STS PVT LTD

AI

MACHINE LEARNING
PYTHON
DEEP LEARNING

A GUIDE TO BECOME AN AI PROFESSIONAL

Get your career started in AI, ML in 3 steps

1

Learn the Foundations1:

Start with the basics of Python programming**,** Data Science**,** Mathematics (Statistics & Linear Algebra)**, and an introduction to** AI & Machine Learning concepts**.**

2

Practice with Real-World Projects2:

Work on hands-on projects like prediction models, chatbots, recommendation systems, and data analysis.

3

Apply & Grow Your Career3:

Create a strong portfolio, earn certifications, and apply for roles like AI Engineer, ML Engineer, Data Analyst, or AI Developer.

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Book Summary: ***Artificial Intelligence – A Practical Guide for Beginners***

This book provides a clear, practical, and beginner-friendly introduction to Artificial Intelligence (AI), designed for students, professionals, and non-technical learners who want to understand AI concepts and apply them in real-world scenarios. Instead of complex theory, the book focuses on simple explanations, practical examples, and hands-on use cases to make AI accessible to everyone.

The book begins with a strong foundation by explaining what Artificial Intelligence is, its history and evolution, and how AI differs from traditional programming. Readers gain clarity on key concepts, including Machine Learning, Deep Learning, and Generative AI, as well as an understanding of how AI systems learn from data and make intelligent decisions.

A major highlight of this book is its tool-oriented approach. It introduces popular AI tools such as ChatGPT and Google Gemini, demonstrating how they can be used for content creation, coding assistance, learning support, productivity improvement, and business automation. Step-by-step examples help readers understand how to effectively interact with AI tools using prompts and real-life tasks.

The book also covers practical applications of AI across industries, including education, IT, healthcare, marketing, finance, and customer support. Readers learn how AI is transforming jobs, improving efficiency, and creating new career opportunities. Ethical considerations, limitations of AI, and responsible usage are also discussed to provide a balanced understanding of the technology.

To reinforce learning, the book includes hands-on activities, mini tasks, and practical exercises, such as writing resumes using AI, creating LinkedIn profiles, generating study notes, and solving real-world problems with AI assistance. These activities ensure readers not only understand AI but also apply it confidently.
Overall, this book serves as a complete starter guide to Artificial Intelligence, helping readers build confidence, develop practical skills, and prepare for AI-driven careers. Whether you are a student, working professional, educator, or entrepreneur, this book equips you with the knowledge and tools needed to succeed in the AI era.

Artificial Intelligence

What is Artificial Intelligence (AI)?

According to the father of Artificial Intelligence, **John McCarthy**, it is "The science and engineering of making intelligent machines, especially intelligent computer programs".

Artificial Intelligence is a way of **making a computer, a computer-controlled robot, or a software think intelligently**, in the similar manner the intelligent humans think.

- Artificial intelligence (AI, also machine intelligence, MI) is intelligence demonstrated by machines, in contrast to the natural intelligence (NI) displayed by humans and other animals.
- Artificial intelligence (AI) makes it possible for machines to learn from experience, adjust to new inputs and perform human-like tasks.

Goals of AI :

- **To Create Expert Systems** – The systems which exhibit intelligent behavior, learn, demonstrate, explain, and advice its users.
- **To Implement Human Intelligence in Machines** – Creating systems that understand, think, learn, and behave like humans.

Some of the activities computers with artificial intelligence are designed for include:

- Speech recognition
- Learning
- Planning
- Problem solving

Ex:-chess-playing computers to self-driving cars – rely heavily on deep learning and natural language processing. Using these technologies, computers can be trained to accomplish specific tasks by processing large amounts of data and recognizing patterns in the data.

- AI research is defined as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals.
- Artificial intelligence was founded as an academic discipline in 1956, and in the years since has experienced several waves of optimism, followed by disappointment and the loss of funding (known as an "AI winter"), followed by new approaches, success and renewed funding.
- Attendees Allen Newell (CMU), Herbert Simon (CMU), John McCarthy (MIT), Marvin Minsky (MIT) and Arthur Samuel (IBM) became the founders and leaders of AI research.

Research associated with artificial intelligence is highly technical and specialized. The core problems of artificial intelligence include programming computers for certain traits such as:

- ✓ Knowledge
- ✓ Reasoning

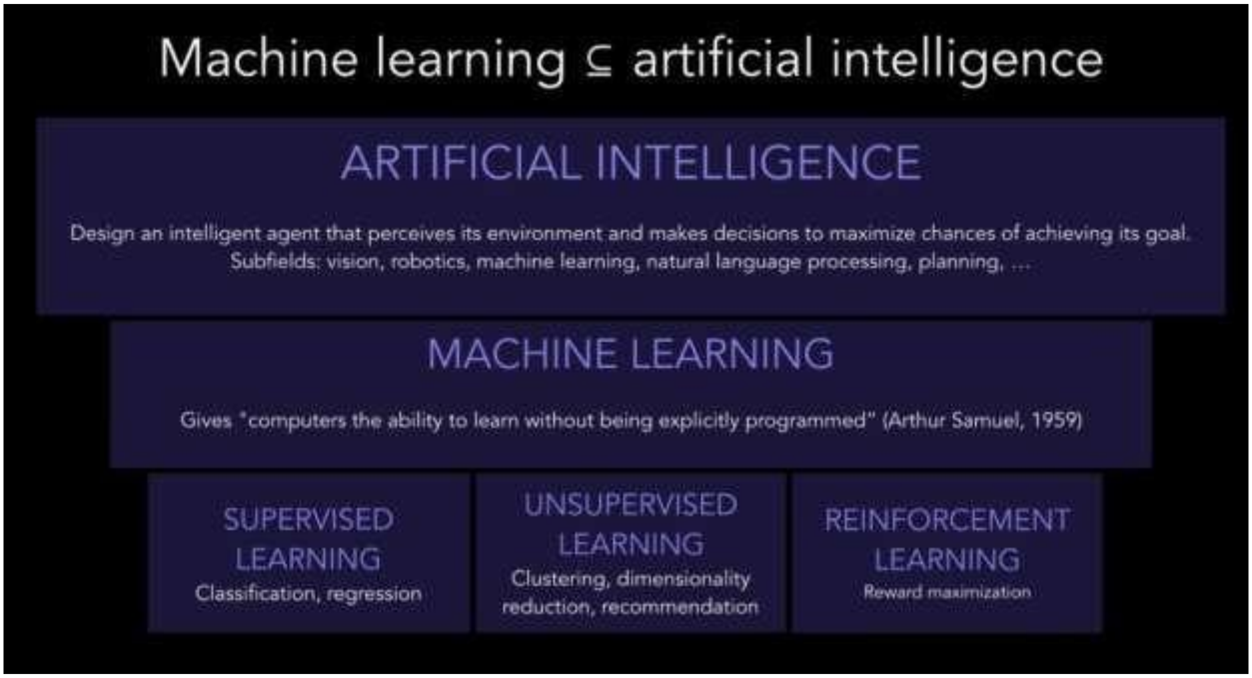
- ✓ Problem solving
- ✓ Perception
- ✓ Learning
- ✓ Planning
- ✓ Ability to manipulate and move objects

Artificial Intelligence History

- ➢ The term artificial intelligence was coined in 1956, but AI has become more popular today thanks to increased data volumes, advanced algorithms, and improvements in computing power and storage.
- ➢ Early AI research in the 1950s explored topics like problem solving and symbolic methods.
- ➢ In the 1960s, the US Department of Defense took interest in this type of work and began training computers to mimic basic human reasoning.
- ➢ For example, Hollywood movies and science fiction novels depict AI as human-like robots that take over the world, the current evolution of AI technologies isn't that scary – or quite that smart. Instead, AI has evolved to provide many specific benefits in every industry.

Why is artificial intelligence important?

- **AI automates repetitive learning and discovery through data.** But AI is different from hardware-driven, robotic automation. Instead of automating manual tasks, AI performs frequent, high-volume, computerized tasks reliably and without fatigue. For this type of automation, human inquiry is still essential to set up the system and ask the right questions.
- **AI adds intelligence** to existing products. In most cases, AI will not be sold as an individual application. Rather, products you already use will be improved with AI capabilities, much like Siri was added as a feature to a new generation of Apple products. Automation, conversational platforms, bots and smart machines can be combined with large amounts of data to improve many technologies at home and in the workplace, from security intelligence to investment analysis.
- **AI adapts through progressive learning algorithms** to let the data do the programming. AI finds structure and regularities in data so that the algorithm acquires a skill: The algorithm becomes a classifier or a predicator. So, just as the algorithm can teach itself how to play chess, it can teach itself what product to recommend next online. And the models adapt when given new data. Back propagation is an AI technique that allows the model to adjust, through training and added data, when the first answer is not quite right
- **AI analyzes more and deeper data** using neural networks that have many hidden layers. Building a fraud detection system with five hidden layers was almost impossible a few years ago. All that has changed with incredible computer power and big data. You need lots of data to train deep learning models because they learn directly from the data. The more data you can feed them, the more accurate they become.
- **AI achieves incredible accuracy** though deep neural networks – which was previously impossible. For example, your interactions with Alexa, Google Search and Google Photos are all based on deep learning – and they keep getting more accurate the more we use them. In the medical field, AI techniques from deep learning, image classification and object recognition can now be used to find cancer on MRIs with the same accuracy as highly trained radiologists.
- **AI gets the most out of data.** When algorithms are self-learning, the data itself can become intellectual property. The answers are in the data; you just have to apply AI to get them out. Since the role of the data is now more important than ever before, it can create a competitive advantage. If you have the best data in a competitive industry, even if everyone is applying similar techniques, the best data will win.



How Artificial Intelligence Is Being Used

Every industry has a high demand for AI capabilities – especially question answering systems that can be used for legal assistance, patent searches, risk notification and medical research.

Other uses of AI include:

Health Care

- AI applications can provide personalized medicine and X-ray readings.
- Personal health care assistants can act as life coaches, reminding you to take your pills, exercise or eat healthier.

Retail

- AI provides virtual shopping capabilities that offer personalized recommendations and discuss purchase options with the consumer.
- Stock management and site layout technologies will also be improved with AI.

Manufacturing

- AI can analyze factory IoT data as it streams from connected equipment to forecast expected load and demand using recurrent networks, a specific type of deep learning network used with sequence data.

Sports

- AI is used to capture images of game play and provide coaches with reports on how to better organize the game, including optimizing field positions and strategy.

AI at Recent News:

Google's New AI Algorithm Can Predict Heart Disease By Scanning Your Eyes

JEEVAN BISWAS – 1 WEEK AGO

19 SHARES

Remember that song by Bryan Adams that said "*Look into my eyes... And when you find me there, you'll search no more*" ? Google's new AI algorithm can do one better — it can look into your eyes, search and find signs of cardiovascular risks.

