

A MATHEMATICALLY FOCUSED VIRTUAL CAREER FAIR

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THE 16 CAREER CLUSTERS

The table to the right is found on the BLS (Bureau of Labor Statistics) at: [Clusters, pathways, and BLS: Connecting career information : Career Outlook: U.S. Bureau of Labor Statistics](#)

Career Clusters	Projected 2012–22	
	Job openings ⁽¹⁾	New jobs ⁽²⁾
Hospitality and tourism	7,575,300	1,740,200
Business management and administration	7,210,400	1,819,700
Marketing	6,068,100	1,331,400
Health science	5,575,300	3,079,800
Architecture and construction	3,678,800	1,799,800
Transportation, distribution, and logistics	3,672,700	993,700
Education and training	3,311,400	1,163,300
Manufacturing	3,077,100	360,000
Human services	2,906,600	1,458,200
Finance	2,054,900	567,400
Law, public safety, corrections, and security	1,679,100	448,400
Information technology	1,231,800	647,100
Agriculture, food, and natural resources	813,600	-81,200
Science, technology, engineering, and mathematics	710,900	157,300
Arts, audio/video technology, and communications	670,400	71,600

LAW, PUBLIC SAFETY, CORRECTIONS, AND SECURITY

Profession	Average Illinois Salary	Education	BLS Information Page
Police	\$78,350	Bachelors Preferred	Click Here
Lawyer	\$157,010	Doctorate Degree (JD)	Click Here
Game Warden	\$74,570	Bachelors Preferred	Click Here
EMT's & Paramedics	\$43,310	Associates Preferred (Continuing Education Required)	Click Here
Security Guard	\$33,800	Certification Required	Click Here

LAW, PUBLIC SAFETY, CORRECTIONS, AND SECURITY

MATHEMATICS EXAMPLE

One of the more unfortunate jobs that a police officer performs is to investigate accidents. In the accident investigation, the officer will try to gather as much information as possible so that a court or insurance agency can determine who might have been at fault in causing the accident. In the case of some accidents, the officer is able to compute the approximate speed of a car by measuring the length of skid marks that the car leaves. To do this they use a math equation called “*The Skid Mark Formula*”. To use this formula you need to know two things: 1. What is the length of the skid marks that are left (in feet and inches)? 2. What is the type of surface that the skids are on? (This is called the K number and is a number between 0 and 1). To get the K number you can look it up in a table or conduct tests to figure it out for your self.

THE FORMULA

$$v = \sqrt{30 \cdot D \cdot k}$$

- V= Velocity or speed of the car
- D= The length of the skid
- K= The pavement factor (it determines how sticky the car tires are to the ground)

Example: If a car hits the brakes and skids 50 feet, and it does that a slightly wet asphalt pavement, how fast was the car going?

Roadway Condition	K -Value
Wet Asphalt	0.57
Dry Asphalt	0.68
Dry Concrete	0.7
Wet Concrete	0.57
Dry-Snow Packed	0.43

$$v = \sqrt{30 \cdot 50 \cdot .57}$$

$$v = \sqrt{855}$$

$$v = 29.2$$

PRACTICE PROBLEM

THE PROBLEM

While riding his bike, Raphael noticed a set of long skid marks on the road. He thought to himself “that car must have been going fast”. When he told his sister about the skid marks he had seen, she told him that her physics teacher at school said you could figure out the speed using a formula, and by knowing the length of the skid mark, and what type of road the skid was made on. Raphael went back with a tape measure and found that the skid marks were 124 ft long, and that the road was dry asphalt.

THE QUESTIONS

1. How fast did Raphael calculate the car was going if he used the formula correctly?
2. If Raphael was asked if he was **sure** of the speed, what things should he think about that might have an effect on the speed calculation?
3. When you look at the K numbers, how do they affect the speed calculation? (ex: how would a K number of .23 affect the speed compared to a K number of .62)

MANUFACTURING

Profession	Average Illinois Salary	Education	BLS Information Page
Welder	\$43,150	Certification Required	Click Here
Machinists	\$42,800	High School and Certification	Click Here
CNC Operators	\$40,320	High School and Certification	Click Here
Electrical Assemblers	\$34,030	High School	Click Here
Millwright	\$63,050	High School and Certification	Click Here

MANUFACTURING MATHEMATICS EXAMPLE

One of the more common jobs in manufacturing is for a worker to be able to read a blueprint (plan) of the item to be manufactured. To read a blueprint accurately a person will have to have a knowledge of Geometry and Basic Algebra. However, they will also have to have an understanding of a concept called tolerance. **Tolerance** is defined as *how much bigger or smaller something can be from the size it is supposed to be*. As an example: A company may manufacture bolts that are supposed to be 2.5 inches in length. However, they will also specify that the bolt will work as intended if it is within a hundredth of an inch of the 2.5 it is supposed to be. What this means is that if you grab a bolt off the assembly line, and measure it, you may find that it is slightly shorter, or slightly longer than the exact 2.5 inches that was asked for. Bolts that measure within the tolerance will be accepted as ok, bolts that don't measure in the tolerance range will be rejected and sent back.

HOW TO CALCULATE TOLERANCE LIMITS

UPPER LIMIT= REQUIRED MEASUREMENT + TOLERANCE

LOWER LIMIT= REQUIRED MEASUREMENT - TOLERANCE

- M= Required Measurement
- U= Upper Tolerance limit
- L= Lower tolerance limit
- T= Tolerance allowed

Example: A manufacturer wishes to make Vinyl table-cloths that should measure 6 ft in length. The tolerance on the machine that cuts them needs to be within + or - 1/4 or .25 inch. What are the acceptable lengths for a table-cloth that comes from this manufacturer?

Tolerance called for	Decimal Value
Tenths	0.0
Hundredths	0.00
Thousandths	0.000
Ten Thousandths	0.0000

$$L = M - T$$

$$L = 72.00 - 0.25$$

$$L = 71.75$$

$$L = M + T$$

$$L = 72.00 + 0.25$$

$$L = 72.25$$

Notice in the example above that we changed the measurement of 6 feet to inches (each foot is 12 inches, so $12 \times 6 = 72$). We had to do this because the tolerance was in inches, so we needed the same measurement units to be accurate.

PRACTICE PROBLEM

THE PROBLEM

Wendy was recently hired at a manufacturing plant. Her job description says that she has to produce parts for a washing machine. The part she is in charge of producing is the drum the clothes sit in while being washed. The drum is to be manufactured to a diameter of 26.5 inches. The manufacturer specifies a tolerance of + or - .0025 inches.

THE QUESTIONS

1. What is the upper tolerance measure that is acceptable?
2. What is the lower tolerance measure that is acceptable?
3. Why are tolerances important in manufacturing, especially when items are sold to you and I?

INFORMATION TECHNOLOGY

Profession	Average Illinois Salary	Education	BLS Information Page
Programmer	\$94,010	Bachelors Degree or Higher	Click Here
Systems/Network Administrator	\$86,810	Bachelors Degree or Higher	Click Here
Database Manager	\$97,880	Bachelors Degree or Higher	Click Here
Web Designer	\$78,700	Associates Degree or Higher	Click Here
Security Analysts	\$102,780	Bachelors Degree or Higher	Click Here

INFORMATION TECHNOLOGY MATHEMATICS EXAMPLE

The backbone of all things that operate in the computer world is the use of electricity. Plain and simple, a computer couldn't do what it does without electricity. So how is it that a computer takes electricity and makes itself do all of those calculations, videos, pictures, etc. just from plain old electricity? Well, the basis for its ability to do all those fancy things is mathematics. In particular, it is a special type of math that uses a numbering system called binary. Binary is a way of counting that only has 2 digits, a 1 and a 0. The numbering system we use is called decimal, because it has 10 digits 0,1,2,3,4,5,6,7,8,9 . Since electricity can only be thought of as ON (1) or OFF(0) the use of binary numbers is a perfectly suited way to explain what is happening in the computer when you use it.



