

**CAREER  
PATHS**

Robert Cunningham, PE  
Jenny Dooley



# INDUSTRIAL ENGINEERING



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Book

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# INDUSTRIAL ENGINEERING



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## Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	The Industrial Engineer	Job posting	analytical, design, develop, eliminate, evaluate, implement, improve, industrial, manage, optimize, plan	Talking about work experience
2	Fundamentals of Industrial Engineering	Webpage	analysis, ergonomics, facility, management, manufacturing, materials handling, method, operate, production, quality control, safety, work measurement	Making a suggestion
3	Basic Numbers and Math	Chart	add, and, comes to, divided by, equals, -hundred, is, less, minus, multiplied by, over, plus, subtract, times	Pointing out a mistake
4	Analyzing Quantities	Textbook excerpt	convert, decimal number, denominator, fraction, mixed fraction, numerator, -out of-, percentage, point, quantity, reduce, whole number	Correcting oneself
5	Tables and Graphs	Textbook excerpt	bar graph, category, column, compare, data, legend, line graph, pie chart, report, represent, row, scatter plot, table, x-axis, y-axis	Expressing uncertainty
6	Describing Change	Report	decline, decrease, expand, fluctuate, increase, plummet, rise, shrink, skyrocket, stabilize	Asking for an explanation
7	Presentations and Communications	Guide	body language, cite, command, eye contact, flip chart, handout, note card, presentation, projector, signpost, summarize, visual aid	Asking for suggestions
8	Measurements 1	Survey	area, capacity, density, dimensions, distance, height, length, measure, perimeter, record, volume, weight, width	Asking for confirmation
9	Measurements 2	Table	centimeter, foot, gallon, imperial unit, inch, kilogram, liter, long ton, meter, metric ton, metric unit, pound, short ton	Asking for information
10	Large Numbers	Memo	cubed, exponent, integer, leading zero, rounding error, scientific notation, significant figure, squared, to the nth power, trailing zero	Identifying a problem
11	The Scientific Method	Abstract	conclusion, control group, experiment, experimental group, hypothesis, independent variable, observations, problem, purpose, result, scientific method, testable	Congratulating someone
12	Problem-Solving	Textbook excerpt	approach, identify, involve, iteration, iterative approach, plan of attack, problem-solving, procedure, redefine, solution, synthesis	Expressing an opinion
13	Systems	Textbook excerpt	cause, closed system, component, dynamic system, effect, objective, open system, relationship, static system, system	Asking for an example
14	Systems Accounting	Memo	consumption, extensive quantity, final, gain, generation, initial, input, intensive quantity, loss, output, Universal Accounting Equation (UAE)	Expressing possibility
15	Education	Online article	ABET, accredited, bachelor's degree, calculus, EAC, emphasis, expert, master's degree, obtain, PhD, physics, postgraduate, science, skill	Expressing preference

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# INDUSTRIAL ENGINEERING



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## Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Traits of an Industrial Engineer	Job posting	ability, commitment, critical thinking, curious, dedicated, expertise, focus, goal-oriented, innovative, logical, out-of-the- box, team player	Requesting more information
2	SI Units	Textbook excerpt	amount, ampere, base unit, current, derived unit, force, frequency, hertz, joule, kelvin, mole, newton, temperature	Offering assistance
3	Energy	Webpage	conserve, energy efficiency, energy management, energy quality, heat, kinetic energy, potential energy, solar energy, thermal energy, transfer, work	Expressing uncertainty
4	Statistics and Probability	Textbook excerpt	event, independent, intersection, median, mutually exclusive, outcome, population, probability, range, sample, sample space, statistics, union	Making predictions
5	Rate Processes	Report summary	diameter, driving force, flow rate, flux, inlet, outlet, pressure, rate, rate process, resistance, viscosity	Giving a recommendation
6	Facility Planning 1: Site Selection	Email	apples to apples, comparison, cost-benefit, labor availability, proximity, quality of life, real estate, relocation, selection driver, site, strategic objective, transportation infrastructure, weight	Discussing importance
7	Facility Planning 2: Layout	Textbook excerpt	activity, affinity, implementation, layout, macro layout, material flow, micro layout, negative affinity, nonflow affinity, populated layout, positive affinity, proximity value, SPI, SPU	Asking about progress
8	Methods Engineering 1: Charts & Diagrams	Textbook excerpt	combine, eliminate, flow diagram, flow process chart, Gantt chart, left-hand—right-hand chart, methods engineering, multiple activity chart, operations process chart, repetitive, sequence, work distribution chart, workstation	Asking for advice
9	Methods Engineering 2: Approaches	Email	analytical approach, constraint condition, define, design approach, ideal, implement, improvement plan, scope, specification, study subject, target	Asking for clarification
10	Work Measurement 1	Abstract	actual time, adjust, allow for, allowance, bottom-up, delay, fatigue, normal pace, normal time, personal needs, standard time, top-down, work measurement	Expressing surprise
11	Work Measurement 2	Textbook excerpt	action-based, activity-based, average skilled operator, direct time study, element, methods time measurement (MTM-1), motion economy, motion-based, predetermined time system, standard data, work factor, work sampling	Expressing concern
12	Materials Handling 1: Equipment	Job Posting	AGV, ASRS, container, conveyor, crane, elevator, forklift, hoist, industrial truck, lift, materials handling, rack	Making suggestions
13	Materials Handling 2: Principles	Textbook excerpt	adaptability principle, capacity principle, control principle, dead weight principle, gravity principle, obsolescence principle, performance principle, space utilization principle, standardization principle, systems principle, unit size principle, utilization principle	Asking for an explanation
14	Materials Handling 3: Distribution Systems	Webpage	air freight distribution system, delivery, distribution, hybrid system, minimize, ocean container system, plant-direct, regional distribution center, routing, sales model, shipping point, shipping point model, transportation cost model	Expressing certainty
15	Ergonomics and Safety	Contract excerpt	carpal tunnel syndrome, historical data, injury, intervention, musculoskeletal disorder, posture, risk factor, stress, turnover, vibration, workers' compensation	Asking for suggestions