Artificial Intelligence has the potential to add 1 trillion to India's economy in 2035

A new NITI Aayog working paper outlines a comprehensive strategy for AI adoption in India. Given many countries, including China and France, have formalised strategies even as the US powers through with AI research, Indian policymakers will do well to pay heed to NITI's recommendations.

By The Financial Express | Published: June 9, 2018 1:36 AM

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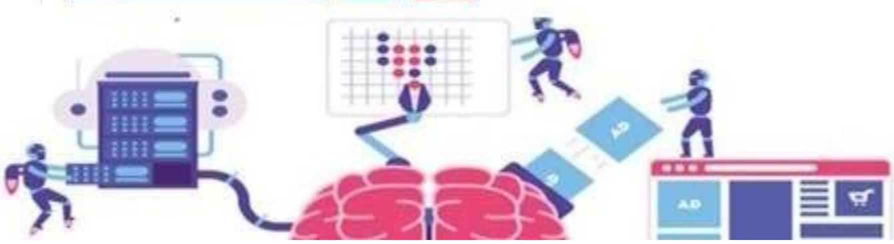

Artificial Intelligence facing large skills shortage, says Microsoft

The fast-emerging field of Artificial Intelligence, which has suddenly caught the attention of the IT industry and the governments across the world, is facing a large skills shortage, a top Microsoft official has said.

By: PTI | Washington | Updated: May 13, 2018 10:30 PM

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News / Technology / News / Google can now predict when you will die, with 95 per cent accuracy

Google can now predict when you will die, with 95 per cent accuracy

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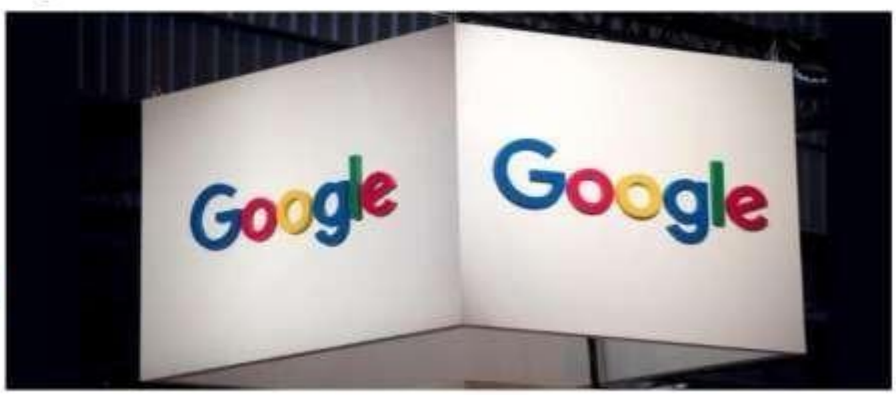

Google has seeped into our lives and it is no surprise that it knows a lot about us. From our contacts to our address, there is hardly anything hidden from Google and now it can even predict the survival chances of a hospital patient.

What are the challenges of using artificial intelligence?

- Artificial intelligence is going to change every industry, but we have to understand its limits.
- The principle limitation of AI is that it learns from the data. There is no other way in which knowledge can be incorporated. That means any inaccuracies in the data will be reflected in the results. And any additional layers of prediction or analysis have to be added separately.
- Today's AI systems are trained to do a clearly defined task. The system that plays poker cannot play solitaire or chess.
- The system that detects fraud cannot drive a car or give you legal advice. In fact, an AI system that detects health care fraud cannot accurately detect tax fraud or warranty claims fraud.
- In other words, these systems are very, very specialized. They are focused on a single task and are far from behaving like humans.
- self-learning systems are not autonomous systems. The imagined AI technologies that you see in movies and TV are still science fiction. But computers that can probe complex data to learn and perfect specific tasks are becoming quite common.

How Artificial Intelligence Works

AI works by combining large amounts of data with fast, iterative processing and intelligent algorithms, allowing the software to learn automatically from patterns or features in the data. AI is a broad field of study that includes many theories, methods and technologies, as well as the following major subfields:

- **Machine learning** automates analytical model building. It uses methods from neural networks, statistics, operations research and physics to find hidden insights in data without explicitly being programmed for where to look or what to conclude.

  Machine learning is a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention.

- **A neural network** is a type of machine learning that is made up of interconnected units (like neurons) that processes information by responding to external inputs, relaying information between each unit. The process requires multiple passes at the data to find connections and derive meaning from undefined data.
- **Deep learning** uses huge neural networks with many layers of processing units, taking advantage of advances in computing power and improved training techniques to learn complex patterns in large amounts of data. Common applications include image and speech recognition.

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- **Cognitive computing** is a subfield of AI that strives for a natural, human-like interaction with machines. Using AI and cognitive computing, the ultimate goal is for a machine to simulate human processes through the ability to interpret images and speech – and then speak coherently in response.
- **Computer vision** relies on pattern recognition and deep learning to recognize what's in a picture or video. When machines can process, analyze and understand images, they can capture images or videos in real time and interpret their surroundings.
- **Natural language processing** (NLP) is the ability of computers to analyze, understand and generate human language, including speech. The next stage of NLP is natural language interaction, which allows humans to communicate with computers using normal, everyday language to perform tasks.