HOW TO COUNT AND ADD IN BINARY

Binary Number	Decimal Number
0	0
1	1
10	2
11	3
100	4
101	5
110	6
111	7
1000	8

See if you can find the pattern in the table on the left for the binary numbers. Then push that pattern further to fill in the table on the right for the binary numbers. **Hint:** what do you notice about the binary numbers that are odd, then what about the ones that are even?

Answer:

Binary Number	Decimal Number
	9
	10
	11
	12
	13
	14
	15
	16
	17

PRACTICE PROBLEM

THE PROBLEM

Being able to change a binary number to a decimal number is something that is relatively easy to do. Look at the example to the right to follow the process. Then change the binary number below to its Decimal (our numbering system) value.

10001100111010

Binary Number	1	0	0	0	1	1	0	0	1	1	1	0	1	0
Decimal Value														

Decimal Value=

EXAMPLE

Change 11000111 to Decimal

Start at the rightmost digit and put a 1 under it.

Then for every other digit going left keep double the previous number and write it under that digit

Binary Number	1	1	0	0	0	1	1	1
Decimal Value	128	64	32	16	8	4	2	1

Then add up all the decimal values that have a 1 above them.

$$1+2+4+64+128 = 199 \leftarrow \text{Your answer}$$

HEALTH SCIENCE

Profession	Average Illinois Salary	Education	BLS Information Page
Registered Nurse	\$73,300	Bachelors Degree or Higher	Click Here
Medical Transcriptionist	\$32,230	Certification Required	Click Here
Medical Assistants	\$36,500	Certification Required	Click Here
Surgical Technologist	\$49,030	Certification Required	Click Here
Athletic Trainers	\$45,930	Bachelors Degree	Click Here

HEALTH SCIENCES MATHEMATICS EXAMPLE

For those that work in the healthcare industry, the use of mathematics guides everything that they do. From nurses, to pharmacists, to physicians and surgeons, the ability to calculate the needed dosages of medication or accurately measure vital signs means the difference between life and death. In some cases, the math that is used is very basic (addition and subtraction), in other cases it's a complex formula (like calculating how much anesthesia to administer to a patient). In all cases, the math must be extremely accurate, so harm to the patient is avoided.



TAKING A VITAL STATISTIC PULSE RATE

One of the basic Vital Signs that Nurses, CNA's and Doctors take is your pulse rate. Pulse rates are measured in number of beats per minute that your heart makes. Since your heart beats in a steady rhythm (unless you have a condition like arrhythmia), the medical professional will not need to hold your wrist (or other location) for a full minute and count the number of beats present. In most cases, they will count beats for six or ten seconds, and then simply multiply their count out by ten or six to get what a full minute of beating would add up to. Ex: Nurse Carey holds Melissa's wrist and starts counting her pulse for six seconds. In that six seconds nurse Carey counts 7 beats. To calculate the beats per minute, nurse Carey will take the seven beats she counted and multiply them by 10. She uses 10 since she counted for six seconds, and six times 10 would be sixty (or 1 full minute). Remember, pulse rate is always measured in beats per minute!

PRACTICE PROBLEMS

PROBLEM

NURSE A TAKES THE PULSE OF HER PATIENT FOR 10 SECONDS AND GETS A PRELIMINARY COUNT OF 9 BEATS.

NURSE B COMES IN LATER AND TAKES THE PULSE OF THE SAME PATIENT FOR SIX SECONDS AND GETS A PRELIMINARY COUNT OF SIX.

QUESTIONS:

1. WHAT IS THE COMPUTED PULSE RATE IN BEATS PER MINUTE THAT EACH NURSE FOUND?
2. DO YOU THINK THE RATES THEY FOUND WERE ACCURATE (WHY OR WHY NOT)?

ARCHITECTURE AND CONSTRUCTION

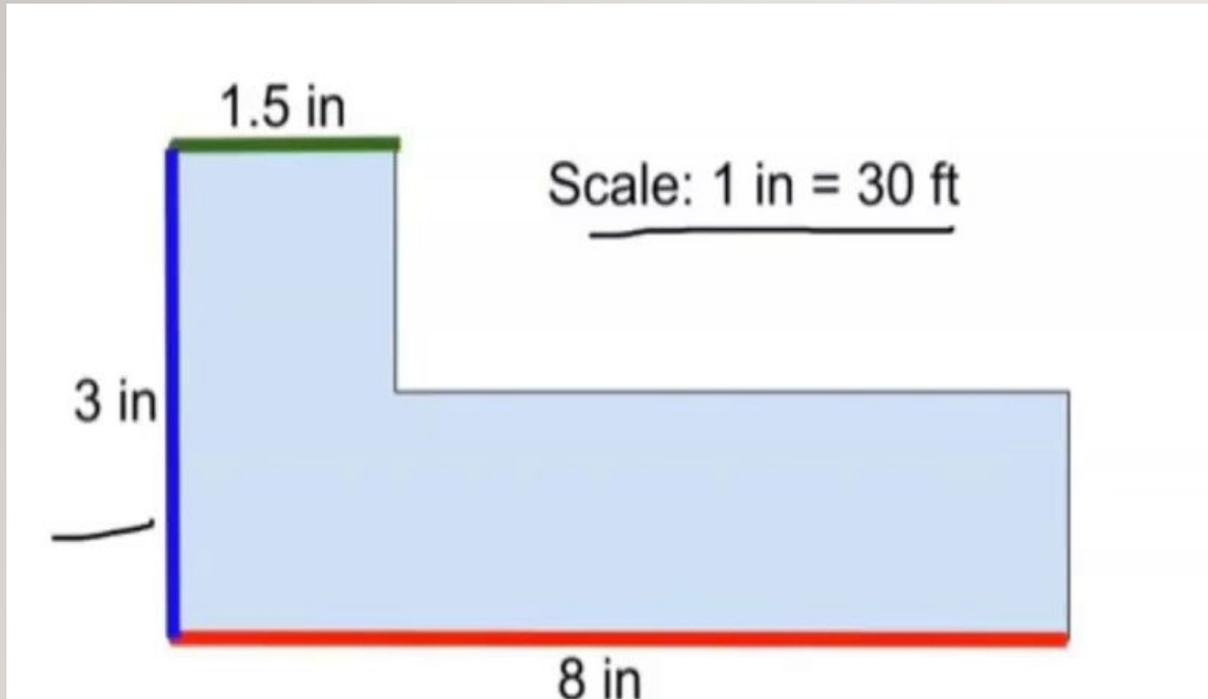
Profession	Average Illinois Salary	Education	BLS Information Page
Architects	\$84,430	Bachelors Degree	Click Here
Chemical Engineers	\$ 97,450	Bachelors Degree	Click Here
Civil Engineering Technologist	\$63,170	Associates	Click Here
Computer Hardware Engineers	\$ 100,680	Bachelors	Click Here
Drafters	\$ 58,950	Associates	Click Here

ARCHITECTURE AND CONSTRUCTION MATHEMATICS EXAMPLE

The Architecture and Construction industries work hand in hand to take an idea from its very beginnings to its ultimate completion. In order to do that, the two industries must have a way to communicate with each other. That communication happens in the plans that the Architect makes. In making those plans, the architect will draw out the plans for the item to be built. In doing so, in most cases the Architect will need to make a drawing that is no where near the same size as the product to be manufactured or built. So, when the Architect draws the building, or object, they will draw the object to **SCALE**. Scale means that when you measure the item on the architect's paper each unit of measure on the paper will represent a specific distance in real life. As an example: A drawing may have a scale of 1 in = 2.5 ft. This would mean that each inch you measure on the paper is really 2.5 ft in real life.

