Career Awareness Bridge Curriculum

Math Resources

MATH 110 Landscape Horticulture   Worksheet #4

Ratios

The math name for a fraction is *ratio*. It is just a comparison of one quantity with another quantity that is similar. As a Landscape Horticulturist, you will use ratios often.

You can use ratios when you convert from one unit to another. Since 12 inches = 1 foot, the conversion ratio can be written as a fraction

$$\frac{\textbf{12 inches}}{\textbf{1 foot}} \quad \textit{or} \quad \frac{\textbf{1 foot}}{\textbf{12 inches}}$$

You can see that these ratios relate inches and feet.

Example 1: Using a ratio to convert from 2.5 feet into an equivalent number of inches, we use the first ratio.

$$(2.5\ \cancel{\text{feet}})\text{x}\left(\frac{12\ \text{inches}}{1\ \cancel{\text{foot}}}\right) = 30\ \text{inches}$$

So 2.5 feet equals 30 inches. Notice the feet units cancel (because $\frac{\text{feet}}{\text{feet}} = 1$; that is, anything divided by itself is equal to 1). Always arrange the number you want to convert and the unit conversion ratio so that the units you don't want cancel out and you are left with the units you do want in the numerator (along with some numbers).

Example 2: Using a ratio to convert from 42 inches into an equivalent number of feet, we use the second ratio.

$$(42\ \cancel{\text{inches}})\text{x}\left(\frac{1\ \text{foot}}{12\ \cancel{\text{inches}}}\right) = 3.5\ \text{feet}$$

So 42 inches equals 3.5 feet.

Notice that in each case, you use the conversion ratio that forces the units to cancel (divide) out. The units tell you which form of the conversion ratio you must use.

Example 3: Use a ratio to convert 14.4 feet into yards. There are 3 feet in one yard. So the ratio to convert from feet to yards is

$\left(\frac{1\,\text{yard}}{3\,\text{ft}}\right)$. If you wanted to convert from yards to feet you would multiply by $\left(\frac{3\,\text{ft}}{1\,\text{yard}}\right)$. So for our problem:

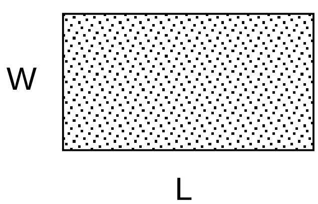
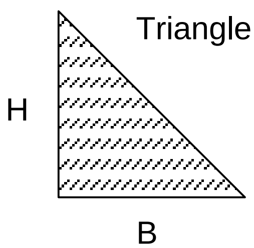
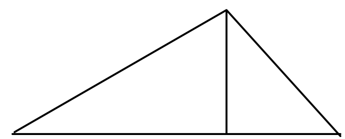
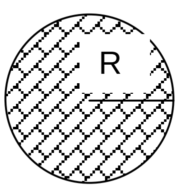
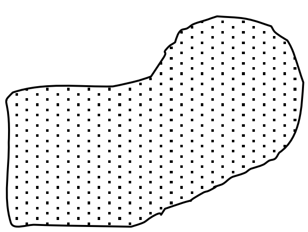
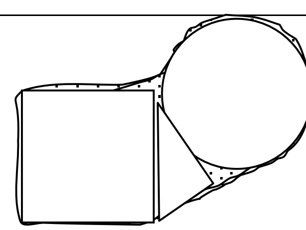
$(14.4\cancel{\text{ft}})\text{x}\left(\frac{1\,\text{yard}}{3\cancel{\text{ft}}}\right) = 4.8\,\text{yards.}$ Most people would convert the .8 yards into feet and inches.

To do that, first see how many feet there are in 0.8 yards:

$$(0.8\,\cancel{\text{yards}})\text{x}\left(\frac{3\,\text{ft}}{1\,\cancel{\text{yard}}}\right)=2.4\,\text{ft}$$. Then convert the .4 ft into inches:

$$(0.4\,\cancel{\text{ft}})\text{x}\left(\frac{12\,\text{inches}}{1\,\cancel{\text{ft}}}\right)=4.8\,\text{inches}$$. So there are 4 yards, 2 ft and 4.8 inches in 14.4 feet.

One of the most common calculations you will have to do is finding the *area* of a plot of ground in square feet or some other similar unit. We will look at how to calculate area and then how to convert from one area unit to another. To find the area of a plot, you first need to know the shape of the plot:

		Comments
Rectangle or Square  	Area of Square or Rectangle = Length x Width = L x W	It doesn't matter which side is called the length and which is called the width.
Triangle  	Area of Triangle = ½ Base x Height = ½ B x H	Big triangles can be broken into smaller ones: 
Circle  	Area of Circle = π x radius^2 = π x R^2	The radius is *half* way across the circle. You can always measure the *diameter* (all the way across) and divide by two to get the radius. $\pi = 3.14$
Irregular Shape 	For an irregular shape, divide the shape into smaller, regular shapes. Then find the area of each regular shape and add them together to get the total area of the irregular shape. With careful measurements you can be accurate to within 5 or 10%.	 Here, a square, a triangle, and a circle are used to estimate the area of the irregular shape.

Example 4: A rectangular flowerbed on a commercial property measures 15 feet by 32 feet. What is the area of the plot?

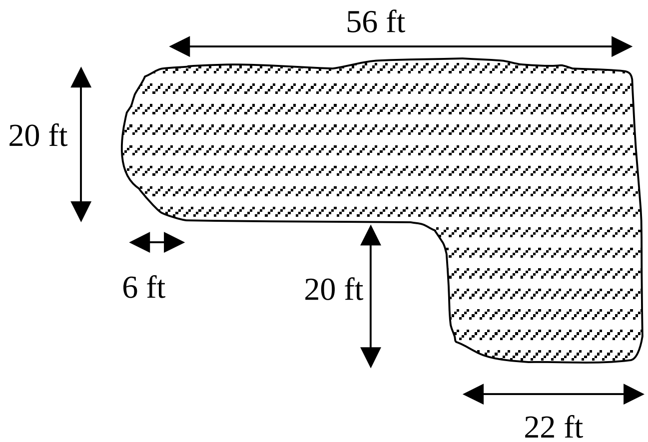
The area of a rectangular plot is length x width. So the area is (15 ft) x (32 ft) = 480 ft^2 = 480 square feet.

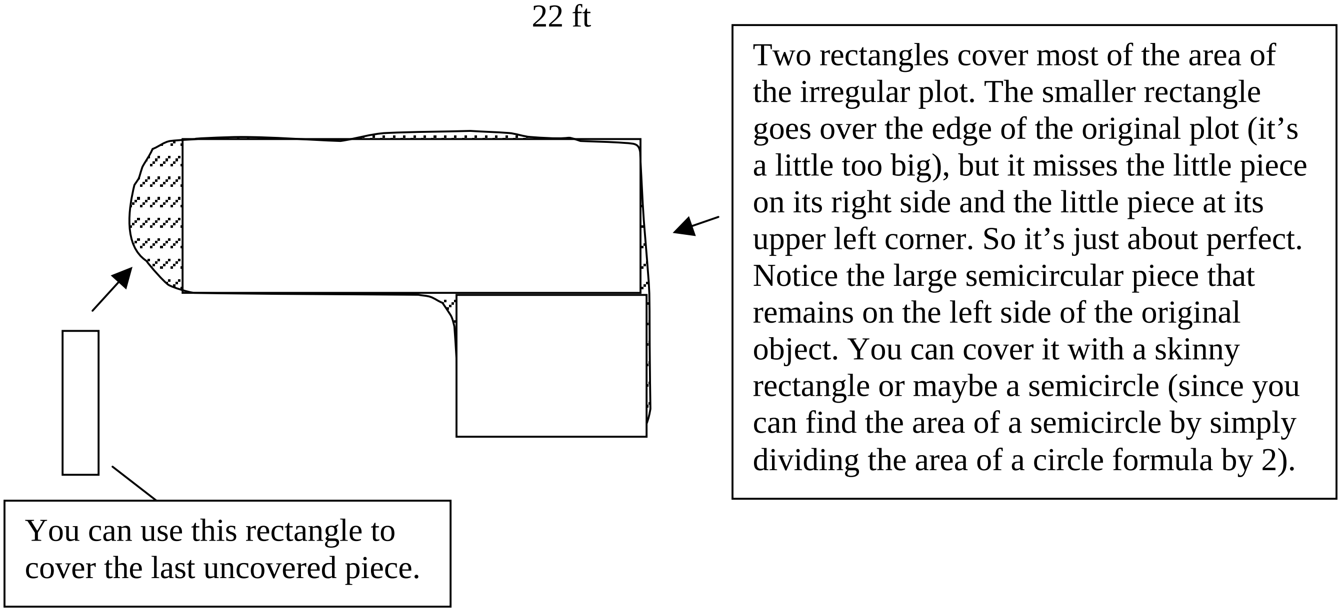
Example 5: The circular flowerbed at Acme corporate headquarters is 30 feet across. The label on a bale of compressed peat moss says it can cover an area of 86.4 square feet with a 1-inch deep layer of the moss. How many bales of peat moss should you buy for the job?

First find the area of the plot in square feet. Area of a circle = π x radius^2. But notice we are given the diameter of the circle, not the radius. To get the radius just divide the diameter by 2: radius = 30 feet/2 = 15 feet. So now: Area of a circle = π x radius^2 = (3.14) x (15 ft)^2 = 706.5 square ft.

Each bale of peat moss only covers an area of 86.4 square feet, so we will need (706.5 sq.ft)/(86.4 sq ft per bale) = 8.18 bales. So you better buy 9 bales of peat moss to do the job.

Example 6: Estimate the area of the following irregularly shaped plot of land:





Now to find the total area of the irregular shape, just find the areas of each piece we covered it with and add those areas together. The area of the big rectangle is: length x width = (56 ft) x (20 ft) = 1120 sq.ft.

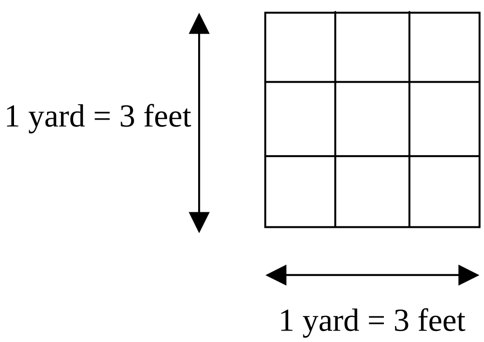
The area of the second biggest rectangle is length x width = (20 ft) x (22 ft) = 440 sq.ft.

The area of the smallest rectangle (the skinny one) is length x width = (20 ft) x (5 ft) = 100 sq. ft. Notice that the width is only 5 ft instead of 6 ft (the width of that semicircular area). That's because the corners of the rectangle stick out past the semicircular shape a bit. We can compensate for that bit of overestimation by making the rectangle a little narrower.

Therefore the total area of the irregular shape is approximately 1120 sq. ft. + 440 sq. ft. + 100 sq. ft. = 1660 sq. ft.

