Christina School District Assignment Board

Student's First & Last Name _____ **Student ID/Lunch #** _____ **School**_____ **Grade**_____

Grade Level: 10th

Week of May 11th, 2020

	Day 1	Day 2	Day 3	Day 4	Day 5
ELA	This week we will utilize your close reading and critical thinking skills to understand the informational text **Taking the Beef Out of Burgers.** ---------- Read the article on writer's moves. Put a check next to all of the ones that you remember from ELA class and that you understand. Complete the **Alternative Meats Are Having a Moment** sheet.	Read the article. As you read; **Write** questions that arise as you read. **Write** connections you have to the topic, text, or ideas. **Underline** words/ideas you don't understand. **Star** ideas you agree with. When done write for 2-3 minutes your initial reactions to the text. Choose one of the words/ideas that you do not understand. Ask another person or if able, look up the word you don't understand to find understanding.	Re-read the text and answer the following. 1. What surprised you as you read? 2. What did the author think you already knew? 3. What challenged, changed or confirmed what you knew? 4. What are your thoughts about taking the beef out of burgers? Explain. 5. Pick a word/line/passage from the article and respond to it.	Re-read the article a final time looking specifically for writer's craft. Make notes about the kinds of ideas covered in the text, the type of evidence the writer uses to support his ideas, how the piece is organized and presented, and how the writer uses language/words to add layers of meaning. Refer back to the writer's craft sheet to help you. After you identify some of the techniques choose one of focus. Quote the example from the text. Identify where in the text the author uses the technique in the text. How does the use of this technique support	Write a 1-2 paragraph response to the article. Utilize 1-2 of the writer's techniques in addition to 2 of the vocabulary words in your response **OR** create a poster, cartoon, poem, song or rap that supports one of the burger options and critiques the other.

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				the main idea and impact the reader? Explain in 1- 2 paragraphs.	
Math (IM2)	*Multiplication Rule for Independent Events* *Answer "Which One Doesn't Belong?" and justify your choice. (attached)* Review Concept Summary: Probability Events (attached), and complete Probability Events Worksheet 1 #1-3. (attached)	Complete Probability Events Worksheet 2 #1-9. (attached) Reference Concept Summary if needed.	Complete Probability Events Worksheet 3 #1-7. (attached) Reference Concept Summary if needed.	Read pages 49-51. (attached) Use the examples as a guide to complete p. 52 #1-5. (attached)	Complete p. 52 #6-10. Use the examples from pages 49-51 as a guide if needed. (attached)
Science	**Coronavirus: What's the Real Story?:** Watch a recent newscast or read a newspaper article about the coronavirus. Write down some "noticings" and/or thoughts about what the article or newscast is communicating. Write down your best answers to the following: a) What is your current understanding about the coronavirus? What are your feelings? What questions do you have about the coronavirus? Think about your previous learning in science in school. Write down any connections or possible connections you can think of between the coronavirus outbreak and what you have learned in this science class or	**How COVID-19 Spreads:** Read the article. Annotate. Create and complete a table on which you record connections to questions or ideas from the previous day, new ideas, and new questions.	**How To Protect Yourself & Others:** Read the article. Summarize the main idea(s) and continue to generate your list of connections, new ideas, and questions. Also remember to annotate.	**Coronavirus Mythbusters (part 1):** Read the 1st 2 pages of the article. Summarize the main idea(s) and continue to generate your list of connections, new ideas, and questions. Also remember to annotate.	**Coronavirus Mythbusters (part 2):** Read the 2nd 2 pages of the article. Summarize the main idea(s) and continue to generate your list of connections, new ideas, and questions. Also remember to annotate. Answer the following questions: Were there any noticeable patterns or repetitions in the articles you summarized so far? Why might this be? What questions that you posed earlier did this article possibly help to answer?

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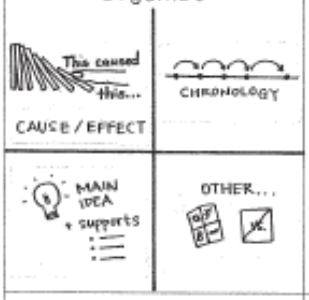
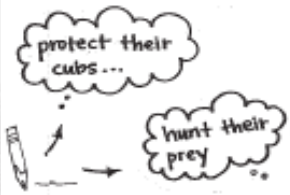
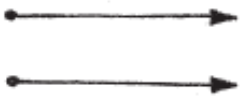
		previous science classes.				
Social Studies	**Civics**	Complete Activity 3, Debrief Your Thoughts from the document titled, "Woodrow Wilson's Stroke" NOTE: You have this document from last week's (Week 5 of May 4) CSD Assignment Board	Complete Activity 3, Your Own Legislation from the document titled, "Woodrow Wilson's Stroke" NOTE: You have this document from last week's (Week 5 of May 4) CSD Assignment Board	Complete Activity 1, Social Distancing and Learning Loss from the document titled, "Participate in a Return to School Citizen's Planning Group"	Complete Activity 1, Safety and Event Planning from the document titled, "Participate in a Return to School Citizen's Planning Group"	Complete Activity 1, Extra Curricular Activities and Plan B Group from the document titled, "Participate in a Return to School Citizen's Planning Group" NOTE: The rest of Activity 1, Activity 2, and Activity 3 will be on next week's CSD Assignment Board
	Economics	Complete Questions 1 & 2 from the document titled, "Will Robots Take Our Jobs?	Complete Questions 3 & 4 from the document titled, "Will Robots Take Our Jobs?	Complete Question 5 from the document titled, "Will Robots Take Our Jobs?	Complete Questions 1-10 from the document titled, "Smart Phones and Budget Changes"	Complete Questions 11 & 12 from the document titled, "Smart Phones and Budget Changes" NOTE: Questions 13 & 14 will be on next week's CSD Assignment Board

Writers of Informational Texts Use Techniques Such As:

Organize 	Make a comparison 	Raise questions (and sometimes answer them) 
Give an example/anecdote 	Address the reader directly 	Quote an authority 
Provide a surprising fact or statistic 	Choose words/phrases that lead the reader to think one way or another 	Repeat Use parallelism 
Use text features and/or provide a visual 	Define key terms and use technical vocabulary 	Incorporate humor 

Alternative Meats Are Having a Moment

Look at the image and the chart below.

- Looking at the ingredients of the various burgers, which would you say is healthier?Explain.
- Based upon the chart which is better, meat or meatless burgers? Explain
- In your opinion which burger is better meat or meatless? Explain

	Impossible Burger	Beyond Burger	MorningStar Farms Veggie Burger	85% lean, 15% fat Beef Burger
Number of Ingredients	21	18	37	1
Calories	240	250	187	250
Fat (g)	14	18	8	17
Saturated Fat (g)	8	6	1	7
Carbohydrates (g)	9	3	15	0
Sodium (mg)	370	390	663	90
Protein (g)	19	20	19	21
Cholesterol (mg)	0	0	<5	85

Based on a 4 oz serving size; burger patty only.[2]

Vocabulary

1. **Beyond Burger**: a plant-based alternative that looks and cooks like beef, but does not contain heme or soy
2. **Impossible Burger**: a plant-based alternative to traditional beef burgers that contains heme and mimics the flavor, aroma, and texture of beef
3. **genetically engineered** (GE): the technical process of inserting or modifying a gene into an existing species, with the help of specific techniques, to enhance a receiving organism
4. **heme:** an iron-containing molecule found in every living plant and animal that looks and tastes like blood
5. **leghemoglobin:** an oxygen carrier and hemoprotein found in the nitrogen-fixing root nodules of leguminous plants
6. **alchemy:** the idea of transforming simple or lesser quality materials into high quality materials
7. **livestock:** farm animals
8. **yeast:** a microscopic fungus consisting of single oval cells that reproduce by budding, and are capable of converting sugar into alcohol and carbon dioxide
9. **consumer-** a person who purchases good and services for personal use

Background Connections

Plant-based protein is on the rise and alternative burgers are showing up on fast-food menus. As more and more meatless alternatives become available, consumers may be faced with various questions and concerns. What is a plant-based burger? How does the Impossible Burger compare to a Beyond Burger? Are meatless burgers a healthier alternative?

Many consumers have enjoyed plant-based proteins—like veggie burgers—for years, but why the sudden surge of popularity? Companies like Impossible Foods and Beyond Meat have revolutionized the plant-based industry by creating meatless burgers that actually look, cook, smell, and *taste* like beef. These taste- and lookalike burgers also come advertised as a more environmentally friendly protein alternative, and a possible solution to feeding our growing population.

Beef

Humans began eating beef (domesticated cattle) in 6,500 B.C. Beef cattle have since played an important role in agricultural production. Because of their ruminant digestive system, cows have the unique ability to upcycle human-inedible forages and byproducts. Feeds like grass, cottonseed meal, and distillers' grain are upcycled into high-quality cuts of protein, iron, and zinc. What most consumers don't realize is that all cattle spend the majority of their lives eating grass and forage products. Calves are raised with their mother on pasture or grass until they are between 6-12 months of age. After weaning, cattle are then fed grain and/or more forages to a finishing weight (1,200-1,400 pounds) for harvesting. A 1,200-pound steer will produce about 500 pounds of meat including steaks, roasts, and ground beef. The remaining byproducts from the beef carcass are used for common objects such as leather, pet foods, cosmetics, detergents, glue, and brake fluid.

The Beyond Burger

Beyond Meat began in 2009 and their plant-based "Beyond Burger" debuted in 2016. The protein in a Beyond Burger comes from a combination of pea, mung bean, and rice protein. The red color of the meat—to resemble beef—comes from beets. Other ingredients in this popular patty include water, expeller-pressed canola oil, refined coconut oil, natural flavors, cocoa butter, methylcellulose, potato starch, apple extract, salt, potassium chloride, vinegar, lemon juice concentrate, sunflower lecithin, and pomegranate fruit powder. Beyond Meat advertises a plant-based protein that is soy, gluten, and GMO free.