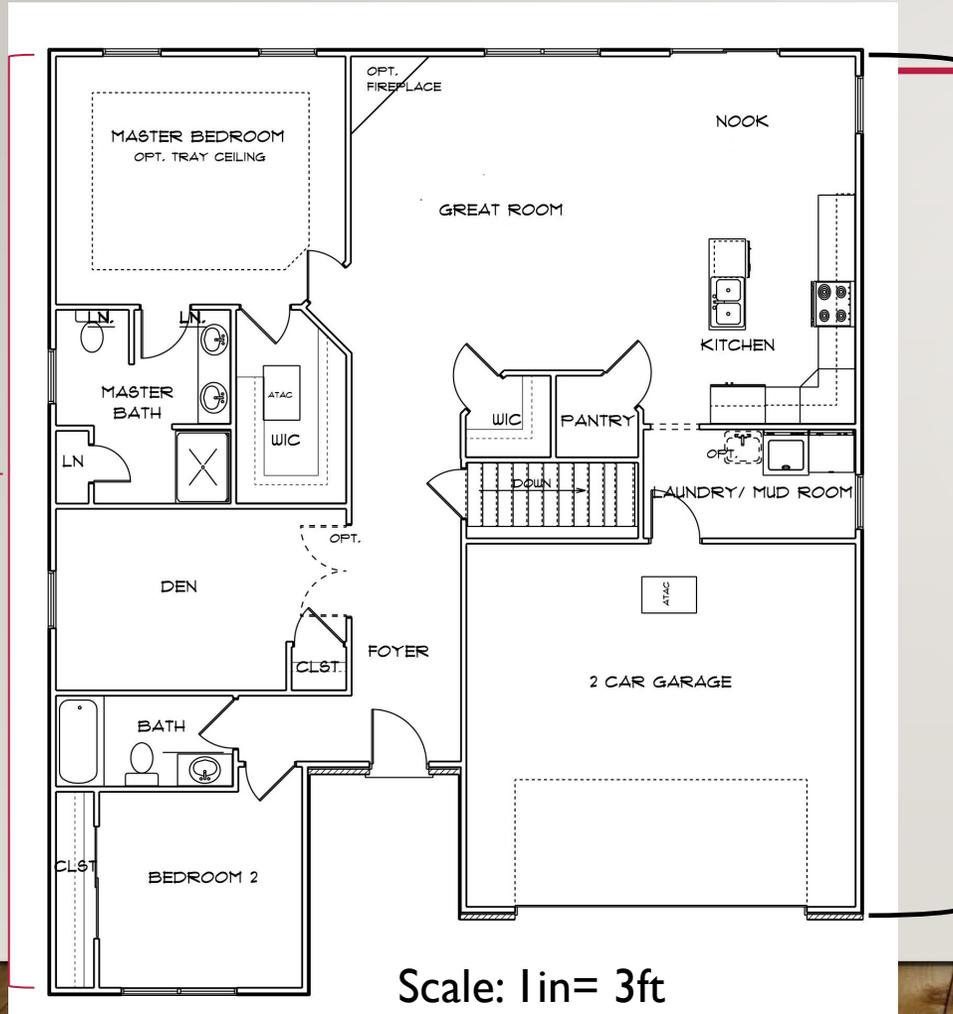


SCALE MEASUREMENT EXAMPLE



In the drawing to the left we are told that the drawing has a scale of 1 inch to 30ft. So, in this example if we wanted to see what this shape would measure when put into a real life construction, we would take each measurement in the drawing and multiply it by 30 to get the real life measurement. In our example, if we wanted the measure of the red line at the bottom, we would take 30×8 to get a result of 240. So if this were a building it would be 240 feet long. Other sides would measure 90 ft, and 45 ft.

PRACTICE PROBLEMS



13.8 in

12.4 in

Scale: 1 in = 3 ft

IN THE DRAWING TO THE LEFT, YOU ARE GIVEN THE SCALE OF THE DRAWING AND ARE TOLD SOME BASIC MEASUREMENTS.

1. WHAT IS THE LENGTH OF THE HOUSE FROM THE CORNER OF THE NOOK TO THE END OF THE 2 CAR GARAGE?

2. HOW MUCH LONGER IS THE HOUSE ON THE SIDE THAT CONTAINS THE BEDROOMS?

HOSPITALITY AND TOURISM

Profession	Average Illinois Salary	Education	BLS Information Page
Travel Agent	\$ 45,250	High School Diploma	Click Here
Chef Head Cook	\$ 55,450	High School Diploma	Click Here
Recreation Workers	\$ 27,560	High School Diploma	Click Here
Meeting, Convention and Event Planners	\$ 51,740	Bachelors Degree	Click Here
Lodging Managers	\$ 54,690	High School Diploma	Click Here

HOSPITALITY AND TOURISM MATHEMATICS EXAMPLE

The Hospitality and Tourism industry performs its work by working alongside other human beings to make their lives more enjoyable and satisfying. To do this, Hospitality and Tourism workers will have duties that require them to seek out what their customers want, and then provide them with their needs. To do this, there will be a cost associated with their services. It is in that cost that workers will need to do a variety of mathematical operations that serve their customers in the best way possible. It might be a chef making a dinner for 20 people so that all enjoy its taste, or it may be a travel agent that plans a family vacation. In both cases, the worker may need to take a single serving recipe and expand it so it can feed 20 people, or it may be a travel agent has to help a family on a budget understand how much their American money is worth on a vacation to Israel. In either case, they need to get it correct, or their customers will walk away very unhappy.



EXCHANGE RATE AND MEASUREMENT EXAMPLES

When a person takes a trip from the United States to another country, they will need to have money to spend to make their trip enjoyable. Since the United States uses American Dollars as its form of currency, an American may need to exchange their American money for the type of money that is used in the place they are visiting. This exchange of money is based upon the value an American dollar as compared to the money in the place they are visiting. This difference in the value of money is called **“The Exchange Rate”**. In some cases an American dollar may be worth more than the money in the place being visited, or it may end up being worth less. That rate of exchange can make a serious difference in the cost of the trip. As an example: If an American were to visit Canada, in Canada they would have to use Canadian dollars. Currently (as of this slide) an American Dollar is worth \$1.25 in Canadian dollars. That is a 25% difference and increase in value for the American Dollar. So, let's say a trip to Canada, flight and hotel stay, were to cost \$2500 in Canadian money. The American would take the \$2500 which is in Canadian dollars, and divide it by the \$1.25 (American Dollar Value). In doing so they would find that they only had to spend \$2000 American money to pay for the trip.

EXCHANGE RATE AND MEASUREMENT EXAMPLES

When working in the food preparation industry there are many times that a person needs to make food in amounts that are much greater than the recipe was intended for. As an example, there may be a recipe for a spaghetti that calls for using 32 ounces of sauce to feed four people. However, perhaps this recipe is being used by a cafeteria manager in a large school. On a given day they may need to feed 500 students. To make sure they have the correct amounts, the cafeteria manager could figure out the correct numbers in a couple of different but still accurate ways.

Method 1: The manager could figure out how many ounces they need to serve a single person. To do that, they would take the 32 ounces and divide it by the 4 people it would feed. That would mean that each person should get 8 ounces. Then since they want to serve 500 people, they would multiple 8 times 500 to get 4000 ounces that would be required to feed the students.

Method 2: The manager could use a ratio (fraction) to compare the 32 ounces for 4 people to how many would be needed to feed 500. It would look like the equation (proportion) below. Remember when you set up a proportion, the numbers on top of each fraction should be related to each other, and the numbers on the bottom should be related to each other.

$$\frac{32}{4} = \frac{x}{500}$$

PRACTICE PROBLEMS

Marcella is planning a trip to France. In France, the currency used is the Euro. Currently the American dollar is worth 0.82 Cents Euro. If the flight and hotel stay were to cost 7800 Euro, what would be the cost of the trip in American Dollars?

Based Upon the exchange rate, when Marcella goes on this trip, and takes money for food, would it be wise for her to plan for things to cost more than she expects? Why or why not?

John has planned to have a small dinner party for 10 people at his house. The food he is preparing is based upon a recipe that feeds four people. If the recipe called for the following:

- 2.5 Pounds Beef
- 4 Diced Carrots
- 2 Medium Potatoes
- 16 oz Beef broth

How much of each of these ingredients would have to be prepared to supply food for the 10 guests to eat equal portions.