The next thing you might have to do is to convert from one area unit to another. For instance, say you made your measurements of a rectangular plot in yards: 12 yards by 21 yards. Then the area is (12 yards) x (21 yards) = 252 square yards. But say you need to know how many square feet that is. You need to first come up with the unit conversion ratio.

To figure out how many square feet there are in 1 square yard, consider the diagram below of a region that is 1 yard long on each side:



Since area of a square is length x width, the area of this region is (1 yard) x (1 yard) = 1 square yard. But since 1 yard is equal to 3 feet, we can rewrite this as

Area = (3 feet) x (3 feet) = 9 square feet. You can also count 9 squares, each 1 sq. ft., in the region.

Therefore, **1 square yard = 9 square feet.** This is our unit conversion that we can use to convert from sq. yards to sq. ft or vice versa.

So for a plot that is 252 square yards, we can find the number of square feet by

$$\left(\mathbf{252\ \cancel{square\ yards}}\right)\mathbf{x}\left(\frac{\mathbf{9\ square\ feet}}{\mathbf{1\ \cancel{square\ yard}}}\right)\mathbf{= 2268\ square\ feet}$$

. This method is identical to the method we used at the beginning of this document for converting units of length. Just arrange the unit conversion ratio so the units you want are on the top and the units you don't want anymore cancel out.

You can do a similar thing to find the unit conversions for other units as well. I will summarize the conversions in the table below. We'll save metric units for the last worksheet.

	Area Unit Conversions
1 yard = 3 feet	1 sq. yard = 9 sq. feet
1 yard = 36 inches	1 sq. foot = 144 sq. inches
1 foot = 12 inches	1 sq. yard = 1296 sq. inches
1 mile = 5280 feet	43,560 sq. feet = 1 acre
1 mile = 1760 yards	1 acre = 4840 sq. yard
	640 acres = 1 sq. mile

Example 7: A 1/8 acre piece of property needs topsoil. In order to figure out how much topsoil you will need, you would first have to find out how many square feet this lot is. Let's just do that.

We need to convert from acres to square feet:

$\left(\frac{1}{8}\ \cancel{\text{acre}}\right) x \left(\frac{43{,}560\ \text{sq.ft.}}{1\ \cancel{\text{acre}}}\right) = 5445\ \text{sq. ft.}$ Then if you knew how many inches deep you wanted the topsoil you figure out how much topsoil you would need (we'll save that kind of volume calculation for a later worksheet).

Homework Problems

1. How many inches are there in 22.5 feet?

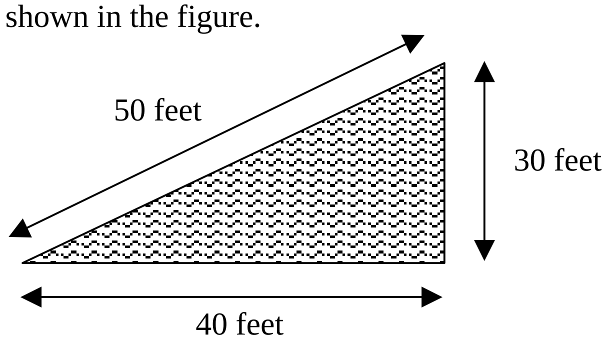
2. How many inches are there in 7.3 yards?

3. How many feet are there in 125.9 yards?

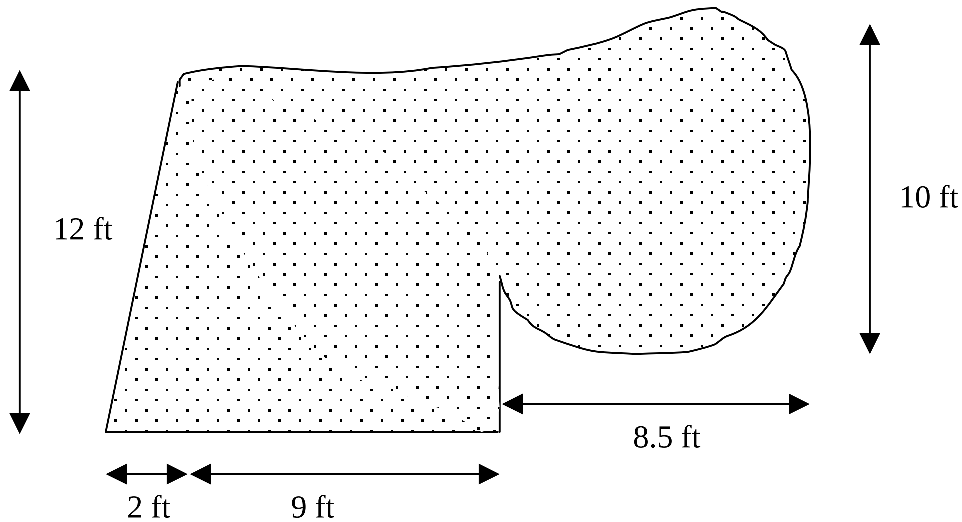
4. How many square feet are there in 19.3 square yards? How many square inches are there?

5. A rectangular plot of land measures 40 yards and 2 feet on one side and 41.5 yards on the other. How many **square yards** is this plot?

6. Find the area of the plot of land shown in the figure.



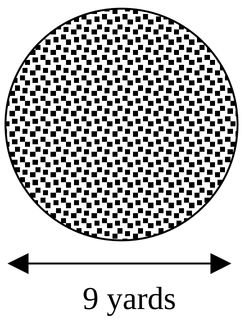
7. Estimate the area of the plot of land shown in the figure below.



8. The directions say to mix 1 teaspoon of an emulsifiable concentrate liquid herbicide per gallon of water to cover 100 square **yards** of lawn. Your lawn actually covers 1,250 square **feet**. How many gallons of spray mix do you actually need?

9. The directions say to apply 2 pounds of an herbicide product per 1,000 square **feet** of area. The planting bed to be treated covers 390 square **yards**. How many pounds of product need to be applied to this planting bed?

10. The flowerbed shown needs to be covered with leaf compost to a depth of 3 inches. You have bales of compost that say each bale will cover 28 sq. ft. to that depth. How many bales of compost do you need for the job?



Landscape Horticulture – Answer Key

1. 270”
2. 262.8”
3. 377.7”
4. 173.7 square feet 25,012.8 square inches
5. 1668.3 square yards
6. 60,000 square feet
7. 217 square feet
8. 1.38 gallons - need to round up to 2 gallons for purchasing
9. 3.03 bales – round up to 4 bales

Outcome #2 Rubber Band Cars

Resources/Materials

For each group of students:

- 16 in. x 16 in. sheet of corrugated cardboard (cereal box or smaller piece of cardboard can be used)
- Four CDs, paper plates, or plastic lids from yogurt, coffee or takeout food.
- 4 rubber bands
- 3 unsharpened pencils
- 4 paper clips
- 1 box thumb tacks
- Scissors
- Masking tape
- Meter or yardstick
- Stopwatch

Procedure

1. Show students the various Student Reference Sheets. These may be read in class or provided as reading material for the prior night's homework.
2. Divide students into groups of 3 or 4 students, providing each group a set of materials.
3. Explain that students must develop a car powered by rubber bands from everyday items, and that the rubber band car must be able to travel a distance of at least 3 meters within a 1 meter wide track. Rubber bands cannot be used to slingshot the cars. The car that can travel within the track for the greatest distance is the winner.
4. Students meet and develop a plan for their rubber-band car. They agree on materials they will need, write or draw their plan, and then present their plan to the class.
5. Student teams may trade unlimited materials with other teams to develop their ideal parts list.
6. Next, student groups execute their plans. They may need to rethink their plan, request other materials, trade with other teams, or start over.
7. Finally, teams will test their rubber band car. Students can create the 1 meter wide "track" using masking tape on the floor.
8. Teams then complete an evaluation/reflection worksheet and present their findings to the class.

Outcome #2 Rubber Band Cars Student Reference Sheets

Automobiles and Automotive Engineering

- **Brief History of the Automobile**

The development of the automobile as we know it today has been an evolution over the past several hundred years. Both Leonardo da Vinci and Isaac Newton sketched ideas for vehicles during their lifetimes. The first steam-powered automobile was developed in the late 18th century by Nicolas Cugnot. Robert Anderson of Scotland developed the first electric vehicle sometime in the 1830s. In 1876 Nicolaus Otto developed the first effective gasoline motor engine which paved the way for the first gasoline powered vehicles. The first successful gasoline-powered vehicles were developed by Karl Benz and Gottleib Daimler in 1885. Some of the first mass producers of gasoline powered automobiles included Rene Panhard and Emile Levassor and Peugeot in France; and Charles and Frank Duryea, Eli Olds and Henry Ford in the United States.

- **Modern Automobiles**

Even today, automobiles are constantly evolving. Today you can find automobiles in a wide array of colors, shapes and sizes. The vehicles of today possess innovative design features such as GPS, iIPod Interfaces, rear video cameras and the ability to parallel park on their own! In some markets, the size and efficiency of automobiles has become a priority. One of the smallest cars on the market, the smart car Fortwo, was introduced in 1998 by Nicholas Hayek the inventor of Swatch watches. The smart car is roughly 8 feet long 5 feet high and 5 feet wide making it ideal for crowded cities. The smart car For two gets a reported 46.3 mpg in the city, and 68.9 mpg for highway driving. Some of the greatest innovations in automotive engineering are occurring in the way cars are powered. The supply, cost, and environmental impact of fossil fuels are motivating many automakers to offer vehicles that use green technology or run on alternative energies. Hybrid cars use two systems of power including a gasoline powered engine and an electric motor. Some hybrid models need to be plugged in to recharge power and can even generate electricity. Electric cars run on electric battery powered motors. Some cars are designed to run on alternative fuels such as ethanol or biodiesel. Hydrogen powered cars and cars that run on hydrogen fuels are currently in development. Cars that run on compressed air are also being investigated by automakers around the world.

- **Automotive Engineering**

Automotive engineers design the vehicles that we use for life, work, and play. They are involved in aspects of engineering design ranging from the initial design concept all the way to production. They design, test and refine vehicles for safety, style, comfort, handling, practicality, and customer needs. The work of automotive engineers falls into three basic categories: design, development and production. The work of some engineers involves designing the basic part or systems of an automobile, such as brakes or engines. Research and development engineers devise solutions to various engineering challenges. Production engineers design the processes that will be used to manufacture the automobile. Here are a few science concepts that will be helpful to keep in mind when designing and testing your rubber band car.

- **Energy**

Energy is the ability to do work. All forms of energy fall into two basic categories: potential energy and kinetic energy. Potential energy is mechanical energy which is due to a body's position. It is also known as stored energy. A car at rest has potential energy. Kinetic energy is mechanical energy that is due to a body's motion. For a car to move, potential energy must be transformed into kinetic energy.

- **Newton's Laws of Motion**

Sir Isaac Newton (1642 – 1727) was a brilliant mathematician, astronomer and physicist who is considered to be one of the most influential figures in human history. Newton studied a wide variety of phenomena during his lifetime, one of which included the motion of objects and systems. Based on his observations he formulated Three Laws of Motion which were presented in his masterwork Philosophiæ Naturalis Principia Mathematica in 1686.