Additionally, several technologies enable and support AI:

- **Graphical processing units** are key to AI because they provide the heavy compute power that's required for iterative processing. Training neural networks requires big data plus compute power.
- **The Internet of Things** generates massive amounts of data from connected devices, most of it unanalyzed. Automating models with AI will allow us to use more of it.
- **Advanced algorithms** are being developed and combined in new ways to analyze more data faster and at multiple levels. This intelligent processing is key to identifying and predicting rare events, understanding complex systems and optimizing unique scenarios.
- **APIs, or application processing interfaces,** are portable packages of code that make it possible to add AI functionality to existing products and software packages. They can add image recognition capabilities to home security systems and Q&A capabilities that describe data, create captions and headlines, or call out interesting patterns and insights in data.

Algebra

What is Algebra: -

Algebra from Arabic "al-Jabr", literally meaning "reunion of broken parts as per Wikipedia.

Algebra: -Whole branch of math called "Algebra".

Algebra Definition:

- Algebra can be defined as the representation of numbers and quantities in equations and formulae in the form of letters.
- The topic of algebra is broadly divided into 2 parts namely, elementary algebra (or basic algebra) and abstract algebra (or modern algebra).
- The modern algebra is mainly studied by professional mathematicians.
- The basic algebra is involved in almost most of the mathematical and scientific subjects.
- The application of algebra is not only limited to science and engineering but is also used in medicine and economics.

Various types of definitions for Algebra:

1) Algebra is a branch of mathematics that deals with properties of operations and the structures these operations are defined on.
2) Algebra is a branch of mathematics that substitutes letters for numbers, and an algebraic equation represents a scale where what is done on one side of the scale is also done to the other side of the scale and the numbers act as constants.
3) Algebra is a branch of pure mathematics that deals with the rules of operations and solving equations.

* Algebra is lot like Arithmetic it follows all the rules of arithmetic and it uses the same four main operations that arithmetic is built on "Operations"

-->Algebra introduces a new element of unknown "?"

Ex: - 1+2=?

The answer isn't known until you go ahead and do the arithmetic. Coming to algebra we use a symbol in its place. The Symbol is usually just any letter either of the alphabet A to Z.

Really popular letter to choose is the letter "X". In Algebra we had to write it like this 1+2=X

Arithmetic 1+2=_____

Algebra 1+2=X

"This is the very basic algebraic equation."

=>An equation is just a mathematical statement that two things are equal.

Algebraic Equation 1+2=X

where 1+2 = x Known Unknown

GOALS: Figure out what the unknown values in equations are and when you do that, it called solving the equation

So 1+2= X

X=3

Definition: Algebra solving equation is all lot like again where you are given mixed up complicated equations and its your job to simplify them and rearrange them until it is nice a simple equation where it's easy to tell what the unknown values are

2X= (30-2X)/4

8X=30-2X

8x+2X=30

10X=30

X=3

Concepts Associated with Algebra

Elementary Algebra involves simple rules and operations on numbers such as:

- Addition
- Subtraction
- Multiplication
- Division
- Equation solving techniques
- Variables
- Functions
- Polynomials
- Algebraic Expressions

There is no limit on the complexity of all these concepts as far as "Algebra" is concerned

Why Algebra Matters

Even if you don't think you'll need algebra outside of the hallowed halls of your average high school, managing budgets, paying bills, and even determining health care costs and planning for future investments will require a basic understanding of algebra.

3 Reasons Why We Learn Algebra

1. Speed: We can directly use algebra to solve problems more quickly and easily than we could do otherwise. For example, a simple algebraic equation can help you make a recipe smaller or when you're doing home repairs.

2. A Building Block: Algebra can serve as a building block that we can use to learn more advanced math like statistics, calculus, etc. and learn more advanced subjects, like physics, chemistry, etc. Experts say that members of the next generation could change jobs 30-40 times throughout their career, so you don't know if you will need some of the algebra you learn or not. Learning algebra is a life skill beneficial for upward mobility.

3. So that we can understand and critically evaluate the math done by others such as reporters, political candidates, insurance salesmen, bank loan officers, etc..

Algebra in Everyday Life

Examples of using algebra in everyday life

Here are some simple examples that demonstrate the relevance of algebra in the real world.

You purchased 10 items from a shopping plaza, and now you need plastic bags to carry them home. If each bag can hold only 3 items, how many plastic bags you will need to accommodate 10 items?

10 items(3 items/bag) = 3.333 bags ≈ 4bags

Explanation :

Example 1:

Going shopping

Explanation :

The figure below illustrates the problem:
The different shapes inside the bags denote different items purchased. The number depicts the item number.

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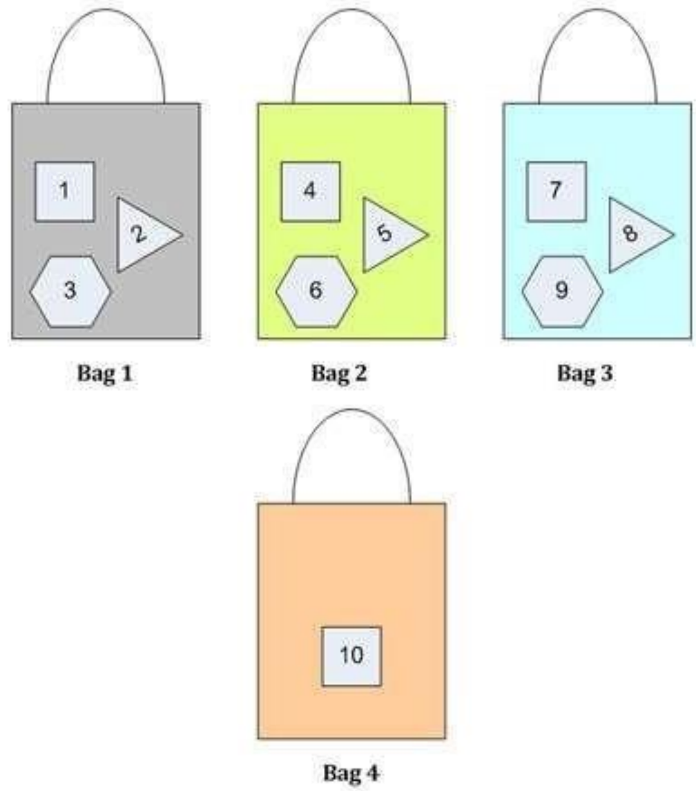


We use simple algebraic formula xy to calculate the number of bags.

x = Number of items purchased = 10

y = Capacity of 1 bag = 3

Hence,

10/3 = 3.333 bags ≈ 4 bags

So,we need 4 shopping bags to put 10 items.