BUSINESS MANAGEMENT AND ADMINISTRATION

Profession	Average Illinois Salary	Education	BLS Information Page
Accountants and Auditors	\$ 77,640	Bachelors Degree	Click Here
Human Resource Managers	\$ 121,720	Bachelors Degree	Click Here
Appraiser and Assessor of Real Estate	\$ 53,590	Bachelors Degree	Click Here
Loan Officers	\$ 78,740	Bachelors Degree	Click Here
Insurance Underwriters	\$ 74,400	Bachelors Degree	Click Here

BUSINESS MANAGEMENT AND ADMINISTRATION MATHEMATICS EXAMPLE

In the Business Management cluster one of the primary parts of their jobs is dealing with the oversight of money and its uses in business. One particular job, that of a Loan Officer, is very specific in its requirements to make sure that people who borrow money fully understand how much it will cost to borrow money. The cost of borrowing money is called INTEREST. One particular formula that a loan officer might use is the Simple Interest Formula. The simple interest formula is a way to compute how much borrowing money will cost a person. Remember the money it cost to borrow is called Interest. In our formula that will be the Letter I. The amount of money you borrow is called the Principal, and we will call that P. Lastly, our formula will need to know for how long the money will be borrowed (that is called time and we will call it T), and what the Interest Rate will be (we will call that R). $I = P \times R \times T$

The next page will show an example of this formula being used.

SIMPLE INTEREST FORMULA EXAMPLES

Mr. Medina has entered a bank and is looking to take out a small loan to make some repairs to his automotive business. He is looking to borrow \$25,000. The loan officer informs him that because he has good credit, and his business is doing well, he will be able to authorize a loan at 2.5% interest. Mr. Medina states he wants to pay back the loan within a year. The loan officer informs him that if he takes the whole year to pay back the loan it will cost him \$625 in interest, so the grand total he will pay back will be \$25,625. He also informs Mr. Medina that if he pays the money back faster, the \$625 will decrease as well.

To calculate the Interest on the loan:

$$I = P \times R \times T$$

$$I = 25000 \times .025 \times 1$$

$$I = 625$$

Above, remember that the 25000 is the Principal, the money that is borrowed. The .025 is the interest rate, and to get the decimal we had to move the decimal two places to the left in the rate that was given.

What if Mr. Medina paid off the loan in six months (1/2 a year)?

$$I = P \times R \times T$$

$$I = 25000 \times .025 \times 0.5$$

$$I = 312.50$$

Noticed above we changed the last number from a one to a .5 since it was 1/2 a year.

PRACTICE PROBLEMS

April has decided to do some home improvements to her house. A handyman gives her an estimate of \$12,500 to do the repairs. When April goes to her bank, they inform her that they can give her a loan, but her loan rate will be 8.25%. If she takes out the loan for a year, how much interest will she be charged to borrow the money? At the end of the year, how much total will she have paid back to the bank in both principal and interest?

Sean has decided to take out a loan for a used car he wants to buy. The loan officer tells him that he can get a loan for the car and it will be at a 9.9% interest rate. If the car costs \$18,900 and Sean wants to pay it back over two years. How much interest will he be charged when all is paid back?

(Note, in buying cars there is a more complicated formula used to figure the interest, but we are using simple interest which will be close to the actual cost)

MARKETING

Profession	Average Illinois Salary	Education	BLS Information Page
Sales Managers	\$ 135,790	Bachelors Degree	Click Here
Advertising, Promotions and Marketing Manager	\$ 133,280	Bachelors Degree	Click Here
Public Relations Specialist	\$ 64,380	Bachelors Degree	Click Here
Editor	\$ 61,080	Bachelors Degree	Click Here
Graphic Designer	\$ 61,080	Bachelors Degree	Click Here

MARKETING MATHEMATICS EXAMPLE

One important part of marketing is the effort to figure out how effective you are with the advertising you are sending out. This effectiveness is called **R**eturn **O**n **I**nvestment. Simply, what it means is that to sell something you will have to spend some money in order to let people know you are selling it, and that it is to their advantage to buy whatever you are selling. There is an old saying “*It takes money to make money*”, that is Return on Investment (which is called ROI). When Marketing people look at their ROI, they will figure in the costs associated with making whatever item they are selling, how much money they made in selling the item, and then comparing the money left over to how much they invested total. The equation they use looks like this:

$$\frac{(\text{Gross Profit}) - (\text{Marketing Investment})}{\text{Investment}} = \text{ROI}$$

MARKETING ROI EXAMPLE

Marketing Investment



Example:

Let's say over the past year ACME Anvil Factory Inc. has spent \$5,000 on advertising on blog posts. These posts brought in 150 newly interested customers, and of those 150, 15 became new customers who purchased items from the company. That is a 10% rate for creating 15 new customers. These 15 customers had an average order size of 800 Anvils. The Anvils cost \$1 each to make, and they are sold for \$2.50. So, to figure our ROI we first calculate Gross Profit

Gross Profit = (the amount you made selling the item) - (the cost to make the item)

$(15 \text{ orders} * 800 \text{ rubber ducks} * \$2.50/\text{duck}) - (15 \text{ orders} * 800 \text{ rubber ducks} * \$1/\text{duck}) = \$18,000$ ← Gross Profit



$(\text{Gross Profit} - \text{Marketing Investment}) / \text{Investment} = \text{Marketing ROI}$

$(\$18,000 - \$5,000.00) / \$5,000.00 = 260\%$

A marketing ROI of 260%. This means for every dollar we spent on blog posts for our Anvil blog, it brought a return of \$2.60. Not too shabby!

MARKETING ROI SAMPLE PROBLEM

The ABC Funstuff Company decided to increase their marketing efforts to sell their underwater drone. They spent \$3,000,000 on ads that were designed to appear for specific groups on Facebook. When the ad campaign was over the company found that their advertising campaign had generated 1250 new customers. The average new customer ordered one drone at a cost of \$750 each. If each drone had cost \$250 to manufacture. What was the Return On Investment (ROI) for this advertising campaign?

Based upon the ROI you calculated, was the advertising campaign a success for the company (Why or Why Not)?

TRANSPORTATION, DISTRIBUTION AND LOGISTICS

Profession	Average Illinois Salary	Education	BLS Information Page
Heavy And Tractor Trailer Drivers	\$49,800	Certification	Click Here
Delivery Truck Drivers and Driver/Sales Workers	\$28,690	High School Diploma	Click Here
Air Traffic Controllers	\$ 136,700	Associates	Click Here
Airline and Commercial Pilots	\$ 99,200	Bachelors Degree	Click Here
Flight Attendants	\$ 51,010	High School Diploma	Click Here

TRANSPORTATION DISTRIBUTION AND LOGISTICS MATHEMATICS EXAMPLE

Logistics is the process of transporting items from one place to another in the most time and cost- efficient method. For this to happen, a logistician will want to take into consideration how the objects in questions will be transported. Many times, items are transported in large quantities via shipping containers. The shipping containers are then loaded on cargo ships and sent to every part of the world. In this example a logistics professional would look at the cargo to be shipped, and figure the best way to pack it in a cargo container. The cargo container has specific dimensions that are used by everyone, so it is easy to calculate how much can be packed into the container by using the geometry formula for volume (which is length x height x width).



LOGISTICS PACKING EXAMPLE

A 40' standard container has usable dimensions of 39'5" (Length) X 7'8" (Width) X 7'10" (Height).

A typical shipping pallet is just under four feet square (42-46 inches in length and width, often height too).

If you wanted to pack a standard shipping container as efficiently as possible, and the shipping pallets were 45 inches square and 45 inches high. How many could you fit in the container?

To answer this lets first ask how many pallets we would fit based upon width. Since the container is 7'8" wide, we will convert it to just inches. Since each foot is 12 inches, and the container is 7' wide we will take 7×12 and get 84". Then we will add the extra 8 inches from the width to get 92" inches wide. So, since each pallet is 45 inches wide, we could fit two pallets wide (for 90 inches), and have an inch to spare on each side.

Now, lets see how many pallets will fit length wise. The length of the shipping container is 39'5" . So, we take 39×12 and get 468 inches, then we add on the extra 5 inches to get a total of 473 inches. Since the pallet is 45 inches wide, we will take 473 and divide by 45 and get 10.5 pallets. Since we are only concerned with full pallets, we say we can pack 10 pallets in length.

Now let's see how many pallets high we can stack into the container. Since the container is 7'10" high, we take 7' and multiply it by 12 to get 84 inches. Then we add on the extra 10" and get a total height of 94". Since each pallet is usually about 45 inches high, that means we could stack one on top of the other and get two pallets stacked to 90 inches and have 4 inches left over.