Newton's First Law – An object at rest will remain at rest and an object in motion will remain in motion at a constant speed unless acted on by an unbalanced force (such as friction or gravity). This is also known as the law of inertia. Newton's Second Law – An object's acceleration is directly proportional to the net force acting on it and inversely proportional to its mass. The direction of the acceleration is in the direction of the applied net force.

Newton's Second Law can be expressed as: $F = ma$

Newton's Third Law – For every action there is an equal and opposite reaction.

Design a Rubber Band Racer

You are a team of engineers who have been given the challenge to design your own rubber band car out of everyday items. The rubber band car needs to be able to travel a distance of at least 3 meters within a 1 meter wide track. The car that can travel the farthest distance within the track is the winner.

- **Planning Stage**

Meet as a team and discuss the problem you need to solve. Then develop and agree on a design for your rubber band car. You'll need to determine what materials you want to use. Draw your design in the box below, and be sure to indicate the description and number of parts you plan to use. Present your design to the class. You may choose to revise your team's plan after you receive feedback from class.

Design:

Materials Needed:

-
-
-

- **Construction Phase**

Build your rubber band car. During construction you may decide you need additional materials or that your design needs to change. This is ok – just make a new sketch and revise your materials list.

- **Testing Phase**

Each team will test their rubber band car. Your rubber band car must travel 3 meters within a 1 meter wide track. Calculate your car's speed (distance traveled per unit of time; S = d/t). Be sure to watch the tests of the other teams and observe how their different designs worked.

Rubber Band Car Data

	Distance Traveled within Track (m)	**Time Traveled within Track (s)**	**Speed (m/s)**
Test 1			
Test 2			
Test 3			
Average			

- **Evaluation Phase**

Evaluate your teams' results, complete the evaluation worksheet, and present your findings to the class.

Use this worksheet to evaluate your team's results in the Rubber Band Racer Lesson:

1. Did you succeed in creating a rubber band car that traveled 3 meters within the track? If so, how far did it travel? If not, why did it fail?

2. Did you negotiate any material trades with other teams? How did that process work for you?

3. What is the average speed your car achieved?

4. Did you decide to revise your original design or request additional materials while in the construction phase? Why?

5. If you could have had access to materials that were different than those provided, what would your team have requested? Why?

6. Do you think that engineers have to adapt their original plans during the construction of systems or products? Why might they?

7. If you had to do it all over again, how would your planned design change? Why?

8. What designs or methods did you see other teams try that you thought worked well?

9. Do you think you would have been able to complete this project easier if you were working alone? Explain…

Outcome #3 Discussion Questions

Name: ______________________________

1. What are some of the responsibilities of a law enforcement officer (sheriff or police officer)?

2. Why is it necessary to pay people to protect us?

3. A major focus for law enforcement officers is to keep the roads safe. List situations where someone might either receive a ticket or be taken to jail for traffic offenses.

4. How does a law enforcement officer use math when dealing with traffic offenses?

5. List some pros and cons for pursuing a career in law enforcement.

Outcome #3 Discussion Questions – Answer Key

Name: ____________________________

1. What are some of the responsibilities of a law enforcement officer (sheriff or police officer)?
   - ✔ Enforce traffic laws
   - ✔ Serve warrants/arrest criminals
   - ✔ Assist families who need help
   - ✔ Protect and serve the community

2. Why is it necessary to pay people to protect us?

   - ✔ To maintain order

3. A major focus for law enforcement officers is to keep the roads safe. List situations where someone might either receive a ticket or be taken to jail for traffic offenses.

   - ✔ Speeding
   - ✔ Running red lights/stop signs
   - ✔ Passing a stopped school bus
   - ✔ Reckless driving/driving too fast for conditions
   - ✔ DUI (driving under the influence)

4. How does a law enforcement officer use math when dealing with traffic offenses?

   - ✔ Calculate speed
   - ✔ Measure skid marks in accidents

5. List some pros and cons for pursuing a career in law enforcement.
   - ✔ Pros
     - o Business always steady
     - o Pension
     - o College not required
     - o Earn the trust of the public
     - o Many different jobs within law enforcement system (street copy, CSI investigator, captain/chief of police, undercover work)
   - ✔ Cons
     - o Relatively low pay
     - o Daily work includes risking your life
     - o Emotional stress on officers' families' – they tend to worry
       - ✔

Outcome #3

To Serve and Protect

Law enforcement officers can determine the speed of motorists by using radar or Vascar. When both an officer's and a motorist's car are moving, the officer must use math to calculate the motorist's speed.

1. Radar scenario #1: The officer's car is approaching an oncoming motorist who seems to be speeding in a 50 mph speed zone. The radar gun reads 120.46 mph (closing speed) and your squad car is going 55.5 mph (patrol speed). Use the formula below to determine how fast the motorist is traveling.

   Closing speed – patrol speed = suspect speed

2. Radar scenario #2: The officer's car is traveling west and the motorist is traveling east. You believe that she is speeding in a 45 mph speed zone and use the radar gun to clock her speed. The reading shows 75.93 mph (separation speed) and your squad car is going 20.3 mph (patrol speed). Use the formula below to determine how fast the motorist is traveling.

   Separation speed – patrol speed = suspect speed

3. Vascar scenario #1: Using a Vascar computer, a trooper recorded 1000 feet as the distance between two reference points. He also used Vascar to time the travel of a target vehicle between the two reference points. If the vehicle took 18 seconds to travel from one reference point to the other, and if the posted speed limit was 60 mph, was the person speeding?

   Distance ÷ time = suspect speed

4. Officer serves an execution: A local resident was arrested for writing bad checks. He posted bond for $15,000 but failed to appear in court. The bond company notified the sheriff's department and they were authorized to serve an execution, which allows them to collect the value of the bond in cash or property from the resident. The bond company has agreed to settle for 87.5% of the bond. What is the value of cash/property that the sheriff's department hopes to recover?

Outcome #3 To Serve and Protect – Answer Key

Law enforcement officers can determine the speed of motorists by using radar or Vascar. When both an officer's and a motorist's car are moving, the officer must use math to calculate the motorist's speed.

1. Radar scenario #1: The officer's car is approaching an oncoming motorist who seems to be speeding in a 50 mph speed zone. The radar gun reads 120.46 mph (closing speed) and your squad car is going 55.5 mph (patrol speed). Use the formula below to determine how fast the motorist is traveling.

   Closing speed – patrol speed = suspect speed

   120.46 – 55.50 = 64.96 mph

2. Radar scenario #2: The officer's car is traveling west and the motorist is traveling east. You believe that she is speeding in a 45 mph speed zone and use the radar gun to clock her speed. The reading shows 75.93 mph (separation speed) and your squad car is going 20.3 mph (patrol speed). Use the formula below to determine how fast the motorist is traveling.

   Separation speed – patrol speed = suspect speed

   73.93 – 20.30 = 55.63 mph

3. Vascar scenario #1: Using a Vascar computer, a trooper recorded 1000 feet as the distance between two reference points. He also used Vascar to time the travel of a target vehicle between the two reference points. If the vehicle took 18 seconds to travel from one reference point to the other, and if the posted speed limit was 60 mph, was the person speeding?

   Distance ÷ time = suspect speed

   100 ÷ 18 = 55.5 feet per second
   Convert 55.5 fps to mph = 37.88 mph
   37.88 < 60 mph, so the motorist was not speeding

4. Officer serves an execution: A local resident was arrested for writing bad checks. He posted bond for $15,000 but failed to appear in court. The bond company notified the sheriff's department and they were authorized to serve an execution, which allows them to collect the value of the bond in cash or property from the resident. The bond company has agreed to settle for 87.5% of the bond. What is the value of cash/property that the sheriff's department hopes to recover?

   15,000 x .875 = $13,125

Outcome #4 Food Service Industry —Discussion Starters

As a class, consider the following questions, using the background information to help supplement the discussion. (The information comes from the U.S. Bureau of Labor Statistics' *Occupational Outlook Handbook* page about chefs, cooks, and food preparation workers, at https://www.bls.gov/ooh/food-preparation-and-serving/home.htm.)

What kinds of jobs might be available in food service?

Chefs, cooks, and food preparation workers prepare, season, and cook a wide range of foods in a variety of restaurants and other food service establishments. In general, chefs and cooks measure, mix, and cook ingredients according to recipes, direct other kitchen workers, estimate food requirements, and order food supplies. Some chefs and cooks go into business as caterers or personal chefs, or they open their own restaurants.

As of 2023, nearly two-thirds of all chefs, cooks, and food preparation workers were employed in restaurants and other food services. Almost one-fifth worked in institutions such as schools, universities, hospitals, and nursing care facilities. Grocery stores, hotels, gasoline stations with convenience stores, and other organizations employed the remainder.

Where can one get training to work in food service?

The American Culinary Federation accredits more than 100 formal training programs and sponsors apprenticeship programs around the country. Typical apprenticeships last three years and combine classroom training and work experience. Vocational or trade-school programs typically offer more basic training in preparing food, such as food handling and sanitation procedures, nutrition, slicing and dicing methods for various kinds of meats and vegetables, and basic cooking methods, such as baking, broiling, and grilling.

What is the employment outlook for food service employees over the next several years?

Job openings are expected to be plentiful through 2023 as the food service industry jobs are projected to grow at or a little above the average of all other industries.

What characteristics help a person become successful in a food service career?

Important characteristics for chefs, cooks, and food preparations workers include working well as part of a team, having a keen sense of taste and smell, and working efficiently to turn out meals rapidly. Personal cleanliness is essential because most states require health certificates indicating that workers are free from communicable diseases. Knowledge of a foreign language can be an asset because it may improve communication with other restaurant staff, vendors, and the restaurant's clientele.

What aspects of the food service industry would you find to be most interesting?

http://www.learnnc.org/lp/media/uploads/2008/02/2_fractions_teacher.pdf

Outcome #4

Apple Pan Dowdy: How Many Recipes?

1. The following recipe serves 8 people. You are planning a party for 16 people. How many times would you need to make this recipe to serve your guests? How much of each ingredient would you need to make your recipes? Write your new recipe in the chart.

Apple Pan Dowdy

Ingredients for 8	Ingredients for 16	Ingredients for 20
½ cup brown sugar		
¼ cup chopped walnuts		
¼ cup raisins		
3 cups apples, sliced		
¼ cup butter, softened		
2/3 cup sugar		
2 eggs, beaten		
4 tsp baking powder		
½ tsp salt		
1 ½ cups milk		
2 ¼ cups flour		

Apple Pan Dowdy: How Many Recipes? (cont)

2. How many times would you need to make this recipe to serve 20 people? How much of each ingredient would you need to make your new recipe? Place your new recipe in the chart.
3. If you only had ¼ cup of brown sugar available, how much of each ingredient would you use to make sure the recipe tastes good?
4. How many recipes would you need to make to serve your whole class? How would you determine the amount of ingredients to use? Show your new recipe on the chart below.