The Impossible Burger

Impossible Foods was founded in 2011 and their plant-based "Impossible Burger" first hit fast-food menus in 2019. The Impossible Burger is a stand-out from other plant-based burgers because the burger patty "bleeds" like a regular beef burger. This is done using an iron-containing molecule found in every living plant and animal known as heme. Scientists discovered that heme is what gives meat its aroma and flavor. It is also what humans crave when eating meat. Soy leghemoglobin (legume hemoglobin) is a protein found in plants that carries heme. In the past, researchers at Impossible Foods harvested leghemoglobin directly from the roots of soy plants; however, they soon realized they could produce much more leghemoglobin using fermentation. Leghemoglobin is now harvested using a yeast engineered with the gene for soy leghemoglobin. The genetically engineered yeast ferments and multiplies, creating large amounts of soy leghemoglobin which contains heme. The heme is then isolated from the yeast and mixed with other ingredients to create the meaty flavor in the Impossible Burger. This process of using genetically engineered yeast allows Impossible Foods to produce heme on a large scale without digging up soy roots, promoting soil erosion, and releasing carbon from the soil.[11]

Other ingredients mixed with the soy leghemoglobin (heme) include: water, soy protein concentrate, coconut oil, sunflower oil, natural flavors, 2% or less of: potato protein, methylcellulose, yeast extract, cultured dextrose, food starch modified, salt, soy protein isolate, mixed tocopherols (Vitamin E), zinc gluconate, thiamine hydrochloride (Vitamin B1), sodium ascorbate (Vitamin C), niacin, pyridoxine hydrochloride (Vitamin B6), riboflavin (Vitamin B2), Vitamin B12.

Are plant-based burgers a healthier alternative?

There are many burger options available to consumers whether they are plant-based or made from beef. While plant-based and meatless burgers are a good alternative, they might not meet the same amino acid, vitamin, mineral and antioxidant levels that are found in an eight-ounce piece of red meat. Consumers can get 100% of the daily intake of vitamin B12 from one serving of red meat, while a Beyond Burger will account for 20% of the daily intake of B12. The sodium content of each burger varies as well. A Beyond Burger contains 380 milligrams (mg) of sodium, the Impossible Burger contains 370 mg of sodium, and a freshly ground beef burger (85% lean) contains 90 mg of sodium. Plant-based burger patties, however, contain significantly less cholesterol when compared to a beef patty. Consumers should be aware of the production and processing methods of each burger, as well as ingredients and nutrient content so they can select a burger that fits their dietary needs and preferences. Those who are allergic to soy should avoid eating plant-based products that contain soy leghemoglobin.

Text-Based Questions

1. What makes meatless burgers different from veggie burgers?
   _____
   _____

2. What reasons does the text state for consumers are seeking alternatives to meat burgers?
   _____
   _____

3. What is the difference between the Beyond Burger and the Impossible Burger?
   _____
   _____

Taking the Beef Out of Burgers
Source: TheWeek.com, January 12, 2020

Sales are booming for alternative meats. Are plant-based burgers just a fad? Here's everything you need to know:

Why are meatless burgers so popular?
Food scientists believe they've achieved a kind of alchemy, making plants look and taste like meat. Global sales suggest they've largely succeeded. All-plant burgers, nuggets, meatballs, and sausage patties exploded in popularity last year, driven by California-based Beyond Meat and Impossible Foods. Beyond had 2019's most successful IPO and gained a presence in 20,000 U.S. grocery stores plus 53,000 fast-food restaurants such as Dunkin' Donuts and Carl's Jr., while McDonald's is testing a Beyond Burger in Canada. Burger King's Impossible Whopper and White Castle's Impossible Sliders were almost *too* successful, causing a supply crisis. Overall U.S. restaurant sales of plant-based meat grew by 400 percent last year; combine those with supermarket sales, and consumers spent nearly $1 billion on these products in 2019. Plant-based burgers attract eaters who are health conscious and/or environmentally concerned but aren't willing to give up familiar tastes and textures for quinoa and seitan. Ninety-five percent of Impossible's customers eat meat; in taste tests, half of them can't tell Impossible Burgers from the real thing.

What's their secret?
"Meat analogues" such as tofu go back 2,000 years, but these are not your father's frozen veggie burgers. The new faux burgers are engineered to imitate the way ground meat sizzles on the grill, bleeds in the middle, and crumbles in your mouth. That's no small feat, considering cooked beef contains 4,000 different molecules, about 100 of which create its smell and umami-rich flavor. Impossible Foods simulates that pinkish color and savory flavor with heme, the iron-carrying molecule in blood and some plant roots. The heme is created by genetically modifying yeast with soy DNA in gigantic tanks.

What else are they made of?
The new burgers vary in composition, but are largely made of plant proteins — usually soy, but sometimes pea, bean, or wheat — and plant fats. These ingredients are cooked in big pressure cookers, which use low heat and compression to replicate the fibrous texture of meat. The first challenge in creating a plant-based burger is to make a tasteless patty, getting rid of so-called off-flavors. (Pea protein is said to taste of urine.) "Once we cracked the code on meat flavor," said Impossible Foods scientist Laura Kliman, "if you change a few of the ratios and ingredients, it's not that hard to get fish or pork or chicken." Impossible Burgers have 21 ingredients — mostly soy and potato proteins, plus coconut and sunflower oils. Beyond Burgers have 18 ingredients, a mixture of isolated pea protein, mung bean, and rice proteins. Beetroot juice provides the "bleeding" effect. The thickener methylcellulose, potato starch for texture, and the salt substitute potassium chloride are also used. Beyond Burgers get the marbled look of ground beef from coconut oil and cocoa butter whipped into tiny globules of fat.

Is that healthier than meat?
Yes and no. Consuming meat is believed to increase the risk of cardiovascular disease and colorectal cancer, and humans can develop unsafe resistance to antibiotics by eating animals fed those drugs. Commercial beef, pork, and poultry often carry bacteria and viruses from fecal matter and cause illness if not properly cooked or handled. Critics of alternative meat, however, say that companies are exploiting the healthy sound of "plant-based" while providing heavily engineered products. Whole Foods CEO John Mackey, for example, has warned customers that these burgers "are super, highly processed foods." Meatless burgers are cholesterol free and contain about the same calorie count as hamburgers but have more sodium: The Impossible Whopper has 1,240 milligrams of sodium, 260 more than the beef version. Coconut oil gives Beyond and Impossible Burgers saturated fat levels similar to beef, and their proteins are considered less nutritious. Impossible's recipe depends on soy, which can mimic estrogen in the body, but food scientists say it's safe to consume in moderate quantities.

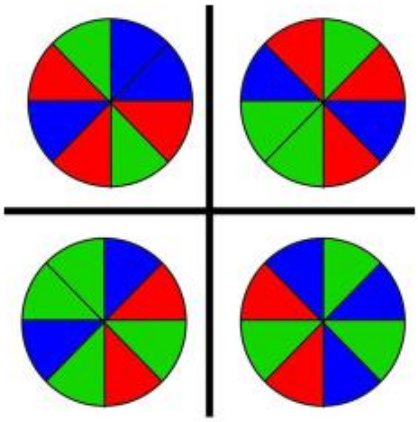
Is the meat industry alarmed?
Stanford University biochemist Patrick Brown, who founded Impossible Foods/';, says it should be. "We plan to take a double-digit portion of the beef market within five years," he said, "and then we can push that industry, which is fragile and has low margins, into a death spiral." That's unlikely. Americans on average eat three hamburgers a week, and the combined annual revenue of the three largest U.S. meatpacking companies is about $200 billion. Still, the meat industry clearly feels threatened: Lobbyists convinced 12 state legislatures last year to ban products from using words such as "burger" and "meat" if they don't come from animals. But to hedge their bets and to take advantage of the boom, Perdue, Nestlé, Kellogg, and meat giant Tyson Foods are developing their own plant-based or hybrid burgers. As Tyson's former CEO Tom Hayes said, "If you can't beat 'em, join 'em, right?"

The environmental impact of livestock
Environmentalists estimate that eating 4 pounds of beef contributes as much to global warming as flying from New York to London, and the average American eats more than that each month. There are many ways of producing meat, but it's clear that the annual farming and slaughter of 50 billion animals for meat worldwide leaves a massive footprint in terms of land use, crop consumption, emissions, and water pollution. In the past 25 years, an area larger than South America has been razed for cattle grazing, and cows releasing methane from digesting grains and grass — mostly through burps — causes two-thirds of the livestock sector's greenhouse gas emissions. A landmark report in *Science* found that avoiding meat and dairy is the "single biggest way" to reduce one's environmental impact. A recent University of Michigan study found that a plant-based burger generates 90 percent less greenhouse gas, requires 46 percent less energy, and has 99 percent less impact on water scarcity than a quarter pound of U.S. beef. CEO Pat Brown says that's Impossible Foods' primary purpose. "We see our mission as the last chance to save the planet from environmental catastrophe," he says.

IM2 – Week of May 11th

The Multiplication Rule for Independent Events

Which One Doesn't Belong? Why?



CONCEPT SUMMARY Probability Events

Concept Summary Assess

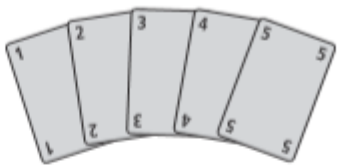
	Mutually Exclusive Events	Independent Events
WORDS	A and B are mutually exclusive because no outcome is in both A and B.	D and M are independent because the occurrence of one does not affect the probability of the other.
ALGEBRA	If A and B are mutually exclusive events, then $P(A \text{ or } B) = P(A) + P(B)$. If C is the event that A does not occur, then $P(C) = 1 - P(A)$.	If D and M are independent events, then $P(D \text{ and } M) = P(D) \cdot P(M)$. If $P(D \text{ and } M) = P(D) \cdot P(M)$, then D and M are independent events.
EXAMPLES	Experiment: spin the spinner.  Event A: number less than 3 Event B: number greater than 5 $P(A \text{ or } B) = P(A) + P(B) = \frac{2}{6} + \frac{1}{6} = \frac{1}{2}$	Experiment: spin the spinner and roll a number cube  Event D: odd number on spinner Event M: number greater than 4 on number cube $P(D \text{ and } M) = P(D) \cdot P(M) = \frac{1}{2} \cdot \frac{1}{3} = \frac{1}{6}$

Probability Events Worksheet 1

1. A card is selected at random and the number cube is rolled.

Event A: An odd-numbered card is selected.

