topics instead of just once?

Name of the Scratch block: _____

Rubric: Unit 4, Item 3a

Rubric for Task 3a

Total points: **4 points**

Below are the point allocations and steps the student must include in the program in order to receive each point. Each step must be clearly present to receive the corresponding point. An example code is shown below with each step in red rectangles and labeled with a corresponding step. The steps may be written in code (e.g., Scratch, Alice), in pseudocode, or as clear descriptions.

Example of Correct Code

```
ask "Player 1: On a scale from 1 to 5, rate the topic." and wait        (Step 2)
set Rating for Player 1 to answer                                       (Step 3)
ask "Player 2: On a scale of 1 to 5, rate the topic." and wait          (Step 4)
set Rating for Player 2 to answer                                       (Step 5)
if(Rating for Player 1 = Rating for Player 2) then {                    (Step 6a)
    say "You two agree!"
}
else {                                                                  (Step 6b)
    say "You two disagree!"
}
```

- **1 point** for having the program ask Player 1 for a rating (Step 2).
- **1 point** for having the program ask Player 2 for a rating (Step 4).
- **1 point** for having the program set at least one of the answers for the ratings in a separate variable (Step 3 or Step 5).
- **0.5 points** for using a conditional statement (e.g., *If () Then ()*) to have the program provide an output when the players' ratings match (Step 6a).
- **0.5 points** for using a conditional statement (e.g., *If () Then (), Else ()*) to have the program provide an output when the players' ratings do **NOT** match (Step 6b).

Sample Responses: Unit 4, Item 3a

```
ask Player 1: On a scale of 1 to 5 how would you rate this?
set answer 1 to answer
ask Player 2: On a scale of 1 to 5 how would you rate this?
set answer 2 to answer
if answer 1 = answer 2
   say You all agree for 3 secs
else
   say You all disagree for 3 secs
```

- Put a say block to ask for the topic
- Then say player 1's turn and let them choose or input a number from 1-5
- Then say player 2's turn and let them choose or input a number from 1-5
- Then check whether they matched or not and let them know on screen

Sample Responses: Unit 4, Item 3a cont

1. **When green flag click**
2. **Say “pick a topic”**
3. **Options will be given**
4. **Say “player 1 rate the topic from 1 to 5, 1 being I don’t like and 5 being I like it a lot.”**
5. **Player would rate it.**
6. **Same thing as step 4 but it will be for player 2.**
7. **Step 5 again.**
8. **Same would say “you agree” or “you disagree” depending on what the players rate.**

Rubric: Unit 4, Item 3b

Rubric for Task 3b

Total points: **2 points**

- **0.5 points** for identifying an appropriate variable.
  - Acceptable variables include:
    - Topic
    - Rating for Player 1
    - Rating for Player 2
  - **Note:** The variable may have a different name from the ones provided here as long as it's clear it is one of the acceptable variables. It must be used in the program code written in Task 3a in order to receive this point.
- **0.5 points** for providing an appropriate value for the identified variable.
  - Acceptable values regarding each variable include:
    - Topic: Any string or text
    - Rating for Player 1: Any single number
    - Rating for Player 2: Any single number
- **1 point** for providing an appropriate explanation about the use of a variable.
  - The explanation should address at least one of the following functions of a variable:
    - Storing information
    - Reusing or recalling information
    - Having the program do something different depending on the values entered (e.g., comparing two variables)

Sample Responses: Unit 4, Item 3b

Variable: topic

What is one possible value for this variable? movies

This variable will be set to the answer to the question "choose a topic" which will show the current topic as the answer so that players will know what topic they are rating.

Variable: Chantelle

What is one possible value for this variable? 1-5

This variable recorded Chantelle's answer/rate of the topic and would if the rating recorded didn't match Jasmine's the program would tell them.

Variable: topic

What is one possible value for this variable? Strawberries, apples, bananas

It picks a question from a bank of 3

Rubric: Unit 4, Item 3c

Rubric for Task 3c

Total points: **1 point**

- **1 point** for identifying the *Repeat Until ()* or *Repeat ()* block for Scratch OR some other conditional loop (e.g., While loop, Do-While loop, For loop).

Unit 4, Item 4

4. Below is the initial stage and Scratch code for programming a dance performance.

The code uses a custom block called Dance (Dance). The Dance block makes the ballerina do a dance. The number of times the ballerina does the dance is based on the value of Times (Times).

The following is what happens when the green flag is clicked:

1. The ballerina says "Hello!"
2. The ballerina asks "How long should I dance?"

Unit 4, Item 4

a) You enter the number 100 when asked "How long should I dance?" Describe what would happen in the stage window after that.

b) You enter the number 50 when asked "How long should I dance?" The following happens:

- The ballerina does the dance.
- Then the ballerina asks "How long should I dance?" again.

Based on the code, explain why the ballerina does the dance instead of saying "That's too long!"

Based on the code, explain why the ballerina asks "How long should I dance?" again instead of stopping.

c) The ballerina should never dance more than 50 times. Provide two **different** numbers you would enter when asked "How long should I dance?" to test if the program was working correctly.

1st number: _____

Explain why you chose this number.

2nd number: _____

Explain why you chose this number.

Rubric: Unit 4, Item 4a

Rubric for Task 4a

Total points: **1 point**

- **1 point** for providing an appropriate description that the ballerina (or the program) will say "That's too long!"
  - **Note:** If the student indicates that the program ends, the student does not receive the point.

Sample Responses

The ballerina would say, "That's too long". Then, it will ask again, and keep asking until my answer is less than 50. Then, if my answer is less than 50, she will dance, and the whole process continues again.

She would ask the question again.

The dancer says "That's too long" and then the program just stops.

Rubric: Unit 4, Item 4b

Rubric for Task 4b

Total points: **2 points**

- **1 point** for providing an appropriate explanation that indicates that the check for "if(Times > 50)" will return false (i.e., 50 is NOT > 50), so the ballerina will dance 50 times.
- **1 point** for providing an appropriate explanation that indicates that the check for "repeat until(Times < 50)" will return false (i.e., 50 is NOT < 50), so the ballerina (or program) will ask "How long should I dance?"

Sample Responses: Unit 4, Item 4b

Based on the code, explain why the ballerina does the dance instead of saying "That's too long!"

The happens because the ballerina to not dance the number is suppose to be GREATER than 50, and that's why 50 is not greater than 50, so the ballerina dances.

Based on the code, explain why the ballerina does the dance instead of saying "That's too long!"

This is because 50 is not > 50, so she repeats the dance 50 times.

Based on the code, explain why the ballerina asks "How long should I dance?" again instead of stopping.

This happens because once the series of dance is completed, it is set ask "How long should I dance?" because it is on repeat.

Rubric: Unit 4, Item 4c

Rubric for Task 4c

Total points: **3 points**

- The 1st number is not scored.
  - Note which range the identified number belongs in. Ranges of numbers that the student can identify for the 1st and 2nd number:

    < 0, 0, 0-50 (not including 0 or 50), 50, > 50, non-integer numbers
- **1 point** for providing an appropriate explanation for the 1st number chosen. The explanation could just indicate what the student would expect to see the program do.
  - The explanation should generally indicate that the student is using the identified number to test some quality of the program. Explanations may include:
    - The student indicates using an input to test whether the program produces the expected result or not (e.g., using 10 to see if the ballerina dances 10 times or not, using 51 to see if the ballerina says "That's too long!!").
    - The student indicates using an input that has not been defined in the program (e.g., using a decimal number, using an undefined boundary number such as 50, using a word instead of a number) to see what would happen when the behavior is not known. The student may indicate using the input to make sure the test case doesn't break the program. In these cases, the student does not need to provide an accurate expected result in order to receive the point.
    - The student indicates using an input to generally test the program and see what would happen.
      - **Note:** This explanation would only apply for the first test case. If the student is testing the 2nd number and uses this explanation, the student does not receive the point for the second explanation.

Rubric: Unit 4, Item 4c

- Below are the expected results for numbers in each number range:
  - **< 0 (less than 0):** The ballerina is supposed to dance for numbers that are less than 50, but because this is a negative number, the ballerina does nothing (it's not possible to repeat an event negative times).
  - **0:** The ballerina does not dance. The program ends.
  - **0-50 (between 0-50):** The ballerina repeats the dance for the set number of times. The program ends.
  - **50:** The ballerina repeats the dance 50 times. The ballerina asks "How long should I dance?" again.
  - **> 50 (greater than 50):** The ballerina says "That's too long!" The ballerina asks "How long should I dance?" again.
- **Note:** If the student only indicates what the expected result is, the expected result must accurately reflect the next step in the program in order to receive the point. For example, for the number 51, an expected result of dancing 51 times or the ballerina only asking "How long should I dance?" again is wrong, but an expected result of "That's too long!" would be correct and receive the point.