Ingredients for 8 people	Ingredients for the class (______)

Apple Pan Dowdy: How Many Recipes? Answer Key

1. The following recipe serves 8 people. You are planning a party for 16 people. How many times would you need to make this recipe to serve your guests? How much of each ingredient would you need to make your recipes? Write your new recipe in the chart.

Apple Pan Dowdy

Ingredients for 8	Ingredients for 16	Ingredients for 20
½ cup brown sugar	1 cup brown sugar	1 ¼ cups brown sugar
¼ cup chopped walnuts	½ cup walnuts	5/8 cups walnuts
¼ cup raisins	½ cup raisins	5/8 cup raisins
3 cups apples, sliced	6 cups apples	7 ½ cups apples
¼ cup butter, softened	½ cup butter	5/8 cup butter
2/3 cup sugar	1 1/3 cup sugar	1 2/3 cup sugar
2 eggs, beaten	4 eggs	5 eggs
4 tsp baking powder	8 tsp baking powder	10 tsp baking powder
½ tsp salt	1 tsp salt	1 ¼ tsp salt
1 ½ cups milk	3 cups milk	3 ¾ cups milk
2 ¼ cups flour	4 ½ cups flour	5 5/8 cups flour

Apple Pan Dowdy: How Many Recipes? (cont)

2. How many times would you need to make this recipe to serve 20 people? How much of each ingredient would you need to make your new recipe? Place your new recipe in the chart.

    2 ½ recipes

3. If you only had ¼ cup of brown sugar available, how much of each ingredient would you use to make sure the recipe tastes good?

    ¼ cups brown sugar
    1/8 cup walnuts
    1/8 cup raisins
    1 ½ cups apples
    1/8 cup butter
    1/3 cup sugar
    1 egg
    2 tsp baking powder
    ¼ tsp salt
    ¾ cup milk
    1 1/8 cups flour

4. How many recipes would you need to make to serve your whole class? How would you determine the amount of ingredients to use? Show your new recipe on the chart below.

    Answers vary according to class size.

FERRET FIGURES
Teaching Guidelines

Subject:	Mathematics
Topics:	Problem Solving
Grades:	6-12

Concepts:
- Rate (expressed as percent)

Knowledge and Skills:
- Can apply the problem-solving strategy "Identify the variables"
- Can apply the problem-solving strategy "Use a chart or table"
- Can solve complex, multi-step problems

Procedure:

Prepare the Futures Channel movie "The Black-Footed Ferret" for presentation. Tell students that as they watch the movie, you want them to think about this question (which should be posted):

How would you accurately predict whether or not an animal species in the wild is likely to become extinct?

At the end of the movie, discuss some answers to the question. Then, as you distribute the handout, tell students that you want them to think about a very specific example, as follows:

50 ferrets (25 males, 25 females) are re-introduced into the wild, in a region of Colorado, one year in February. What would you need to know in order to make a good guess as to whether or not that population of ferrets will increase or decrease?

Arrange the students in teams of 2-3 members and ask them to work together for 10 minutes to list answers to the question.

In discussing answers, you will find that they fall into two categories—those in the list below, or other factors which affect those in the list below (for example, student lists may include "having enough food," a factor which affects how many ferrets survive each year). In the course of the discussion, guide students to understand that if they knew the numbers below, they would know everything they needed to know to predict the survival of the species.

- How many ferrets are born each year
- How many ferrets die each year
- How many ferrets come into the area from somewhere else each year
- How many ferrets leave the area to go somewhere else each year

Distribute the second page of the handout, and review it. Tell students that they have already applied one problem-solving strategy to this situation: "Identify the variables." Ask them if they can think of another strategy to help them solve this problem, and elicit or present the strategy: "Make a chart or table."

Create the following chart, with these figures filled in. Explain that the figures represent the number of ferrets of each age.

Age of ferrets (months)	Start of 1st year	born	died	Start of second year
0 up to 12	0			
12 up to 24	0			
24 up to 36	50			
36 up to 48	0			
48 up to 60	0			
60 up to 72	0			
72 up to 84	0			

Start filling out the chart, as a class activity. Begin by determining the number of kits born in the first year:

Number of kits born = 80% of females 12 months and older x 4 kits per female
*= .8*25*4*
= 80

Next, compute the number of kits expected to die before the end of the first year:

Number of kits that don't survive = 70% of kits born = 70% of 80 = 56

Next, find the difference to compute the total number of 12-month-olds that you have after the first year:

Number of 12-month olds = 80 - 56 = 24

The chart would now look like this:

Age of ferrets (months)	Start of 1st year	born	died	Start of 2nd year
0 up to 12	0	***80***	***56***	
12 up to 24	0			***24***
24 up to 36	50			
36 up to 48	0			
48 up to 60	0			
60 up to 72	0			
72 up to 84	0			

Point out to students that the final figure, the number of 12 month-olds, goes in the <u>next line down</u>.

Next do the computations for ferrets who were 12-24 months old at the start of the first year. Since there weren't any, this is easy:

Age of ferrets (months)	Start of 1st year	born	died	Start of 2nd year
0 up to 12	0	80	56	
12 up to 24	0	***0***	***0***	24
24 up to 36	50			***0***
36 up to 48	0			
48 up to 60	0			
60 up to 72	0			
72 up to 84	0			

Next, do the computations for the ferrets in the 24-35 month age range—this includes the 50 that were re-introduced. Since no ferrets were born into that age range, you only need to compute the number that die: 40% of them, according to the figures (20 ferrets). That leaves 30 of them alive as 36-month-old ferrets at the beginning of the second year:

Age of ferrets (months)	Start of 1st year	born	died	Start of 2nd year
0 up to 12	0	80	56	
12 up to 24	0	0	0	24
24 up to 36	50	***0***	***20***	0
36 up to 48	0			***30***
48 up to 60	0			
60 up to 72	0			
72 up to 84	0			

Since there were no ferrets in any other age ranges at the beginning of the first year, the rest of the figures are all "0."

Age of ferrets (months)	Start of 1st year	born	died	Start of 2nd year
0 up to 12	0	80	56	
12 up to 24	0	0	0	24
24 up to 36	50	0	20	0
36 up to 48	0	***0***	***0***	30
48 up to 60	0	***0***	***0***	***0***
60 up to 72	0	***0***	***0***	***0***
72 up to 84	0	***0***	***0***	***0***
				54

Total population at beginning of second year

Next, you will compute the population changes from the beginning of the second year to the beginning of the third year:

Age of ferrets (months)	Start of 1st year	born	died	Start of 2nd year	born	died	Start of 3rd year
0 up to 12	0	80	56				
12 up to 24	0	0	0	24			
24 up to 36	50	0	20	0			
36 up to 48	0	0	0	30			
48 up to 60	0	0	0	0			
60 up to 72	0	0	0	0			
72 up to 84	0	0	0	0			
				54			

Again, begin by determining the number of kits born:

Number of kits born = *80% of females older than 12 month x 4 kits per female*

= *.8*27*4 = 86* (this assumes that the number of females is half of the total population)

Number of kits that don't survive = *70% of kits born*

= *70% of 86*

= *60*

Age of ferrets (months)	Start of 1st year	born	died	Start of 2nd year	born	died	Start of 3rd year
0 up to 12	0	80	56		***86***	***60***	
12 up to 24	0	0	0	24			***26***
24 up to 36	50	0	20	0			
36 up to 48	0	0	0	30			
48 up to 60	0	0	0	0			
60 up to 72	0	0	0	0			
72 up to 84	0	0	0	0			
				54			

Then use the survival rate data given to determine the number of ferrets that die in each of the other age ranges, to fill in the rest of the chart:

Age of ferrets (months)	Start of 1st year	born	died	Start of 2nd year	born	died	Start of 3rd year
0 up to 12	0	80	56		86	60	
12 up to 24	0	0	0	24	***0***	***14***	26
24 up to 36	50	0	20	0	***0***	***0***	***10***
36 up to 48	0	0	0	30	***0***	***12***	***0***
48 up to 60	0	0	0	0	***0***	***0***	***18***
60 up to 72	0	0	0	0	***0***	***0***	***0***
72 up to 84	0	0	0	0	***0***	***0***	***0***
				54			***54***

At this point, you can turn the problem over to students, working in teams of 2-3 members each and continuing to fill out the chart for the next three years. Remind them to take into account the change in survival rates for ferrets in their fifth and sixth years. The final chart should look like the one on the next page.

As an extra-credit exercise, ask students to re-compute the chart based on a survival rate of 40% in the first year, instead of 30%. They will be surprised at the results.

Note: This activity is an excellent context for teaching the use of spreadsheets.

Ferret Population Projection

	start	born	died	end of 1st year	born	died	end of 2nd year	born	died	end of 3rd year	born	died	end of 4th year	born	died	end of 5th year
0 through 11 mos	0	80	56	0	86	60	0	86	60	0	86	60	0	76	53	0
12 through 23 mos	0	0	0	24	0	14	26	0	15	26	0	15	26	0	15	23
24 through 35 mos	50	0	20	0	0	0	10	0	4	11	0	4	11	0	4	11
36 through 47 mos	0	0	0	30	0	12	0	0	0	6	0	2	7	0	2	7
48 through 59 mos	0	0	0	0	0	0	18	0	7	0	0	0	4	0	1	5
60 through 71 mos	0	0	0	0	0	0	0	0	0	11	0	7	0	0	0	3
72 through 83 mos	0	0	0	0	0	0	0	0	0	0	0	0	4	0	3	0
				54			**54**			**54**			**52**			**49**

Ferret Figures

50 ferrets are re-introduced into the wild, in a region of Colorado. What would you need to know in order to make a good prediction as to whether or not that population of ferrets will increase or decrease?

Factors leading to population increase	Factors leading to population decrease

Suppose that the figures below represent what usually happens to ferrets in the wild. Can you predict how many ferrets you would have 10 years after the re-introduction of twenty five 22-month-old old male ferrets and twenty five 22-month-old year old female ferrets?

Assume that

- No ferrets come into the area or leave the area
- The ferrets are introduced in February and mate in early March, with kits born in late April

<u>Figures:</u>

1) Female ferrets can only get pregnant (are fertile) after their full first year of life (in the spring of their second year).
2) 80% of the fertile females in a ferret group become pregnant every year.
3) Ferrets give birth, on average, to two females and two males each year.
4) 30% of ferrets survive their first year.
5) 60% of ferrets survive their second, third and fourth years.
6) 30% of ferrets survive their fifth year.
7) 10% of ferrets survive their sixth year.
8) No ferrets live longer than seven years.

Outcome #6 Life as a Meteorologist

Name:___________________________

Courtesy of Environment Canada's "Skywatchers" website: http://www.on.ec.gc.ca/skywatchers/index_e.html

Forecasting the weather is interesting…whether it's a sunny weekend, a hurricane, or some other wild weather. If you're interested in the weather, like to solve problems, and want a job where you work with people and computers, then maybe meteorology is the career for you.