Event B: An odd number comes up on the number cube.



Use the terms to complete true statements.

Terms may be used more than once.

are	are not	no
does	does not	at least one
equals	does not equal	

a. A and B _____ mutually exclusive because _____ outcome in A can occur at the same time as an outcome in B.

b. A and B _____ independent because the occurrence of A _____ affect the probability of B.

c. P(A or B) _____ P(A) + P(B) because A and B _____ mutually exclusive.

d. P(A and B) _____ P(A) · P(B) because A and B _____ independent.

2. Dakota calculates the probabilities shown below.

Event A: an even numbered card Event B: a number cube roll greater than 4

Identify and correct the error(s).

$P(A) = \frac{2}{5}$

$P(B) = \frac{2}{6}$

$P(A \text{ and } B) = \frac{22}{30}$

3. A classmate asks Juan to find the probability of tossing a number cube and getting an even number on the first roll and a 2 on the second roll. Complete the calculation.

$P(\text{even}) = \frac{3}{6}$ $P(2) = \frac{}{6}$ $P(\text{even and } 2) = \frac{1}{} \cdot \frac{}{6} = \text{—}$

Probability Events Worksheet 2

1. **Understand** Only 93% of the airplane parts being examined pass inspection. What is the probability that the next 5 parts examined will all pass inspection?

2. **Apply** Exactly 62% of the students in your school are under 17 years old. In addition, 4% of the students are over 18. What is the probability that a student chosen at random is under 17 or over 18?

You have a drawer with five pairs of white socks, three pairs of black socks, and one pair of red socks. You choose one pair of socks at random each morning, starting on Monday. You do not put the socks you choose back in the drawer. Find the probability of each event.

3. You select black socks on Monday and white socks on Tuesday.

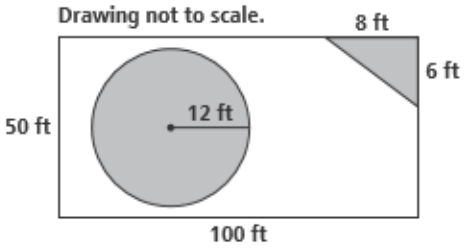
4. You select white socks on Monday and Tuesday.

The rectangular yard shown below has a circular pool and a triangular garden. A ball from an adjacent golf course lands at a random point within the yard. Find each probability.

5. The ball lands in the garden.

6. The ball lands in the garden or the pool.

7. The ball does not land in the pool.



8. Of the 195 students in the senior class, 104 study Spanish and 85 study French, with 12 studying both Spanish and French. What is the probability that a student chosen at random is studying Spanish but not French?

9. You donate 8 baseballs to a local baseball team. Your uncle donates 12 baseballs. If a total of 50 baseballs are donated, what is the probability that the first pitch of the season uses one of your baseballs or one of your uncle's baseballs?

Probability Events Worksheet 3

For a math project, Maxine's class surveyed students at their school about the mode of transportation they most often use to go to and from school.

A **frequency table** is a record of the number of times that an event occurs.

Relative frequency is the ratio of the number of times an event occurs to the total number of trials.

Frequency Table

Grade	9	10	11	12	Total
Walk	52	44	40	32	
Car					
Bus	84	90		42	282
Total	160	176	160	140	636

Relative Frequency

Grade	9	10	11	12	Total	Probability (%)
Walk	0.08	0.07	0.06	0.05		
Car						
Bus	0.13	0.14		0.07		
Total	0.25	0.28	0.25	0.22		

1. A student lost some of the data. Complete the frequency table.

2. Complete the relative frequency table.

Use the data in the tables for Items 3–7. Write probabilities to the nearest whole percent.

3. What is the sum of all the individual relative frequencies? How can you use this to check your work?

4. a. How can you use frequency to find the relative frequency of an outcome?

b. How can you use relative frequency to find the probability that a senior selected at random takes the bus? Find the probability and explain.

5. If 8% of students sometimes take a bike to school, how many spaces in the bike rack should the school make available for each student to have a space?

6. What is the probability that a 10^{th} grader walks to school or takes the bus?

7. If 5% of students in Grade 9 who usually take the bus sometimes ride a bicycle to school, what is the probability that a ninth-grade student selected at random usually takes the bus and sometimes rides a bicycle to school?

Although the definition of probability is simple, calculating a particular probability can sometimes be tricky. When calculating the probability of flipping a coin and having it come up tails, we can easily see that there are only two possibilities and one successful outcome. But what if neither the total number of outcomes nor the total number of successes is obvious? In this case, we need to have an accurate way to count the number of these events. In these lessons, we look at three models to do this: making a systematic list, making a tree diagram, and making an area model. Each different model has its strengths and weaknesses, and is more efficient in different situations.

See the Math Notes boxes in Lessons 4.2.3 and 4.2.4 for more information about calculating probabilities.

Example 1

As Ms. Dobby prepares the week's lunch menu for the students, she has certain rules that she must follow. She must have a meat dish and a vegetable at each lunch. She has four choices for meat: chicken, fish, beef, and pork. Her list of choices for vegetables is a bit larger: peas, carrots, broccoli, corn, potatoes, and beets. Considering just the meat and the vegetable, what is the probability that the first lunch she makes will have meat and a green vegetable?

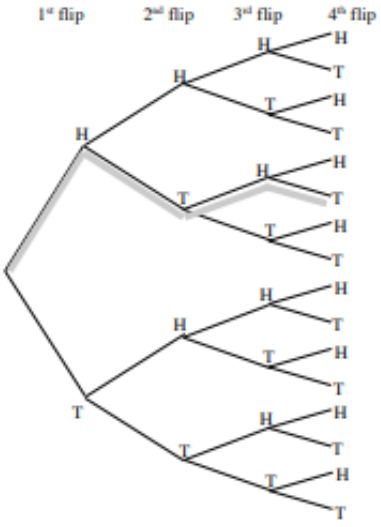
To determine the probability of a lunch with meat and a green vegetable, we need to know how many different lunch menus are possible. Then we need to count how many of the lunch menus have meat and a green vegetable. To count all of the possible lunch menus, we will make a systematic list, pairing each meat with a vegetable in an organized way.

Chicken	Fish	Beef	Pork
Chicken and peas	Fish and peas	Beef and peas	Pork and peas
Chicken and carrots	Fish and carrots	Beef and carrots	Pork and carrots
Chicken and broccoli	Fish and broccoli	Beef and broccoli	Pork and broccoli
Chicken and corn	Fish and corn	Beef and corn	Pork and corn
Chicken and potatoes	Fish and potatoes	Beef and potatoes	Pork and potatoes
Chicken and beets	Fish and beets	Beef and beets	Pork and beets

From this list we can count the total number of lunch menus: 24. Then we count the number of lunch menus with meat and a green vegetable (peas or broccoli). There are eight such menus. Therefore the probability of the first lunch menu having meat and a green vegetable is $\frac{8}{24} = \frac{1}{3}$.

Example 2

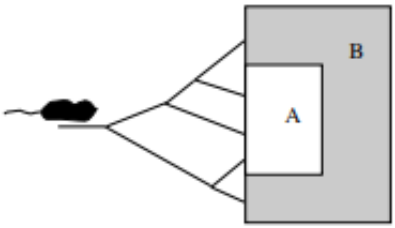
What is the probability of flipping a fair coin 4 times and have tails come up exactly two of those times?



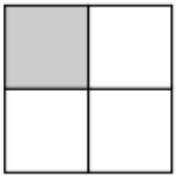
To solve this problem, we could make a systematic list as we did in the previous example, but there is another technique that works well for this type of problem. Since each flip gives us only two outcomes, we can organize this information in a tree diagram. The first flip has only two possibilities: heads (H) or tails (T). From each branch, we split again into H or T. We do this for each flip of the coin. The final number of branches at the end tells us the total number of outcomes. In this problem, there are 16 outcomes. We now count the number of "paths" along the branches that have exactly two Ts. One path consisting of HTHT is highlighted. The others are HHTT, HTTH, THHT, THTH, and TTHH, for a total of six paths. Thus the probability of flipping a coin four times and having T come up exactly two times is $\frac{6}{16} = \frac{3}{8}$.

Example 3

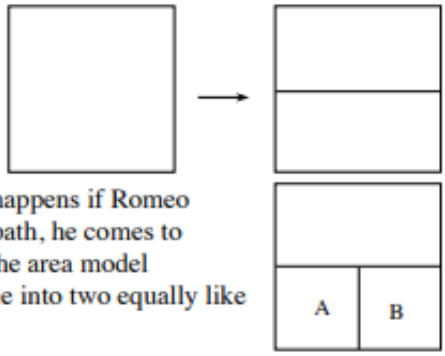
Romeo the rat is going to run through a maze to find a block of cheese. The floor plan of the maze is shown at right, with the cheese to be placed in either section A or section B. If every time Romeo comes to a split in the maze he is equally like to choose any path in front of him, what is the probability he ends up in section A?



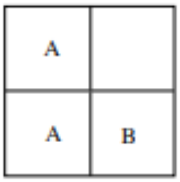
To answer this question we will construct an area model to represent this situation. Using an area model is like turning the problem into a dartboard problem. It is easy to see what the probability of hitting the shaded portion on the dartboard at right is because the shaded portion makes up one-fourth of the board. Therefore the probability of hitting the shaded portion is $\frac{1}{4}$. What we want to do is turn the maze problem into a dartboard with the outcome we want (our success) represented by the shaded part.



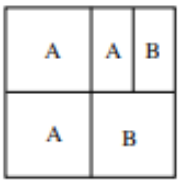
To begin, we start with a square dartboard. You can think of this as being a 1×1 square. When Romeo comes to the first branch in the maze, he has two choices: a top path and a bottom path. We represent this on the dartboard by splitting the board into two same sized (equally likely) pieces. Then consider what happens if Romeo chooses the bottom path first. If he chooses the bottom path, he comes to another split with two choices, each equally likely. On the area model (dartboard) we show this by splitting the bottom rectangle into two equally like sections, shown at right.