- **1 point** for providing a 2nd number that is in a different range than the 1st number.
  - Ranges of numbers that the student can identify for the 1st and 2nd number:

    < 0, 0, 0-50 (not including 0 or 50), 50, > 50, non-integer numbers
- **1 point** for providing an appropriate explanation for the 2nd number chosen. The explanation could just indicate what the student would expect to see the program do.
  - See rubric for the 1st number's explanation above for appropriate explanations.

Sample Responses: Unit 4, Item 4c

1st number: 73

I would choose a number greater than 50 to make sure it (the sprite) says "That's too long!!"

2nd number: 34

I would also test a number less than 50 to make sure the costume switches as they are suppose to and repeat the series of blocks properly.

Sample Responses: Unit 4, Item 4c

1st number: 50

I would enter 50 as an answer to see if the program was working correctly. This is because the program only programmed for if the answer is greater or less than 50. So, it would tell me what the program does when 50 is entered.

2nd number: 0 or -3

I would enter 0 or, a number less than 0 to see if the program was working correctly. This would show me what the program does when 0 or a negative number is entered.

Cumulative Assessment Rubric Overview

Updates to the Cumulative Assessment

- Assessment changes from last year's version
  - A new task was used for task 1 (instead of previous tasks 1 and 2)
  - A parallel task was used for task 2 (instead of the previous task 3)
  - Minor changes to task 3 (previously task 5): the colors were changed from red, orange, green to red, yellow, green
  - Picture was updated for task 4
- The rubric is similar to last years for tasks 2-4

Cumulative Assessment, Item 2

2. A self-driving car is a car that has been programmed to drive from place to place without needing a human to drive it.

a) What is one **benefit** for society if you allow people access to self-driving cars?

Benefit: _____

Describe how this benefits society.

Cumulative Assessment, Item 2

b) What is one **concern** (e.g., legal concern, ethical concern) for society if you allow people access to self-driving cars?

Concern: _____

Describe why this is a concern for society.

Cumulative Assessment, Item 2

Your company is going to create a new self-driving car. When creating a self-driving car, there are many design decisions that you have to make. One decision is whether or not to allow a person to take control of driving the car.

c) What is one possible **advantage** and one possible **disadvantage** for the user of a self-driving car that allows a person to take control of driving the car at any time versus a self-driving car that never allows a person to take control of driving the car.

Advantage of a self-driving car that allows a person to take control:

Describe why this is an advantage for a user.

Disadvantage of a self-driving car that allows a person to take control:

Describe why this is a disadvantage for a user.

Rubric: Cumulative Assessment, Item 2a

Rubric for Task 2a

Total points: **1 point**

- The identified benefit is not scored and is only used to help score the description.
- **1 point** for providing an appropriate description of a benefit or positive impact self-driving cars may have on society.
    - The description must address how self-driving cars may benefit or positively impact society or a sub-group within society.
        - **Note:** If the student only provides an individual benefit (e.g., you can do other things while being driven around) without explaining its impact on society (or a sub-group within society), the student does not receive the point.
        - **Note:** If the student only addresses an insular need that does not benefit a group of people in society (e.g., *"A self-driving car can drive me to my friends house if my parents can't drive me," "People don't need to get a driver's license anymore"*), the student does not receive the point.
    - **Note:** If the student has a misconception about the capabilities of a self-driving car (e.g., the student thinks that the car drives fast, that you don't need a driver's license, that self-driving cars are controlled by classical computer algorithms [if-then rules]), the student may still receive the point as long as the student relates the perceived benefit to its potential positive impact on society.
    - **Note:** The explanation ideally relates to the identified benefit, but as long as it is clear that the explanation relates to a relevant benefit, the student may still receive the point.

Sample Responses: Cumulative Assessment, Item 2a

Benefit: Less human-made accidents

If everyone had programmed cars on the road that drove themselves there would be less human made accidents like not paying attention to the road or drinking and driving.

Benefit: Allows blind people to ride cars alone

People w/ vision disabilities would have access to easier means of transportation.

Benefit: comfort

People don't have to worry about driving their car. All they have to do is sit back and relax.

Rubric: Cumulative Assessment, Item 2b

Rubric for Task 2b

Total points: **1 point**

- The identified concern is not scored and is only used to help score the description.
- **1 point** for providing an appropriate description of a concern or negative impact self-driving cars may have on society.
    - The explanation must address how self-driving cars may concern or negatively impact society or a sub-group within society.
        - **Note:** If the student only provides a concern (e.g., young children or teens can drive now, someone could hack into my car's computer) without explaining its impact on society (or a sub-group within society), the student does not receive the point.
        - **Note:** If the student only addresses an insular concern that does not negatively impact a group of people in society (e.g., *"A self-driving car can get hacked in and the hacker can stalk me"*), the student does not receive the point.
    - **Note:** If the student has a misconception about the capabilities of a self-driving car (e.g., the student thinks that the car drives fast, that you don't need a driver's license, that self-driving cars are controlled by classical computer algorithms [if-then rules]), the student may still receive the point as long as the student relates the perceived concern to its potential negative impact on society.
    - **Note:** The explanation ideally relates to the identified concern, but as long as it is clear that the explanation relates to a relevant concern, the student may still receive the point.

Sample Responses: Cumulative Assessment, Item 2b

Concern: What if the car stops functioning while on the road.

If something goes wrong with the car, like it stops when it isn't supposed to or just drives into a ditch (example) then people could end up just as hurt.

Concern: People won't know how to drive

This is a concern because if one day the self-driving cars don't work anymore then people will start to cause accidents because they don't know how to drive.

Concern: Dangerous driving patterns

End up in acidents when people suddenly begin driving.

Rubric: Cumulative Assessment, Item 2c

Rubric for Task 2c

Total points: **2 points**

- The identified advantage is not scored and is only used to help score the description.
- **1 point** for describing one appropriate advantage for a user of a self-driving car that allows the user to take control of the car.
    - The description needs to clearly indicate *why* there is an advantage for a user to take control of the car (e.g., the user can easily change where to go, the user can stop and control the car in an emergency) and should be more than a statement that the user can drive him/herself (i.e., indicating that the user can drive the car is not enough).
    - **Note:** If the student has a misconception about the capabilities of a self-driving car (e.g., the student thinks that the car drives fast, that you don't need a driver's license, that self-driving cars are controlled by classical computer algorithms [if-then rules]), the student may still receive the point as long as the student relates the perceived advantage to its potential positive impact on the user.
    - **Note:** The description ideally relates to the identified advantage, but as long as it is clear that the description relates to a relevant advantage, the student may still receive the point.

Rubric: Cumulative Assessment, Item 2c

- The identified disadvantage is not scored and is only used to help score the description.
- **1 point** for describing one appropriate disadvantage for a user of a self-driving car that allows the user to take control of the car.
    - The description needs to clearly indicate *why* there is a disadvantage for a user to take control of the car (e.g., the user may not notice something that the computer notices then makes an erroneous judgement, the user may not have experience to drive the car) and should be more than a statement that the user should not drive him/herself (i.e., indicating that the user should not drive the car is not enough).
    - **Note:** If the student has a misconception about the capabilities of a self-driving car (e.g., the student thinks that the car drives fast, that you don't need a driver's license, that self-driving cars are controlled by classical computer algorithms [if-then rules]), the student may still receive the point as long as the student relates the perceived disadvantage to its potential negative impact on the user.
    - **Note:** The description ideally relates to the identified disadvantage, but as long as it is clear that the description relates to a relevant disadvantage, the student may still receive the point.

Sample Responses:
Cumulative Assessment, Item 2c Advantages

Advantage of a self-driving car that allows a person to take control:

If the machine messes up the human can take over

Describe why this is an advantage for a user.

If the machine breaks, crashes or messes up a turn then the human can take over, preventing greater accidents.

Advantage of a self-driving car that allows a person to take control:

Being able to stop at stoplights

Describe why this is an advantage for a user.

If the car just continued driving from a stop sign that would result in many car crashes. The stop lights are a way to make driving efficient, and human control is the only way to stop a car that is just programmed to go from point A to point B

Sample Responses:
Cumulative Assessment, Item 2c Disadvantages

Disadvantage of a self-driving car that allows a person to take control:

People mess up a lot

Describe why this is a disadvantage for a user.

By allowing a user to take control, there is a probability that the human will mess up as they do now causing accidents and disrupting traffic by unnecessarily taking control of the car if they feel frustrated or angry and commit errors

Disadvantage of a self-driving car that allows a person to take control:

It defeats the purpose of having a self-driving car.

Describe why this is a disadvantage for a user.

This is a disadvantage because I feel that if people have a choice of driving a self-driving car, that they'll decide to drive the car themselves. This could lead to people driving a self-driving car rather than using the car for what it was made for.