Atmospheric science is the study of the atmosphere – the thin layer of air covering the Earth. Atmospheric scientists study everything about the atmosphere and how it moves and changes. The best-known atmospheric scientists are meteorologists who forecast the weather, but atmospheric scientists may also study things, such as air pollution, or trends in the climate of Earth, such as global warming or droughts (dry weather), or ozone holes in the Arctic.

A meteorologist needs to have an assortment of skills and education. A strong science background is important, and meteorologists must complete either a Bachelor of Science Degree (BS) in atmospheric science or in math or physics with extra training in meteorology. Meteorologists must have strong communication skills and must be good at turning lots of complex data into information that people can use.

Meteorologists study information on air pressure, temperature, humidity, precipitation and wind. They use computers to watch how these change and then use that information to make weather forecasts. Their data come from weather satellites, weather radar, computers, sensors and observers all over the world. One meteorologist might write the weather forecasts and weather warnings for a huge area, giving people the weather information they need to plan their day and letting them know when severe weather is expected. Every day is different and that goes along with how quickly the weather changes. One day might be quiet, while the next day is busy tracking a severe storm or lightning strikes across the region. Whether it's day or night, weekday, weekend or a holiday, there are always meteorologists forecasting the weather in the Storm Prediction Centers.

One thing is for sure: If you choose a career in weather, you'll hear about it if your sunny forecast turns to rain. Meteorology as a career is fun but challenging.

FACTOID: Aristotle, an ancient Greek philosopher invented the term meteor to mean "things in the air." Weather forecasters are called meteorologists because they work with things in the air: rain, snow, ice, clouds, and air pollution.

“Life as a Meteorologist” questions

Name:___________________________

1. Why are weather forecasters called meteorologists?

2. With which statement would the author of the article most agree?

a. A meteorologist must be skilled in art, science, and math.
b. Meteorologists are computer experts.
c. You must be attractive and a good actor to be a meteorologist.
d. A meteorologist must excel in computer research, science, communication skills, and problem-solving.

3. What does the author imply in the statement, “Meteorology as a career is fun, but very challenging”? Use a fact from the article to support your answer.

4. Which skills do you possess that would make meteorology a possible career choice for you?

5. Sunny McGregor reported that the high yesterday was 23° F. The low temperature was -2° F. What was the difference in temperatures?

6. The temperature at 3:00 am was 7° F. For each of the next two hours the temperature dropped 5°F. What was the temperature at 5:00 am?

7. Sunny McGregor, the meteorologist, recorded the following temperatures for Oslo, Norway, the first week in December: -5°, 4°, 12°, 6°, -3°, -1°, 7°. What was the range of temperatures?

8. The weekly salary for 10 meteorologists is given in the chart below. Find the mean salary.

Weekly salary	Number of people
$500	5
$600	3
$700	2

9. You are interviewing for a position as a meteorologist. The manager of the television station shows you the following salaries: $32,500; $40,000; $36,000; $72,000; $38,525. Which measure of central tendency (mean, median, mode, or range) best describes the salaries earned at the television station? Why did you use that measure?

Answer Key

"Life as a Meteorologist" questions

1. Why are weather forecasters called meteorologists?

   Factoid) Aristotle's term meteor means "things in the air." Weather forecasters are called meteorologists because they work with things in the air: rain, snow, ice, clouds and air pollution.

2. With which statement would the author of the article most agree?
   a. A. Meteorologist must be skilled in art, science, and math.
   b. Meteorologists are computer experts.
   c. You must be attractive and a good actor to be a meteorologist
   d. **<u>A meteorologist must excel in computer research, science, communication skills, and problem-solving.</u>**

3. What does the author imply in the statement, "Meteorology as a career is fun, but very challenging"? Use a fact for the article to support your answer.

   Fun: very interesting career, wild weather patterns, solve problems, work with people and computers, every day is different.
   Challenging: weather changes quickly, people count heavily on your forecasts, people face dangerous weather situations.

4. Which skills do you possess that would make meteorology a possible career choice for you?
   Answers will vary

5. Sunny McGregor reported that the high yesterday was 23º F. The low temperature was -2º F. What was the difference in temperatures?

   23 – (2) = 25

6. The temperature at 3:00 am was 7º F. For each of the next two hours the temperature dropped 5º F. What was the temperature at 5:00 am?

   -3

7. Sunny McGregor, the meteorologist, recorded the following temperatures for Oslo, Norway, the first week in December: -5º, 4º, 12º, 6º, 3º, -1º, 7º. What was the range of temperatures?

   Low: -5º
   High: 12

   17-degree range

8. The weekly salary for 10 meteorologists is given in the chart below. Find the mean salary.

Weekly Salary	Number of people
$500	5
$600	3
$700	2

$500 x 5 - $2500
$600 x 3 = $1800
$700 x 2 = $1400

Total = $5700

$5700 divided by 10 people = $570 per week mean salary

9. You are interviewing for a position as a meteorologist. The manager of the television station shows you the following salaries: $32,500; $40,000; $36,000; $72,000; $38,525. Which measure of central tendency (mean, median, mode, or range) best describes the salaries earned at the television station? Why did you use that measure?

Use the mean. The $72,000 salary is probably earned by the station manager. The other salaries are in the $32,000 - $42,000 range.

a.

Outcome #6 European Weather

Name:____________________________

Steps for graphing the monthly mean temperatures for European capitals:

1. Record the capitals of the following European countries:

    a. England _____________________________

    b. France ______________________________

    c. Germany ____________________________

    d. Greece ______________________________

    e. Ireland ______________________________

    f. Italy ________________________________

    g. Spain ______________________________

2. Go to the website www.worldweather.org
   Who developed and maintains this site?

3. Record on the back of this paper the monthly mean temperatures (both minimum and maximum temperatures) in degrees Fahrenheit for one of the European capital cities you listed above.

4. Make a spreadsheet and graph of your data. Follow these guidelines carefully.

    - Find the Excel program on your computer. (It might be in Microsoft Office.)

    - On a new spreadsheet, select cell A1 and type the following words: Month enter Jan enter Feb enter Mar enter Apr enter May enter Jun enter Jul enter Aug enter Sept enter Oct enter Nov enter Dec enter

    - Select cell B1 and type the following data: Minimum (Low temps in degrees Fahrenheit) enter then type in cells B2-B13 the low temperatures for each month that you recorded on the back of this sheet.

- Select cell C1 and type the following data: Maximum (High temps in degrees Fahrenheit) enter then type in cells C2-C13 the high temps for each month that you recorded on the back of this sheet.
- Select cells A2:C13 (highlight this area).
- Choose “Chart” from the “Insert” menu.
- In Chart Wizard, select the “Standard Types” tab.
- In Chart Type, select “Line.”
- Click the Next button two times to go to the Chart Options.
- Select the “Titles” tab. For the Chart Title, type Monthly Temps (High/Lows) for the European city and country that you researched. For the Category (X) axis, type Months. For the Category (Y) axis, type Temperatures (degrees Fahrenheit).
- Click on Finish.
- Double click on any value seen on the vertical (Y) axis.
- Select the “Scale” tab. For minimum enter 0. For maximum enter 100. For Major Unit type 10. Click the OK or Finish button.
- Move the graph below the spreadsheet data so you can see both.
- Print the spreadsheet and graph. Write your name on your paper and hand it in.

Answer Key

European Weather

Steps for graphing the monthly mean temperatures for European capitals:

1. Record the capitals of the following European countries:

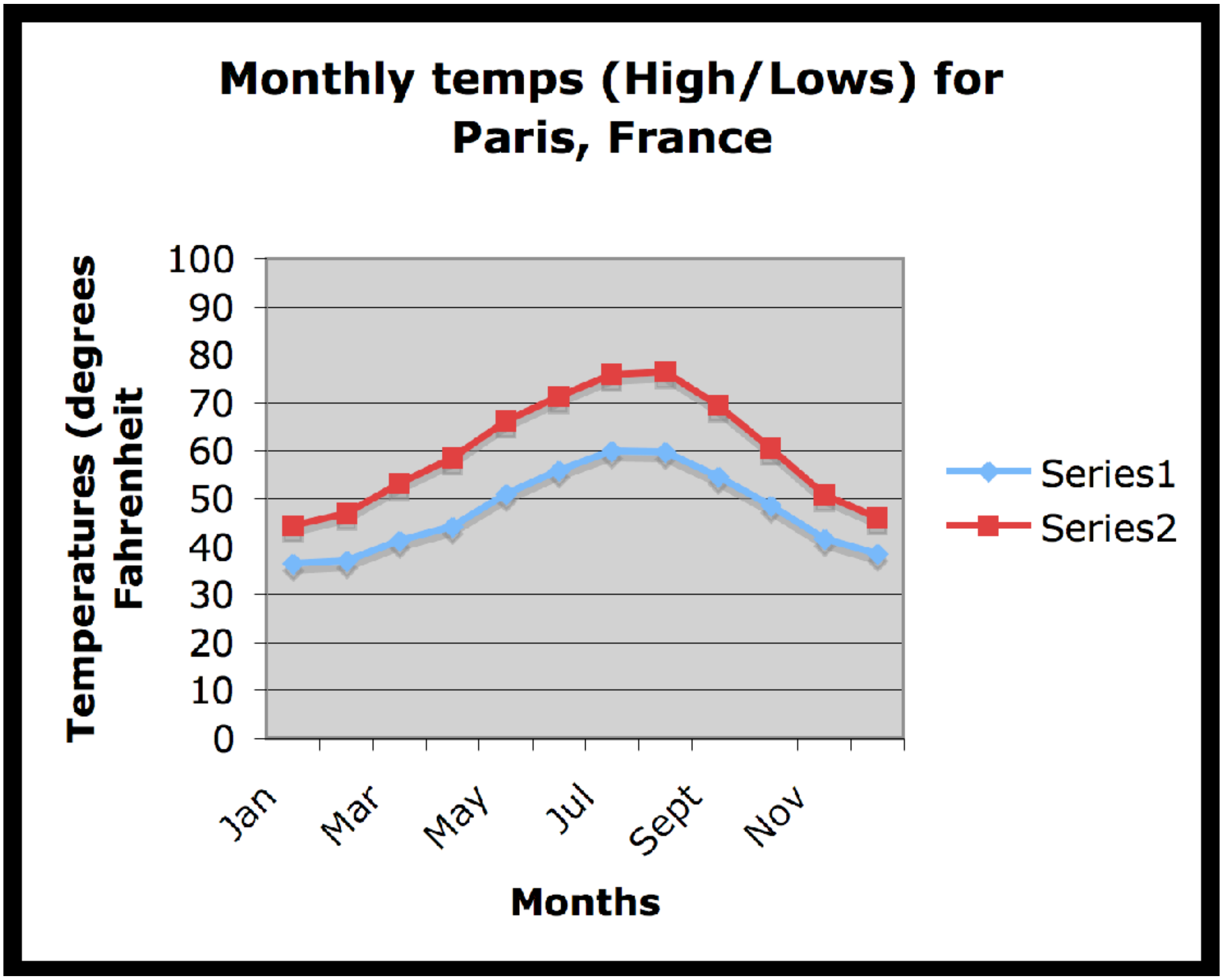
    a. England: **London**
    b. France: **Paris**
    c. Germany: **Berlin**
    d. Greece: **Athens**
    e. Ireland: **Dublin**
    f. Italy: **Rome**
    g. Spain: **Madrid**

2. Go to the website www.worldweather.org Who developed and maintains this site?

    The Hong Kong Observatory

(Example based on temperatures for Paris, France):

Month	Low temp (degrees F.)	High temp (degrees F.)
Jan	36.5	44.4
Feb	37	46.8
Mar	41.2	53.2
Apr	44.2	58.5
May	50.9	66.2
Jun	55.9	71.2
Jul	59.9	75.9
Aug	59.7	76.3
Sept	54.5	69.4
Oct	48.6	60.4
Nov	41.5	50.7
Dec	38.5	46


Monthly temps (High/Lows) for Paris, France
Temperatures (degrees Fahrenheit
100
90
80
70
60
50
40
30
20
10
0
Jan
Mar
May
Jul
Sept
Nov
Months
Series1
Series2

Outcome #6

Positive and Negative Integers: A Card Game

This card game provides practice adding and subtracting positive and negative integers.