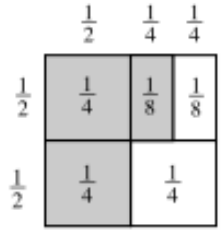
With one branch, Romeo will end up in section A; with the other branch he will end up in B. We indicate this by putting the letters in the regions representing these outcomes. Note: you can split the bottom rectangle in half with a "top" rectangle and a "bottom" rectangle as well. Since we are ultimately going to consider the area covered with an "A," it can be split in any way as long as the pieces are equal in size.



Now consider the top path. If Romeo takes the top path at the first split, he quickly comes to another split where again he has a choice of a top path or a bottom path. Once again we split the top rectangle into two same-sized rectangles since each path is equally likely. One box will represent the top path and one will represent the bottom. If Romeo takes the lower path, he will end up in section A. We indicate this by choosing one of the new regions as representing the lower path, and writing an A in that portion. If Romeo takes the upper path, he comes to another split, each equally likely. This means the last section of the dartboard that is not filled in needs to be cut into two equal parts, since each path is equally likely. One of the paths will lead directly to section A, the other to section B. Now we can fill in those letters as well.



By looking at the dart board now, we can see that since A takes up more of the board, we would be more likely to hit section A. But to find the actual probability, we must determine how much area the sections marked with A take up. Recall that this is a 1×1 square. We can find the fraction of the area of each part. Remember: the key is that we divided regions up into equal parts. The length of each side of each rectangle is shown on the exterior of the square, while the area is written within the region. We want to know the probability of getting into section A, which is represented by the shaded portion of the dartboard. The area of the shaded region is:



$$\begin{aligned} A &= \tfrac{1}{4}+\tfrac{1}{4}+\tfrac{1}{8} \\ &= \tfrac{2}{8}+\tfrac{2}{8}+\tfrac{1}{8} \\ &= \tfrac{5}{8} \end{aligned}$$

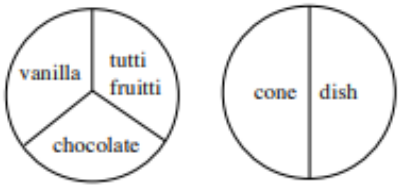
Therefore the probability of Romeo wandering into section A is $\frac{5}{8}$. This means the probability that he wanders into section B is $\frac{3}{8}$ since the sum of both probabilities must be 1.

Problems

1. If Keisha has four favorite shirts (one blue, one green, one red, and one yellow) and two favorite pairs of pants (one black and one brown), how many different favorite outfits does she have? What is the best way to count this?

2. Each morning Aaron starts his day with either orange juice or apple juice followed by cereal, toast, or scrambled eggs. How many different morning meals are possible for Aaron?

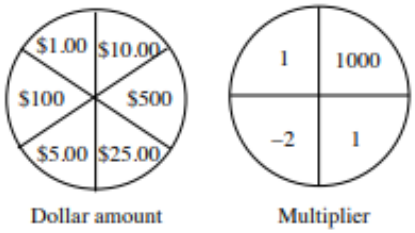
3. Eliza likes to make daily events into games of chance. For instance, before she went to buy ice cream at the local ice cream parlor, she created two spinners. The first has her three favorite flavors while the second has "cone" and "dish." Eliza will order whatever comes up on the spinners. What is the probability that she will be eating tutti fruitti ice cream from a dish?



4. Barty is going to flip a coin three times. What is the probability that he will see *at least* two tails?

5. Mr. Fudge is going to roll two fair dice. What is the probability that the sum will be 4 or less?

6. Welcome to another new game show, "Spinning for Luck!" As a contestant, you will be spinning two wheels. The first wheel determines a possible dollar amount that you could win. The second wheel is the "multiplier." You will multiply the two results of your spin to determine the amount you will win. Unfortunately, you could *owe* money if your multiplier lands on –2! What is the probability that you could win $100 or more? What is the probability that you could owe $100 or more?



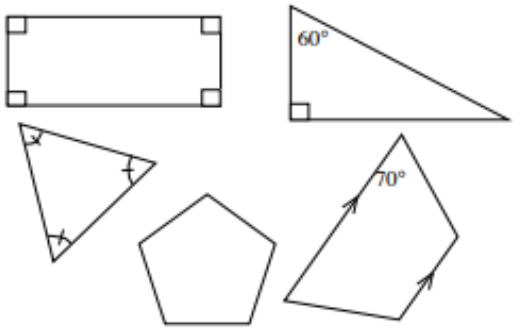
For problems 7 through 10, a bag contains the figures shown below right. If you reach in and pull out a shape at random, what is the probability that you pull out:

7. A figure with at least one right angle?

8. A figure with an acute angle?

9. A shape with at least one pair of parallel sides?

10. A triangle?



How COVID-19 Spreads

COVID-19 is thought to spread mainly through close contact from person-to-person in respiratory droplets from someone who is infected. People who are infected often have symptoms of illness. Some people without symptoms may be able to spread virus.

COVID-19 is a new disease and **we are still learning about how it spreads** and the severity of illness it causes.

Person-to-person spread

The virus is thought to spread mainly from person-to-person.

- Between people who are in close contact with one another (within about 6 feet).
- Through respiratory droplets produced when an infected person coughs, sneezes or talks.
- These droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs.
- Some recent studies have suggested that COVID-19 may be spread by people who are not showing symptoms.

Maintaining good social distance (about 6 feet) is very important in preventing the spread of COVID-19.

Spread from contact with contaminated surfaces or objects

It may be possible that a person can get COVID-19 by touching a surface or object that has the virus on it and then touching their own mouth, nose, or possibly their eyes. This is not thought to be the main way the virus spreads, but we are still learning more about this virus.

Wash your hands often with soap and water. If soap and water are not available, use an alcohol-based hand rub. Also, routinely clean frequently touched surfaces.

How easily the virus spreads

How easily a virus spreads from person-to-person can vary. Some viruses are highly contagious, like measles, while other viruses do not spread as easily. Another factor is whether the spread is sustained, which means it goes from person-to-person without stopping.

The virus that causes COVID-19 is spreading very easily and sustainably between people. Information from the ongoing COVID-19 pandemic suggest that this virus is spreading more efficiently than influenza, but not as efficiently as measles, which is highly contagious.

How to Protect Yourself & Others

Older adults and people who have severe underlying medical conditions like heart or lung disease or diabetes seem to be at higher risk for developing serious complications from COVID-19 illness. More information on Are you at higher risk for serious illness?

Know how it spreads

- There is currently no vaccine to prevent coronavirus disease 2019 (COVID-19).
- **The best way to prevent illness is to avoid being exposed to this virus.**
- The virus is thought to spread mainly from person-to-person.
    - Between people who are in close contact with one another (within about 6 feet).
    - Through respiratory droplets produced when an infected person coughs, sneezes or talks.
    - These droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs.
    - Some recent studies have suggested that COVID-19 may be spread by people who are not showing symptoms.

Everyone Should

Wash your hands often

- Wash your hands often with soap and water for at least 20 seconds especially after you have been in a public place, or after blowing your nose, coughing, or sneezing.
- If soap and water are not readily available, **use a hand sanitizer that contains at least 60% alcohol**. Cover all surfaces of your hands and rub them together until they feel dry.
- **Avoid touching your eyes, nose, and mouth** with unwashed hands.

Avoid close contact

- **Avoid close contact with people who are sick, even inside your home.** If possible, maintain 6 feet between the person who is sick and other household members.
- **Put distance between yourself and other people outside of your home**.
    - Remember that some people without symptoms may be able to spread virus.
    - Stay at least 6 feet (about 2 arms' length) from other people.
    - Do not gather in groups.
    - Stay out of crowded places and avoid mass gatherings.
    - Keeping distance from others is especially important for people who are at higher risk of getting very sick.

Cover your mouth and nose with a cloth face cover when around others

- You could spread COVID-19 to others even if you do not feel sick.
- Everyone should wear a cloth face cover when they have to go out in public, for example to the grocery store or to pick up other necessities.
    - Cloth face coverings should not be placed on young children under age 2, anyone who has trouble breathing, or is unconscious, incapacitated or otherwise unable to remove the mask without assistance.

- The cloth face cover is meant to protect other people in case you are infected.
- Do NOT use a facemask meant for a healthcare worker.

- Continue to keep about 6 feet between yourself and others. The cloth face cover is not a substitute for social distancing.

Cover coughs and sneezes

- **If you are in a private setting and do not have on your cloth face covering, remember to always cover your mouth and nose** with a tissue when you cough or sneeze or use the inside of your elbow.
- **Throw used tissues** in the trash.
- Immediately **wash your hands** with soap and water for at least 20 seconds. If soap and water are not readily available, clean your hands with a hand sanitizer that contains at least 60% alcohol.

Clean and disinfect

- **Clean AND disinfect frequently touched surfaces daily**. This includes tables, doorknobs, light switches, countertops, handles, desks, phones, keyboards, toilets, faucets, and sinks.
- **If surfaces are dirty, clean them.** Use detergent or soap and water prior to disinfection.
- **Then, use a household disinfectant.** Most common EPA-registered household disinfectantsexternal icon will work.

Coronavirus disease (COVID-19) advice for the public: Myth busters

There are currently no drugs licensed for the treatment or prevention of COVID-19

While several drug trials are ongoing, there is currently no proof that hydroxychloroquine or any other drug can cure or prevent COVID-19. The misuse of hydroxychloroquine can cause serious side effects and illness and even lead to death. WHO is coordinating efforts to develop and evaluate medicines to treat COVID-19.

Adding pepper to your soup or other meals DOES NOT prevent or cure COVID-19

Hot peppers in your food, though very tasty, cannot prevent or cure COVID-19. The best way to protect yourself against the new coronavirus is to keep at least 1 metre away from others and to wash your hands frequently and thoroughly. It is also beneficial for your general health to maintain a balanced diet, stay well hydrated, exercise regularly and sleep well.

