RAMPED – Summer 2016 Cheryl Anderson

Getting Started with Raspberry Pi

P = Pretest (think essential questions)

O = Objectives (measurable - see Bloom's taxonomy)

C = Catch (hook, anticipatory set, etc... use different senses, not a question)

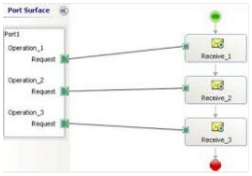
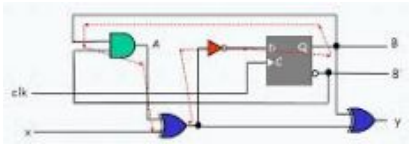
A = Activity (procedure of what the students should do)

R = Review (how will students go over what they've learned?)

A = Assessment (formative and/or summative)

P = Posttest (same as pretest for comparison purposes)

S = Standards (Wyoming, NGSS, etc...) showcasing crosscutting concepts[1]

Pretest Questions	1. What demonstrates sequential operation? a.  b.  2. Which of the following hardware architectures can be used to execute parallel programs? a single CPU core architecture multiple Raspberry Pis interconnected using a network an Arduino microcontroller architecture multiple standalone single core desktop computers

[1] http://ngss.nsta.org/CrosscuttingConceptsFull.aspx

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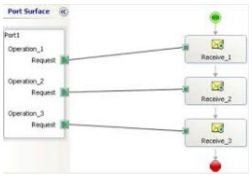
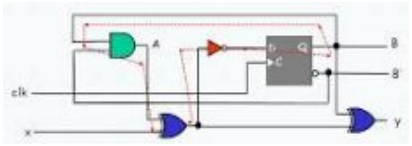
	What is Raspberry Pi and what can it do? simple controller capable of performing simple operations like turning on lights at your home supercomputer capable of performing 10 petaflops computations credit card sized computer capable of performing word processing, complex computations, stream high definition video to mention a few capabilities graphics processing unit capable of processing video (Taken from RAMPED 2016 Raspberry Pi pre-test)
Objectives	■ Know the basic architectures of a computing device. ■ Understand the difference between hardware and software. ■ Be able to set up a Raspberry Pi, turn it on, load the graphical user interface, and navigate the desktop for the first time.
Catch	In an effort to gain student attention, I will have them complete the attached decoding worksheet. While this is a simple task, it will engage their brains for the introduction of Raspberry Pi and computer code. Further, after the message is revealed, I will ask students to converse with their elbow partner for one minute on what a computer and a credit card might have in common. I will have them give responses. I will then introduce the Raspberry Pi as the computer "the size of a credit card, but the heart of a desktop".
Activity	The Raspberry Pi is a tiny computer smaller than a pack of cards, which can transform the way we perceive and approach computation. In this lesson we will introduce the basic components of the Raspberry Pi and how they relate to a traditional computer. We will discuss the general nature of computation and how the same computer can be programmed to simultaneously do many different things, from word processing to music synthesis. Finally, we will introduce the most basic principle of programming: a program as a sequence of instructions. Distribute the computing device cards to pairs of students. Ask them to match the device to the description. Then ask students to create two piles: one for

	devices that they think are a type of computer, and one for devices they do not think are types of computers. After a few minutes discuss the outcomes of this task with the class. Note that all the cards are types of computing devices! Draw on students answers to discuss what makes a computer. An introduction to the basic physical parts of a Raspberry Pi ■ An introduction to two types of computer interface: ■ command line ■ graphical 1. Watch the official 'What is a Raspberry Pi?' animation. 2. The animation is available on Vimeo and YouTube 3. Start with all the parts of the Raspberry Pi on a table: ■ keyboard ■ mouse ■ SD memory card ■ power supply ■ monitor ■ monitor cable ■ Raspberry Pi 4. Ask the class to name and describe each component as you connect it to the Raspberry Pi in front of them. 5. Explain that these components are hardware. Hardware refers to the physical elements of the computer that you can see and touch. This includes what is sometimes hidden inside the case. 6. Finally, plug in the power and watch it boot up. An alternative demonstration would be to leave out the memory card and attempt to boot the Pi, which will fail. You can then describe the memory card as something that contains instructions to tell the Raspberry Pi how to start. 7. Demonstrate that the Raspberry Pi is a standard computer by opening up some applications and closing them again. If you are able to connect