Materials:

- standard deck(s) of cards.

Procedure:

1. Arrange students into groups of two or more. Have students deal out as many cards as possible from a deck of cards, so that each student has an equal number of cards. Put aside any extra cards.

2. Explain to students that every black card in their pile represents a positive number. Every red card represents a negative number. In other words a black seven is worth +7 (seven), a red three is worth -3 (negative 3). Note: *If this game is new to students, you might want to discard the face cards prior to dealing.* If students are familiar with the game, or if you want to provide an extra challenge, leave the aces and face cards in the deck. In that case, explain to students that aces have a value of 1, jacks have a value of 11, queens have a value of 12, and kings have a value of 13.

3. At the start of the game, each player places his or her cards in a stack, face down. Then ask the player to the right of the dealer to turn up one card and say the number on the card. For example, if the player turns up a black eight, he or she says "8."

4. Continue from one player to the next in a clockwise direction. The second player turns up a card, adds it to the first card, and says the sum of the two cards aloud. For example, if the card is a red 9, which has value of -9, the player says "8 + (-9) = (-1)."

5. The next player takes the top card from his or her pile, adds it to the first two cards, and says the sum. For example, if the card is a black 2, which has a value of +2, the player says "(-1) + 2 = 1."

6. The game continues until someone shows a card that, when added to the stack, results in a sum of exactly 25.

Extra Challenging Version

To add another dimension to the game, you might have students always use subtraction. Doing this will reinforce the skill of subtracting negative integers.

For example, if player #1 plays a red 5 (15) and player #2 plays a black 8 (+8), the sum is -13: (-5) – (+8) = -13.

If the next player plays a red 4, the sum is -9: (-13) – (-4) = -9. [Recall: Minus a minus number is equivalent to adding that number.}

Adaptation Idea
For students who find the game too challenging, you might change the sum you're aiming for to a number less than 25. The game will end more quickly. As students become more comfortable with the game, you can gradually increase the numeric goal.

Writing Extension
After the game ends, have the students write about it in their math journals. For example, you might have them explain the rules in their own words.

Adapted from: A Teacher Submitted Lesson Plan by Pam Harper, Rockville Jr/Sr High School, Rockville, Indiana on the Education World website.
Original Lesson at:
http://www.educationworld.com/a_ts!/archives/03-1/lesson001.shtml

Outcome #7 Let's Review

Name: ______________________________

1. What is the probability of rolling a die twice and getting a 5 both times?

2. What is the probability of rolling a die twice and getting an even number on both rolls?

3. What is the probability of rolling a die twice and getting a 3 on the first roll and a prime number on the second roll?

4. You have a hat with the numbers 1-20 in it. What is the probability of someone picking the number 7, replacing the number, and picking 7 again?

5. You have a hat with the numbers 1-20 in it. What is the probability of someone picking the numbers 2 or 12, replacing the number, and then picking a single digit number?

6. You have a hat with the numbers 1-20 in it. What is the probability of someone picking the number 5, not replacing the number, and then picking the number 2?

Source: http://www.learnnc.org/lp/media/uploads/2008/02/8medical_probability.pdf

Outcome #7 Answer Key

Let's Review

1. What is the probability of rolling a die twice and getting a 5 both times.?

.027 2.7% $2\frac{7}{9}$

2. What is the probability of rolling a die twice and getting an even number on both rolls?

P (even, even) = ½ x ½ = ¼

.25 25%

3. What is the probability of rolling a die twice and getting a 3 on the first roll and a prime number on the second roll?

P (3, p[rime) – $\frac{1}{6}$ x $\frac{1}{2}$ = $\frac{1}{12}$

4. You have a hat with the numbers 1-20 in it. What is the probability of someone picking the number 7, replacing the number, and picking 7 again?

$\frac{1}{20}$ x $\frac{1}{20}$ = $\frac{1}{400}$ .0025

5. You have a hat with the numbers 1-20 in it. What is the probability of someone picking the number 2 or 12, replacing the number, and then picking a single digit number?

$\frac{2}{20}$ x $\frac{9}{20}$ = $\frac{18}{400} = \frac{9}{200}$ .045

6. You have a hat with the number 1-20 in it. What is the probability of someone picking the number 5, not replacing the number, and then picking the number 2?

P (5, 2) = $\frac{1}{20}$ x $\frac{1}{19}$ = $\frac{1}{380}$

.0026315 .3%

Outcome #7 A Career in the Medical Field Might Be Neat!

A recent study by the American Pediatrics Association showed that 45% of children under the age of three years old are likely to get ear infections, while 20% are likely to get strep throat.

Complete the table to determine the following probabilities.

	Ear infections (0.45)	**No ear infections (0.55)**
Strep throat (0.2)		
No strep throat (0.8)		

1. What is the probability that a child under the age of three will have both an ear infection and strep throat?

2. What is the probability that a child under the age of three will have an ear infection but not have strep throat?

3. What is the probability that a child under the age of three will not have an ear infection but will have strep throat?

4. What is the probability that a child under the age of three will not have an ear infection nor will they have strep throat?

A recent study released by the Journal of the American Medical Association presented findings that showed that 70% of all Americans over the age of 72 are likely to have a stroke and 60% are likely to break at least one bone.

Complete the table to determine the following probabilities.

	Stroke (0.7)	**No stroke (0.3)**
No broken bones (0.4)		
Broken bones (0.6)		

5. What is the probability that someone over the age of 72 will have both a stroke and a broken bone?

6. What is the probability that someone over the age of 72 will have a stroke but not break a bone?

7. What is the probability that someone over the age of 72 will not have a stroke but will break a bone?

8. What is the probability that someone over the age of 72 will not have a stroke nor will they have a broken bone?

Outcome #7 Answer Key

A Career in the Medical Field Might Be Neat!

A recent study by the American Pediatrics Association showed that 45% of children under the age of three years old are likely to get ear infections, while 20% are likely to get strep throat. Complete the table to determine the following probabilities.

	Ear Infections (0.45)	**No ear infections (0.55)**
Strep throat (0.2)	**.45 x .2 = .09** $\frac{9}{100}$ **9%**	**.2 x .55 = .11** $\frac{11}{100}$ **11%**
No strep throat (0.8)	**.8 x .45 = .36** $\frac{36}{100}$ **36%**	**.8 x .55 = .44** $\frac{44}{100} = \frac{11}{25}$ **44%**

1. What is the probability that a child under the age of three will have both an ear infection and strep throat?

   .09 $\frac{9}{100}$ 9%

2. What is the probability that a child under the age of three will have an ear infection but not have strep throat?

   .36 $\frac{36}{100} = \frac{9}{25}$ 36%

3. What is the probability that a child under the age of three will not have an ear infection but will have strep throat?

   .11 $\frac{11}{110}$ 11%

4. What is the probability that a child under the age of three will not have an ear infection nor will they have strep throat?

   .44 $\frac{44}{100} = \frac{11}{25}$ 44%

Answer Key

A recent study released by the Journal of the American Medical Association presented findings that showed that 70% of all Americans over the age of 72 are likely to have a stroke and 60% are likely to break at least one bone.

Complete the table to determine the following probabilities.

	Stroke (0.7)	**No Stroke (0.3)**
No broken bones (0.4)	**.4 x .7 = .28** **28%** $\frac{28}{100}$ **=** $\frac{7}{25}$	**.3 x .4 = .12** **12%** $\frac{12}{100}$ **=** $\frac{3}{25}$
Broken Bones (0.6)	**.7 x .6 = .42** **42%** $\frac{42}{100}$ **=** $\frac{21}{50}$	**.3x .6 = .18** **18%** $\frac{18}{100}$ **=** $\frac{9}{50}$