COVID-19 IS NOT transmitted through houseflies

To date, there is no evidence or information to suggest that the COVID-19 virus transmitted through houseflies. The virus that cause COVID-19 spreads primarily through droplets generated when an infected person coughs, sneezes or speaks. You can also become infected by touching a contaminated surface and then touching your eyes, nose or mouth before washing your hands. To protect yourself, keep at least 1-metre distance from others and disinfect frequently-touched surfaces. Clean your hands thoroughly and often and avoid touching your eyes, mouth and nose.

Spraying and introducing bleach or another disinfectant into your body WILL NOT protect you against COVID-19 and can be dangerous

Do not under any circumstance spray or introduce bleach or any other disinfectant into your body. These substances can be poisonous if ingested and cause irritation and damage to your skin and eyes.

Bleach and disinfectant should be used carefully to disinfect surfaces only. Remember to keep chlorine (bleach) and other disinfectants out of reach of children.

Drinking methanol, ethanol or bleach DOES NOT prevent or cure COVID-19 and can be extremely dangerous

Methanol, ethanol, and bleach are poisons. Drinking them can lead to disability and death. Methanol, ethanol, and bleach are sometimes used in cleaning products to kill the virus on surfaces – however you should never drink them. They will not kill the virus in your body and they will harm your internal organs.

To protect yourself against COVID-19, disinfect objects and surfaces, especially the ones you touch regularly. You can use diluted bleach or alcohol for that. Make sure you clean your hands frequently and thoroughly and avoid touching your eyes, mouth and nose.

5G mobile networks DO NOT spread COVID-19

Viruses cannot travel on radio waves/mobile networks. COVID-19 is spreading in many countries that do not have 5G mobile networks.
COVID-19 is spread through respiratory droplets when an infected person coughs, sneezes or speaks. People can also be infected by touching a contaminated surface and then their eyes, mouth or nose.

Exposing yourself to the sun or to temperatures higher than 25C degrees DOES NOT prevent the coronavirus disease (COVID-19)

You can catch COVID-19, no matter how sunny or hot the weather is. Countries with hot weather have reported cases of COVID-19. To protect yourself, make sure you clean your hands frequently and thoroughly and avoid touching your eyes, mouth, and nose.

You can recover from the coronavirus disease (COVID-19). Catching the new coronavirus DOES NOT mean you will have it for life.

Most of the people who catch COVID-19 can recover and eliminate the virus from their bodies. If you catch the disease, make sure you treat your symptoms. If you have cough, fever, and difficulty breathing, seek medical care early – but call your health facility by telephone first. Most patients recover thanks to supportive care.

Being able to hold your breath for 10 seconds or more without coughing or feeling discomfort DOES NOT mean you are free from the coronavirus disease (COVID-19) or any other lung disease.

The most common symptoms of COVID-19 are dry cough, tiredness and fever. Some people may develop more severe forms of the disease, such as pneumonia. The best way to confirm if you have the virus producing COVID-19 disease is with a laboratory test. You cannot confirm it with this breathing exercise, which can even be dangerous.

Drinking alcohol does not protect you against COVID-19 and can be dangerous

Frequent or excessive alcohol consumption can increase your risk of health problems.

COVID-19 virus can be transmitted in areas with hot and humid climates

The best way to protect yourself against COVID-19 is by maintaining physical distance of at least 1 metre from others and frequently cleaning your hands. By doing this you eliminate viruses that may be on your hands and avoid infection that could occur by then touching your eyes, mouth, and nose.

Cold weather and snow CANNOT kill the new coronavirus.

There is no reason to believe that cold weather can kill the new coronavirus or other diseases. The normal human body temperature remains around 36.5°C to 37°C, regardless of the external

temperature or weather. The most effective way to protect yourself against the new coronavirus is by frequently cleaning your hands with alcohol-based hand rub or washing them with soap and water.

Taking a hot bath does not prevent the new coronavirus disease

Taking a hot bath will not prevent you from catching COVID-19. Your normal body temperature remains around 36.5°C to 37°C, regardless of the temperature of your bath or shower. Actually, taking a hot bath with extremely hot water can be harmful, as it can burn you. The best way to protect yourself against COVID-19 is by frequently cleaning your hands. By doing this you eliminate viruses that may be on your hands and avoid infection that could occur by then touching your eyes, mouth, and nose.

The new coronavirus CANNOT be transmitted through mosquito bites.

To date there has been no information nor evidence to suggest that the new coronavirus could be transmitted by mosquitoes. The new coronavirus is a respiratory virus which spreads primarily through droplets generated when an infected person coughs or sneezes, or through droplets of saliva or discharge from the nose. To protect yourself, clean your hands frequently with an alcohol-based hand rub or wash them with soap and water. Also, avoid close contact with anyone who is coughing and sneezing.

Are hand dryers effective in killing the new coronavirus?

No. Hand dryers are not effective in killing the 2019-nCoV. To protect yourself against the new coronavirus, you should frequently clean your hands with an alcohol-based hand rub or wash them with soap and water. Once your hands are cleaned, you should dry them thoroughly by using paper towels or a warm air dryer.

Ultra-violet (UV) lamps should not be used to disinfect hands or other areas of your skin

UV radiation can cause skin irritation and damage your eyes.
Cleaning your hands with alcohol-based hand rub or washing your hands with soap and water are the most effective ways to remove the virus.

How effective are thermal scanners in detecting people infected with the new coronavirus?

Thermal scanners are effective in detecting people who have developed a fever (i.e. have a higher than normal body temperature) because of infection with the new coronavirus.
However, they cannot detect people who are infected but are not yet sick with fever. This is because it takes between 2 and 10 days before people who are infected become sick and develop a fever.

Do vaccines against pneumonia protect you against the new coronavirus?

No. Vaccines against pneumonia, such as pneumococcal vaccine and Haemophilus influenza type B (Hib) vaccine, do not provide protection against the new coronavirus.
The virus is so new and different that it needs its own vaccine. Researchers are trying to develop a vaccine against 2019-nCoV, and WHO is supporting their efforts.

Although these vaccines are not effective against 2019-nCoV, vaccination against respiratory illnesses is highly recommended to protect your health.

Can regularly rinsing your nose with saline help prevent infection with the new coronavirus?

No. There is no evidence that regularly rinsing the nose with saline has protected people from infection with the new coronavirus.

There is some limited evidence that regularly rinsing nose with saline can help people recover more quickly from the common cold. However, regularly rinsing the nose has not been shown to prevent respiratory infections.

Can eating garlic help prevent infection with the new coronavirus?

Garlic is a healthy food that may have some antimicrobial properties. However, there is no evidence from the current outbreak that eating garlic has protected people from the new coronavirus.

Does the new coronavirus affect older people, or are younger people also susceptible?

People of all ages can be infected by the new coronavirus (2019-nCoV). Older people, and people with pre-existing medical conditions (such as asthma, diabetes, heart disease) appear to be more vulnerable to becoming severely ill with the virus.

WHO advises people of all ages to take steps to protect themselves from the virus, for example by following good hand hygiene and good respiratory hygiene.

Are antibiotics effective in preventing and treating the new coronavirus?

No, antibiotics do not work against viruses, only bacteria.

The new coronavirus (2019-nCoV) is a virus and, therefore, antibiotics should not be used as a means of prevention or treatment.

However, if you are hospitalized for the 2019-nCoV, you may receive antibiotics because bacterial co-infection is possible.

Are there any specific medicines to prevent or treat the new coronavirus?

To date, there is no specific medicine recommended to prevent or treat the new coronavirus (2019-nCoV).

However, those infected with the virus should receive appropriate care to relieve and treat symptoms, and those with severe illness should receive optimized supportive care. Some specific treatments are under investigation, and will be tested through clinical trials. WHO is helping to accelerate research and development efforts with a range or partners.

Participate in a Return to School Citizen's Planning Group

Standard Benchmark	**Civics 4a**: Students will develop and employ the skills necessary to work with government programs and agencies **Civics 4b**: Students will understand the process of working within a political party, a commission engaged in examining public policy, or a citizen's group.
Grade	10
Vocabulary	Cost Benefit Analysis

This lesson was developed by the University of Delaware's Democracy Project
~Modified and added to by CSD for use at home~

Directions:
Schools have been closed since March due to the coronavirus and will remain so through the rest of this school year. While online and at-home teaching and learning continue, schools and districts are now thinking about safe and effective ways to transition back into schools in the fall. In fact, leaders around the country are formulating plans as you read this.

Policymakers are interested in students' ideas about what the "return to school" plans should look like, as you were the ones experiencing many of the shifts from classroom to at-home learning. There are five specific return issues that they want you to consider.

Scenario: Your school board announced plans to set up a youth-citizens group to begin planning for students to return to school in the fall of 2020. You and members of your class are asked to serve and contribute ideas for the return to school plan. They hope that students can come up with great ideas that they have not thought about. In this activity, your task is to create recommendations for the "return to school" plan with an opportunity to suggest some or all of them to members of your principal or school board members.

ACTIVITY 1:
Read through the "Issues" and use the questions to guide you to come up with your ideas – Make sure each question is addressed. You should come up with at least two ideas (recommendations) for each of the 6 issues (Social distancing, Learning Loss, Safety, Event Planning, Extra-Curricular Activities, Plan B Group).
The issues that you have been asked to consider appear below.