Cumulative Assessment, Item 4

4. You and your classmates are making plans to see a concert in another city. There are 15 people going, and you decide to drive several cars to the concert. Each car can hold up to 5 people, including the driver. Here is additional information to help make your plans:

- It costs $30 per car to park. Everyone has agreed to split the cost of parking evenly.
- It takes about 10 minutes for someone to drive between houses to pick up the next person.

Sonja wants to take 5 cars and put 3 people in each car, but Arya wants to take only 3 cars and put 5 people in each car.

a) Describe one benefit of using Sonja's method.

b) Describe one benefit of using Arya's method.

Cumulative Assessment, Item 4

Your classmates have decided to use Arya's method, and you now have to figure out who goes in which car. Below is a map showing your classmates' locations. The stars show the people who are driving, and the squares show where the other people live.

Darci would like to create a computer program to make sure everyone travels the shortest distance using Arya's method. This program will use the map of the area shown above.

Cumulative Assessment, Item 4

c) List two inputs that are shown on the map.

Input 1: _____

Input 2: _____

d) List two inputs that are **NOT** shown on the map and that the program needs to figure out the shortest distance the cars would travel.

Input 1: _____

Input 2: _____

Cumulative Assessment, Item 4

Your classmate, Dylan, thinks it would be best to have each driver pick up everyone who lives on the same street as the driver.

e) Would Dylan's method meet Arya's requirement that all cars have 5 people in them (1 driver and 4 passengers)?

- ☐ Yes
- ☐ No

Explain your answer.

f) If another car with 5 more people (1 driver and 4 passengers) wanted to go, would Dylan's method still work?

- ☐ Yes
- ☐ No
- ☐ Depends

Explain your answer.

Rubric: Cumulative Assessment, Item 4a

Rubric for Task 4a

Total points: **1 point**

- **1 point** for providing an appropriate benefit of Sonja's method.
  - The benefit should focus on how there are fewer people in each car, which helps:
    - Save time on picking up everyone.
      - **Note:** If the student only indicates that the group would get to the concert faster without noting why it's faster (i.e., it takes less time to pick up everyone), the student does not receive the point.

      OR
    - Provide more room in the car so people can be more comfortable on the drive over.

Sample Responses: Cumulative Assessment, Item 4a

One benefit of having 5 cars and putting 3 people in each car is it will take less time to go pick up everybody since it already takes 10 minutes to get to someone else's house. So it will take 30 minutes to pick up everyone rather than 50 minutes with 3 cars.

One of the benefits is that they can get to the concert on time with the extra 2 cars. One concern is the 30 dollar fee for each car that someone is bring to the concert

They will get to the concert faster and waste less time.

Rubric: Cumulative Assessment, Item 4b

Rubric for Task 4b

Total points: **1 point**

- **1 point** for providing an appropriate benefit of Arya's method.
  - The benefit should focus on how there are fewer cars, which helps:
    - Save money (i.e., for parking, for gas).
      - **Note:** If the student only indicates that it would cost less money without noting why it costs less (i.e., it costs less for parking or for gas), the student does not receive the point.

      OR
    - Reduce pollution in the environment (i.e., there is less car emission).

Sample Responses: Cumulative Assessment, Item 4b

It would be a lot cheaper for each person because each person would pay $6 to pay parking. It's also better for the environment to use less cars.

One benefit of using Arya's method is people would pay less money for parking since its 30 dollars per car to park. Since there are 3 cars they would only have to pay 90 dollars rather than 150 dollars for 5 cars. And since 15 people are going, everyone is splitting the money, so each people will pay 6 dollars rather than 10 dollars.

Arya's method is more convenient b/c it's less money being spent and less time to drive between houses.

One benefit of using Arya's method is that it'll be cheaper and the cost will be lower!

Rubric: Cumulative Assessment, Item 4c

Rubric for Task 4c

Total points: **1 point**

- **0.5 points** for identifying an input that is provided on the map for Input 1.
  - Possible inputs provided on the map include:
    - Location of the drivers
    - Location of the passengers (or houses)
    - Street names (i.e., avenues, boulevards)
    - Number of passengers (on each street)
    - Number of drivers (on each street)
    - Estimated distance between houses
- **0.5 points** for identifying an input that is provided on the map that is different from Input 1 for Input 2.
  - See rubric for Input 1 above for appropriate inputs.
  - **Note:** If the student provides an input that is in the same category as Input 1 (e.g., avenues and boulevards are considered the same type of input), the student does not receive the point. Input 2 must be from a different category

Rubric: Cumulative Assessment, Item 4c - sample responses

Input 1: driver
Input 2: passengers

Input 1: Locations
Input 2: Streets

Input 1: One driver has exactly 4 people in their block
Input 2: columns/rows

Rubric: Cumulative Assessment, Item 4d

Rubric for Task 4d

Total points: **1 point**

- **0.5 points** for identifying a relevant input that is **NOT** shown on the map for Input 1.
  - The input identified must be relevant for determining which driver should pick up which passenger. Possible relevant inputs NOT provided on the map include:
    - Relevant information about the drivers or passengers (e.g., their addresses)
    - How many people will fit in each car
    - Location of the destination
    - Distance or time between locations
    - Traffic information (e.g., possible routes, traffic conditions, street signs)
  - **Note:** The student must provide an input (i.e., a discrete piece of data), not something that needs to be calculated or derived (e.g., "routes" would be acceptable as they may be inputs, but a route that is qualified such as "fastest route" or "shortest route" would not be acceptable as a program would need to calculate those).
  - **Note:** If the student provides an input that is already provided on the map, the student does not receive the point. See rubric for Task 4c above for a list of inputs already provided on the map.

Rubric: Cumulative Assessment, Item 4d

- **0.5 points** for identifying a relevant input that is **NOT** shown on the map that is different from Input 1 for Input 2.
  - See rubric for Input 1 above for appropriate inputs.
  - **Note:** If the student provides an input that is in the same category as Input 1 (e.g., distance and time between locations are considered the same type of input, possible routes and street signs fall under traffic information), the student does not receive the point. Input 2 must be from a different category

Rubric: Cumulative Assessment, Item 4c - sample responses

Input 1: The direction the cars can drive
Input 2: Distances between the drivers

Input 1: how long it will take to get to the people's houses
Input 2: the fastest route to get there

Input 1: Which passenger is picked up by which driver
Input 2: boulevards/avenues

Rubric: Cumulative Assessment, Item 4e

Rubric for Task 4e

Total points: **1 point**

- **1 point** for selecting "Yes" AND for providing an appropriate explanation that indicates that each street has the exact number and ratio of people for a full car (i.e., there are 1 driver and 4 passengers on each street).
  - The explanation should indicate that there are 5 people per street. The student does not need to indicate there are exactly 1 driver and 4 passengers per street in order to receive the point.

Sample Responses

☑ Yes
☐ No

Every street has five people on it so if the driver picked up everyone on that street it would work.

☑ Yes
☐ No

Everybody would get picked up.

Rubric: Cumulative Assessment, Item 4f

Rubric for Task 4f

Total points: **1 point**

- The selection is not scored and is only used to help score the explanation.
- **1 point** for providing an appropriate explanation that indicates that Dylan's method would only work in certain cases (i.e., his method only works if the 5 additional people are on the same street).
    - The explanation could indicate that Dylan's method would work ONLY if the 5 additional people live on the same street.

      OR
    - The explanation could indicate that Dylan's method would not work (or that it's uncertain it would work) because it's unclear where the 5 additional people live (i.e., the method only works if they all live on the same street).

      OR
    - The explanation could indicate that it depends on the location of the drivers and passengers.
    - **Note:** If the student indicates certainty about whether the 5 additional people live on the same street or not (e.g., *"Yes, it would work because all 5 people live on the same street," "No, it won't work because the 5 people live on different streets"*), the student does not receive the point. The student must indicate uncertainty about where the 5 additional people live (e.g., *"Yes, it would work when the 5 people live on the same street," "It won't work if the 5 people live on different streets"*) in order to receive the point.

Sample Responses: Cumulative Assessment, Item 4f

☐ Yes
☐ No
☑ Depends

It would depend if these five people lived on the same street or not

☐ Yes
☐ No
☑ Depends

It might work. It all depends on who lives where.

☐ Yes
☑ No
☐ Depends

No There not 4 people on every street That has a driver.

Questions?

Thanks for joining ☺

Stay in touch!