Example 2:

Calculating grocery expense

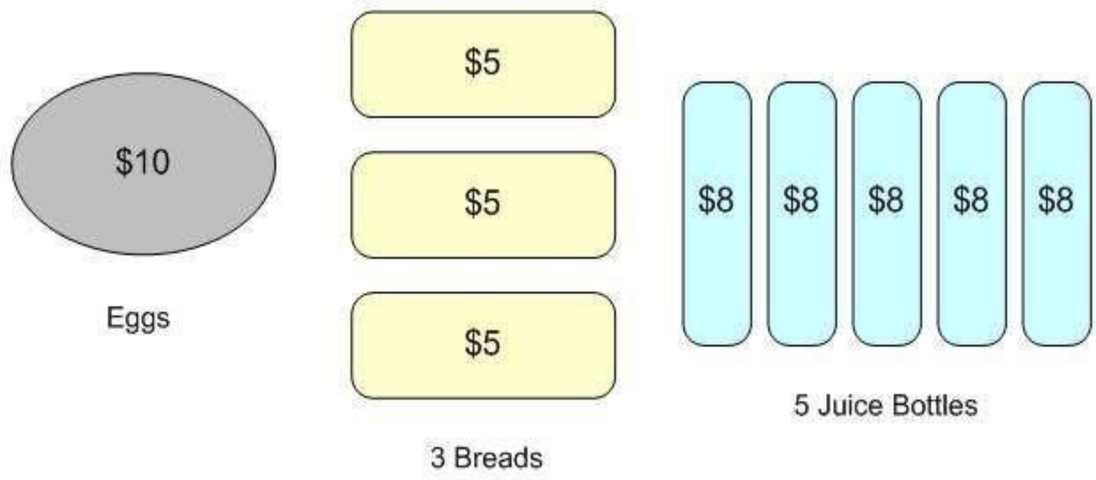
You have to buy two dozen eggs priced at $10, three breads (each bread is $5), and five bottles of juice (each bottle is $8). How much money you will need to take to the grocery store?

$65

Explanation :

The figure below shows the three items in different shapes and colors.

This will help your mind to calculate faster.



We will use algebra to solve the problem easily and quickly.

The prices are

a = Price of two dozen eggs = $10

b = Price of one bread = $5

c = Price of one bottle of juice= $8

=> Money needed = a + 3b + 5c

=> Money needed = $10 + 3($5) + 5($8) = $10 + $15 + $40 = $65

Example 3:

Filling up the gas tank

You need to fill the gas tank but you have only $15 in your pocket. If the price of the gas is $3 a gallon, how many gallons can you buy?

55 gallons

Explanation :

In the below diagram, each block represents $1, and each row is a bundle of $3, which is used to buy 1 gallon of gas.

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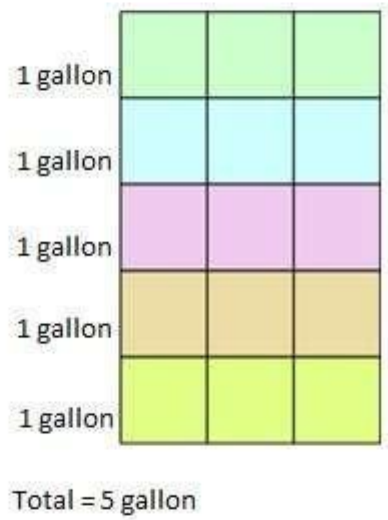


We use simple algebraic formula, xy to calculate the total gallons that can be bought.

x = Money in your pocket= $15

y = Price of 1 gallon of gas= $3

Hence,

$15/$3 = 5 gallon

So, with $15 we can buy 5 gallons of gas.

Basic Terms

Equation : An equation can be defined as a statement involving symbols (variables), numbers (constants) and mathematical operators (Addition, Subtraction, Multiplication, Division etc) that asserts the equality of two mathematical expressions. The equality of the two expressions is shown by using a symbol "=" read as "**is equal to**".

For example: 3X + 7 = 16 is an equation in the variable X.

==

Variable: A variable is a symbol that represents a quantity in an algebraic expression. It is a value that may change with time and scope of the concerned problem.

For example: in the equation 3X + 7 = 16, X is the variable.

Also in the polynomial $X^2 + 5XY - 3Y^2$,

both X and Y are variables.

A variable is a letter or symbol that represents an unknown value.

- When variables are used with other numbers, parentheses, or operations, they create an algebraic expression.

a + 2

(a) (b)

3m + 6n - 6

A variable can use any letter of the alphabet.

- n + 5
- x – 7
- w - 25

In algebra, variables are symbols used to represent unspecified numbers or values. Any letter may be used as a variable.

- An expression that represents a particular number is called a numerical expression.