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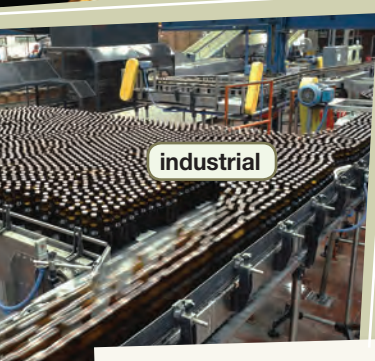
## Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Forecasting	Article	anticipate, demand history, demand trend, economy, estimate, EWMA (Exponentially Weighted Moving Average), extrapolate, forecast, moving average, phase out, plotting, precision, regression analysis, smoothing constant, weighted moving average	Making a recommendation
2	Financial Management 1	Email	accounts payable, accounts receivable, assets, balance sheet, cost of sales, fixed assets, gross profit, intangible assets, liabilities, net profit, overhead, owner's equity, P&L report, P&E, revenue	Expressing concern
3	Financial Management 2	Report	activity driver, activity, activity-based costing, activity-based management, cost driver, direct cost, direct labor, direct material, expense, fixed cost, gross margin, indirect cost, resource driver, variable cost, variable overhead	Giving an example
4	Management Planning Systems	Memo	function, goal, key results area, line function, long-range planning, management control system, mission statement, objective, operational planning, organizational chart, span of control, staff function, Standard Operating Procedure (SOP), tactical planning	Offering help
5	Automation	Guide	actuator, assembly, automation, control unit, degree of freedom, end-effector, flow line, hydraulic, manipulator, oscillation, payload, pneumatic, precision, processing operations, robot, work envelope	Expressing relief
6	Production 1	Textbook excerpt	batch production, boutique production, build to order, continuous production, downtime, flow production, human error, inflexible, job production, job shop, mass production, production cell, stage	Discussing pros and cons
7	Production 2	Letter	autonation, changeover time, flow line, idle, inventory, JIT, lead time, lean manufacturing, price volatility, production leveling, SMED, storage, value stream mapping, waste	Expressing pleasure
8	Inventory Control	Report	carrying cost, damage, finished goods, insurance, lot size, optimal, order, procurement cost, raw materials, reorder point, safety stock, spoilage, supply chain, warehouse, WIP (work in progress)	Describing importance
9	Automated Data Collection	Webpage	2-D symbology, automated data collection, automatic speech recognition, bar code, biometric, contact memory button, hand geometry, magnetic stripe card, optical, pen-based system, QR code (Quick Response code), reader, RFDC (Radio Frequency Data Communication), RFID (Radio Frequency Identification), scan, UPC (Universal Product Code), wireless	Asking for an explanation
10	Operations Research	Course description	assignment problem, critical path, deterministic approach, globalization, Markov decision process, mathematical optimization, maximum, operations research, pricing science, probabilistic approach, scheduling, transportation, unconstrained optimization	Asking for an example
11	CAD	Article	2-D, 3-D, boundary representation, CAD (Computer-Aided Design), Constructive Solid Geometry (CSG), drafting, exploded view, IGES (Initial Graphics Exchange Standard), manifold model, model, non-manifold model, PDES (Product Description Exchange for STEP), photorealistic rendering, technical drawing	Disagreeing
12	CAM	Textbook excerpt	approximation error, APT, CAM (Computer-Aided Manufacturing), CLDATA, manufacturing tolerance, non-cutting, numerical control (NC), offset, overcut, part programming, rapid prototyping, stereolithography, art-to-part time, tedious	Checking familiarity
13	Quality Control 1	Report	equipment design, market trends, marketing, materials selection, off-line, on-line, prototype, R&D, supplier variation, test methods, tolerances, training, wear and tear	Expressing uncertainty
14	Quality Control 2	Webpage	analyze, apply, assess, benchmarking, best practice, collaborative benchmark, comparison, competition, competitive benchmark, functional benchmark, internal benchmark, market share, measure, metric, SWOT analysis	Listing options
15	Resource Management	Email	consumption, dispose of, eliminate, energy costs, energy management, hazardous chemical, hazardous material, hazardous waste, HVAC, insulation, meter, pollution, spill, substitution, water management, water recovery	Giving advice