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Center for Technology in Learning

Extras: Unit 4 Rubric Overview

Unit 4, Item 1

1. **For a class assignment, Gabriela and Lucia both created an algorithm that has a dog run laps on the screen.**

Gabriela's algorithm	Lucia's algorithm

• **Step 1:** Ask how many laps the dog should run. Go to Step 2.
• **Step 2:** Check the number entered.
  ▪ **Step 2a:** If the number entered is less than 2, then the dog says "Not enough laps." Then skip to Step 5.
  ▪ **Step 2b:** If the number entered is greater than 200, then the dog says "Too many laps." Then skip to Step 5.
  ▪ **Step 2c:** If the number entered is greater than or equal to 2 AND less than 100, then skip to Step 3.
  ▪ **Step 2d:** If the number entered is between 100 and 200 (including 100 and 200), then skip to Step 4.
• **Step 3:** The dog runs the number of laps entered. Skip to Step 5.
• **Step 4:** The dog runs **half** of the number of laps entered. Go to Step 5.
• **Step 5:** The program ends.
	• **Step 1:** Ask how many laps the dog should run. Go to Step 2
	• **Step 2:** Check the number entered.
	  ▪ **Step 2a:** If the number entered is less than 2, then the dog says "Not enough laps." Then skip to Step 4.
	  ▪ **Step 2b:** If the number entered is NOT less than 2, then move to Step 3.
	• **Step 3:** The dog runs the number of laps entered. Go to Step 4.
	• **Step 4:** The program ends.

Unit 4, Item 1

a) In Gabriela's algorithm, what is shown on the screen if the number entered is 120?

- ☐ Dog says "Not enough laps."
- ☐ Dog says "Too many laps."
- ☐ Dog runs 120 laps.
- ☐ Dog runs 60 laps.

b) In Lucia's algorithm, what is shown on the screen if the number entered is 120?

- ☐ Dog says "Not enough laps."
- ☐ Dog says "Too many laps."
- ☐ Dog runs 120 laps.
- ☐ Dog runs 60 laps.

You are the programmer for **Lucia's algorithm**.

c) Which step(s) in Lucia's algorithm would you program using the *If* structure block? Select all that apply.

If structure block:

- ☐ Step 1
- ☐ Step 2a
- ☐ Step 2b
- ☐ Step 3
- ☐ None of the steps

Unit 4, Item 1

d) Which step(s) in Lucia's algorithm would you program using the *Repeat Until* structure block? Select all that apply.

Repeat Until structure block:

- ☐ Step 1
- ☐ Step 2a
- ☐ Step 2b
- ☐ Step 3
- ☐ None of the steps

e) Using Gabriela's algorithm, can the dog run 150 laps?

- ☐ Yes
- ☐ No

Explain your answer.

Rubric: Unit 4, Items 1a, 1b

Rubric for Task 1a

Total points: **1 point**

- **1 point** for selecting:
  - ☐ Dog says "Not enough laps."
  - ☐ Dog says "Too many laps."
  - ☐ Dog runs 120 laps.
  - ☑ Dog runs 60 laps.

Rubric for Task 1b

Total points: **1 point**

- **1 point** for selecting:
  - ☐ Dog says "Not enough laps."
  - ☐ Dog says "Too many laps."
  - ☑ Dog runs 120 laps.
  - ☐ Dog runs 60 laps.

Rubric: Unit 4, Items 1c, 1d

Rubric for Task 1c

Total points: **1 point**

- **1 point** for selecting **ONLY** the correct steps in the algorithm (0.5 points for each correct selection):
  - ☐ Step 1
  - ☑ Step 2a
  - ☑ Step 2b
  - ☐ Step 3
  - ☐ None of the steps
  - **Note:** If the student selects any other steps aside from "Step 2a" or "Step 2b," the student receives 0 points.

Rubric for Task 1d

Total points: **1 point**

- **1 point** for selecting **ONLY** the correct step in the algorithm:
  - ☐ Step 1
  - ☐ Step 2a
  - ☐ Step 2b
  - ☑ Step 3
  - ☐ None of the steps

Rubric: Unit 4, Item 1e

Rubric for Task 1e

Total points: **2 points**

- **1 point** for selecting:
  - ☐ Yes
  - ☑ No
- **1 point** for providing an appropriate explanation indicating *why* the dog cannot run 150 laps (i.e., it would run half or not run at all).
  - Possible explanations for this scenario:
    - The dog cannot run 150 laps because for values entered between 100 and 200, the dog would only run half the number of laps. If 150 is entered, the dog would only run 75 laps.
    - The dog cannot run 150 laps because for values entered that are greater than 200, the dog only says "Too many laps" and does not run. If 300 is entered (to try to get 150 laps), the dog will not run.

Sample Responses: Unit 4, Item 1e

☐ Yes
☑ No

If I entered 150 in Gabriela's Algorithm, the dog will run half which is 75. Number between 100 and 200, the dog runs half.

☐ Yes
☑ No

Gabriela's algorithm won't allow numbers over 200, and if the teacher put in 150, the dog would run half these laps. The teacher can't put in 300, so the dog would run no laps.

☑ Yes
☐ No

Gabriela's algorithm is designed for long/big amount of laps. The dog will go 150 laps if the number entered is between 100-200.

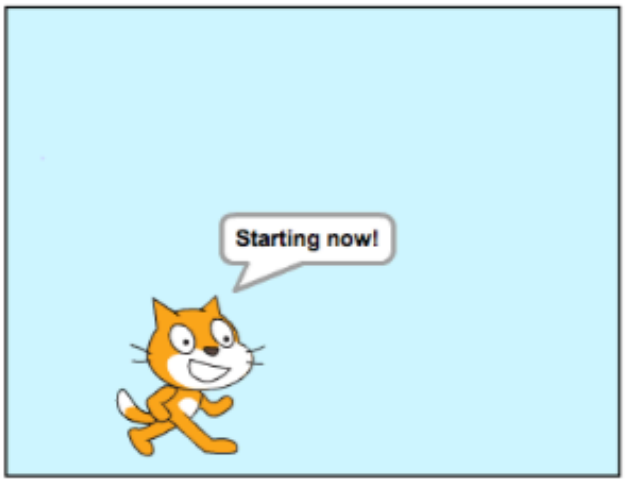
Unit 4, Item 2

2. Jamal creates the following Scratch program:

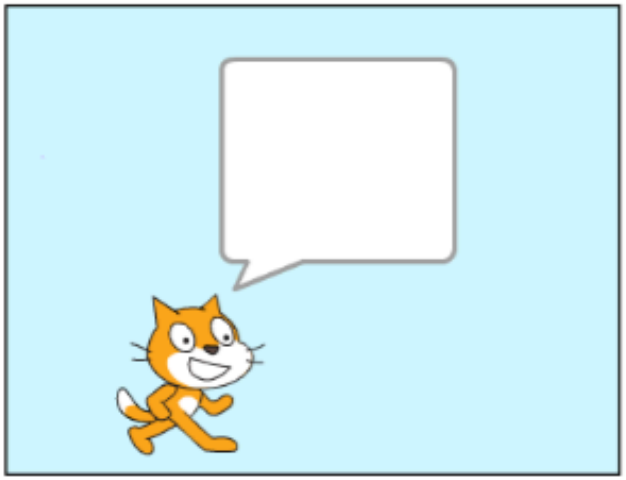
Unit 4, Item 2

Fill in the following screens to show what is shown on the screen when Jamal clicks the green flag.
The first screen is provided.

1.



2.



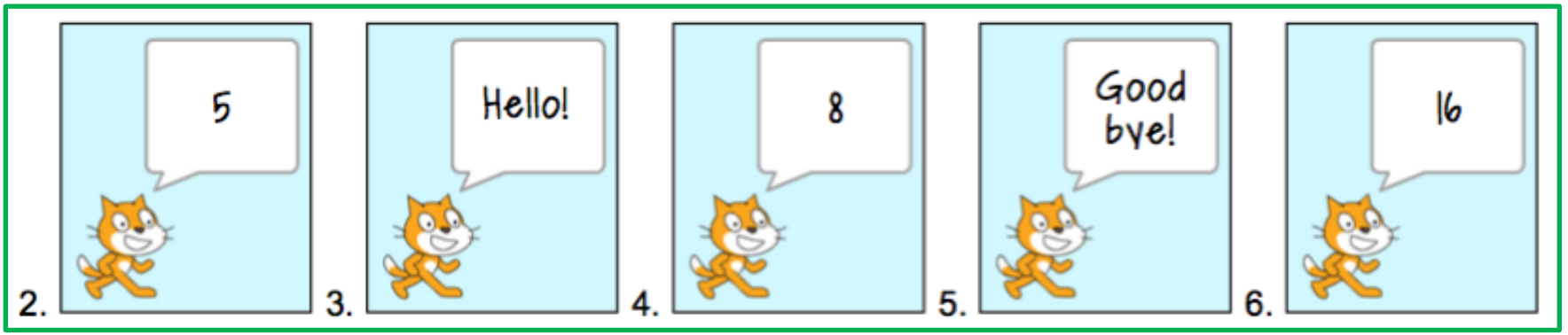
Rubric: Unit 4, Item 2

Rubric for Task 2

Total points: **2 points**

- **0.5 points** for indicating that the number 5 appears on screen #2 or that it is the first number shown.
- **0.5 points** for indicating that the number 8 appears on screen #4 or that it is the second number shown.
- **0.5 points** for indicating that the number 10 (or 6 or 16 if the student does not understand how the *Change () by ()* block functions) appears on screen #6 or that it is the third number shown.
- **0.5 points** for indicating that the word "Hello!" appears on screen #3 AND that the word "Goodbye!" appears on screen #5.