  Example: 3 + 2

- An algebraic expression consists of one or more constants and variables along with one or more arithmetic operationss.

  constants - numbers variables - letters

  operations - addition, subtraction, multiplication and division

  Example of an algebraic expression: 3x + 2

- In algebraic expressions, a raised dot or parentheses are often used to indicate multiplication as the symbol x can be easily mistaken for the variable x.

  Here are some ways to represent the product of x and y.

  x.y , x(y) , (x)y , (x)(y) , xy

In each expression, the quantities being multiplied are called factors, and the result is called the product.

- Variables are used to change verbal expressions into algebraic expressions, that is, expressions that are composed of letters that stand for numbers.

Key words that can help you translate words into letters and numbers include:

- For addition: sum, more than, greater than, increase

- For subtraction: minus, less than, smaller than, decrease
- For multiplication: times, product, multiplied by, of
- For division: halve, divided by, ratio.

One Variable Equation:

An equation that involves only one variable is knows as a One Variable Equation.

$3X + 7 = 16$ is an example of it.

Two Variable Equation: An equation that involves two variables is knows as a Two Variable Equation.

$2X + Y = 10$ is a Two Variable Equation of where X and Y are variables.

Please note that here both X and Y have a power or exponent of 1.

Hence it is an equation with degree 1. The degree is equal to the highest power of the variable(s) involved.

$X^2 + 5XY – 3Y^2 = 25$ is an example of a Two Variable Equation of degree 2.

Three Variable Equation: An equation that comprises three variables / symbols is called a Three Variable Equation

x + y - Z = 1 --------------(1)
8x + 3y - 6z = 1 --------------(2)
-4x - y + 3z = 1-------------- (3)

The above three equations form a system of 3 equations in 3 variables X, Y and Z. Each of these equations is a Three Variable Equation of degree 1. also, these equations are called **Linear equations** in three variables.

Monomial: A monomial is a product of powers of variables. A monomial in a single variable is of the form $\mathbf{x}^n$ where X is a variable and n is a positive integer.

- There can also be monomials in more than one variable. For example, $\mathbf{x}^m \mathbf{y}^n$ is a monomial in two variables where m, n are any positive integers. Monomials can also be multiplied by nonzero constant values.
- $24x^2 y^5 z^3$ is a monomial in three variables x,y,z with exponents 2,5 and 3 respectively.

Polynomial: A polynomial is formed by a finite set of monomials that relate with each other through the operators of addition and subtraction.

- The order of the polynomial is defined as the order of the highest degree monomial present in the mathematical statement.
- $2x^3 + 4x^2 + 3x – 7$ is a polynomial of order 3 in a single variable.
- Polynomials also exist in multiple variables.
- $x^3 + 4x^2y + xy^5 + y^2 – 2$ is a polynomial in variables x and y.

COEFFICIENT

"A coefficient is the number multiplied by the variable in an algebraic expression".

Algebraic Expression	Coefficient
6m + 5	6
8r + 7m + 4	8, 7
14b - 8	14

In the expression 7x + 9y + 15, 7x, 9y, and 15 are called terms.

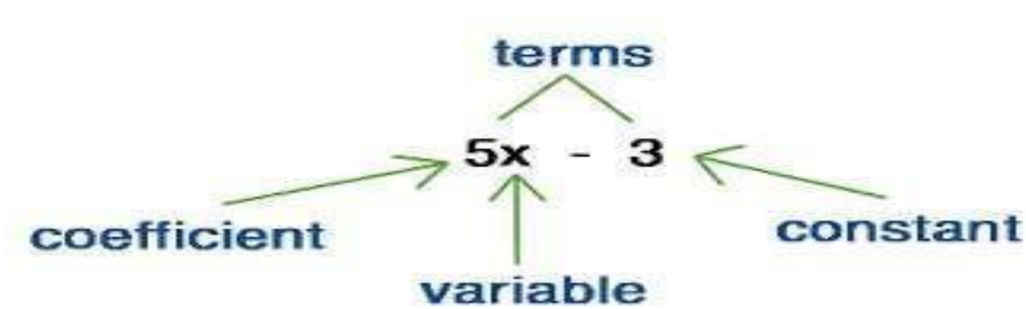
- A term can be a number, a variable, or a product of numbers and variables.
- Terms in an expression are separated by + and –.

7x	+ 5	– 3y2	+ y	+ x/3
term	term	term	term	term

In the term 7x, 7 is called the coefficient. A coefficient is a number that is multiplied by a variable in an algebraic expression.

A variable by itself, like y, has a coefficient of 1. So y = 1y.

7x => coefficient = 7
variable = x



Ex: Find the coefficient of p in p3 + 2p2 - 5p - 1.

Sol: The coefficient of p in the expression p3 + 2p2 - 5p - 1 is -5.

Coefficient of Algebraic Expressions Properties

1. the coefficient may be positive or negative
2. When we are performing, addition or subtraction operation in polynomials, we need to add or subtract the coefficients of the like terms.
3. Depending up on the coefficient, the term can be named as positive term or negative term.

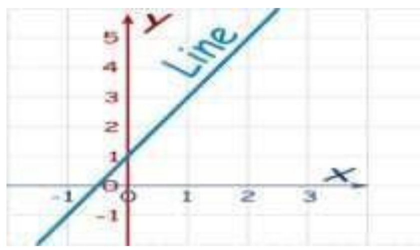
For example -3 x --- negative term

3x ----- positive term

LINEAR EQUATIONS

A **linear equation in one variable** is an equation which can be written in the form:

$$ax + b = c$$



Why are the following Not linear equations in one variable.