	the Raspberry Pi via a network connection, then open up a web browser and surf to several different sites. 8. Explain that this is software. Software is the term given to programs that run on the computer system and make the hardware work. Software has many uses, such as making a calculation or organising files. There are two main types of software: system software which runs and manages your computer, and application software which performs a specific task or function. 9. Distribute equipment to students and ask them to set up their own Raspberry Pis. Distribute the power supplies last, checking that students have connected their cables and SD cards correctly before they are powered up. 10. Ask students to log in to their Pis for the first time using the following login information: 11. Login: pi password: raspberry 12. Note that students will not see any text when typing the password but assure them it is working. Why do they think this might be the case? *Hint: what might happen if someone was looking over their shoulder?* 13. If you are uisng the latest up to date software then you should boot straight to the desktop environment or Graphical User Interface If you are using older software then they will need to load the GUI by typing 'startx'. Once logged in, explain to the students that they can give instructions to the Raspberry Pi using the command line interface instead of the GUI. 14. Ask them to identify any parts that they recognise such as the desktop, task bar, menu system, mouse pointer, icons, etc. Ask students to load a Terminal window by clicking on Menu,Accessories and Terminal. This is what the command line interface looks like. Ask students to try different commands like ls to list files and directories and 'cd' to change between directories. 15. As an extension task, ask students to compare a Raspberry Pi to a desktop computer. What are the similarities? What are the differences?

	In what situations could you use a Raspberry Pi instead of a desktop computer? (e.g. in a weather station)
Review	Students are to label a Raspberry Pi to include: ■ all inputs (and where they connect to the Pi) ■ all outputs (and where they connect to the Pi) ■ processor ■ storage (i.e. where the SD card goes) ■ power. This could be completed with sticky notes, a hand drawn diagram on paper, or on a computer using shapes and call out boxes.
Assessments	All students are able to:

	■ Plug the components of a Raspberry Pi together. ■ Understand that computers are general-purpose devices, and that not every computer obviously resembles one. ■ Identify the basic architecture of a computer: processor, storage, and input/output. Most students are able to: ■ Set up a Raspberry Pi for the first time, log in, and load the graphical user interface. ■ Identify different types of computers and explain what makes them a computer. ■ Understand basic architecture of a computer: processor, storage, and input/output. Some students are able to: ■ Set up a Raspberry Pi, log in, and load the graphical user interface without assistance. ■ Explain, with examples, the similarities and differences of a Raspberry Pi compared with a personal computer. ■
Posttest Questions (same as pretest questions)	2. What demonstrates sequential operation? b.  b. 

	2. Which of the following hardware architectures can be used to execute parallel programs? a single CPU core architecture multiple Raspberry Pis interconnected using a network an Arduino microcontroller architecture multiple standalone single core desktop computers What is Raspberry Pi and what can it do? simple controller capable of performing simple operations like turning on lights at your home supercomputer capable of performing 10 petaflops computations credit card sized computer capable of performing word processing, complex computations, stream high definition video to mention a few capabilities graphics processing unit capable of processing video (Taken from RAMPED 2016 Raspberry Pi post-test)
Standards	CONTENT STANDARD 1. Concepts and Processes Systems and organization, models, form and function 2. Science as Inquiry 3. Science and Nature of Science
Crosscutting Concepts from NGSS	2. Cause and Effect 4. Systems and system models 6. Structure and Function 7. Stability and Change

Patterns, Tables, and Graphs Name _____

Identify the Independent Variable in Each of the following Situations.

1. An automobile tire loses t milliliters of tread traveling m miles.

2. An object falls d meters in t seconds.

3. An athlete runs m miles and burns c calories.

4. A garden hose runs for m minutes and produces g gallons of water.

Identify the Dependent Variable in Each of the following Situations.