Sample Response



Unit 4, Item 3

3. **Chantelle and Jasmine are programming an Opinion Game. The game will check to see if two players have the same opinion by comparing their ratings about a topic (e.g., movies, food). The two players rate a topic by entering a number from 1 to 5 where 1 means you "don't like it at all" and 5 means you "like it a lot."**

   The game works as follows:

   1. The players are asked to enter a topic to rate.
   2. The game asks Player 1 to rate the topic by entering a number from 1 to 5.
   3. Player 1 enters a number from 1 to 5.
   4. The game asks Player 2 to rate the topic by entering a number from 1 to 5.
   5. Player 2 enters a number from 1 to 5.
   6. The game then tells the players if the two ratings match or not.

   Example: Two players might rate vanilla ice cream by each entering a number from 1 to 5. One person rates it as a 3 while the other person rates it as a 5. The game tells them that they don't agree.

Unit 4, Item 3

a) The program is started for you below. Write the rest of the program in the space provided by writing out which Scratch blocks you would use. Make sure your program addresses ALL of the steps listed above. You may use the Scratch Reference Guide below.

Unit 4, Item 3

b) Name one variable used in the program you wrote in part (a).

Variable: _____

What is one possible value for this variable? _____

Why would you use the variable in the program instead of the value?

c) What is the name of the Scratch block you would use to make the game play for 20 topics instead of just once?

Name of the Scratch block: _____

Rubric: Unit 4, Item 3a

Rubric for Task 3a

Total points: **4 points**

Below are the point allocations and steps the student must include in the program in order to receive each point. Each step must be clearly present to receive the corresponding point. An example code is shown below with each step in red rectangles and labeled with a corresponding step. The steps may be written in code (e.g., Scratch, Alice), in pseudocode, or as clear descriptions.

Example of Correct Code

```
ask "Player 1: On a scale from 1 to 5, rate the topic." and wait        (Step 2)
set Rating for Player 1 to answer                                       (Step 3)
ask "Player 2: On a scale of 1 to 5, rate the topic." and wait          (Step 4)
set Rating for Player 2 to answer                                       (Step 5)
if(Rating for Player 1 = Rating for Player 2) then {                    (Step 6a)
    say "You two agree!"
}
else {                                                                  (Step 6b)
    say "You two disagree!"
}
```

- **1 point** for having the program ask Player 1 for a rating (Step 2).
- **1 point** for having the program ask Player 2 for a rating (Step 4).
- **1 point** for having the program set at least one of the answers for the ratings in a separate variable (Step 3 or Step 5).
- **0.5 points** for using a conditional statement (e.g., *If () Then ()*) to have the program provide an output when the players' ratings match (Step 6a).
- **0.5 points** for using a conditional statement (e.g., *If () Then (), Else ()*) to have the program provide an output when the players' ratings do **NOT** match (Step 6b).

Sample Responses: Unit 4, Item 3a

```
ask Player 1: On a scale of 1 to 5 how would you rate this?
set answer 1 to answer
ask Player 2: On a scale of 1 to 5 how would you rate this?
set answer 2 to answer
if answer 1 = answer 2
   say You all agree for 3 secs
else
   say You all disagree for 3 secs
```

- Put a say block to ask for the topic
- Then say player 1's turn and let them choose or input a number from 1-5
- Then say player 2's turn and let them choose or input a number from 1-5
- Then check whether they matched or not and let them know on screen

Rubric: Unit 4, Item 3b

Rubric for Task 3b

Total points: **2 points**

- **0.5 points** for identifying an appropriate variable.
  - Acceptable variables include:
    - Topic
    - Rating for Player 1
    - Rating for Player 2
  - **Note:** The variable may have a different name from the ones provided here as long as it's clear it is one of the acceptable variables. It must be used in the program code written in Task 3a in order to receive this point.
- **0.5 points** for providing an appropriate value for the identified variable.
  - Acceptable values regarding each variable include:
    - Topic: Any string or text
    - Rating for Player 1: Any single number
    - Rating for Player 2: Any single number
  - **Note:** The variables would be able to hold any value that is the same variable type (i.e., text string for Topic variable, number values for Rating variables). While the topic should be something that can be rated, and the rating should be an integer between 1 and 5, it is acceptable if that is not the case as long as the value matches the variable type.

Rubric: Unit 4, Item 3b

- **1 point** for providing an appropriate explanation about the use of a variable.
  - The explanation should address at least one of the following functions of a variable:
    - Storing information
    - Reusing or recalling information
    - Having the program do something different depending on the values entered (e.g., comparing two variables)

Sample Responses: Unit 4, Item 3b

Variable: topic

What is one possible value for this variable? movies

This variable will be set to the answer to the question "choose a topic" which will show the current topic as the answer so that players will know what topic they are rating.

Variable: Chantelle

What is one possible value for this variable? 1-5

This variable recorded Chantelle's answer/rate of the topic and would if the rating recorded didn't match Jasmine's the program would tell them.

Variable: topic

What is one possible value for this variable? Strawberries, apples, bananas

It picks a question from a bank of 3

Rubric: Unit 4, Item 3c

Rubric for Task 3c

Total points: **1 point**

- **1 point** for identifying the *Repeat Until ()* or *Repeat ()* block for Scratch OR some other conditional loop (e.g., While loop, Do-While loop, For loop).

Unit 4, Item 4

4. Below is the initial stage and Scratch code for programming a dance performance.

The code uses a custom block called Dance (Dance). The Dance block makes the ballerina do a dance. The number of times the ballerina does the dance is based on the value of Times (Times).

The following is what happens when the green flag is clicked:

1. The ballerina says "Hello!"
2. The ballerina asks "How long should I dance?"

Unit 4, Item 4

a) You enter the number 100 when asked "How long should I dance?" Describe what would happen in the stage window after that.

b) You enter the number 50 when asked "How long should I dance?" The following happens:

- The ballerina does the dance.
- Then the ballerina asks "How long should I dance?" again.

Based on the code, explain why the ballerina does the dance instead of saying "That's too long!"

Based on the code, explain why the ballerina asks "How long should I dance?" again instead of stopping.

c) The ballerina should never dance more than 50 times. Provide two **different** numbers you would enter when asked "How long should I dance?" to test if the program was working correctly.

1st number: _____

Explain why you chose this number.

2nd number: _____

Explain why you chose this number.

Rubric: Unit 4, Item 4a

Rubric for Task 4a

Total points: **1 point**

- **1 point** for providing an appropriate description that the ballerina (or the program) will say "That's too long!"
  - **Note:** If the student indicates that the program ends, the student does not receive the point.

Sample Responses

The ballerina would say, "That's too long". Then, it will ask again, and keep asking until my answer is less than 50. Then, if my answer is less than 50, she will dance, and the whole process continues again.

She would ask the question again.

The dancer says "That's too long" and then the program just stops.

Rubric: Unit 4, Item 4b

Rubric for Task 4b

Total points: **2 points**

- **1 point** for providing an appropriate explanation that indicates that the check for "if(Times > 50)" will return false (i.e., 50 is NOT > 50), so the ballerina will dance 50 times.
- **1 point** for providing an appropriate explanation that indicates that the check for "repeat until(Times < 50)" will return false (i.e., 50 is NOT < 50), so the ballerina (or program) will ask "How long should I dance?"

Sample Responses: Unit 4, Item 4b

Based on the code, explain why the ballerina does the dance instead of saying "That's too long!"

The happens because the ballerina to not dance the number is suppose to be GREATER than 50, and that's why 50 is not greater than 50, so the ballerina dances.

Based on the code, explain why the ballerina asks "How long should I dance?" again instead of stopping.

Because 50 and 50 is the same number the scratch gets confused so it tells the code to a repeat the 1st code which repeat until.

Based on the code, explain why the ballerina does the dance instead of saying "That's too long!"

This is because 50 is not > 50, so she repeats the dance 50 times.

Based on the code, explain why the ballerina asks "How long should I dance?" again instead of stopping.

This happens because once the series of dance is completed, it is set ask "How long should I dance?" because it is on repeat.