Issues to Consider and Required Elements of this Return to School Plan

- **Social Distancing** – experts from the field of medicine believe that the coronavirus will still be around in the fall and that social distancing will be necessary to ensure that it does not spread. Among the matters to consider are: will all grades return every day; the numbers of students who may be in classes, on busses, in the cafeteria for breakfast and lunch, in hallways before and after school as well as between classes; how to prevent crowds entering and leaving the school building at the beginning and end of a school day; a school-wide hall pass policy that limits the number of students in the hallways; staggered bell schedules etc.
    - How should a return to school plan address the issue of social distancing?
- **Learning Loss** – Learning loss is a term used to describe the phenomenon whereby students forget what they learned due to being out of school for an extended period of time. It can also refer to content that was not covered because schools were closed. In many cases, less learning occurred during the time when schools shifted to online instruction, and when schools decided not to move forward with "new learning". Additionally, many students may not have had access to laptops or the internet while others did. As a result, those students were unable to participate in online learning sessions. Therefore, there may also be gaps in how much was learned between the "hads" (had technology) and the "had nots" (did not have technology).
    - How should a return to school plan address the issue of learning loss?
- **Safety** – we should assume that the coronavirus will still be around and that we will not know definitely know who has had it, who has it, and who does not have it. In addition to social distancing, what other measures might be put in place

to limit chances that the virus will spread throughout the school building (e.g. require masks, testing negative, taking temperatures, handwashing, sanitizing the building and busses, borrowing of school supplies such as pencils, trading food/snacks etc.)?
    - How should a return to school plan address the issue of safety?
- **Event Planning** - there are many events that take place during the school year such as dances, proms, graduations, awards nights etc. Some students are missing-out on those this year. Should they be rescheduled? You also have to think about events that will normally occur next school year.
    - How should a return to school plan address the issue of event planning?
- **Extra-Curricular Activities** – in addition to scheduling classes, any return to school plan must include recommendations for extra-curricular activities such as sports and clubs. Some sports can pose higher risks of spreading due to close contact, perspiration etc. In addition, will fans be permitted to attend any activities that might be held?
    - How should a return to school plan address the issue of extra-curricular activities?
- **Plan B Group** – smart citizens always have a Plan B in mind. What if schools cannot re-open? Based on what you are experiencing during school closure this semester, what recommendations do you have if schools remain closed in the fall? Focus on the following issues:
    - test everyone at the beginning of the year to determine what they know or skip the testing and begin teaching on day 1?
    - continue online learning or use packets of lessons sent to students?
    - let teaching proceed as if it is a normal school year or pick-up with the content where schools left off when schools closed back in March?
    - grade work or pass-fail?

ACTIVITY 2:

Before you decide on which final recommendations to make, do a cost-benefit analyses for each idea. What will the costs of each recommendation be, and what will the benefits be? Use the results of your cost-benefit analyses to decide what to recommend and how to support each recommendation. This can be completed in the charts on pages 2, 3, & 4.

COST / BENEFIT ANALYSIS

Cost = what you give up when you decide to do something

Benefit = something that satisfies your wants

From: https://en.wikipedia.org/wiki/Cost%E2%80%93benefit_analysis

Cost–benefit analysis (CBA), sometimes also called benefit–cost analysis or benefit costs analysis, is a systematic approach to estimating the strengths and weaknesses of alternatives used to determine options which provide the best approach to achieving benefits while preserving savings (for example, in transactions, activities, and functional business requirements).[1] A CBA may be used to compare completed or potential courses of actions, or to estimate (or evaluate) the value against the cost of a decision, project, or policy. It is commonly used in commercial transactions, business or policy decisions (particularly public policy), and project investments.

CBA has two main applications:[2]

1. To determine if an investment (or decision) is sound, ascertaining if – and by how much – its benefits outweigh its costs.
2. To provide a basis for comparing investments (or decisions), comparing the total expected cost of each option with its total expected benefits.

The following is a generic cost-benefit analysis that you might find helpful to determine your best ideas / recommendations:

1. Define the goals and objectives of the action.
2. List alternative actions
3. List stakeholders
4. Select measurement(s) and measure all cost and benefit elements.
5. Predict outcomes of costs and benefits over the relevant time period.

ISSUE: SOCIAL DISTANCING

Idea / Recommendation #1: _____

Cost of the Recommendation	Benefit of the Recommendation

Idea / Recommendation #2: _____

Cost of the Recommendation	Benefit of the Recommendation

ISSUE: Learning Loss

Idea / Recommendation #1: _____

Cost of the Recommendation	Benefit of the Recommendation

Idea / Recommendation #2: _____

Cost of the Recommendation	Benefit of the Recommendation

ISSUE: Safety

Idea / Recommendation #1: _____

Cost of the Recommendation	Benefit of the Recommendation

Idea / Recommendation #2: _____

Cost of the Recommendation	Benefit of the Recommendation

ISSUE: Event Planning

Idea / Recommendation #1: _____

Cost of the Recommendation	Benefit of the Recommendation

Idea / Recommendation #2: _____

Cost of the Recommendation	Benefit of the Recommendation

ISSUE: Extra-Curricular Activities

Idea / Recommendation #1: _____

Cost of the Recommendation	Benefit of the Recommendation

Idea / Recommendation #2: _____

Cost of the Recommendation	Benefit of the Recommendation

ISSUE: Plan B Group

Idea / Recommendation #1: _____

Cost of the Recommendation	Benefit of the Recommendation

Idea / Recommendation #2: _____

Cost of the Recommendation	Benefit of the Recommendation

ACTIVITY 3:

What are your final recommendations? Fill out the recommendation sheet (page 6). Make sure to describe, stipulate and be precise in your recommendations. Use the cost benefit analysis to support your recommendations.

RECOMMENDATIONS FOR RETURN TO SCHOOL PLANNING

Issue: _____

The Recommendation: _____
_____
_____
_____

Issue: _____

The Recommendation: _____
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Issue: _____

The Recommendation: _____
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Issue: _____

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Issue: _____

The Recommendation: _____
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Benchmark Standard	Economics 1a: Students will demonstrate how economic choices are made in a market economy in which markets and the actions of the government influence the production and distribution of goods and services.
Grade	10
Vocabulary	Automation; Human Capital; Law of demand; Physical capital; Technological advance Budget; Disposable income; expenditures; income; per capita; productivity; saving; spending

Will Robots Take Our Jobs?

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"Robots will harvest, cook, and serve our food. They will work in our factories, drive our cars, and walk our dogs. Like it or not, the age of work is coming to an end." —**Gray Scott, futurist philosopher**

GLOSSARY

Automation: Automatically controlled operation of an apparatus, process, or system by mechanical or electronic devices that take the place of human labor.

Human capital: The knowledge and skills that people obtain through education, experience, and training.

Law of demand: As the price of a good or service rises, the quantity demanded of that good or service falls. Likewise, as the price of a good or service falls, the quantity demanded of that good or service rises.

Physical capital: Goods that have been produced and are used to produce other goods and services. They are used over and over again in the production process; also called capital goods and capital resources.

Technological advance: An advance in overall knowledge in a specific area; also known as technological change.

"Robot Apocalypse" is a modern expression that refers to a fear of **technological advance**, but the anxiety goes back centuries.1 In 1589, Queen Elizabeth refused to grant the inventor of a mechanical knitting machine a patent for fear of putting manual knitters out of work.2 In the early 19th century, textile artisans called Luddites attempted to prevent or derail the mechanization of the textile industry. Even economists, such as John Maynard Keynes, have worried about "technological unemployment."3 The fear has not receded. A recent headline from Business Insider suggests that "machines may replace half of human jobs."4 Before your anxiety rises to uncomfortable levels, consider economist David Autor's warning that journalists tend to overstate the extent to which machines will substitute for human labor and ignore the positive aspects that benefit workers and create jobs.5

Robots, Artificial Intelligence, and Automation

What exactly is a "robot"? We might envision a Star Wars-like robot in the vein of R2-D2 or C-3PO, but a robot is any device or algorithm that does what humans once did, from mechanical combines and thermostats to dishwashers and airfare search sites.6 And, unlike other **physical capital** or forms of technology, robots can be programmed to perform many tasks and do not need a human operator.7 Robots are very good at doing routine or repetitive tasks. The jobs that include many of these types of tasks are most susceptible to **automation**, which means that once the technology is in place and programmed, the production process happens automatically (without human assistance). As computer processing has become faster and cheaper, it is cost-effective to have robots do more routine tasks previously done by humans. These are tasks that can be divided into steps and then into computer code for a computer to replicate. Some of these tasks are mathematical calculations, information retrieval, and data sorting. It is more difficult to automate tasks that require flexibility, judgment, intuition, creativity, and common sense. 8

Automation does not mean that jobs with routine or repetitive tasks will simply disappear. When ATMs were introduced during the 1970s, many worried that they would replace bank branches and tellers and that employment would contract. Actually, because ATMs reduced the cost of operation, the number of bank branches increased. And while the number of tellers per branch decreased, because there were more branches, there were more employment opportunities for tellers. There were more tellers employed in 2010 than in 1980, and their duties have since expanded to include "relationship banking"—something ATMs cannot do.9 A similar effect has occurred in auto manufacturing: While much manual human labor has been replaced by automation, cars have become more complex, requiring more labor. As a result, it takes more human labor to produce a car now than in the past.10

Substitute or Complement?

The way technology impacts jobs has to do with the way workers relate to the technology. It's important to differentiate between two similar terms here: physical capital and technology. Physical capital is all the tools and equipment used to produce other goods and services. Technology includes the knowledge, processes, and techniques used to produce goods and services. In other words, technology is all the intangible features embodied in the physical capital. Think of an iPhone— for a business, it is physical capital, but the difference between the original iPhone and the iPhone 10 is a difference in technology.