$2x + 3y = 11$	$(x - 1)^2 = 8$	$\frac{2}{3x} + 5 = x - 7$
Two variables	x is squared.	variable in the denominator

Types of linear equations:

There are three types of linear equations.

- The most common type is a conditional it has one solution
- A linear equation whose solution is all real numbers is called an identity
- Linear equations that have no solution are called contradictions

A **solution** of a linear equation in one variable is a real number which, when substituted for the variable in the equation, makes the equation true.

Example: Is 3 a solution of 2x + 3 = 11?

$$2x + 3 = 11$$

$$2(3) + 3 = 11$$

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6 + 3 = 11 false equation

=> 3 is not a solution of 2x + 3 = 11.

Example: Is 4 a solution of 2x + 3 = 11?

2x + 3 = 11

2(4) + 3 = 11

8 + 3 = 11 true equation

=> 4 is a solution of 2x + 3 = 11.

To solve linear equations, we will make heavy use of the following facts.

1. If $a=b$ then $a+c=b+c$ for any c. All this is saying is that we can add a number, c, to both sides of the equation and not change the equation.
2. If $a=b$ then $a-c=b-c$ for any c. As with the last property we can subtract a number, c, from both sides of an equation.
3. If $a=b$ then $ac=bc$ for any c. Like addition and subtraction. we can multiply both sides of an equation by a number, c, without changing the equation.
4. If $a=b$ then $\frac{a}{c}=\frac{b}{c}$ for any non-zero c. We can divide both sides of an equation by a non-zero number, c, without changing the equation.

Graphs of functions:

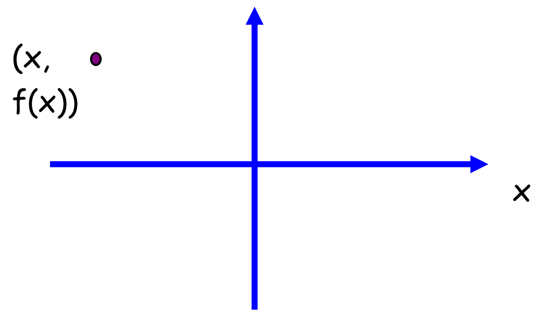
Graphs of functions: A graph of a function is a visual representation of a function's behavior on an x-y plane.

- Graphs help us understand different aspects of the function, which would be difficult to understand by just looking at the function itself.
- You can graph thousands of equations, and there are different formulas for each one. That said, there are always ways to graph a function if you forget the exact steps for the specific type of function.

The graph of a function f is the set of all points in the plane of the form (x, f(x)). We could also define the graph of f to be the graph of the equation y = f(x). So, the graph of a function if a special case of the graph of an equation.

- Variable x is called independent variable

- Variable y is called dependent variable
- For convenience, we use f(x) instead of y.
- The ordered pair in new notation becomes:
- (x, y) = (x, f(x))

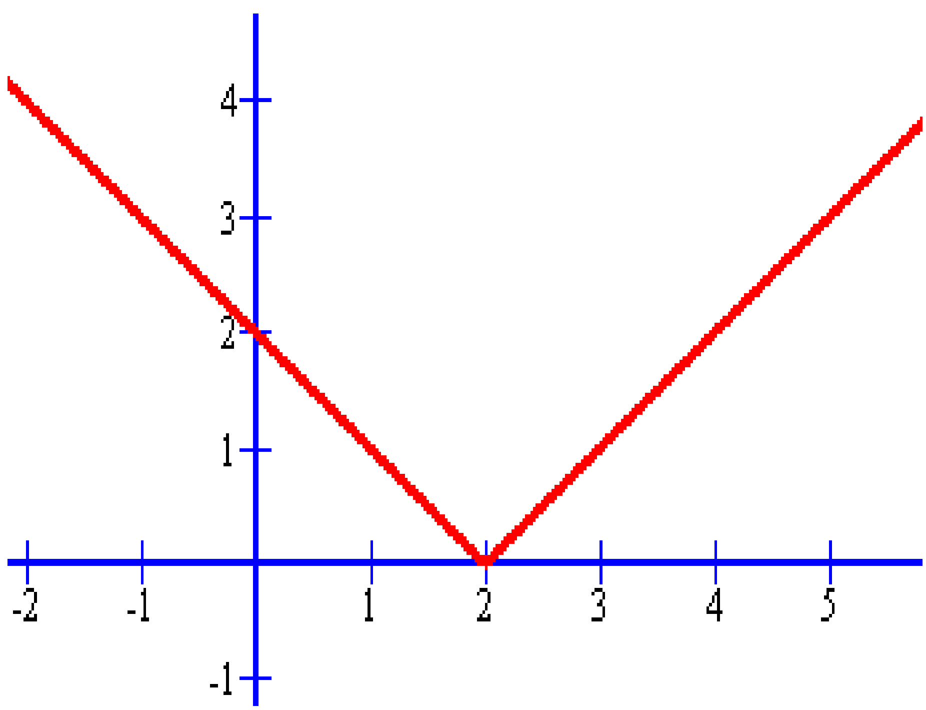


Graphing steps:

1) Isolate the variable (solve for y).
2) Make a t-table. If the domain is not given, pick your own values.
3) Plot the points on a graph.
4) Connect the points.

A **function** is a relation in which each element of the domain is paired with exactly one element of the range. Another way of saying it is that there is one and only one output (y) with each input (x).

X →f(x)→Y



Example 1.

Let **f(x) =** $\mathbf{x^2}$ **- 3**.