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# 1 The Industrial Engineer



## Colby Consulting Firm

Colby Consulting is expanding and looking for a new **industrial** engineer. We are looking for someone with:

- A bachelor's degree in engineering
- Relevant work experience (3+ years)
- Experience **managing** a team of five people or more
- Knowledge of **designing** systems
- Skills and experience with **implementing** systems
- Strong **analytical** skills

Your job duties include:

- **Improving** and **optimizing** current factory lines
- **Developing** and implementing new procedures
- **Planning** procedures
- **Evaluating** the effectiveness of new procedures
- **Eliminating** any ineffective procedures

*If you want to be part of a dynamic organization, send us your résumé at [colby@consulting.com](mailto:colby@consulting.com)*

## Get ready!

① Before you read the passage, talk about these questions.

- 1 What are some requirements for an industrial engineering job?
- 2 What are an industrial engineer's job duties?

## Reading

② Read the job posting. Then, choose the correct answers.

- 1 What is the purpose of the posting?  
A to describe the consulting firm's goals  
B to explain what an industrial engineer does  
C to advertise an available position  
D to promote engineering degrees
- 2 Which of the following is NOT one of the job duties listed?  
A coming up with new procedures  
B evaluating employee performance  
C making factory lines work better  
D assessing the effectiveness of changes
- 3 What can be inferred about Colby Consulting?  
A The firm is doing well.  
B It is easy to get a job there.  
C The employees are happy.  
D Workers are frequently evaluated.

## Vocabulary

③ Read the sentences and choose the correct words.

- 1 The industrial engineer decided to **manage/ implement** a new procedure.
- 2 The employee had to **plan/improve** the procedures in advance.
- 3 The worker needed to **eliminate/design** a new system to replace an old one.
- 4 The industrial engineer's goal was to **develop/ eliminate** inefficient procedures.
- 5 The woman was responsible for **managing/ optimizing** a team of ten people.

4 Fill in the blanks with the correct words from the word bank.

**Word BANK**

develop improve evaluate analytical optimize

- 1 To interpret data and provide solutions to problems, engineers need \_\_\_\_\_ skills.
- 2 The woman needed to \_\_\_\_\_ the candidates' qualifications.
- 3 The industrial engineer wanted to \_\_\_\_\_ the factory lines to make them as efficient as possible.
- 4 The owner intended to \_\_\_\_\_ efficiency at the company by twenty percent.
- 5 The industrial engineer was able to \_\_\_\_\_ a new system for processing materials.

5 Listen and read the job posting again. What kind of training and experience should applicants have?

**Listening**

6 Listen to a conversation between an interviewee and an interviewer. Mark the following statements as true (T) or false (F).

- 1 \_\_\_ The woman has relevant work experience.
- 2 \_\_\_ The man is looking for someone with leadership skills.
- 3 \_\_\_ The woman has not worked in a factory before.