Physical capital, in its current state of technology, often substitutes for human labor. In fact, that is often the reason it is developed. But technology also complements labor; it raises the output in ways that lead to a higher demand for labor. For example, think of the spreadsheet software on your computer. It can be used to organize information into columns, but it can also be used as a high-powered calculator to process thousands of pieces of data at one time. The development of spreadsheet software during the early 1980s made repetitive calculations simpler and faster. In fact, the spreadsheet replaced the work that bookkeepers used to do in ledgers with simple adding machines and calculators—it substituted for the labor of bookkeepers. But spreadsheets also created demand for people who could analyze numbers in new and interesting ways, such as accountants and management consultants.11 Why? Remember the **law of demand**: As the price of something decreases, the quantity demanded of that good increases. Because the spreadsheet reduced the price of calculations (a cost to firms), it increased the quantity of calculations demanded. As more calculations were demanded, the demand for data analysis performed by accountants and management consultants increased as well. So, the spreadsheet was a substitute for bookkeepers but a complement to the work of accountants and consultants—higher-skilled jobs. And the growth in accounting and analytical jobs since the 1980s has been much larger than the loss of bookkeeping jobs.12

In fact, as some sectors contract due to technology (substitution), other (complementary) sectors arise . In 1900, 41 percent of the U.S. workforce was employed in agriculture; by 2000 that share had fallen to 2 percent, mostly due to substituting capital for labor.13 While agricultural jobs became a smaller part of the labor force, manufacturing, service, and repair of farm machinery increased. As passenger cars displaced the horse and buggy (and the jobs associated with them) during the 1920s, motel and fast-food industries rose up to serve the "motoring public."14

Changes in technology will likely change the types of jobs available and what those jobs pay. As technology substitutes for routine work, economists suggest that polarization will likely result. This means that many jobs in the "middle" will disappear through automation, but the number of low-skill/low-income jobs and high-skill/ high-income jobs will see gains. In both cases, it is because these types of jobs are difficult to automate. Low-skill jobs often require skills such as adaptability, physical mobility, and interpersonal interaction—food preparation and serving, cleaning and janitorial services, home healthcare, hair styling—which are difficult to replicate through automation. On the other side are "abstract" jobs that require skills such as problem-solving, intuition, creativity, and persuasion; in the job market these are professional, technical, and managerial positions. These workers generally have a lot of education, and the jobs require inductive reasoning, communication, and specialized skills.15 Some economists worry that in addition to jobs migrating to the two ends of the skills spectrum, the gap between high-income workers and middle- and low-income workers will grow even wider.16

Preparing For Change

The transition from an agricultural economy in 1900 to an industrial economy in later decades coincided with a change in the education system. In 1900, the typical American had only a common school education, equivalent to six or eight years of formal schooling. From 1910-1940, the United States engaged in the high school movement and became the first nation in the world to deliver universal high school education to its citizens. The fraction of youths enrolled in U.S. high schools increased from 18 percent to 71 percent.17 This constituted a dramatic increase in the **human capital** of the American work force, which enabled the economy to make the transition from agriculture to industry. Similarly, as the economy employs more robots and automation, the need for manual and repetitive labor will decrease, and the demand for computer programmers, engineers, and problem solvers will increase.

And, like the transition from agriculture to industry, investments in human capital by parents, students, and governments will play an important role in the preparation of workers. Andrew McAfee, an economist who has researched the topic, suggests that students pursue a double major, one in liberal arts (to develop problemsolving, creativity, and critical-thinking skills) and another in the sciences (to develop quantitative and technological skills).18 This pairing reflects what many economists suggest about the jobs of the future, where human skills and judgment will be bundled with technological automation. For workers to be employable, they must acquire the skills necessary to ensure that technology is a complement rather than a substitute for their human capital. And education will not end with a high school or postsecondary education; employability will mean constantly upgrading skills and education.

The Future: Intolerable Abundance or Continued Scarcity?

While humans have long feared technology and robots automating all the jobs of society, one might wonder if that is such a bad thing. Remember that while robots can produce goods and services, they don't consume in the way humans do. We currently live in an economy where most people exchange their labor resources for income, and then they use their income to purchase goods and services. And we live in a world where there are not enough resources to fulfill everyone's wants; in other words, we live in a condition of scarcity. But if we're in a world where robots do the work, then goods and services are plentiful, and the demand for labor is greatly reduced (a post-scarcity world).19 This futuristic, post-scarcity world poses new problems, such as how will goods and services be distributed among people? And who will pay taxes? Mark Zuckerberg (Facebook)20 and Elon Musk (Tesla)21 suggest that the benefits of automation be used to fund continuous education and universal basic income.22 Bill Gates suggests that the government should tax the work done by robots to compensate the workers they replace.23 Economist Larry Summers disagrees with Bill Gates. He says that because robots provide society with many benefits, taxing (and thereby reducing) them is counterproductive.24 Summers, and others, suggest that subsidizing education and training is a more effective means of supporting people who lose their jobs to robots.

Conclusion

Considering a world where distribution (not scarcity) is the central problem is interesting, but many economists see this as needless worry. Productivity-enhancing technology has changed the economy in dramatic ways over the past two centuries, and it has not made human labor obsolete. Nor has it eliminated the problem of scarcity. Herbert Simon, economist, computer scientist, and Nobel laureate, wrote in the 1960s (another period of automation anxiety), "Insofar as they are economic problems at all, the world's problems in this generation and the next are problems of scarcity, not of intolerable abundance. The bogeyman of automation consumes worrying capacity that should be saved for real problems."25 In short, many economists see the current wave of new technology and automation as a trend that has been occurring for most of human history, and one that will continue in the future. The challenge is in equipping future workers with the skills they need to be competitive and productive in a changing economy.

NOTES

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18 Regalado (2012; see footnote 16).

19 Autor (2015; see footnote 8).

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22 Sodha (2017; see footnote 20).

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After reading the article, complete the following on a separate sheet of paper:

1. What types of jobs are most likely to be automated? What types of tasks are difficult to automate?
2. Does automation mean fewer jobs in an industry? Why or why not? (Clue: Consider the impact of ATMs on banking jobs.)
3. How can technology both complement and substitute for human labor? Provide an example.
4. How does education play a role in preparing workers for the changing needs of employers? How should students prepare for the expected changes in the labor market?
5. Adjusting for the future:
    a. What does Bill Gates propose?
    b. What does economist Larry Summers propose?

Smart Phones and Budget Changes

Jeannette n. Bennett, Senior Economic Education Specialist

"A wise man adapts himself to circumstances, as water shapes itself to the vessel that contains it." **—Chinese proverb**

GLOSSARY

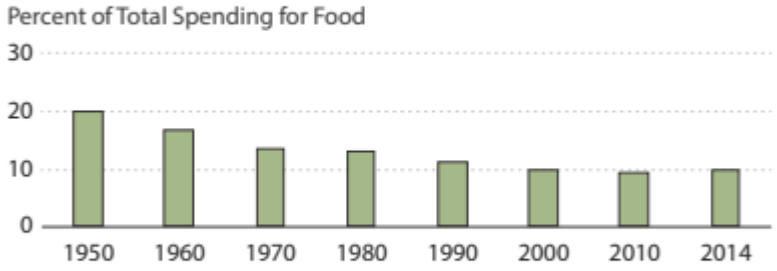
Budget: An itemized summary of probable income and expenses for a given period; a plan for managing income, spending, and saving during a given period.
Disposable income: The amount of a person's paycheck that is available to spend or save.
Expenditures: Money spent to buy goods and services.
Income: The payment people receive for providing resources in the marketplace. When people work, they provide human resources (labor) and in exchange receive income in the form of wages or salaries. People also earn income in the form of rent, profit, and interest.
Per capita: Per person. Determined by dividing the total quantity by the total population.
Productivity: The ratio of output per worker per unit of time.
Saving: Income not spent on current consumption or taxes. Saving involves giving up some current consumption for future consumption.
Spending: Using some or all of your income to buy things you want now.

Introduction

Everyone wants financial success, but how can it be achieved? A first step in attaining this goal is making a **budget**. This means creating a plan that ensures an effective way to balance **income**, **spending,** and **saving** during a given time. Because a budget is so valuable, it is specifically included in the National Standards in Personal Finance: "People can improve their economic well-being by making informed spending decisions, which entails collecting information, planning, and budgeting."1

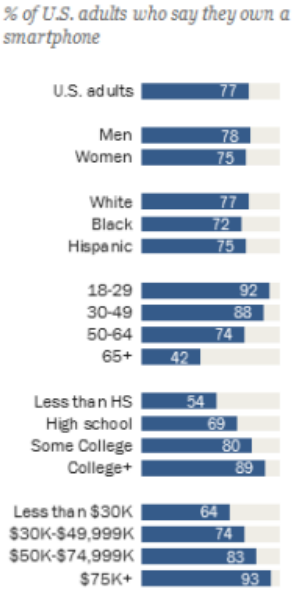
Yesterday's budget won't work for today. Consumer spending patterns change in response to changes in other aspects of life, such as income, workforce and educational levels, family demographics, and technology. Food expenditures is one example: The percentage of **per capita disposable** income spent on food from 1950 to 2014 changed dramatically. In 2014, consumers had about 10 percent more of their disposable income available for things other than food than consumers did in 1950. (See Figure 1.) Certainly, a budget designed in 1950 would look quite different from one created today.

Figure 1
Percent of Per Capita Disposable Income Used for Food Expenditures in the United States, 1950-2014



SOURCE: USDA, Economic Research Service, Food Expenditures Series, Table 7, Food expenditures by families and individuals as a share of disposable personal income; https://www.ers.usda.gov/data-products/food-expenditures/.

Figure 2
Roughly Three-Quarters of Americans Own a Smart Phone



NOTE: The White and Black segments include only non-Hispanics. The survey was conducted from September 29 through November 6, 2016.

SOURCE: Reprinted with permission from the Pew Research Center. http://www.pewresearch.org/fact-tank/2017/06/28/10-facts-about-smartphones/.

Phone Technology Changes Our Lives and Our Budgets

Food expenditures are not the only expenditures that affect a budget over time. Spending patterns also change because of the vast number of consumer goods and services that continue to be developed and gradually become accepted as necessities. Of course, technology has played a huge role in this change. For example, in 1900, only one out of twenty people had a telephone; at that time, telephones were not considered necessities to include in a budget.2

It's a different story today. A survey conducted in December 2016 by the National Health Interview Survey (NHIS) of the civilian noninstitutionalized U.S. population indicated approximately 97 percent of households had telephone service and 50.8 percent had only wireless phone service. That

year was the first time a majority of American homes had only wireless telephones.3 Clearly, telephones have now been accepted as necessities and should be considered in a household budget.