The graph of f(x) in this example is the graph of $y = x^2 - 3$. It is easy to generate points on the graph. Choose a value for the first coordinate, then evaluate f at that number to find the second coordinate. The following table shows several values for x and the function f evaluated at those numbers.

Each column of numbers in the table holds the coordinates of a point on the graph of f.

Summary of Graphs of Common Functions:

Histograms:

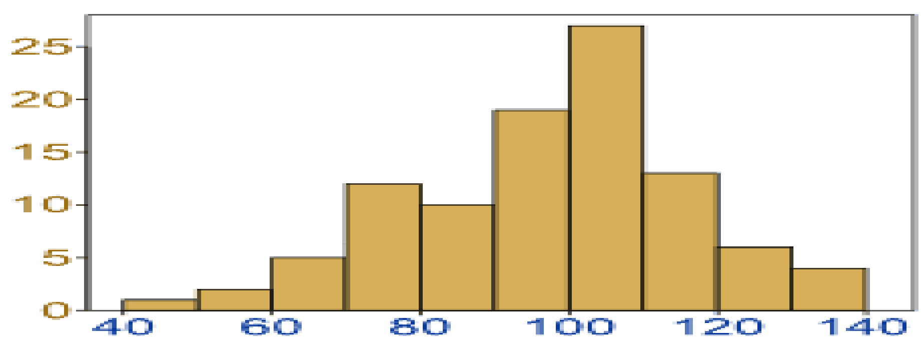
Histograms: - A graphical display of data using bars of different heights.

Def 1:- A **histogram** is a visual way to display frequency data using bars. A feature of **histograms** is that they show the frequency of continuous data, such as the number of trees at various heights from 3 feet to 8 feet.

General Characteristics:

- Column label is quantitative variable (ages).
- Column label is a range of values (or single value).
- Column height is size of the group.
- Columns NOT separated by space.
- Calculate mean, median, quartiles, standard deviation, and so on.

It is similar to a Bar Chart, but a histogram groups numbers into **ranges.**



Histograms are a great way to show results of continuous data, such as:

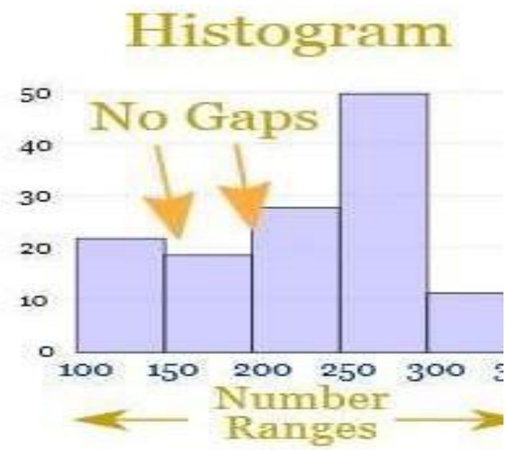
- weight
- height
- how much time. etc.

But when the data is in **categories** (such as Country or Favorite Movie), we should use a Bar Chart.

Histograms versus Bar Graphs:

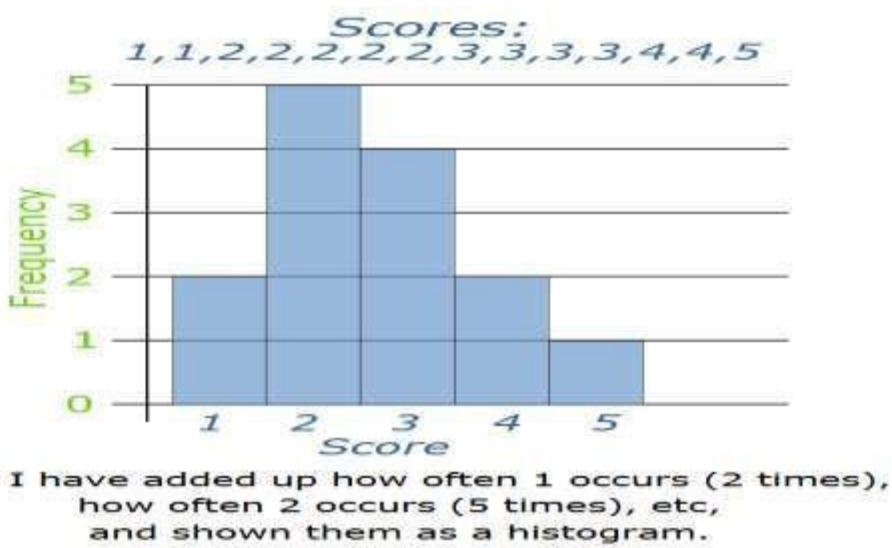
1. Histograms are used to show distributions of variables, while bar graphs are used

to compare variables.
2. Histograms plot quantitative (numerical) data with ranges of the data grouped into intervals, while bar graphs plot categorical data.
3. The bars in a bar graph can be rearranged, but it does not make sense to rearrange the bars in a histogram.
4. It is possible to speak of the skewness of a histogram, but not of a bar graph.
5. Bar graphs have space between the columns, while histograms do not.



Frequency Histogram:

A Frequency Histogram is a special histogram that uses vertical columns to show frequencies (how many times each score occurs):



Cumulative Frequency Histograms:

- The term "cumulative frequency" refers to the running total of the frequencies.

Note:

- This is a **preview AI eBook** containing **only 30 pages**.
- It is provided to help you understand **how the full AI eBook looks and is structured**.
- The **complete AI eBook** includes detailed concepts, real-world examples, and career guidance.
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