7 Listen again and complete the conversation.

**Interviewee:** Thank you for inviting me 1 \_\_\_\_\_ for the position.

**Interviewer:** Your 2 \_\_\_\_\_ is impressive. Why don't you tell me more about yourself?

**Interviewee:** Well, I've been working as an industrial engineer for the 3 \_\_\_\_\_.

**Interviewer:** Do you have any 4 \_\_\_\_\_ ?

**Interviewee:** Yes, I have been in charge of a team for the last two years.

**Interviewer:** Great. What other experience do you have?

**Interviewee:** I have 5 \_\_\_\_\_ new processes for factories.

**Interviewer:** What were the results?

**Interviewee:** Each time, 6 \_\_\_\_\_ and waste decreased.

**Speaking**

8 With a partner, act out the roles below based on Task 7. Then, switch roles.

**USE LANGUAGE SUCH AS:**

*Why don't you ...?*  
*I've worked / 've been working as ...*  
*Each time ...*

**Student A:** You are an interviewee. Talk to Student B about:

- the position
- your experience
- achievements

**Student B:** You are an interviewer. Talk to Student A about the job.

**Writing**

9 Use the conversation from Task 8 to complete the interviewee's résumé.

**Résumé**

Name: \_\_\_\_\_

Qualifications: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Work History: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Relevant Experience: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Glossary

- ABET** [ABBREV-U15] The **ABET** (American Board for Engineering and Technology) is the governing body that grants accreditation to university engineering degree programs in the United States.
- accredited** [ADJ-U15] If something is **accredited**, it has been officially recognized by a governing body as meeting certain basic requirements.
- add** [V-T-U3] To **add** a number/quantity (A) to another number/quantity (B) is to increase (A) by (B).
- analysis** [N-COUNT-U2] An **analysis** is a study of how something works and what it is made up of to understand it better.
- analytical** [ADJ-U1] If someone has **analytical** skills, they are able to use logical reasoning and clear judgment, but also to problem-solve, analyze and interpret information so as to improve a business' operations and productivity.
- and** [CONJ-U3] We say **and** when we want to perform addition in math, i.e. when we want to add two or more numbers/quantities together. For example, two and three equals five ( $2+3=5$ ).
- approach** [N-COUNT-U12] An **approach** is how someone deals with something.
- area** [N-COUNT-U8] An **area** is the measure of surface space within a region.
- bachelor's degree** [N-COUNT-U15] A **bachelor's degree** is an undergraduate degree that is awarded upon completion of a course of study that typically lasts four years.
- bar graph** [N-COUNT-U5] A **bar graph** is a chart in which a comparison of rates is shown by parallel shapes (bars).
- body language** [N-UNCOUNT-U7] **Body language** is any kind of communication that is not expressed verbally, including posture, eye contact, and hand gestures.
- calculus** [N-UNCOUNT-U15] **Calculus** is a method of calculation that uses symbolic notation.
- capacity** [N-COUNT-U8] **Capacity** is the amount of liquid a container can hold.
- category** [N-COUNT-U5] A **category** is a group of things that share common features or qualities.
- cause** [N-COUNT-U13] A **cause** is a reason that makes something occur.
- centimeter** [N-COUNT-U9] A **centimeter** is a metrical unit of length equal to one-hundredth of a meter.
- cite** [V-T-U7] To **cite** evidence is to quote a source as evidence to support a point.
- closed system** [N-COUNT-U13] If a system is **closed**, it is not influenced or affected very much, or at all, by outside factors.
- column** [N-COUNT-U5] A **column** is a vertical section of data in a table.
- comes to** [V-T-U3] When quantity (A) **comes to** another quantity (B), then (A) is precisely the same as (B). For example, three-fourths comes to point seven five ( $3/4=0.75$ ), or ten times two comes to twenty ( $10 \times 2=20$ ).
- command** [V-T-U7] To **command** attention is to deserve and receive it because of one's confidence or demeanor.
- compare** [V-T-U5] If one **compares** two or more things, they consider their similarities and differences.
- component** [N-COUNT-U13] A **component** is an important piece or part of something.
- conclusion** [N-COUNT-U11] A **conclusion** is a decision or determination that is made after an experiment.
- consumption** [N-UNCOUNT-U14] **Consumption** is the amount of an extensive quantity that is destroyed during a particular period of time.
- control group** [N-COUNT-U11] A **control group** is a part of an experiment that does not receive the substance or treatment that is being tested.
- convert** [V-T-U4] To **convert** a number is to change its form. For example, changing a number from a fraction to a percentage.  $5/10$  equals to  $50/100$  which equals to 50%.
- cubed** [ADJ-U10] If a number is **cubed**, it is multiplied by itself three times. For instance, 2 cubed ( $2^3$ ) is 8 because  $2 \times 2 \times 2=8$ .
- data** [N-PLURAL-U5] **Data** are the collection of information and facts typically in the form of figures or statistics that are gathered and analyzed.
- decimal number** [N-COUNT-U4] A **decimal number** is a number that represents wholes and parts of a whole.
- decline** [V-I-U6] If something **declines**, it becomes less in amount, importance or strength.
- decrease** [V-I-U6] If something **decreases**, it becomes less in amount or size.
- denominator** [N-COUNT-U4] The **denominator** is the number that appears below the line in a fraction, for example the denominator in  $3/4$  is 4.
- density** [N-COUNT-U8] **Density** is the mass or heaviness of an object or a substance within a three-dimensional space.
- design** [V-T-U1] To **design** something is to make a model of it and then create it.
- develop** [V-T-U1] To **develop** something is to make it or help it grow.
- dimensions** [N-PLURAL-U8] If you describe the **dimensions** of an object, you talk about its length, width or height.