5. What is the probability that someone over the age of 72 will have both a stroke and a broken bone?

   .42   42% $\frac{42}{100} = \frac{21}{50}$

6. What is the probability that someone over the age of 72 will have a stroke but not break a bone?

   .28   28% $\frac{28}{100} = \frac{7}{25}$

7. What is the probability that someone over the age of 72 will not have a stroke but will break a bone?

   .18   .18% $\frac{18}{100} = \frac{9}{50}$

8. What is the probability that someone over the age of 72 will not have a stroke nor will they have a broken bone?

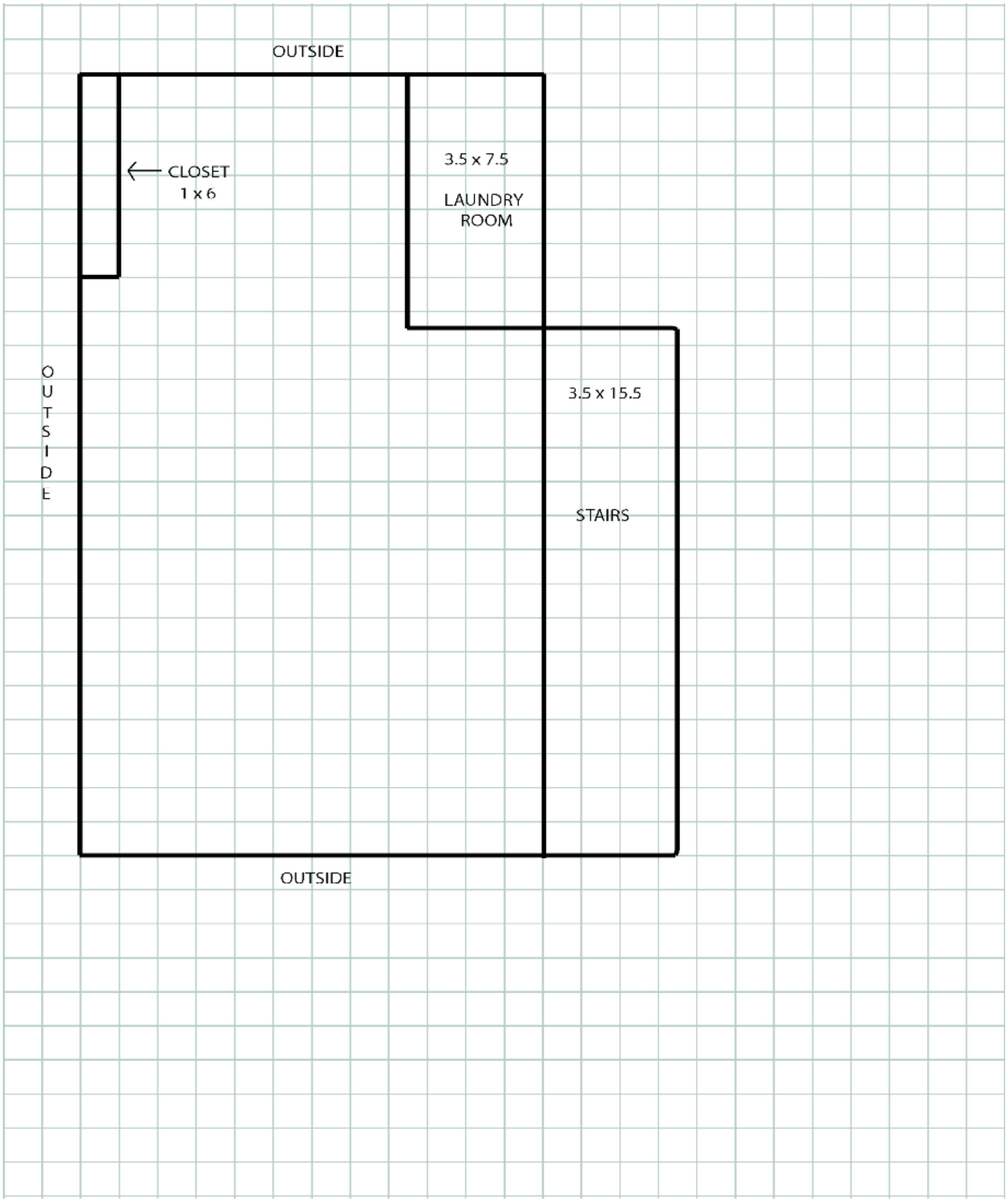
   .12   12% $\frac{12}{100} = \frac{3}{25}$

Source: *http://www.learnnc.org/lp/media/uploads/2008/02/8medical_probability_key.pdf*

Outcome #8 Floor Plan/Job Sheets
Found at http://www.learnnc.org/lp/media/uploads/2008/02/8medical_probability_key.pdf

Name: ___________________________

Floor plan



Name: ___________________________

Job Sheet #1 – Walls

1. Plastic to keep the moisture out. Find the perimeter of the space marked "outside" and use this information to estimate the amount needed.

   Perimeter _________ One roll will cover ____________

   Unit cost _________ x quantity ___________ = cost ____________

2. Studs (2x4x8) to create a frame so the drywall can be screwed into something that will keep it in place. It should be on each end of a wall and placed every 16 inches in the center.

   Unit cost _________ x quantity __________ = cost _____________

3. Treated studs (2x4x8) for the entire perimeter of the floor.

   Unit cost _________ x quantity __________ = cost _____________

4. Insulation (R-11) – This is the pink stuff that goes in between the wall studs.

   Unit cost _________ x quantity __________ = cost _____________

5. Drywall (~ inch)

Unit cost _________ x quantity __________ = cost _____________

6. Tape and mud (joint compound)

Tape: Unit cost ____________ x quantity _____________ = cost ___________
Mud: Unit cost ____________ x quantity _____________ = cost ___________

7. Miscellaneous items

Concrete nails: cost ___________
Drywall screws: cost __________
16 penny nails: cost ___________

8. Are there any special tools required that will need to be rented or purchased? Explain and give the cost.

Total cost for this part of the job: _______________

Name: ___________________________

Job Sheet #2 - Ceiling

The rafters are already in place. You will need to show on your floor plan how the pieces will be placed

1. Drywall (~ inch)

   Unit cost ___________ x quantity ____________ = cost _____________

2. Tape and mud joint compound

   Tape: Unit cost _____________ x quantity ______________ = cost ____________
   Mud: Unit cost _____________ x quantity ______________ = cost ____________

3. Miscellaneous items

   Drywall screws: cost _____________

4. Light fixtures (two) These should be the same and relatively inexpensive. Also, because they will go in a basement with a low ceiling (7 . feet high), they should not be hanging fixtures.

   Unit cost ___________ x quantity ____________ = cost _____________

5. Are there any special tools required that will need to be rented or purchased? Explain and give the cost.

Total cost for this part of the job: ________________

Name: ___________________________

Job Sheet #3 - Molding

Total perimeter _______________

1. Ceiling molding

   Unit cost ___________ x quantity ____________ = cost _____________

2. Chair railing

   Unit cost ___________ x quantity ____________ = cost _____________

3. Floor molding

   Unit cost ___________ x quantity ____________ = cost _____________

4. Quarter round molding

   Unit cost ___________ x quantity ____________ = cost _____________

5. Miscellaneous items

   Wood-finishing nails: cost ____________
   Wood filler: cost _____________________

6. Are there any special tools required that will need to be rented or purchased? Explain and give the cost.

Total cost for this part of the job: ________________

Name: _________________________

Job Sheet #4 - Floors

Total square feet ___________

Option #1: Medium-grade Berber carpet (padding and installation included)
Total square feet ________ x cost per square foot _________ = total cost ________

Option #2: Real hardwood flooring (cherry finish)
Total square feet ________ x cost per square foot _________ = total cost ________

Option #3: Laminate hardwood flooring (cherry finish)
Cost per box _________ x number of boxes ___________ = cost _________
Miscellaneous items: glue ___________

Option #4 Ceramic tile (medium grade: 12inch x 12 inch)
* You will not need to include the stairs for this option.
Cost per box _________ x number of boxes ___________ = cost _________

Are there any special tools required that will need to be rented or purchased? Explain and give the cost.

Lowest cost for this part of the job: _________________
Highest cost for this part of the job: _________________

Name: ______________________

Job Sheet #5 - Paint

1. Primer (Kilz brand)

   One gallon covers __________ Recommended number of coats ____
   Cost ___________

2. High-grade interior semi-gloss paint
   One gallon covers __________ Recommended number of coats ____
   Cost ___________

3. Miscellaneous items:

   2 paint rollers with handles. Cost: _____________

   1 roller paint pan. Cost: ____________

   2 paint brushes. Cost: ___________

   2 trim brushes. Cost: __________

   Trim tape. Cost: ____________

Total cost for this part of the job __________________

Name: ___________________________

Job Sheet Total - Team estimation work page

Jobs	Cost
Job #1 (Walls)	
Job #2 (Ceiling)	
Job #3 (Molding)	
Job #4 (Floors)	
Job #5 (Paint)	

Total supply cost __________

Labor cost __________

Total estimate for potential customer _____________

Outcome #9 What Do Market Research Analysts Do?

Occupational Employment and Wages, May 2023

13-1161 Market Research Analysts and Marketing Specialists

Research conditions in local, regional, national, or online markets. Gather information to determine potential sales of a product or service, or plan a marketing or advertising campaign. May gather information on competitors, prices, sales, and methods of marketing and distribution. May employ search marketing tactics, analyze web metrics, and develop recommendations to increase search engine ranking and visibility to target markets.

National estimates for Market Research Analysts and Marketing Specialists:

Employment estimate and mean wage estimates for Market Research Analysts and Marketing Specialists:

Employment (1)	Employment RSE (3)	Mean hourly wage	Mean annual wage (2)	Wage RSE (3)
846,370	0.9 %	$ 40.00	$ 83,190	0.4 %

Percentile wage estimates for Market Research Analysts and Marketing Specialists:

Percentile	10%	25%	50% (Median)	75%	90%
Hourly Wage	$ 19.25	$ 25.40	$ 35.90	$ 49.26	$ 65.89
Annual Wage (2)	$ 40,040	$ 52,840	$ 74,680	$ 102,450	$ 137,040

Source: U.S. Bureau of Labor Statistics, https://www.bls.gov/oes/current/oes131161.htm

Outcome #9 **Ice Cream Flavor Survey**

Student Name: ____

Date: ____

Number	Name	Vanilla	Chocolate	Strawberry	Other
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

Example

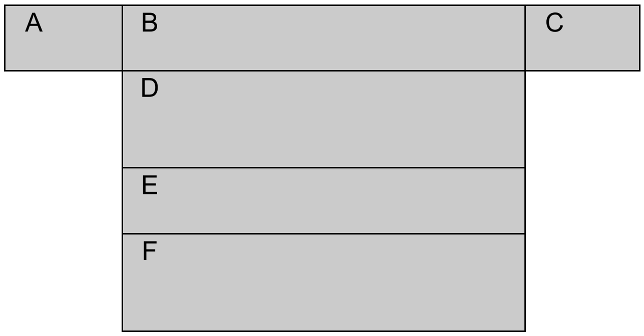
Ice Cream Flavor	Tally	Frequency
Vanilla	IIIII I	6
Chocolate	IIIII IIIII I	11
Strawberry	III	3
Other	IIII	4

Ice Cream Flavor	Tally	Frequency
Vanilla		
Chocolate		
Strawberry		
Other		

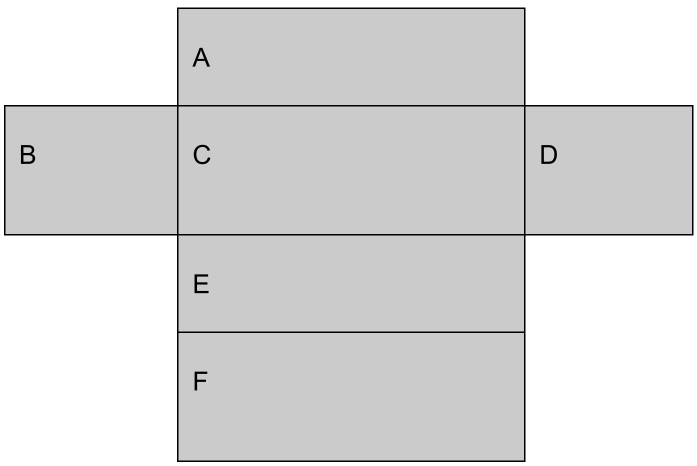
Cardboard box factory worksheet

Directions: Record the length and width of each side of the shaded figures below on the following worksheet. Calculate the area for each of the nets below. Each box is equal to one (1) foot.