Rubric: Unit 4, Item 4c

Rubric for Task 4c

Total points: **3 points**

- The 1st number is not scored.
  - Note which range the identified number belongs in. Ranges of numbers that the student can identify for the 1st and 2nd number:

    < 0, 0, 0-50 (not including 0 or 50), 50, > 50, non-integer numbers
- **1 point** for providing an appropriate explanation for the 1st number chosen. The explanation could just indicate what the student would expect to see the program do.
  - The explanation should generally indicate that the student is using the identified number to test some quality of the program. Explanations may include:
    - The student indicates using an input to test whether the program produces the expected result or not (e.g., using 10 to see if the ballerina dances 10 times or not, using 51 to see if the ballerina says "That's too long!!").
    - The student indicates using an input that has not been defined in the program (e.g., using a decimal number, using an undefined boundary number such as 50, using a word instead of a number) to see what would happen when the behavior is not known. The student may indicate using the input to make sure the test case doesn't break the program. In these cases, the student does not need to provide an accurate expected result in order to receive the point.
    - The student indicates using an input to generally test the program and see what would happen.
      - **Note:** This explanation would only apply for the first test case. If the student is testing the 2nd number and uses this explanation, the student does not receive the point for the second explanation.

Rubric: Unit 4, Item 4c

- Below are the expected results for numbers in each number range:
  - **< 0 (less than 0):** The ballerina is supposed to dance for numbers that are less than 50, but because this is a negative number, the ballerina does nothing (it's not possible to repeat an event negative times).
  - **0:** The ballerina does not dance. The program ends.
  - **0-50 (between 0-50):** The ballerina repeats the dance for the set number of times. The program ends.
  - **50:** The ballerina repeats the dance 50 times. The ballerina asks "How long should I dance?" again.
  - **> 50 (greater than 50):** The ballerina says "That's too long!" The ballerina asks "How long should I dance?" again.
- **Note:** If the student only indicates what the expected result is, the expected result must accurately reflect the next step in the program in order to receive the point. For example, for the number 51, an expected result of dancing 51 times or the ballerina only asking "How long should I dance?" again is wrong, but an expected result of "That's too long!" would be correct and receive the point.

- **1 point** for providing a 2nd number that is in a different range than the 1st number.
  - Ranges of numbers that the student can identify for the 1st and 2nd number:

    < 0, 0, 0-50 (not including 0 or 50), 50, > 50, non-integer numbers
- **1 point** for providing an appropriate explanation for the 2nd number chosen. The explanation could just indicate what the student would expect to see the program do.
  - See rubric for the 1st number's explanation above for appropriate explanations.

Sample Responses: Unit 4, Item 4c

1st number: 73

I would choose a number greater than 50 to make sure it (the sprite) says "That's too long!!"

2nd number: 34

I would also test a number less than 50 to make sure the costume switches as they are suppose to and repeat the series of blocks properly.

Sample Responses: Unit 4, Item 4c

1st number: 50

I would enter 50 as an answer to see if the program was working correctly. This is because the program only programmed for if the answer is greater or less than 50. So, it would tell me what the program does when 50 is entered.

2nd number: 0 or -3

I would enter 0 or, a number less than 0 to see if the program was working correctly. This would show me what the program does when 0 or a negative number is entered.

SRI International

Center for Technology in Learning

Extras: Cumulative Assessment Rubric Overview

Cumulative Assessment, Item 1

1. **A computer scientist once said, "Computer science is no more about computers than astronomy is about telescopes."**

   The idea of this statement is that…

   In astronomy, a telescope is a tool an astronomer uses, but astronomy is not about the tools.
   Instead, astronomy is about the stars, galaxies, and other objects in the universe.

   Complete the rest of this statement:

   In computer science, a computer is a tool a computer scientist uses, but computer science is not about the tools.

   Instead, computer science is about _____

   _____

Rubric: Cumulative Assessment, Item 1

Rubric for Task 1

Total points: **2 points**

- **2 points** for providing an appropriate example of a general concept within computer science. These are concepts that are covered in multiple ECS units.
  - Concepts include:
    - Problem solving
    - Designing and developing creative solutions
    - Analyzing the effects of the development of computing (e.g., how computing innovation affects society)
    - Analyzing computational work (e.g., how computing solutions can apply to problems)
    - Applying abstraction to problems (e.g., generalizing problems and/or solutions)

  OR
- **1 point** for providing an appropriate example of a specific concept or skill within computer science. These would generally be covered in only one ECS unit (e.g., programming, web design, data analysis, learning about how computers work).

  OR
- **0 points** for only identifying tools or products (e.g., programs, codes, data, robots) instead of identifying the action relating to computer science (e.g., problem solving, programming, data analysis) OR for not meeting any of the requirements described above.

Sample Responses: Cumulative Assessment, Item 1

Instead, computer science is about…

> the understanding of the impact of computers and how they work to advance our society and its capacity for research & innovation.

Instead, computer science is about…

> programming, problem solving, analyzing data, and representing data.

Instead, computer science is about…

> logic, commands, and anything else to get an electronic object to complete a task

Instead, computer science is about…

> the web and it's content

Cumulative Assessment, Item 2

2. A self-driving car is a car that has been programmed to drive from place to place without needing a human to drive it.

a) What is one **benefit** for society if you allow people access to self-driving cars?

Benefit: _____

Describe how this benefits society.

Cumulative Assessment, Item 2

b) What is one **concern** (e.g., legal concern, ethical concern) for society if you allow people access to self-driving cars?

Concern: _____

Describe why this is a concern for society.

Cumulative Assessment, Item 2

Your company is going to create a new self-driving car. When creating a self-driving car, there are many design decisions that you have to make. One decision is whether or not to allow a person to take control of driving the car.

c) What is one possible **advantage** and one possible **disadvantage** for the user of a self-driving car that allows a person to take control of driving the car at any time versus a self-driving car that never allows a person to take control of driving the car.

Advantage of a self-driving car that allows a person to take control:

Describe why this is an advantage for a user.

Disadvantage of a self-driving car that allows a person to take control:

Describe why this is a disadvantage for a user.

Rubric: Cumulative Assessment, Item 2a

Rubric for Task 2a

Total points: **1 point**

- The identified benefit is not scored and is only used to help score the description.
- **1 point** for providing an appropriate description of a benefit or positive impact self-driving cars may have on society.
    - The description must address how self-driving cars may benefit or positively impact society or a sub-group within society.
        - **Note:** If the student only provides an individual benefit (e.g., you can do other things while being driven around) without explaining its impact on society (or a sub-group within society), the student does not receive the point.
        - **Note:** If the student only addresses an insular need that does not benefit a group of people in society (e.g., *"A self-driving car can drive me to my friends house if my parents can't drive me," "People don't need to get a driver's license anymore"*), the student does not receive the point.
    - **Note:** If the student has a misconception about the capabilities of a self-driving car (e.g., the student thinks that the car drives fast, that you don't need a driver's license, that self-driving cars are controlled by classical computer algorithms [if-then rules]), the student may still receive the point as long as the student relates the perceived benefit to its potential positive impact on society.
    - **Note:** The explanation ideally relates to the identified benefit, but as long as it is clear that the explanation relates to a relevant benefit, the student may still receive the point.

Sample Responses: Cumulative Assessment, Item 2a

Benefit: Less human-made accidents

If everyone had programmed cars on the road that drove themselves there would be less human made accidents like not paying attention to the road or drinking and driving.

Benefit: Allows blind people to ride cars alone

People w/ vision disabilities would have access to easier means of transportation.

Benefit: comfort

People don't have to worry about driving their car. All they have to do is sit back and relax.

Rubric: Cumulative Assessment, Item 2b

Rubric for Task 2b

Total points: **1 point**

- The identified concern is not scored and is only used to help score the description.
- **1 point** for providing an appropriate description of a concern or negative impact self-driving cars may have on society.
    - The explanation must address how self-driving cars may concern or negatively impact society or a sub-group within society.
        - **Note:** If the student only provides a concern (e.g., young children or teens can drive now, someone could hack into my car's computer) without explaining its impact on society (or a sub-group within society), the student does not receive the point.
        - **Note:** If the student only addresses an insular concern that does not negatively impact a group of people in society (e.g., *"A self-driving car can get hacked in and the hacker can stalk me"*), the student does not receive the point.
    - **Note:** If the student has a misconception about the capabilities of a self-driving car (e.g., the student thinks that the car drives fast, that you don't need a driver's license, that self-driving cars are controlled by classical computer algorithms [if-then rules]), the student may still receive the point as long as the student relates the perceived concern to its potential negative impact on society.
    - **Note:** The explanation ideally relates to the identified concern, but as long as it is clear that the explanation relates to a relevant concern, the student may still receive the point.

Sample Responses: Cumulative Assessment, Item 2b

Concern: What if the car stops functioning while on the road.

If something goes wrong with the car, like it stops when it isn't supposed to or just drives into a ditch (example) then people could end up just as hurt.

Concern: People won't know how to drive

This is a concern because if one day the self-driving cars don't work anymore then people will start to cause accidents because they don't know how to drive.