**distance** [N-COUNT-U8] A **distance** is the amount of separation or space between people, places, and objects.

**divided by** [PHRASE-U3] We say **divided by** when we want to perform division in math. If quantity (A) is divided by another quantity (B), then (A) is split evenly into (B) number of parts.

**dynamic system** [N-COUNT-U13] If a system is **dynamic**, it changes frequently or is very active.

**EAC** [ABBREV-U15] The **EAC** (Engineering Accreditation Commission) is an accreditation commission within the ABET that is assigned to engineering.

**effect** [N-COUNT-U13] An **effect** is the result of an action or condition.

**eliminate** [V-T-U1] To **eliminate** something is to get rid of it.

**emphasis** [N-COUNT-U15] An **emphasis** is special consideration, concentration, or stress given to something.

**equals** [V-T-U3] When quantity (A) **equals** another quantity (B), then (A) is precisely the same as (B). For example, three-fourths equals point seven five ( $3/4=0.75$ ), or ten times two equals twenty ( $10 \times 2=20$ ).

**ergonomics** [N-UNCOUNT-U2] **Ergonomics** is the study of how a workplace and its equipment can be designed for increased comfort, safety, and productivity.

**evaluate** [V-T-U1] To **evaluate** something is to judge its value.

**expand** [V-T-U6] To **expand** something is to make it larger.

**expert** [N-COUNT-U15] An **expert** is someone who has advanced skills or knowledge about something.

**experiment** [N-COUNT-U11] An **experiment** is a scientific process that is designed to test an idea or hypothesis.

**experimental group** [N-COUNT-U11] An **experimental group** is a part of an experiment that receives the substance or treatment that is being tested.

**exponent** [N-COUNT-U10] An **exponent**, usually represented by a small superscript number, shows how many times a number is multiplied by itself. For instance, in the formula  $2^3=8$ , the small number 3 is the exponent, indicating that the number 2 should be multiplied by itself 3 times.

**extensive quantity** [N-COUNT-U14] An **extensive quantity** is an amount that changes based on the size of a system and can be counted.

**eye contact** [N-UNCOUNT-U7] **Eye contact** is the state of looking directly into someone's eyes when talking to them.

**facility** [N-COUNT-U2] A **facility** is a building or place used for a specific purpose.

**final** [ADJ-U14] If something is **final**, it is related to the status of something at the end of a process or period of time.

**flip chart** [N-COUNT-U7] A **flip chart** is a stand with an oversized notebook attached to it where one can write information and use it as a visual aid in presentations.

**fluctuate** [V-I-U6] If something **fluctuates**, it alternates between increasing and decreasing with no clear pattern.

**foot** [N-COUNT-U9] A **foot** is an imperial unit of length equal to one-third of a yard or twelve inches, or 30.48 centimeters.

**fraction** [N-COUNT-U4] A **fraction** shows a part of a whole, with the bottom number showing how many parts the whole has been divided into, and the top number showing how many parts of the whole are present.

**gain** [N-COUNT-U14] A **gain** is an increase in size, profit, value, etc.

**gallon** [N-COUNT-U9] A **gallon** is an imperial unit of volume equal to 128 fluid ounces or about 3.79 liters (in the US).

**generation** [N-UNCOUNT-U14] **Generation** is the amount of an extensive quantity that is created during a particular period of time.

**handout** [N-COUNT-U7] A **handout** is a paper that briefly outlines the key points of a presentation and which is distributed to the audience to help them follow along.

**height** [N-UNCOUNT-U8] **Height** is the measure of someone or something from top to bottom.

- **hundred** [NUMBER-U3] We say **-hundred** after a cardinal number to abbreviate numbers in the thousands. For example, the number 1,400 can be said "fourteen hundred".

**hypothesis** [N-COUNT-U11] A **hypothesis** is an idea or statement that is not proven.

**identify** [V-T-U12] If you **identify** a problem, you discover or recognize it.

**imperial unit** [N-COUNT-U9] The **imperial units** are a set of measurement units that include, among others, the mile, the acre, the ounce, the gallon, the pound and the quart.