1. A tree trunk has r rings after growing for y years.

2. The number of links in a chain and the length of the chain.

3. You spend c dollars on t number of T-shirts.

4. The number of eggs e in the carton and the total cost t of the eggs.

Determine the Relationship Suggested by the Table

x	1	3	5	7	9	11
y	15	17	19	21	23	25

A. Add 15 to x to find y

B. Add 14 to x to find y

C. Triple x to find y

D. Subtract 14 from x to find y

x	2	5	8	10	11	15
y	6	15	24	30	33	45

A. Add 3 to x to find y

B. Divide x by 3 to find y

C. Triple x to find y

D. Subtract 10 from x to find y

x	0	5	7	17	23	30
y	13	18	20			

A. Each value of y is 13 times bigger than x

B. Each value of y is 13 bigger than x

C. Each value of y is 13 smaller than x

D. Each value of y is 13 divided by x

x	14	22	26	30	44	58
y	7	15	19			

A. Divide x by 2 to get y

B. Multiply x by 2 to find y

C. Add 7 to x to find y

D. Subtract 7 from x to find y

Write an equation that represents the relationship between the two variables

1.

x	1	3	5	8	11	13
y	17	19	21	24	27	29

2.

x	0	2	5	6	8	9
y	0	4	10	12	16	18

3.

Wreaths Sold (w)	Dollars Made (d)
1	8
3	24
5	40
6	48
7	56

4.

Minutes in Refrigerator (m)	Temperature of Drink in °C (t)
4	11
6	9
8	7
10	5
11	4

5.

Jet Travel Hours (h)	Jet Travel Miles (m)
1	480
2	960
3	1,440
4	1,920
5	2,400

Write and equation that represents the following situations

6. You open a bank account and deposit \$10. Every month you deposit \$25 dollars. Let T represent the total money in your account after m months.

7. A real estate agent earns \$32,000 a year plus \$1,000 for each apartment he sells. Write an equation that shows the relationship between the number of apartments Abe sells, n, and the total amount he earns in a year, E.

What is the total amount Abe would earn from selling 10 apartments in one year?

Patterns, Tables, and Graphs Name Key

Identify the Independent Variable in Each of the following Situations.

1. An automobile tire loses *t* milliliters of tread traveling *m* miles.
   DV IV

2. An object falls *d* meters in *t* seconds.
   IV DV

3. An athlete runs *m* miles and burns *c* calories.
   IV DV

4. A garden hose runs for *m* minutes and produces *g* gallons of water.
   IV DV

Identify the Dependent Variable in Each of the following Situations.

1. A tree trunk has *r* rings after growing for *y* years.
   DV IV

2. The number of links in a chain and the length of the chain.
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3. You spend *c* dollars on *t* number of T-shirts.
   DV IV

4. The number of eggs *e* in the carton and the total cost *t* of the eggs.
   IV DV

Determine the Relationship Suggested by the Table

x	1	3	5	7	9	11
y	15	17	19	21	23	25

A. Add 15 to *x* to find *y*

(B.) Add 14 to *x* to find *y*

C. Triple *x* to find *y*

D. Subtract 14 from *x* to find *y*

x	2	5	8	10	11	15
y	6	15	24	30	33	45

A. Add 3 to *x* to find *y*

B. Divide *x* by 3 to find *y*

(C.) Triple *x* to find *y*

D. Subtract 10 from *x* to find *y*

x	0	5	7	17	23	30
y	13	18	20	36	36	43

A. Each value of y is 13 times bigger than x

B. Each value of y is 13 bigger than x

C. Each value of y is 13 smaller than x

D. Each value of y is 13 divided by x

x	14	22	26	30	44	58
y	7	15	19	23	37	51

A. Divide x by 2 to get y

B. Multiply x by 2 to find y

C. Add 7 to x to find y

D. Subtract 7 from x to find y

Write an equation that represents the relationship between the two variables

1.

x	1	3	5	8	11	13
y	17	19	21	24	27	29

$X + 16 = Y$

2.

x	0	2	5	6	8	9
y	0	4	10	12	16	18

$X \cdot 2 = Y$

3.

Wreaths Sold (w)	Dollars Made (d)
1	8
3	24
5	40
6	48
7	56

$w \cdot 8 = d$

4.

Minutes in Refrigerator (m)	Temperature of Drink in °C (t)
4	11
6	9
8	7
10	5
11	4

$15 - m = t$

5.

Jet Travel Hours (h)	Jet Travel Miles (m)
1	480
2	960
3	1,440
4	1,920
5	2,400

$h \cdot 480 = m$

Write and equation that represents the following situations

6. You open a bank account and deposit \$10. Every month you deposit \$25 dollars. Let T represent the total money in your account after m months.

$10 + 25 \cdot m = T$

7. A real estate agent earns \$32,000 a year plus \$1,000 for each apartment he sells. Write an equation that shows the relationship between the number of apartments Abe sells, n, and the total amount he earns in a year, E.