Concern: Dangerous driving patterns

End up in acidents when people suddenly begin driving.

Rubric: Cumulative Assessment, Item 2c

Rubric for Task 2c

Total points: **2 points**

- The identified advantage is not scored and is only used to help score the description.
- **1 point** for describing one appropriate advantage for a user of a self-driving car that allows the user to take control of the car.
    - The description needs to clearly indicate *why* there is an advantage for a user to take control of the car (e.g., the user can easily change where to go, the user can stop and control the car in an emergency) and should be more than a statement that the user can drive him/herself (i.e., indicating that the user can drive the car is not enough).
    - **Note:** If the student has a misconception about the capabilities of a self-driving car (e.g., the student thinks that the car drives fast, that you don't need a driver's license, that self-driving cars are controlled by classical computer algorithms [if-then rules]), the student may still receive the point as long as the student relates the perceived advantage to its potential positive impact on the user.
    - **Note:** The description ideally relates to the identified advantage, but as long as it is clear that the description relates to a relevant advantage, the student may still receive the point.

Rubric: Cumulative Assessment, Item 2c

- The identified disadvantage is not scored and is only used to help score the description.
- **1 point** for describing one appropriate disadvantage for a user of a self-driving car that allows the user to take control of the car.
    - The description needs to clearly indicate *why* there is a disadvantage for a user to take control of the car (e.g., the user may not notice something that the computer notices then makes an erroneous judgement, the user may not have experience to drive the car) and should be more than a statement that the user should not drive him/herself (i.e., indicating that the user should not drive the car is not enough).
    - **Note:** If the student has a misconception about the capabilities of a self-driving car (e.g., the student thinks that the car drives fast, that you don't need a driver's license, that self-driving cars are controlled by classical computer algorithms [if-then rules]), the student may still receive the point as long as the student relates the perceived disadvantage to its potential negative impact on the user.
    - **Note:** The description ideally relates to the identified disadvantage, but as long as it is clear that the description relates to a relevant disadvantage, the student may still receive the point.

Sample Responses:
Cumulative Assessment, Item 2c Advantages

Advantage of a self-driving car that allows a person to take control:

If the machine messes up the human can take over

Describe why this is an advantage for a user.

If the machine breaks, crashes or messes up a turn then the human can take over, preventing greater accidents.

Advantage of a self-driving car that allows a person to take control:

Being able to stop at stoplights

Describe why this is an advantage for a user.

If the car just continued driving from a stop sign that would result in many car crashes. The stop lights are a way to make driving efficient, and human control is the only way to stop a car that is just programmed to go from point A to point B

Sample Responses:
Cumulative Assessment, Item 2c Disadvantages

Disadvantage of a self-driving car that allows a person to take control:

People mess up a lot

Describe why this is a disadvantage for a user.

By allowing a user to take control, there is a probability that the human will mess up as they do now causing accidents and disrupting traffic by unnecessarily taking control of the car if they feel frustrated or angry and commit errors

Disadvantage of a self-driving car that allows a person to take control:

It defeats the purpose of having a self-driving car.

Describe why this is a disadvantage for a user.

This is a disadvantage because I feel that if people have a choice of driving a self-driving car, that they'll decide to drive the car themselves. This could lead to people driving a self-driving car rather than using the car for what it was made for.

Cumulative Assessment, Item 3

3. Your teacher wants to create a class website as a place where students can go to view information from the class and to get help from the teacher and each other.

a) Your teacher wants a list of 4 requirements to give to a web design team who will create the website. Your teacher has provided the first requirement. List 3 more requirements to give to the web design team.

Be sure that each requirement describes **specific content** (**WHAT** information is provided) and **specific design** (**HOW** the information should look) for the website.

Requirement 1	A section at the top left that shows the student's current grade. The grade should be colored green, yellow, or red to indicate if the student is passing or not.
Requirement 2	
Requirement 3	
Requirement 4	

Cumulative Assessment, Item 3

The web design team is working on a feature that will color the student's current grade. The feature will:

Step 1: Have the teacher enter the current grade.

Step 2: Set the color of the font based on the following table:

Color	Grade is
Green	> 80%
Yellow	Between 70% and 80% (Including both 70% and 80%)
Red	< 70%

Step 3: Print the grade in the Grade box using the color that is set.

b) You are going to program **Step 2** using a programming language such as Scratch. Write out the instructions a computer would run for **Step 2**.

- You may assume that the variable "grade" contains the student's current grade.
- You may use instructions such as fontColor=blue to set the color of the font.

Make sure:

- You use precise and clear language.
- Your program addresses ALL of the requirements listed above.

Rubric: Cumulative Assessment, Item 3a

Rubric for Task 3a

Total points: **3 points**

- **1 point** for providing a requirement that describes specific content AND specific design elements for Requirement 2.
  - **Note:** The student may write the requirements in HTML and/or CSS to receive the point as long as both content and design elements are present.
  - **Examples of content elements:**
    - Relevant information about the students or teacher (e.g., names, contact information)
    - Information about class (e.g., assignments, tests, grades)
    - Images relating to class or school (e.g., class pictures, student profile pictures)
    - Widgets (e.g., calendar, video player, chat box, social media streams)
    - Security features (e.g., login form, password, username)
    - General features (e.g., forums)
  - **Examples of design elements:**
    - Color information (e.g., blue text, black background, green links)
    - Font information (e.g., bold text, heading 1 text, cursive font)
    - Formatting (e.g., lists, tables, centered text)
    - Layout components (e.g., title, heading, main content, banner, footer, left column, sections)
    - Positioning of content (e.g., in middle, at the top, centered, next to, in grids)
    - Indication that specific content would appear on its own web page

Rubric: Cumulative Assessment, Item 3a

- **Examples of elements that may be content or design elements, depending on context:**
  - Images – If images are used to provide information about the school or class, they are content elements (e.g., images of class group pictures, images of student work). If they are used for aesthetics or layout purposes, they are design elements (e.g., school mascot as default user image, repeat images of the school logo in the background).
  - Paragraphs – Paragraphs may be considered content elements if they are paired with a design element (e.g. *"The layout would include several paragraphs in the middle of the page"*). They may be considered design elements if they are paired with a content element (e.g. *"Paragraphs that describe the class subject"*).
  - Menus or Navigation Bars – Features such as menus or navigation bars may be considered content elements if they are paired with a design element (e.g. *"A blue navigation bar at the top"*). They may be considered design elements if they are paired with a content element (e.g. *"Menu of class topics"*).
  - Navigation links – Navigation links may be considered content elements if they are paired with a design element (e.g., *"Include links at the top of the page.")* They may be considered a design element if they are paired with a content element (e.g., *"Include a link to a page about the class.")*

- **1 point** for providing a requirement that describes specific content AND specific design elements for Requirement 3. See the rubric for Requirement 2 above for examples.
- **1 point** for providing a requirement that describes specific content AND specific design elements for Requirement 4. See the rubric for Requirement 2 above for examples.

Sample Responses: Cumulative Assessment, Item 3a

Requirement 2	A list of class assignments
Requirement 3	A chat box on the right
Requirement 4	Class calendar with due dates in red and special events in green

Requirement 2	Table with students and grades
Requirement 3	There should be a way for students to contact the teacher, maybe an email address next to the teacher's name
Requirement 4	There should be links to homework and reading

Requirement 2	It needs a forum so I can ask questions
Requirement 3	There should be some information about homework
Requirement 4	The background is blue with gold text like my school color

Rubric: Cumulative Assessment, Item 3b

Rubric for Task 3b

Total points: **3 points**

The directions may be written in code (e.g., Scratch, Alice), in pseudocode, or as clear descriptions.

- **1 point** for having the program set the font to the correct color based on the grade for all 3 grade ranges.
  - Below are the correct instructions for all 3 grade ranges the student must include in the program:
    - If the grade is greater than 80% (i.e., grade > 80%), the program sets the grade to green.
    - If the grade is between 70% and 80% (i.e., grade >= 70% AND grade <= 80%), the program sets the grade to yellow.
      - **Note:** The student does not need to indicate a range that is inclusive of 70% or 80% (i.e., grade = 70%, grade = 80%). It is also acceptable for the student to depict the range in simple terms (e.g., *"between 70% and 80%," "70%-80%," "70 to 80"*).
    - If the grade is less than 70% (i.e., grade < 70%), the program sets the grade to red.
- **1 point** for using a conditional statement (e.g., *If () Then ()* statement) to indicate that the program branches based on the grade.
  - **Note:** In order to receive this point, the student only needs to use a conditional statement at least once to indicate the student understands the need for conditional statements.