**implement** [V-T-U1] To **implement** something is to put it into use.

**improve** [V-T-U1] To **improve** something is to make it better.

**inch** [N-COUNT-U9] An **inch** is an imperial unit of length equal to one-twelfth of a foot.

# Glossary

- increase** [V-I-U6] If something **increases**, it gets larger in terms of number, size, or amount.
- independent variable** [N-COUNT-U11] An **independent variable** is the factor that is deliberately introduced in the experimental group.
- industrial** [ADJ-U1] If something is **industrial**, it relates to the production of goods.
- initial** [ADJ-U14] If something is **initial**, it is related to the status of something at the beginning of a process or period of time.
- input** [N-COUNT-U14] An **input** is the amount of an existing extensive quantity that is added to a system during a particular period of time.
- integer** [N-COUNT-U10] An **integer** is any natural number, including its negative, and zero.
- intensive quantity** [N-COUNT-U14] An **intensive quantity** is an amount that does not change based on the size of a system, and which can be measured, but cannot be counted.
- involve** [V-T-U12] If a process **involves** something, that thing is required as necessary in the process.
- is** [V-T-U3] When quantity (A) **is** another quantity (B), then (A) equals (B). For example, three-fourths is point seven five ( $3/4=0.75$ ), or ten times two is twenty ( $10 \times 2=20$ ).
- iteration** [N-COUNT-U12] An **iteration** is a single instance of something done repeatedly.
- iterative approach** [N-UNCOUNT-U12] An **iterative approach** is a scientific method of problem-solving that involves a systematic repetition of specific tasks carried out in the same manner each time.
- kilogram** [N-COUNT-U9] A **kilogram** is a metric unit of weight equal to 1000 grams or about 2.2 pounds.
- leading zero** [N-COUNT-U10] A **leading zero** is any zero that leads a number string, for example 0003476.
- legend** [N-COUNT-U5] A **legend** is a part of a chart or graph that identifies the data represented.
- length** [N-COUNT-U8] **Length** is the measure of how long someone or something is.
- less** [PREP-U3] We say **less** when we want to perform subtraction in math. If quantity (A) is less another quantity (B), then (B) is subtracted from (A). For example, three quarters less one quarter is two quarters ( $3/4-1/4=2/4$ ), or eight less three is five ( $8-3=5$ ).
- line graph** [N-COUNT-U5] A **line graph** is a graph that connects data points on x and y-axis with a straight line.
- liter** [N-COUNT-U9] A **liter** is a metric unit of volume equal to 1000 cubic centimeters or about 0.26 gallons.
- long ton** [N-COUNT-U9] The **long ton** is a unit of weight measurement used in the UK which equals to 2,240 pounds.
- loss** [N-COUNT-U14] A **loss** is a decrease in value, profit, etc.
- manage** [V-T-U1] To **manage** a process or people is to be in charge of them.
- management** [N-UNCOUNT-U2] **Management** is the process of organizing and operating a business.
- manufacturing** [N-UNCOUNT-U2] **Manufacturing** is the business activity of producing goods in a factory.
- master's degree** [N-COUNT-U15] A **master's degree** is a postgraduate degree that is awarded to people who have developed a level of mastery over a particular field. It is achieved through one or more additional years of study beyond the initial undergraduate degree.
- materials handling** [N-UNCOUNT-U2] **Materials handling** is the process in which materials are shipped and stored.
- measure** [V-T-U8] To **measure** something is to estimate or specify its mass, amount, or size.
- meter** [N-COUNT-U9] A **meter** is a metric unit of measurement equal to 100 centimeters or about 39.37 inches.
- method** [N-COUNT-U2] A **method** is a systematic way for doing things.
- metric ton** [N-COUNT-U9] The **metric ton**, also known as tonne, is a unit of weight measurement which equals to 1000 kilograms or 2,204 pounds.
- metric unit** [N-COUNT-U9] The **metric units** are a set of measurement units that include the gram, the liter and the meter, as well as the Celsius scale.
- minus** [PREP-U3] We say **minus** when we want to perform subtraction in math. If quantity (A) is minus another quantity (B), then (B) is subtracted from (A). For example, three quarters minus one quarter is two quarters ( $3/4-1/4=2/4$ ), or eight minus three is five ( $8-3=5$ ).
- mixed fraction** [N-COUNT-U4] A **mixed fraction** is a fraction that contains both whole numbers and parts of a whole, like  $2\frac{3}{4}$ .
- multiplied by** [PHRASE-U3] We say **multiplied by** when we want to perform multiplication in math. If quantity (A) is multiplied by another quantity (B), then (A) is added to itself (B) number of times.
- note card** [N-COUNT-U7] A **note card** is a paper card with key information that helps a speaker keep track of his or her ideas and guide his or her speech.