In the end we can stack pallets 2 wide by 10 deep and 2 high. That gives me a total of 40 pallets we can pack.



LOGISTICS SAMPLE PROBLEM

A 40' standard container has usable dimensions of 39'5" (Length) X 7'8" (Width) X 7'10" (Height).

A typical shipping pallet is just under four feet square (42-46 inches in length and width, often height too).

A shipping company is hired to ship a special oversize package for a high-end client. The package is 16 inches wide by 48 inches long and 36 inches high. The package is fragile, so nothing should be packed on top of it. If the company wants to maximize the amount of goods it can get in the shipping container, how many regular pallets that are 45 x 45 x 45 can be packed into the container with the special shipment?

How many pallets can be packed in?

Based upon how many pallets you can pack in, how might you bill the customer who wants the special package shipped?



EDUCATION AND TRAINING

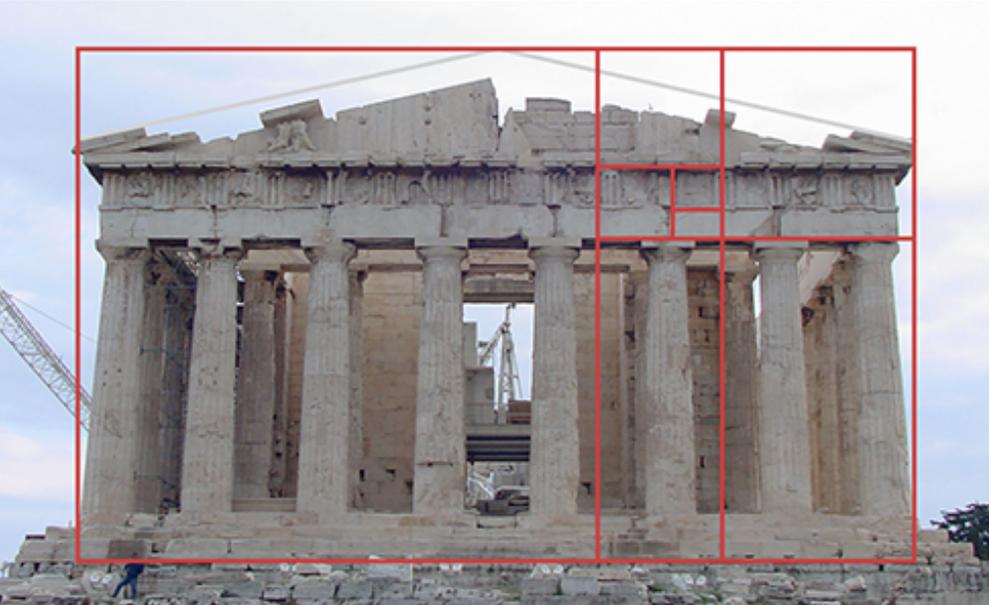
Profession	Average Illinois Salary	Education	BLS Information Page
CTE Teachers	\$68,690	Bachelors Degree	Click Here
Preschool Teachers	\$32,780	Associates	Click Here
High School Teachers	\$ 74,340	Bachelors Degree	Click Here
Special Education Teachers	\$ 71,040	Bachelors Degree	Click Here
Child Care Workers	\$25,440	High School Diploma	Click Here

EDUCATION AND TRAINING MATHEMATICS EXAMPLE

One of the main components of education is the teaching of mathematics. From the simple act of counting (and knowing how to identify the numbers), all the way through calculus and beyond, education plays a primary role in bringing understanding to mathematical concepts. Students are taught these concepts so that as they transition to adulthood they will be able to navigate the demands of a job or perform the basic functions of life. Math has some sort of relationship to every class that is taught in school. In English, you may study Poetry and learn about Iambic Pentameter (where the sounds in a line of poetry are stressed and unstressed for a specific (10) amount of syllables). In science you may learn that plants and other natural organisms grow according to a natural sequence called a Fibonacci series. In art, you learn about symmetry and the “Golden Ratio”, and how objects that fall into that dimension are pleasing to the eye (aesthetically). Lastly, in working with technology one needs to understand numbering systems, especially the binary and hexadecimal systems. Math is everywhere, and your world would not be the same if it did not exist.



EDUCATION AND TRAINING EXAMPLE

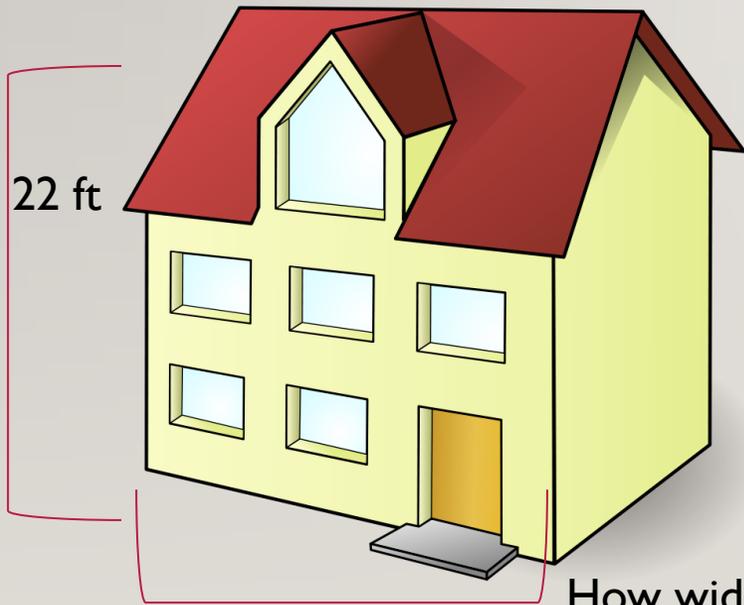


The picture at left shows the Greek Parthenon. It was constructed using the Golden Ratio to lay out its design. The Golden Ratio is a set of numbers that say if the length and width of a rectangle are drawn or built so that the length is 1.61 times the width in measurement it produces a construct that is very pleasing to the eye. While no one knows exactly why this happens, the measurement has been used to build many of the most famous buildings around the world. It is also related to another set of numbers called the Fibonacci numbers that are found in many naturally occurring items.

The approximate height of the Parthenon pictured above is 18.162 Meters. Its width ,outlined by the red rectangle, is approximately 30.906 meters. So what this means, is that according to the golden ratio, if you took the height (the width of the red rectangle) and multiplied it by 1.61, you would get a number very close to the width , which is approximately 30.906m. $18.162 \times 1.61 = 29.24$ ← our number is not exact as the ratio of 1.61 is an approximation, as are the actual measure of of the Parthenon. However, as you can see the measurements come out to be very close.

EDUCATION AND TRAINING SAMPLE PROBLEM(S)

In designing a house, the builder decides to use the Golden ratio to lay out the side that faces the street (to make it more attractive). The height of the side of the house is 22 ft., with that as a measurement to maintain the Golden Ratio, how long (wide) should the front of the house be?



How wide in feet ft?

A Fibonacci series of numbers is a series of numbers that follow a specific pattern. It is found in many natural occurrences (like tree branch growth, flower petals, nautilus shells). The pattern starts 0, 1, 1, 2, 3, 5, 8, Look at the pattern and see if you can come up with the next five numbers in the sequence?

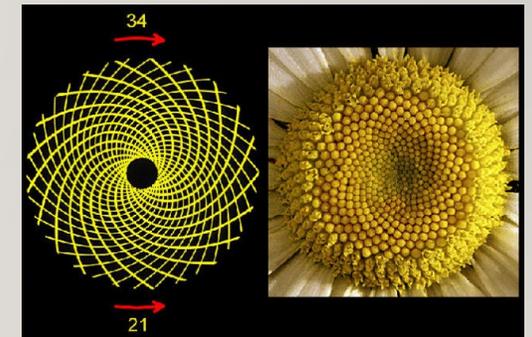
Below are pictures of the Fibonacci sequence in nature.



Tree branches split in the sequence



Flower petals will number as one of a Fibonacci sequence



Seed heads on a flower will number as one of the Fibonacci sequence of numbers.