$32,000 + 1,000 \cdot n = E$

What is the total amount Abe would earn from selling 10 apartments in one year?

$32,000 + 1,000 \cdot 10 = E$

$32,000 + 10,000 = E$

$\$42,000 = E$

Name_____

Code Fun

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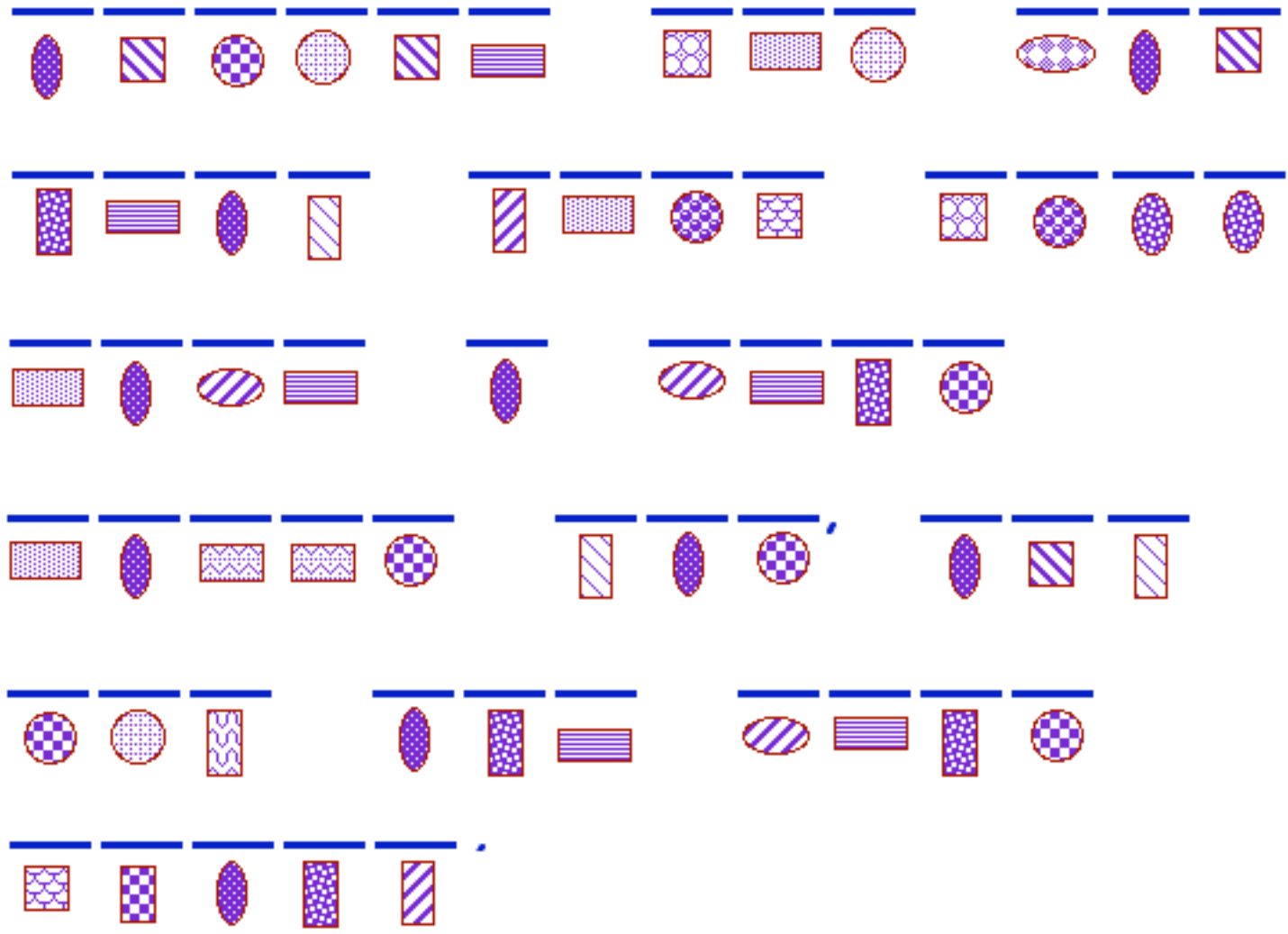
Find out what this sentence says. Print the letters on the line.



Code Key