**numerator** [N-COUNT-U4] The **numerator** is the number that appears above the line in a fraction, for example the numerator in  $6/8$  is 6.

**objective** [N-COUNT-U13] An **objective** is an aim or goal toward which action is directed.

**observations** [N-PLURAL-U11] **Observations** is a data collection process where researchers see and interpret an experimental group's reactions under specific conditions.

**obtain** [V-T-U15] To **obtain** something is to get it.

**open system** [N-COUNT-U13] If a system is **open**, it is influenced or affected by outside factors.

**operate** [V-I-U2] If a company **operates**, it performs its regular activities.

**optimize** [V-T-U1] To **optimize** a process or system is to make it as useful as possible.

**-out of-** [PREP-U4] We use **out of** to indicate a selection from a number or quantity, as in *Three out of four balls were purple.*

**output** [N-COUNT-U14] An **output** is the amount of an extensive quantity that is removed from a system, but not destroyed, during a particular period of time.

**over** [PREP-U3] If quantity (A) is **over** another quantity (B), then (A) is divided by (B).

**percentage** [N-COUNT-U4] A **percentage** is a number out of 100 that represents a part of a whole.

**perimeter** [N-COUNT-U8] The **perimeter** is the length of the borders or outer limits around a closed area.

**PhD** [ABBREV-U15] The **PhD** (Doctor of Philosophy) is a doctorate that can be achieved in a variety of fields.

**physics** [N-UNCOUNT-U15] **Physics** is a branch of science that studies matter and energy, and their interactions.

**pie chart** [N-COUNT-U5] A **pie chart** is a circle which shows in slices the percentage or proportion that different categories represent.

**plan** [V-T-U1] To **plan** a procedure is to decide in detail courses of action.

**plan of attack** [PHRASE-U12] A **plan of attack** is a set of steps or actions that need to be taken so as to achieve a goal.

**plummet** [V-I-U6] If something **plummets**, it falls very low very quickly.

**plus** [PREP-U3] We say **plus** when we want to perform addition in math. If quantity (A) is plus another quantity (B), then the two quantities are added together.

**point** [N-COUNT-U4] The decimal **point** is the dot in a decimal number that separates the whole and the parts of a whole.

**postgraduate** [ADJ-U15] If something is **postgraduate**, it involves a few years of study beyond the initial four-year bachelor's degree.

**pound** [N-COUNT-U9] A **pound** is an imperial unit of weight equal to sixteen ounces or about half of a kilogram.

**presentation** [N-COUNT-U7] A **presentation** is a formal talk, where someone presents his ideas or work in front of a group of people.

**problem** [N-COUNT-U11] A **problem** is a question or situation that needs to be answered or resolved.

**problem-solving** [N-UNCOUNT-U12] **Problem-solving** is the process of using an analytical approach to find solutions to complex problems.

**procedure** [N-COUNT-U12] A **procedure** is the act of doing something in a particular order.

**production** [N-UNCOUNT-U2] **Production** is the act of creating goods from raw materials.

**projector** [N-COUNT-U7] A **projector** is a device used to project film or slides with lenses.

**purpose** [N-COUNT-U11] The **purpose** of doing something is the reason for which something is done.

**quality control** [N-UNCOUNT-U2] **Quality control** is the activity of checking goods for defects and other features so as to maintain a company's acceptable standards for manufactured products. It also tries to reduce waste.

**quantity** [N-COUNT-U4] A **quantity** is the amount of something.

**record** [V-T-U8] If you **record** information about something, you write down notes about it as reference.

**redefine** [V-T-U12] To **redefine** something is to state it again in a different manner.

**reduce** [V-T-U4] To **reduce** a fraction is to put the fraction in the smallest terms possible.  $25/200$  is a huge and unwieldy number.  $1/8$  is a much easier fraction to work with and it represents the same part to whole ratio.

**relationship** [N-COUNT-U13] A **relationship** is a state of affairs between people, places, or things that are related or interrelated in some way.

**report** [N-COUNT-U5] A business **report** is an official document prepared by an appointed person. It provides information and facts about a matter but also conclusions and/or recommendations.

**represent** [V-T-U5] If something **represents** an idea, a state etc., it expresses it or describes what it stands for.