The Government's Support for Phones

The government validated the use of and dependence on phones. As part of the 1996 Telecommunications Act, a federal government-sponsored and regulated program began to assist in the cost of landline phones. The program was designed to "ensure all Americans, including low-income consumers and those who live in rural, insular, high cost areas, shall have affordable service and help to connect eligible schools, libraries, and rural health care providers to the global telecommunications network."4 In 2008, this program moved into the cellular (cell) phone market. As cell phones began to increase in popularity, the program made cell phones and cell phone service free for qualifying consumers—with qualification determined by income level and/or participation in other federal or state assistance programs. The program allows eligible consumers to choose among cell phone companies. Individual plans vary according to the company chosen and often vary from state to state. Some states offer unlimited calling, texting, and even some data allowance; other states offer lesser plans. Although estimates vary, as many as 12 to 15 million Americans participate in the free cell phone program.5

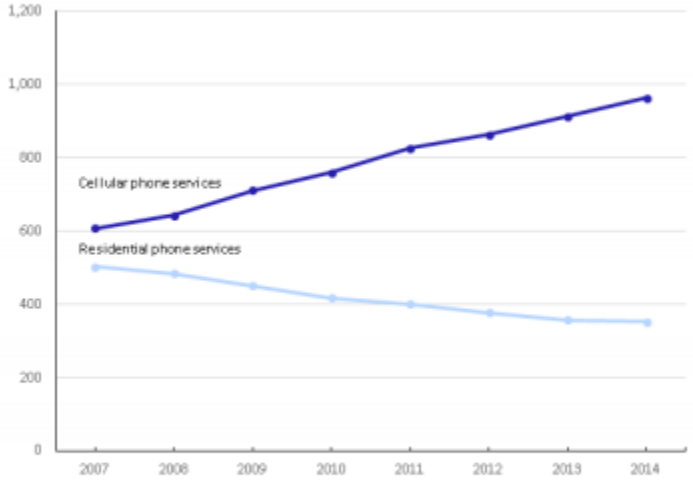
The Cell Phone Revolution The mobile/cell phone revolution began in 1973. This invention brought drastic changes to communication as well as expenditures. New products with new features offered new choices for consumers, with styles and models such as the Brick phone, the Clamshell, the Candybar, and the Razr flip phone. Service providers soon promoted contracts for phone service. By 2007, Apple had created the iPhone, and the smartphone world was born.6

The smartphone expanded the traditional phone by providing the work and services of a computer in a very small and convenient package. American consumers were quick to adopt this technology. A 2014 survey conducted by the Pew Research Center found that 46 percent of smartphone owners said their smartphone is something "they couldn't live without."7 Additional research conducted by the Pew Research Center in late 2016 estimated that 77 percent of American adults owned a smartphone. This 2016 survey indicated younger adults, those with higher levels of education, and those with higher income levels had the highest percentages of smartphone ownership.8 (See Figure 2.)

But other groups have also latched on to the new technology. The survey showed that 42 percent of adults age 65 and older owned a smartphone. While this group represented the lowest ownership among all groups, it was still a fast-growing group: From 2013 to 2016, their smartphone ownership rate increased 24 percent.9 Clearly, seniors have also been jumping on the smartphone bandwagon.

Figure 3

Average Annual Expenditures in Cellular and Residential Phone Services, 2007-2014



SOURCE: USDA, Brett Creech, "Expenditures on cellular phone services have increased significantly since 2007," *Beyond the Numbers: Prices & Spending*, Vol. 5, No. 1 (U.S. Bureau of Labor Statistics, February 2016); https://www.bls.gov/opub/btn/volume-5/expenditures-on-celluar-phone-services-have-increased-significantly-since-2007.htm.

Average Annual Expenditures on Cellular Phone Service Spending from 2007 to 2014 by Age Group

Age Group	Expenditure 2007	Expenditure 2014	Change in Dollars
Under 25 years	$560	$677	$117
25-34 years	728	1,048	320
35-44 years	757	1,250	493
45-54 years	753	1,248	495
55-64 years	546	970	424
65 years and older	264	534	270
65-74 years	374	675	301
75 years and older	148	348	200

SOURCE: U.S. Bureau of Labor Statistics. Brett Creech, "Expenditures on cellular phone services have increased significantly since 2007," *Beyond the Numbers: Prices & Spending*, vol. 5, no. 1 (U.S. Bureau of Labor Statistics, February 2016), Table 2. https://www.bls.gov/opub/btn/volume-5/expenditures-on-celluar-phone-services-have-increased-significantly-since-2007.htm.

Smartphone Usage

How much time do consumers spend using their smartphones? Different reports offer different answers. For example, one 2017 report shows average usage in the United States is a little over 2½ hours per day.10 A different 2017 source says U.S. consumers now spend 5 hours per day on mobile devices.11 The one definite answer is that consumers are increasingly connected to their smartphones and are seldom found "phoneless."

Increasing Expenditures

The cost of smartphone ownership can vary depending on the phone itself, the contract, and the options pur chased. When the smartphone revolution began in 2007, expenditures for cellular phone service in the United States exceeded the amount spent on landlines, or residential lines, for the first time. Expenditures on cellular phone services continue to rise rapidly.12 (See Figure 3.) From 2007-14, the expenditures on cell phone service increased among all age groups. (See the table.) Of course, there are more features and advanced technology involved each time the price tag increases. Fingerprint scanners, faster-charging batteries, better cameras, and more memory are examples of technology included in the newer often-higher price tags.

Conclusion

The percent of per capita disposable income used for food expenditures over the years has decreased; the expenditures on cell phones have increased. These examples demonstrate that a budget is dynamic and requires regular adjustment.

The first mobile phones were designed only for making calls. These were replaced with an advanced cell phone, appropriately called the smartphone. With its capability to perform advanced technological tasks, the smartphone has been accepted for its convenience as well as its ability to increase productivity. The cell phone revolution has changed both the way we interact with our world and our spending choices. And circumstances will continue to change. Technology will continue to bring new developments that will gradually become accepted as necessities and, therefore, change spending patterns. A deliberate adaptation to shifts in spending patterns is a step toward financial success. A recent study by U.S. Bank shows that only 41 percent of Americans use a budget.13 Perhaps this will change with more attention and application of the Chinese proverb: A wise man adapts himself to circumstances, as water shapes itself to the vessel that contains it. nThe percent of per capita disposable income used for food expenditures over the years has decreased; the expenditures on cell phones have increased. These examples demonstrate that a budget is dynamic and requires regular adjustment. The first mobile phones were designed only for making calls. These were replaced with an advanced cell phone, appropriately called the smartphone. With its capability to perform advanced technological tasks, the smartphone has been accepted for its convenience as well as its ability to increase productivity. The cell phone revolution has changed both the way we interact with our world and our spending choices. And circumstances will continue to change. Technology will continue to bring new developments that will gradually become accepted as necessities and, therefore, change spending patterns.

A deliberate adaptation to shifts in spending patterns is a step toward financial success. A recent study by U.S. Bank shows that only 41 percent of Americans use a budget.13 Perhaps this will change with more attention and application of the Chinese proverb: A wise man adapts himself to circumstances, as water shapes itself to the vessel that contains it.

Notes

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8 Ibid.

9 Ibid.

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12 Creech, Brett. “Expenditures on cellular phone services have increased significantly since 2007,” Beyond the Numbers: Prices & Spending, vol. 5, no. 1 (U.S. Bureau of Labor Statistics, February 2016); https://www.bls.gov/opub/btn/volume-5/expenditures-on-celluar-phone-services-have-increased-significantly-since-2007.htm.

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After reading the article, select the best answer to each question.

1. Spending on cell phone service from 2007 to 2014
    a. increased in younger age groups and decreased in older age groups.
    b. increased among all age groups.
    c. decreased by a small percentage.
    d. decreased because of more features and added technology
2. On average, which age group spent the most on cellular phone service spending in 2014?

a. 75 years and older
b. under 25 years
c. between 25 and 34 years old
d. between 35 and 44 years old

3. Telephone expenditures have become part of household budgets because
   a. more than 90 percent of Americans use a budget.
   b. telephones are now accepted as necessities.
   c. government programs do not support telephone services.
   d. food expenses have increased.
4. On average, people in 1950 spent
   a. the same percentage of their disposable income on food as people did in 1960.
   b. a smaller percentage of their disposable income on food than people did in 1970.
   c. a greater percentage of their disposable income on food than people did in 2014.
   d. the same percentage of their disposable income on food as people did in 2000.
5. Government programs that support phone usage
   a. provide free cell phones to all American consumers.
   b. require consumers who are eligible for free cell phones to use the same cell phone company.
   c. first began in 1973 because of the cell phone revolution.
   d. were first started to help people with the cost of a landline phone.
6. The percentage of smartphone ownership in the United States
   a. is the same among all education levels of consumers.
   b. increases as the level of education increases.
   c. increases as the level of education decreases.
   d. is not affected by the level of education.
7. The smartphone
   a. was originally designed as the first of wireless phones.
   b. is a tool that can increase productivity.
   c. is helpful to only high income earners.
   d. was considered a necessity in the 1970s.
8. It is important to make regular adjustments to a household budget because
   a. the percentage of per capita disposable income spent on food increases each year.
   b. consumer spending patterns remain the same over the years.
   c. adapting to shifts in spending patterns is a step toward financial success.
   d. reports show fewer than half of Americans use a budget.
9. Since 2007, the average annual expenditures on residential phone services (landlines) have
   a. decreased each year.
   b. increased in all years except 2011, which showed a decrease.
   c. remained equal to the amount spent on cellular service.
   d. been greater than the amount spent on cellular service.
10. A budget is a plan that addresses a time period and
   a. will probably not need adjustments since the smartphone has already been invented.
   b. will be the same in 1950 and as it is in the current year.
   c. is helpful to only high income earners.
   d. helps to balance income, spending, and saving.

Explain your answers to questions 11 – 14 on a separate sheet of paper.

11. Today most consumers consider a cell phone to be a necessity. There are choices when selecting the phone itself, the contract, and the options purchased. The basic cell phone is much less expensive than a smartphone, but more consumers are choosing the more expensive smartphone. Explain reasons why consumers are willing to pay more for smartphones.
12. George is on a business trip and his flight includes a two-hour layover between connecting flights. Before he had a smartphone, he usually sat in the airport and waited. Sometimes he read a newspaper to pass the time. Now he has a smartphone. What are some work tasks that George can complete during this two-hour wait using his smartphone? How does having a smartphone affect the amount of work that George can complete?
13. Explain how the Chinese proverb “A wise man adapts himself to circumstances, as water shapes itself to the vessel that contains it” relates to managing a budget.
14. Give possible reasons why the number of landlines continues to decrease.