HUMAN SERVICES

Profession	Average Illinois Salary	Education	BLS Information Page
Marriage and Family Therapist	\$ 69,900	Masters Degree	Click Here
Social Workers	\$55,390	Bachelors Degree	Click Here
Probation Officers and Correctional Treatment Specialists	\$ 54,290	Bachelors Degree	Click Here
School and Career Counselors	\$ 56,650	Masters Degree	Click Here
Barbers, Hairstylists and Cosmetologists	\$ 31,480	Certification	Click Here

HUMAN SERVICES MATHEMATICS EXAMPLE

In jobs that primarily deal with working with other human beings (Human Services), one might not think that mathematics will play an important role, but it does! From social workers to Cosmetologists, the Human Services industry works with other human beings to determine what it is that they need to lead a more fulfilling life. In many instances the ability to live a fruitful life does come down to understanding situations based upon the mathematics behind them. As an example, a couple may go to a marriage counselor because they are not getting along. In the course of discussion, the counselor may find out that the root cause of their disagreements is because there are money problems. Maybe one spouse is spending too much, or the other spouse is not understanding how to properly invest their leftover money, so that they can create a backup fund. Whatever it is, many times when one looks at a human problem in terms of numbers, sometimes that is able to remove the emotion surrounding the problem, and lead to an acceptable answer that is able to be understood by all involved.

Money is not the only mathematical example that is found in Human Services. People who work in the barbering or cosmetology industries must understand geometry, color mixing and many other features so that they serve their clients well and are able to produce the look the person wants.



HUMAN SERVICES EXAMPLE

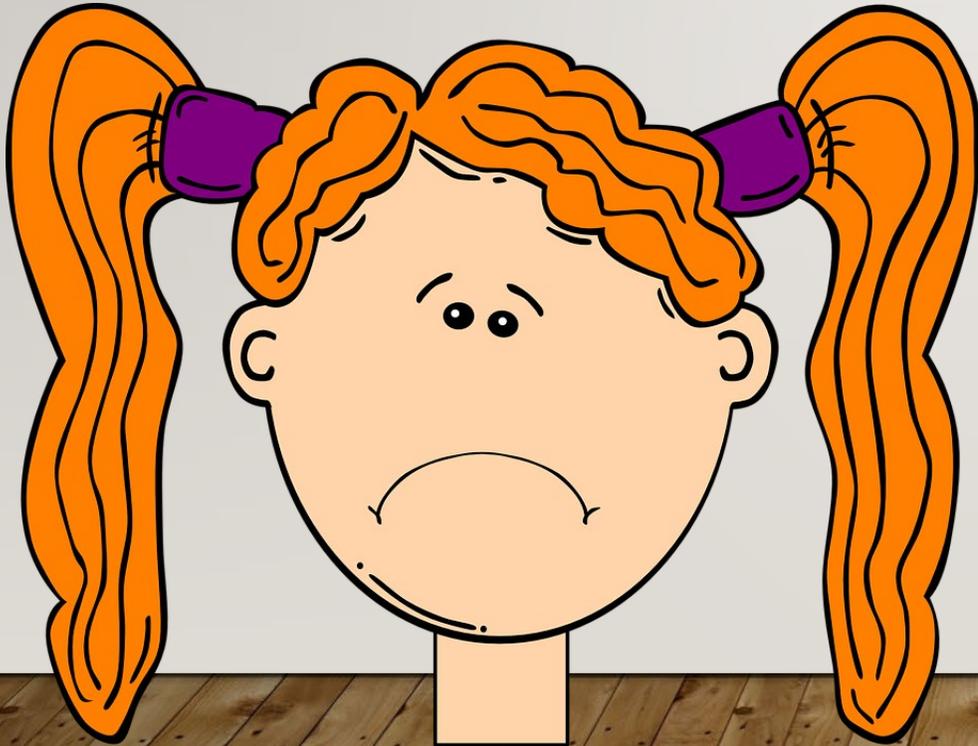
In the cosmetology industry, the understanding of how color (many different colors) is created is extremely important. To do this, cosmetologist must be able to understand the mathematical ratios needed to mix so as to create different colors. A cosmetologist starts by understanding that there are three primary colors they cannot create on their own. Those are Red, Yellow and Blue. From those three PRIMARY colors, they can create another three colors called (SECONDARY COLORS), by mixing equal parts (50%/50%) of two of the primary colors together. Red and Blue create Violet, Red and Yellow create Orange, and Yellow and Blue create Green. Then beyond the secondary colors, the Cosmetologist can create a third level of colors called the TERTIARY COLORS. The Tertiary colors are formed by taking a mixture of 75% of one primary color and mixing it with 25% of another primary color. So, the Tertiary colors are Yellow Green (75% Yellow and 25% blue), Blue Green (75% Blue and 25% yellow), Blue Violet (75% Blue and 25% Red), Red Violet (75% Red and 25 % Blue), Red Orange (75% Red and 25% Yellow), and Yellow Orange (75% Yellow and 25% Red).

You should notice that in the explanation above, when we look to create one of the colors, we are talking in terms of percent. For secondary colors we add equal parts of coloring, so if I want Violet and I mix 5 ounces of red, I then have to add 5 ounces of blue. Like wise, if I go to a tertiary color, I am adding three parts of one color (75%) and 1 part of another color (25%). So, if I want Blue Violet and I add 4 ounces of red, I will need to add 12 ounces of blue (The blue is always three times as much as the red in Blue-Violet).



HUMAN SERVICES SAMPLE PROBLEM(S)

At Maricella's beauty shop, she has been asked by a Cheerleading team to dye all of their hair the same color for an upcoming competition. The team has decided upon a color that is Red-Orange in its appearance. Maricella, knows that she will need 3 ounces of yellow for each head she has to dye on the team. If the team is a 12 member squad, how much dye in total will she need in total to dye all 12 members the Red-Orange color (use the ratios from the previous slide for Reg-Orange)?



FINANCE

Profession	Average Illinois Salary	Education	BLS Information Page
Budget Analysts	\$ 78,240	Bachelors Degree	Click Here
Financial Analyst	\$ 81,590	Bachelors Degree	Click Here
Financial Manager	\$ 146,350	Bachelors Degree	Click Here
Cost Estimator	\$ 71,890	Bachelors Degree	Click Here
Bookkeeping, Accounting, Auditing Clerks	\$ 43,880	Certification	Click Here

FINANCE MATHEMATICS EXAMPLE

Anyone working in finance understands that when you're dealing with other people's money, you better be good at mathematics. Financial workers deal with money in a wide variety of ways. Some work to manage investments so that people earn money, others work to explain how a loan will affect your income while you are paying it back. In all cases, the financial worker must be able to explain the items being discussed so that the client (person affected by the money) can make a decision that is in their best interest. Trust is a key word in all of this. Does the financial worker have the trust of their client? To gain their trust, the financial worker must not only be knowledgeable, but they need to be able to explain that knowledge so that a person who is not in the business can understand it. That includes how the math works.

Many of the equations that are used in finance can be very complex. However, in most cases the formulas can be simplified with some basic mathematics to get an approximate answer to a question that is very accurate.



FINANCE RULE OF 72 EXAMPLE

One of the most exciting things about Finance is the ability to make money. When a person makes an investment, one of the first milestones that many look for, is when will the money I invested double in value.

The actual formula looks complicated and is. $T = \frac{\ln(2)}{\ln\left(1 + \frac{r}{100}\right)}$. This is a complicated problem if you're not into

finance, or into mathematics. However, it turns out that there is a much simpler way that gives you almost the exact same answer, and all you have to do is divide. It is called the rule of 72. The rule of 72 works as follows. Have the financial worker tell you what the annual rate of return is on your investment. Let's say that your advisor says your investment will gather a 5% annual compound return on investment. Then you simply take the number 72 and divide it by the 5 (hint—divide by the 5, do not write it as a decimal). In this case 72 divided by 5 is a little over 14. So, it would take 14.2 years to double your investment. Pretty neat little trick to know when you make investments.