# Glossary

- result** [N-COUNT-U11] A **result** is something that occurs because of something else.
- rise** [V-I-U6] If an amount **ris**es, it increases in number, size or amount.
- rounding error** [N-COUNT-U10] A **rounding error** is a miscalculation that results from improperly rounding a number to a convenient number of decimals.
- row** [N-COUNT-U5] A **row** is a horizontal section of data in a table.
- safety** [N-UNCOUNT-U2] **Safety** is the state of being free from harm, or safe.
- scatter plot** [N-COUNT-U5] A **scatter plot** is a chart that shows data points on an x and y axis not connected by any lines.
- science** [N-UNCOUNT-U15] **Science** is the study of natural laws and general hypotheses tested by gathering data, observation, and experimentation.
- scientific method** [N-UNCOUNT-U11] The **scientific method** is a systematic procedure for making and testing hypotheses.
- scientific notation** [N-UNCOUNT-U10] **Scientific notation** is a way of easily expressing very large or very small quantities. It incorporates the use of superscript digits.  $3 \times 10^6$ , for example, is 3,000,000 written in scientific notation.
- short ton** [N-COUNT-U9] A **short ton**, also known as the ton, is a unit of weight measurement used in the United States that equals 2,000 pounds or 907.18 kilograms.
- shrink** [V-I-U6] If costs, expenses, production rate etc. **shrink**, they become less in amount, worth or size.
- significant figure** [N-COUNT-U10] A **significant figure** is a digit that helps identify a number's precision. All numbers are significant except for leading and trailing zeros when they serve as placeholders, or digits that are introduced as a result of calculations that are carried out to more decimal places than the original numbers.
- signpost** [V-I-U7] To **signpost** is to guide listeners through ideas using clear directional wording.
- skill** [N-COUNT-U15] A **skill** is a task or activity that demands training or special knowledge.
- skyrocket** [V-I-U6] If prices, rates etc. **skyrocket**, they go very high very quickly.
- solution** [N-COUNT-U12] A **solution** is an answer to a problem.
- squared** [ADJ-U10] If a number is **squared**, it is multiplied by itself. For instance, 2 squared ( $2^2$ ) is 4 because  $2 \times 2 = 4$ .
- stabilize** [V-T-U6] To **stabilize** something, such as production, prices, rates, etc. is to keep it balanced and not subject to changes or fluctuations.
- static system** [N-COUNT-U13] If a **system** is **static**, it has structure, but does not change or show activity.
- subtract** [V-T-U3] To **subtract** quantity (A) from another quantity (B) is to reduce (A) by number (B).
- summarize** [V-T-U7] If you **summarize** something, you briefly present its main points.
- synthesis** [N-COUNT-U12] A **synthesis** is a combination of ideas into a single idea or plan.
- system** [N-COUNT-U13] A **system** is a set of components or processes working together as a whole.
- table** [N-COUNT-U5] A **table** is a visual representation of data made up of rows and columns.
- testable** [ADJ-U11] If something is **testable**, it can be proved or disproved by performing an experiment.
- times** [PREP-U3] We say **times** when we want to perform multiplication in math. If quantity (A) is times quantity (B), then quantity (A) is multiplied by (B).
- to the nth power** [PHRASE-U10] If a number is multiplied **to the nth power**, it is multiplied by a given exponent. For example, 2 to the fifth power has an exponent of five and, thus, is multiplied by itself five times to equal 64.
- trailing zero** [N-COUNT-U10] A **trailing zero** is a zero that occurs to the right of a decimal point, as in 15.8900. No other digits follow a trailing zero (or a series of trailing zeros), and they are always considered significant.
- Universal Accounting Equation (UAE)** [N-UNCOUNT-U10] The **Universal Accounting Equation (UAE)** is a method for measuring changes in extensive quantities over particular periods of time.
- visual aid** [N-COUNT-U7] A **visual aid** is a graphical representation of important information designed to support a speaker's ideas.
- volume** [N-UNCOUNT-U8] **Volume** is the amount of space an object occupies.
- weight** [N-UNCOUNT-U8] **Weight** is the measure of the mass or heaviness of a person or object.
- whole number** [N-COUNT-U4] A **whole number** is a number that has not been divided into smaller pieces, such as 5, 8,3619, etc., as opposed to fractions or decimals.
- width** [N-UNCOUNT-U8] **Width** is the measure of someone or something from side to side.
- work measurement** [N-UNCOUNT-U2] **Work measurement** is the amount of time it takes for a worker to finish a task.
- x-axis** [N-COUNT-U5] The **x-axis** is the horizontal axis on a traditional graph.
- y-axis** [N-COUNT-U5] The **y-axis** is the vertical axis on a traditional graph.

**CAREER  
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