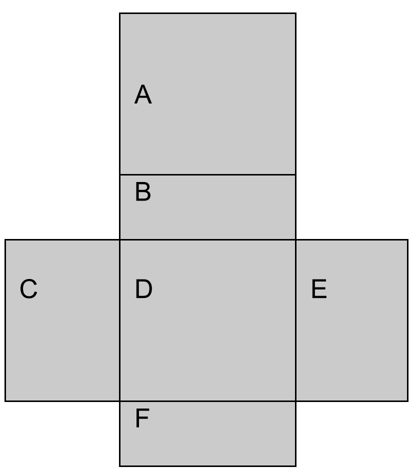
1)



2)

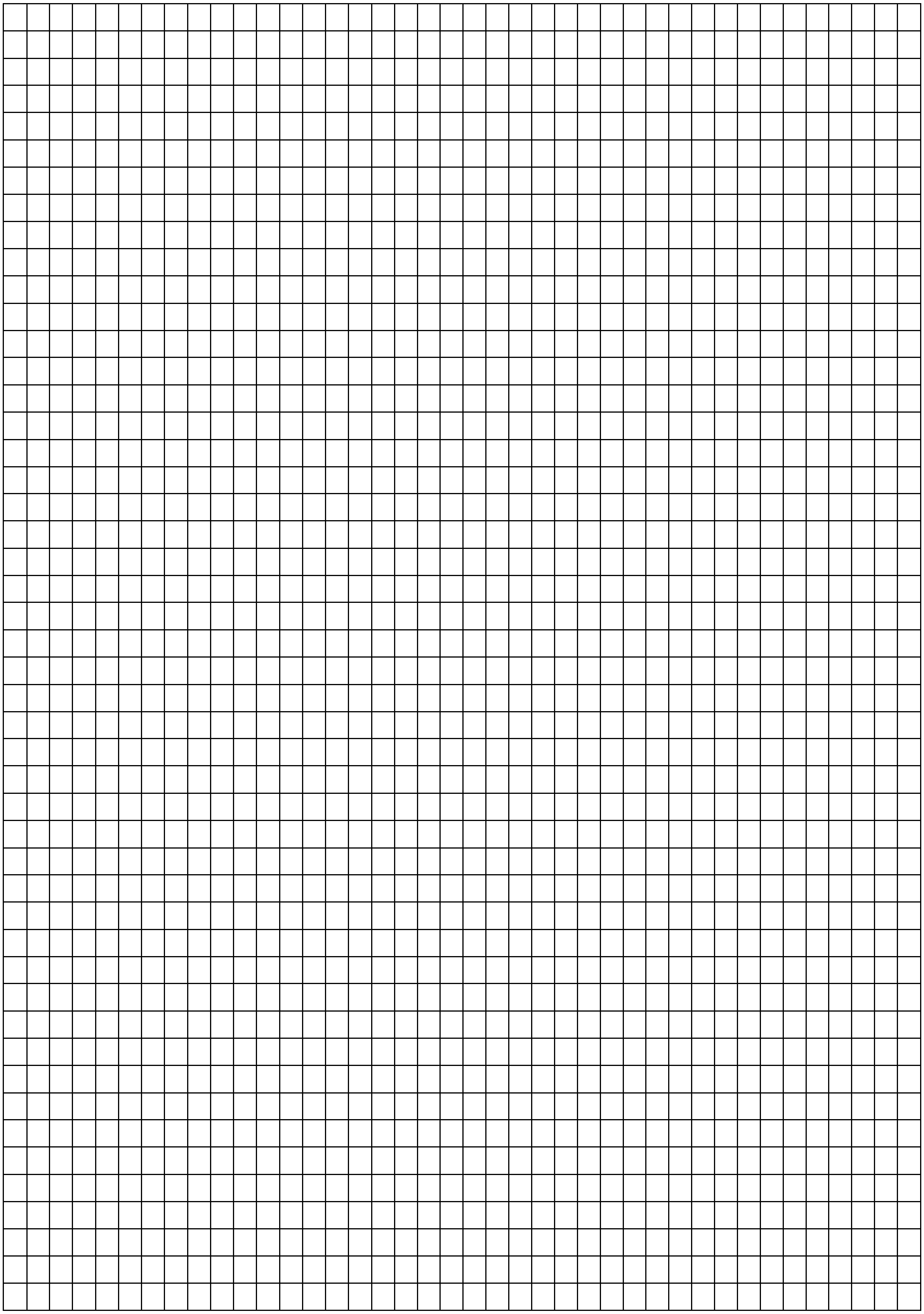


3)



Outcome #10 - Cardboard Box Factory
Directions: Use the following table to record the results from your worksheet.

Net #1		
Side A	Length =	
	Width =	Area side A =
Side B	Length =	
	Width =	Area side B =
Side C	Length =	
	Width =	Area side C =
Side D	Length =	
	Width =	Area side D =
Side E	Length =	
	Width =	Area side E =
Side F	Length =	
	Width =	Area side F =
		Total surface area =
Net #2		
Side A	Length =	
	Width =	Area side A =
Side B	Length =	
	Width =	Area side B =
Side C	Length =	
	Width =	Area side C =
Side D	Length =	
	Width =	Area side D =
Side E	Length =	
	Width =	Area side E =
Side F	Length =	
	Width=	Area side F =
		Total surface area =
Net #3		
Side A	Length =	
	Width =	Area side A =
Side B	Length =	
	Width =	Area side B =
Side C	Length =	
	Width =	Area side C =
Side D	Length =	
	Width =	Area side D =
Side E	Length =	
	Width =	Area side E =
Side F	Length =	
	Width =	Area side F =
		Total surface area =



Outcome #10 - Cardboard Box Factory Answer Key

Net #1		
Side A	Length = 2 ft.	
	Width = 2 ft.	Area side A = 4 $ft.^2$
Side B	Length = 7 ft.	
	Width = 2 ft.	Area side B = 14 $ft.^2$
Side C	Length = 2 ft.	
	Width = 2 ft.	Area side C = 4 $ft.^2$
Side D	Length = 7 ft.	
	Width = 3 ft.	Area side D = 21 $ft.^2$
Side E	Length = 7 ft.	
	Width = 2 ft.	Area side E = 14 $ft.^2$
Side F	Length = 7 ft.	
	Width = 3 ft.	Area side F = 21 $ft.^2$
		Total surface area = 78$ft.^2$
Net #2		
Side A	Length = 6 ft.	
	Width = 3 ft.	Area side A = 18 $ft.^2$
Side B	Length = 3 ft.	
	Width = 4 ft.	Area side B = 12 $ft.^2$
Side C	Length = 6 ft.	
	Width = 4 ft.	Area side C = 24 $ft.^2$
Side D	Length = 3 ft.	
	Width = 4 ft.	Area side D = 12 $ft.^2$
Side E	Length = 6 ft.	
	Width = 3 ft.	Area side E = 18 $ft.^2$
Side F	Length = 6 ft.	
	Width = 4 ft.	Area side F = 24 $ft.^2$
		Total surface area = 108 $ft.^2$
Net #3		
Side A	Length = 3 ft.	
	Width = 5 ft.	Area side A = 15 $ft.^2$
Side B	Length = 3 ft.	
	Width = 4 ft.	Area side B = 6 $ft.^2$
Side C	Length = 2 ft.	
	Width = 5 ft.	Area side C = 10 $ft.^2$
Side D	Length = 3 ft.	
	Width = 5 ft.	Area side D = 15 $ft.^2$
Side E	Length = 2 ft.	
	Width = 5 ft.	Area side E = 10 $ft.^2$
Side F	Length = 3 ft.	
	Width = 2 ft.	Area side F = 6 $ft.^2$
		Total surface area = 62 $ft.^2$

Outcome #11 Career Cards

Account Collectors
Engineering Tech
Bank Teller
Mechanic

Computer Repair Tech
Landscape Artist
Pharmacist Tech

Crane Operator
Carper Installer
Bartender
Customer Service Rep

Outcome #11
Writing mathematical expressions and equations

A mathematical expression uses math symbols instead of words.

Examples:

1) 9 + n means "the sum of *nine* and the number *n*".
2) N – 12 means "a number *n* decreased by *twelve*."
3) 7 x n and 7n both mean "seven times the number n."
4) n/6 and n ÷ 6 both mean "a number *n* divided by six."

Underline the correct mathematical expression.

1) The sum of 13 and 26

   13 x 26
   13 + 26

2) Nine added to negative 5

   9 + -5
   9 + 5

3) Seven decreased by a number z

   7 – z
   Z – 7

4) Ten less than a number x

   x – 10
   10 – x

5) Five times the sum of a number x and a number d

   5x ÷ d
   5 x (x ÷ d)

6) Eight less than the result of dividing a number a by b

   a/b – 8
   $\frac{a - 8}{B}$

Write as mathematical expressions.

7. a number x decreased by eleven
8. the product of 12 and a number g
9. a number *t* decreased by a number *j*
10. the product of ten and a number *v*, divided by 4
11. a number *q* decreased by five.
12. thirty-one divided by a number *s*
13. double the product of a number *v* and a number *r*
14. fifteen more than a number *u*, divided by a number *k*
15. three times a negative six, plus a number *p*
16. the number *b* times the sum of eight and the *f*

Outcome #11 Writing mathematical expressions and equations - Answer Key

A mathematical expression uses math symbols instead of words.

Examples:

6) 9 + n means “the sum of *nine* and the number *n*”.
7) N – 12 means “a number *n* decreased by *twelve*.”
8) 7 x n and 7n both mean “seven times the number n.”
9) n/6 and n ÷ 6 both mean “a number *n* divided by six.”

Underline the correct mathematical expression.

2) The sum of 13 and 26

13 x 26
13 + 26

2) Nine added to negative 5

9 + -5
9 + 5

3) Seven decreased by a number z

7 – z
Z – 7

4) Ten less than a number x

x – 10
10 – x

10) Five times the sum of a number x and a number d

5x + d
5 x (x + d)

6) Eight less than the result of dividing a number a by b

a/b – 8 (correct)
$\frac{a - 8}{B}$

Write as mathematical expressions.

17. a number x decreased by eleven **x - 11**
18. the product of 12 and a number g **12 x g**
19. a number *t* decreased by a number *j* **t - j**
20. the product of ten and a number *v*, divided by 4 $\frac{10 \times v}{4}$
21. a number *q* decreased by five. **q - 5**
22. thirty-one divided by a number *s* $\frac{31}{s}$
23. double the product of a number *v* and a number *r* **2 (v + r)**
24. fifteen more than a number *u*, divided by a number *k* $\frac{15u}{k}$
25. three times a negative six, plus a number *p* **3(-6) + p**
26. the number *b* times the sum of eight and *f* **b (8 + f)**

Outcome #11

Make Fifteen

Game for 2 players that provides practice for building and solving equations.

In turn, each player throws 3 dice and uses the number showing on top to form equations naming numbers 1 to 15 in that order. The number on each die must be used once, and only once, in an equation. When a player is unable to form an equation that names the next number, the play passes to the next player.

Example: First player throws 2, 4, and 6 and forms the equations below:

$$(2 + 4) \div 6 = 1$$
$$(2 \times 4) - 6 = 2$$
$$(2 \times 6) \div 4 = 3$$
$$(6 + 2) - 4 = 4$$
$$(6 + 4) \div 2 = 5$$

The player is unable to name 6, so the dice are passed to the next player. Player number one will begin naming numbers at 6 on the next round of play. The first player to name all numbers to 15 is the winner; however, if both players reach 15 in the same round, extend the goal to 21.