FINANCE SAMPLE PROBLEM(S)

You consult with your financial advisor, and seek to invest \$10,000 in a service that will give you a 12% compound yearly return on investment. How long will it take you to double your investment and have \$20,000 or more?

Another service that a financial worker will offer is to figure out what your NET WORTH is. Net worth is the idea of how much you are worth and is figured out by adding up the value of what you own and then subtracting out what you owe. Below is table for Joe Schmoe. On one side is the value of major items he owns, and the other side is a list of debts he has.. From this table, calculate what Joe's net worth is.

Own (Assets)	Owes (Debts)
Car--\$4500	House-- \$62,000
Silver-- \$1250	Credit Cards-- \$13,700
Boat-- \$8500	Personal Loan-- \$22,400
Savings Account-- \$3500	
IRA-- \$108,200	

SCIENCE, TECHNOLOGY, ENGINEERING AND MATH

Profession	Average Illinois Salary	Education	BLS Information Page
Mathematician, Statistician	\$ 116,850	Masters Degree	Click Here
Information Security Analyst	\$ 99,730	Bachelors Degree	Click Here
Chemical Technicians	\$ 55,130	Associates	Click Here
Forensic Science Technicians	\$ 82,130	Bachelors Degree	Click Here
Computer and Information Research Scientist	\$ 118,970	Masters Degree	Click Here

STEM MATHEMATICS EXAMPLE

Although it seems like it is new, STEM has been around since the beginning of education. **S**cience, **E**ngineering, **T**echnology, and **M**athematics is simply a way of categorizing the education we have always done, and matching it up with a whole grouping of jobs that rely heavily upon using these skill and knowledge sets together. Whether its an Applied Mathematician working for NASA, or a Bio-Chemist working at a drug company, the ability to take mathematics and pair it up with other areas of education is vital to the STEM discipline. As an example, take a person working as a Database Engineer for any large company. The ability to organize and sort large amounts of data is essential for everything from department stores to the US Government. If you think of something as simple as an alphabetical list, how is it that a computer knows that A comes before B etc.? The short answer is that it does because the letters of the alphabet are thought of as numbers by the computer. Then since they are numbers, its easy to compare one value to another to see where it fits in line.

On another hand, an Applied Mathematician working at NASA is going to take equations (very complex ones) and verify that the numbers work to achieve the mission of the project at hand. As an example, when working with the launch of a rocket, a mathematician would be verifying that the signs on the numbers are correct, and that the sign of the number indicates the correct direction (trajectory). You can only imagine that if you got an answer for a rocket launching, and it was negative, that would not mean good things for a successful launch.



STEM EXAMPLE

While the problems that would come for a mathematician working at NASA would be of the complicated nature, they do rely upon some very basic computations and understanding of our Solar system to get their pints across. Think of the following example problem that comes from the NASA Mars Mathematics Text Book ([724927main_Mars_Math.pdf \(nasa.gov\)](#)).

Figure out the diameter of Mars from the clues below:

1. Mercury is $\frac{7}{5}$ the diameter of the moon
2. The moon is $\frac{7}{25}$ the diameter of the Earth
3. Mars is $\frac{7}{5}$ the diameter of Mercury.
4. The Earth is 13,000 kilometers in diameter.

Step 1: Take 13,000 times $\frac{7}{25}$ to get the diameter of the Moon. You get 3640 as the diameter of the Moon

Step 2: Take the 3640, which is the diameter of the Moon and multiply it by $\frac{7}{5}$ to get the diameter of Mercury. 5096 is the diameter of Mercury.

Step 3: Then take 5096 and multiply it by $\frac{7}{5}$ to get the diameter of Mars. 7134.4 is the Diameter of Mars.

STEM SAMPLE PROBLEM(S)

The following problem is taken from https://www.nasa.gov/pdf/724927main_Mars_Math.pdf . See, if you find out the size of the other planets in the Solar System.

Problem 1 - Saturn is 10 times bigger than Venus, and Venus is $\frac{1}{4}$ the size of Neptune. How much larger is Saturn than Neptune?

Problem 2 - Earth is twice as big as Mars, but only $\frac{1}{11}$ the size of Jupiter. How large is Jupiter compared to Mars?

Problem 3 - Earth is the same size as Venus. How large is Jupiter compared to Saturn?

Problem 4 - Mercury is $\frac{3}{4}$ the size of Mars. How large is Earth compared to Mercury?

Problem 5 - Uranus is the same size as Neptune. How large is Uranus compared to Earth?

Problem 6 - The satellite of Saturn, called Titan, is $\frac{1}{10}$ the size of Uranus. How large is Titan compared to Earth?

Problem 7 - The satellite of Jupiter, called Ganymede, is $\frac{2}{5}$ the size of Earth. How large is it compared to Jupiter?

Problem 8 - The Dwarf Planet Pluto is $\frac{1}{3}$ the diameter of Mars. How large is the diameter of Jupiter compared to Pluto?

Problem 9 - If the diameter of Earth is 13,000 km ,what are the diameters of all the other bodies?



POWERPOINTS FOR STEM CAREERS

- <https://www.bls.gov/careeroutlook/2007/spring/art04.pdf>
<https://www.bls.gov/careeroutlook/2012/fall/art01.pdf>

ARTS, AUDIO, VIDEO, TECHNOLOGY AND COMMUNICATIONS

Profession	Average Illinois Salary	Education	BLS Information Page
Multimedia Artist and Animators	\$ 66,300	Bachelors Degree	Click Here
Film and Video Editors and Camera	\$ 48,340	Bachelors Degree	Click Here
Broadcast Sound And Video Technicians	\$ 44,710	Certification	Click Here
Software Developer	\$ 103,760	Bachelors Degree	Click Here
Special Effects Artist and Animators	\$ 75,270	Bachelors Degree	Click Here

ARTS & COMMUNICATION MATHEMATICS EXAMPLE

If you have ever watched any animated (cartoon) movie you might have wondered how they get the characters to look and act so life like. The simple answer to that question is MATH! The people who animate movies in today's world use computers to generate and move the images. In previous times, animators drew the pictures over and over again to achieve the animation. That was a process that took a great deal of time and resulted in having to employ many animators to perform the repeated drawings. With computers, a single animator can generate an image, make it move and add in other scenery all by him/her self in a period of time that is much faster than the process used in previous days. However, to do this there are some very high powered mathematical equations and processes that are put to work to create what you see on the screen. A small example of that process is found in how color is applied to what you see on the screen. When you look at a computer screen, the picture is made up of many millions of small dots called PIXELS. The better the screen, the more pixels it will have. However, each pixel will need to be able to display part of the picture you see, and the color that that part of the picture represents. To create each color, the computer will use three numbers that represent mixtures of the colors red, green, and blue (RGB), By mixing quantities of each color (each color can be represented by a number between 0 and 255), they can create every color found in nature, and many more colors that do not occur naturally. So next time you see a real cool effect in a movie or cartoon, remember that a great deal of high level mathematics went into making that effect happen.



ARTS AND COMMUNICATION EXAMPLE

On the previous slide we discussed how colors are created using a mixture of red, green, and blue . We also stated that each color could be represented by a number between 0 and 255 (256 different choices). The way the color mixing is written is as (255, 0, 0). In this example we have a full mixture of Red, but no green or blue. This number would represent a solid red color. To figure out how many colors could be created in this way, we would use a portion of mathematics called **combination**. An easy way to think of it is just like we have a combination lock. How many different ways can you arrange the numbers in the choices that you have?

- In our case, we have three different numbers that determine the color.
- Each number can be between 0 and 255, or 256 different numbers can be used.
- So, if each of the three numbers can be used 256 different ways, we can calculate the total number of combinations possible by taking the number of possibilities for each number (256) and multiplying it by the number of possibilities for every other number.
- In our example that would be $256 \times 256 \times 256$
- Thus, we get 16,777,216 different possible colors that can be displayed.

ARTS AND COMMUNICATION SAMPLE PROBLEM(S)

The Arts and Communications industry relies heavily upon the use of computers. Computers use a type of mathematics that is called Binary. Binary simply means the computer only recognizes two numbers (0 and 1). In reality, the computer doesn't see 0's and 1's, the 0's and 1's simply represent electricity being present or not present. However, since binary numbers look very different than what students are used to seeing normally, how can you quickly look at the number and decide if it is a large or a small number. This can be done by simply counting up the number of digits in the binary number, and then using the number of digits as the exponent for the number two.