Rubric: Cumulative Assessment, Item 3b

- **1 point** for using the “grade” and “fontColor” variables correctly.
  - The student should use the “grade” variable each time the student checks for a grade range.
  - The student should use the “fontColor” variable each time the student sets a color.
  - **Note:** The student does not need to use the specific name “grade” or “fontColor” as long as it is clear the appropriate variables are being used.

Sample Responses: Cumulative Assessment, Item 3b

```
if (grade > 80%) { fontColor=green }
else {
      if (grade < 70%) { fontColor=red }
      else { fontColor=yellow }
}
```

```
If grade > 80 then
      fontColor = green
Else if grade ≤ 80 and grade ≥ 70 then
      fontColor = Yellow
Else if grade < 70 then
      fontColor = Red
```

Sample Responses: Cumulative Assessment, Item 3b

Grade is > 80%; fontColor=Green

Grade is between 70% and 80%; fontColor=Yellow

Grade is 70%; fontColor=Red

- If grade is
  - Under 70% = Change fontcolor to Red
  - 70% - 80% = Change fontcolor to Yellow
  - higher than 80% = Change fontcolor to green

Cumulative Assessment, Item 4

4. You and your classmates are making plans to see a concert in another city. There are 15 people going, and you decide to drive several cars to the concert. Each car can hold up to 5 people, including the driver. Here is additional information to help make your plans:

- It costs $30 per car to park. Everyone has agreed to split the cost of parking evenly.
- It takes about 10 minutes for someone to drive between houses to pick up the next person.

Sonja wants to take 5 cars and put 3 people in each car, but Arya wants to take only 3 cars and put 5 people in each car.

a) Describe one benefit of using Sonja's method.

b) Describe one benefit of using Arya's method.

Cumulative Assessment, Item 4

Your classmates have decided to use Arya's method, and you now have to figure out who goes in which car. Below is a map showing your classmates' locations. The stars show the people who are driving, and the squares show where the other people live.

Darci would like to create a computer program to make sure everyone travels the shortest distance using Arya's method. This program will use the map of the area shown above.

Cumulative Assessment, Item 4

c) List two inputs that are shown on the map.

Input 1: _____

Input 2: _____

d) List two inputs that are **NOT** shown on the map and that the program needs to figure out the shortest distance the cars would travel.

Input 1: _____

Input 2: _____

Cumulative Assessment, Item 4

Your classmate, Dylan, thinks it would be best to have each driver pick up everyone who lives on the same street as the driver.

e) Would Dylan's method meet Arya's requirement that all cars have 5 people in them (1 driver and 4 passengers)?

- ☐ Yes
- ☐ No

Explain your answer.

f) If another car with 5 more people (1 driver and 4 passengers) wanted to go, would Dylan's method still work?

- ☐ Yes
- ☐ No
- ☐ Depends

Explain your answer.

Rubric: Cumulative Assessment, Item 4a

Rubric for Task 4a

Total points: **1 point**

- **1 point** for providing an appropriate benefit of Sonja's method.
  - The benefit should focus on how there are fewer people in each car, which helps:
    - Save time on picking up everyone.
      - **Note:** If the student only indicates that the group would get to the concert faster without noting why it's faster (i.e., it takes less time to pick up everyone), the student does not receive the point.

      OR
    - Provide more room in the car so people can be more comfortable on the drive over.

Sample Responses: Cumulative Assessment, Item 4a

One benefit of having 5 cars and putting 3 people in each car is it will take less time to go pick up everybody since it already takes 10 minutes to get to someone else's house. So it will take 30 minutes to pick up everyone rather than 50 minutes with 3 cars.

More space in each of the cars.

One of the benefits is that they can get to the concert on time with the extra 2 cars. One concern is the 30 dollar fee for each car that someone is bring to the concert

They will get to the concert faster and waste less time.

Rubric: Cumulative Assessment, Item 4b

Rubric for Task 4b

Total points: **1 point**

- **1 point** for providing an appropriate benefit of Arya's method.
  - The benefit should focus on how there are fewer cars, which helps:
    - Save money (i.e., for parking, for gas).
      - **Note:** If the student only indicates that it would cost less money without noting why it costs less (i.e., it costs less for parking or for gas), the student does not receive the point.

      OR
    - Reduce pollution in the environment (i.e., there is less car emission).

Sample Responses: Cumulative Assessment, Item 4b

It would be a lot cheaper for each person because each person would pay $6 to pay parking. It's also better for the environment to use less cars.

One benefit of using Arya's method is people would pay less money for parking since its 30 dollars per car to park. Since there are 3 cars they would only have to pay 90 dollars rather than 150 dollars for 5 cars. And since 15 people are going, everyone is splitting the money, so each people will pay 6 dollars rather than 10 dollars.

Arya's method is more convenient b/c it's less money being spent and less time to drive between houses.

One benefit of using Arya's method is that it'll be cheaper and the cost will be lower!

Rubric: Cumulative Assessment, Item 4c

Rubric for Task 4c

Total points: **1 point**

- **0.5 points** for identifying an input that is provided on the map for Input 1.
  - Possible inputs provided on the map include:
    - Location of the drivers
    - Location of the passengers (or houses)
    - Street names (i.e., avenues, boulevards)
    - Number of passengers (on each street)
    - Number of drivers (on each street)
    - Estimated distance between houses
- **0.5 points** for identifying an input that is provided on the map that is different from Input 1 for Input 2.
  - See rubric for Input 1 above for appropriate inputs.
  - **Note:** If the student provides an input that is in the same category as Input 1 (e.g., avenues and boulevards are considered the same type of input), the student does not receive the point. Input 2 must be from a different category

Rubric: Cumulative Assessment, Item 4d

Rubric for Task 4d

Total points: **1 point**

- **0.5 points** for identifying a relevant input that is **NOT** shown on the map for Input 1.
  - The input identified must be relevant for determining which driver should pick up which passenger. Possible relevant inputs NOT provided on the map include:
    - Relevant information about the drivers or passengers (e.g., their addresses)
    - How many people will fit in each car
    - Location of the destination
    - Distance or time between locations
    - Traffic information (e.g., possible routes, traffic conditions, street signs)
  - **Note:** The student must provide an input (i.e., a discrete piece of data), not something that needs to be calculated or derived (e.g., "routes" would be acceptable as they may be inputs, but a route that is qualified such as "fastest route" or "shortest route" would not be acceptable as a program would need to calculate those).
  - **Note:** If the student provides an input that is already provided on the map, the student does not receive the point. See rubric for Task 4c above for a list of inputs already provided on the map.

Rubric: Cumulative Assessment, Item 4d

- **0.5 points** for identifying a relevant input that is **NOT** shown on the map that is different from Input 1 for Input 2.
  - See rubric for Input 1 above for appropriate inputs.
  - **Note:** If the student provides an input that is in the same category as Input 1 (e.g., distance and time between locations are considered the same type of input, possible routes and street signs fall under traffic information), the student does not receive the point. Input 2 must be from a different category

Rubric: Cumulative Assessment, Item 4e

Rubric for Task 4e

Total points: **1 point**

- **1 point** for selecting "Yes" AND for providing an appropriate explanation that indicates that each street has the exact number and ratio of people for a full car (i.e., there are 1 driver and 4 passengers on each street).
  - The explanation should indicate that there are 5 people per street. The student does not need to indicate there are exactly 1 driver and 4 passengers per street in order to receive the point.

Sample Responses

☑ Yes
☐ No

Every street has five people on it so if the driver picked up everyone on that street it would work.

☑ Yes
☐ No

Everybody would get picked up.

Rubric: Cumulative Assessment, Item 4f

Rubric for Task 4f

Total points: **1 point**

- The selection is not scored and is only used to help score the explanation.
- **1 point** for providing an appropriate explanation that indicates that Dylan's method would only work in certain cases (i.e., his method only works if the 5 additional people are on the same street).
    - The explanation could indicate that Dylan's method would work ONLY if the 5 additional people live on the same street.

      OR
    - The explanation could indicate that Dylan's method would not work (or that it's uncertain it would work) because it's unclear where the 5 additional people live (i.e., the method only works if they all live on the same street).

      OR
    - The explanation could indicate that it depends on the location of the drivers and passengers.
    - **Note:** If the student indicates certainty about whether the 5 additional people live on the same street or not (e.g., *"Yes, it would work because all 5 people live on the same street," "No, it won't work because the 5 people live on different streets"*), the student does not receive the point. The student must indicate uncertainty about where the 5 additional people live (e.g., *"Yes, it would work when the 5 people live on the same street," "It won't work if the 5 people live on different streets"*) in order to receive the point.

Sample Responses: Cumulative Assessment, Item 4f

☐ Yes
☐ No
☑ Depends

It would depend if these five people lived on the same street or not

☐ Yes
☐ No
☑ Depends

It might work. It all depends on who lives where.

☐ Yes
☑ No
☐ Depends

No There not 4 people on every street That has a driver.