Example: The number 10001110011101 is a binary number, it appears to be very long, but what exactly could be the largest number that can be created by a binary number that is 14 digits long?

To find that answer we simply take $2 \leftarrow$ this is called the base, and we use it because there are only 2 digits in binary

Then we take 2^{14} and calculate it. We use 14 as the exponent because we have 14 digits in the number.

The answer we get is 16,384 \leftarrow This is the maximum value the number above could represent (this includes the number 0)

What is the largest number that the following Binary numbers could represent (including 0)

Ex 1: 11001

Ex 2: 10011111001



GOVERNMENT AND PUBLIC ADMINISTRATION

Profession	Average Illinois Salary	Education	BLS Information Page
Political Scientist	\$ 71,920	Masters Degree	Click Here
Public Relations Specialist	\$ 64,380	Bachelors Degree	Click Here
Urban and Regional Planners	\$ 75,280	Masters Degree	Click Here
Fundraisers	\$ 60,850	Bachelors Degree	Click Here
Reporters, Correspondents, and Broadcast News Analysts	\$ 59,780	Bachelors Degree	Click Here

GOVERNMENT AND PUBLIC ADMINISTRATION MATHEMATICS EXAMPLE

People who work for the government are generally very concerned about the needs and opinions of the people that they serve. So, in order to understand what the people need or want, many government agencies do surveys of their people. The collecting of results from surveys is a type of mathematics called statistics. A statistician (a person who collects and explains numbers that are collected) will take the results of surveys and provide government department with a number of ways to look at the information collected. Some ways, may be by putting it in charts and graphs, so a person can visually see the information collected, or the statistician may perform some mathematical operations on the numbers to explain a little deeper what they may mean. As an example, a politician may want to know some information about the people they represent such as what their average income is (to see if their basic needs are being met), or what the crime rate is like in their district etc. To get this information one type of math operation is to determine a set of numbers called Central Tendency. Central Tendency is used in place of the word average. The reason for that is there are three different types of averages (Mean , Median, and Mode), and these three numbers can be widely different and thus give you a different indication of what the numbers being looked at may stand for.



GOVERNMENT AND PUBLIC ADMINISTRATION EXAMPLE

Employee	Salary
A--Owner	\$180,000
B--Accountant	\$75,000
C--Manager	\$68,000
D--Mechanic	\$65,000
E--Asst Manager	\$42,000
F--Head Clerk	\$28,000
G--Clerk	\$24,000
H--Clerk	\$24,000
I--Clerk	\$24,000
J--Clerk	\$24,000

A sample problem that a statistician may work using mean, median, and mode can produce very different numbers depending upon what is being questioned using the numbers. Consider the following situation: A company employs 10 people. Their salaries are listed in the table to the left. Additionally, the three measures of central tendency are calculated and listed. Then think about what each of the three numbers may say about the statement the company puts out.

Mode—This is the most common or repeated value in the numbers to be looked at. In this case, the Mode is \$24,000

Median—The Median is the value of the number that would occur exactly in the middle of the numbers being looked at. In our case, there are 10 salaries, so we would look to see what is the number that is exactly in the middle of the 5th and 6th salaries. Those are \$42,000 and \$28,000. The number exactly in the middle is \$35,000.

Mean-- The mean is calculated by adding all the numbers being looked at together and then dividing by how many number were added. In our case it will be

$$(180000+75000+68000+65000+42000+28000+24000+24000+24000+24000)=554,000$$

We then take that result and divide by 10 (since there are 10 employees). We get a mean of \$55,4000

If the company advertised that they had an average salary of \$55,400 and were looking to hire a Clerk, do you think this would be honest advertising?

GOVERNMENT AND PUBLIC ADMINISTRATION

SAMPLE PROBLEM(S)

Pond	Amount of Oil
A	14,200 Gallons
B	8,900 Gallons
C	2,200 Gallons
D	22,500 Gallons
E	9,500 Gallons
F	11,700 Gallons
G	14,200 Gallons

A government agency is studying pollution from an oil spill and finds that 7 ponds in a certain region have been affected by the spill. When they take samples, they determine that the amount of oil that spilled into each pond is as found in the chart to the left.

Calculate the three measures of central tendency (mean, median and mode) for the amounts of Oil. Then state which of the seven ponds seems to be closest to the “average” values you found.

Mean:

Median:

Mode:

What could calculating the averages tell you about each pond and how it was affected by the spill?

AGRICULTURE, FOOD, AND NATURAL RESOURCES

Profession	Average Illinois Salary	Education	BLS Information Page
Conservation Scientists and Foresters	\$ 62,710	Bachelors Degree	Click Here
Natural Science Managers	\$ 127,150	Bachelors Degree	Click Here
Agricultural Engineers	\$ 88,090	Bachelors Degree	Click Here
Agricultural Food and Science Technicians	\$ 44,530	Associates Degree	Click Here
Agriculture and Food Scientist	\$ 95,500	Bachelors Degree	Click Here

AGRICULTURE, FOOD AND NATURAL RESOURCES MATHEMATICS EXAMPLE

To almost everyone, the need for food is an obvious statement. However, most people take for granted where their food comes from and how it gets to their table. The ability to produce good and plentiful food is a need that relies heavily upon an understanding of mathematics. To the farmer who is growing food, the need to calculate how much product their fields can produce, the ability to figure out expenses and profits, as well as calculating everything from the fertility of the soil to the types of seeds (they use a numbering pattern to categorize seeds) becomes very important if a farmer is to have a good crop and be able to make a living. That in turn affects the prices you will pay for food at the grocery store. So, if a farmer knows their math, and produces good and plentiful crops, you receive a better and cheaper product at the store.

As an example of how this works: A farmer may go out and take a soil sample from his farm. Once the soil is analyzed he/she will get a report that tells them how much of each vital nutrient is in the soil. From that report he/she may find that they need to add a specific nutrient to the soil (an example might be nitrogen). That added nutrient will need to be applied in the correct ratio to get the soil to the right measurement, and it will also cost money. The extra money will make the cost of the crop go up. So, in the end the farmer has to balance many things. If his/her math is off, they could kill off the crop, or seriously damage how much can be produced. All of this relies upon a knowledge and use of mathematics.



AGRICULTURE FOOD AND NATURAL RESOURCES EXAMPLE

One primary area where farmers use mathematics is in conversion. A simple example of this is in the unit of measurement that is used on farms. The primary measurement of farmland is the Acre. An Acre is defined as 43,560 square feet. This is close to the size of a football field without the endzones. This is important as many of the other measurements a farmer uses will be based upon the size of an acre. As an example, how much will a specific seed yield per acre? So a farmer needs to know what their acreage is.

If a farmer buys a plot of land that is 1250 feet by 3000 feet, how many acres did they purchase. In this example we image the land a s rectangle. The area of a rectangle is found by multiplying the length by the width.

In our example we would take 1250×3000 and get as a result: 3,750,000 square feet.

To calculate acres, we would take our result and divide by the number of square feet in an acre which is 43,560.

When we do our division, we find that the farmer purchased a little over 86 acres.

A second part of this calculation may be that the farmer wants to plant a specific seed that will produce 3000 lbs. of product per acre when planted correctly. In this case the farmer could expect to produce 258,000 pounds of produce (we calculate that by multiplying 3000 by 86). Then depending upon what the price of the product is per lb., or bushel the farmer can further calculate his cost and subtract that out to determine what his/her profit might end up being.



AGRICULTURE, FOOD AND NATURAL RESOURCES

SAMPLE PROBLEM(S)

A Farmer has a field that is measured 8900 feet by 12500 feet.

Calculate the acreage that is included in this field.

In this field the farmer will plant corn seed that produces 1200 DOZEN ears per acre. How many ear of corn would this field produce?

About 112 ears of corn will produce a bushel of shelled corn. How many bushels of shelled corn will this field produce?

If corn sells for 5.45 a bushel, what amount of money can the farmer expect to take in for selling this crop?

