PATHWAY 2 CAREERS

P2C Math

Math Made Relevant

Comprehensive math curriculum for Pre-Algebra, Algebra I, Geometry, and Algebra II

WE ARE p2c

We believe when education becomes relevant, learners can fully engage.

We solve some of the biggest challenges in education, helping learners and teachers make daily connections between what they're doing now in the classroom and what they'll do later in life. In doing so, we answer the most asked question from learners:

When will I ever need to know this in the real world?

What makes us different is our approach. We deliver comprehensive career-connected learning solutions to schools and districts, backed by industry-leading research and technical services that remove obstacles to implementation, narrow the achievement gap, and guide more students to future success.

OUR MISSION

We're dedicated to clearing the biggest hurdles in education by challenging current approaches and motivating student learning through career-connected relevance.

OUR VISION

By connecting classroom and career paths, we believe we can transform not just the future prosperity of individual students, but the economies of whole communities.

Contents

Introduction

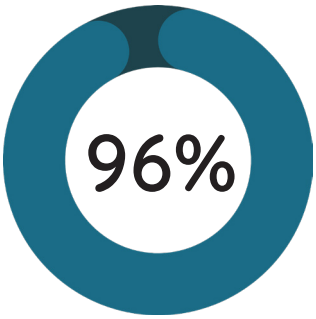
The question asked in every math classroom year after year is, "When will I use this in the real world?" By answering this question and bridging the gap between textbook theory and real-life application, we can help students understand the why behind the what and increase student success and economic growth.

These meaningful and relevant educational experiences can increase students' motivation, persistence, skill retention, task completion, and more.

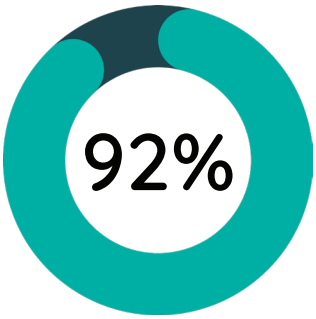
In 2018, Perkins V, the Strengthening Career and Technical Education Act for the 21st Century, updated the previous Carl D. Perkins Career Technical Education Act of 2006 to focus on the demands of regional workforces. With this new focus, federal and state funding recognize the importance of integrating education, the economy, and the workplace into CTE programs, preparing students for high-demand jobs (Comprehensive Local Needs, 2020). In addition, the Federal CTE funding under Perkins V directly addresses monitoring and improving the performance of historically underserved students, standing up to the inequalities and barriers erected for these students in the past (Alliance for Excellent Education, 2018).

P2C Math focuses on the intersection of the workplace and education, preparing all students for successful, lifelong careers. By providing equal opportunities and access to all students, P2C strives to close the performance gap and ensure equal opportunities for everyone.

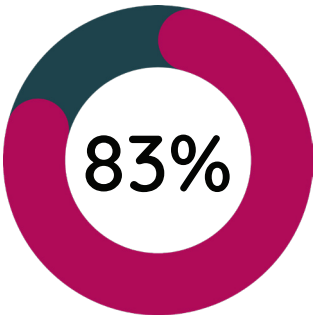
What are teachers saying?[1]



Reported the career content as interesting and engaging.



Observed an increase in math performance.



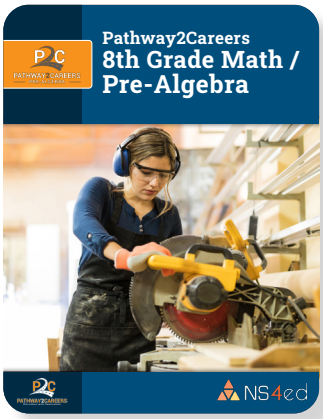
Reported an increased interest in career exploration.

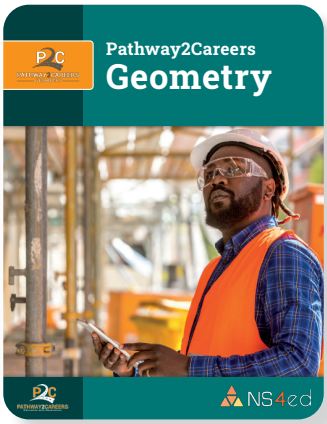
[1]*P2C Math was used as a pilot in New Mexico during the spring of 2021. Surveys were conducted to capture initial use classroom and provide teacher feedback regarding its benefits and weaknesses.*

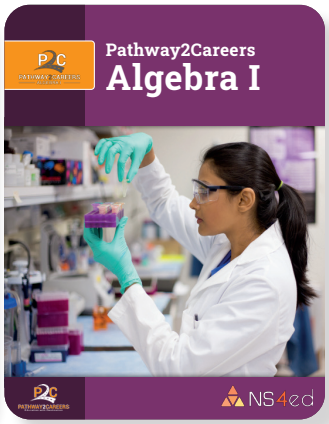
At Cañon City High School, P2C Math is being used as a curriculum resource in a Pilot Program with our students needing intervention and engagement. In the one-quarter of use, the teachers report a **noticeable increase in interest and engagement** that comes from taking the time to introduce each major topic with an exploration of the use of mathematics in the topic as used in actual careers.

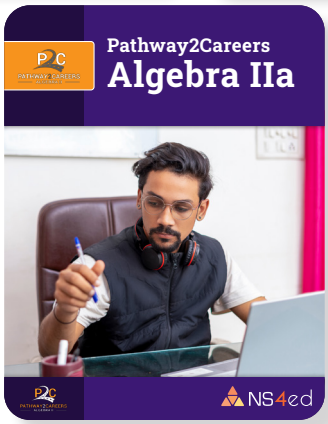
William Summers, Principal
Douglas Freese, Math Teacher

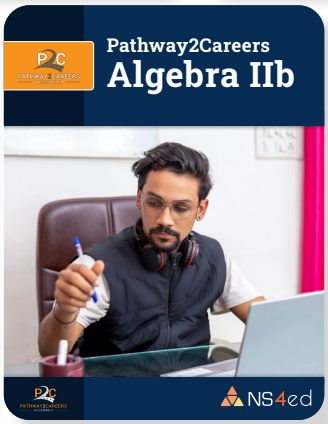
P2C Math

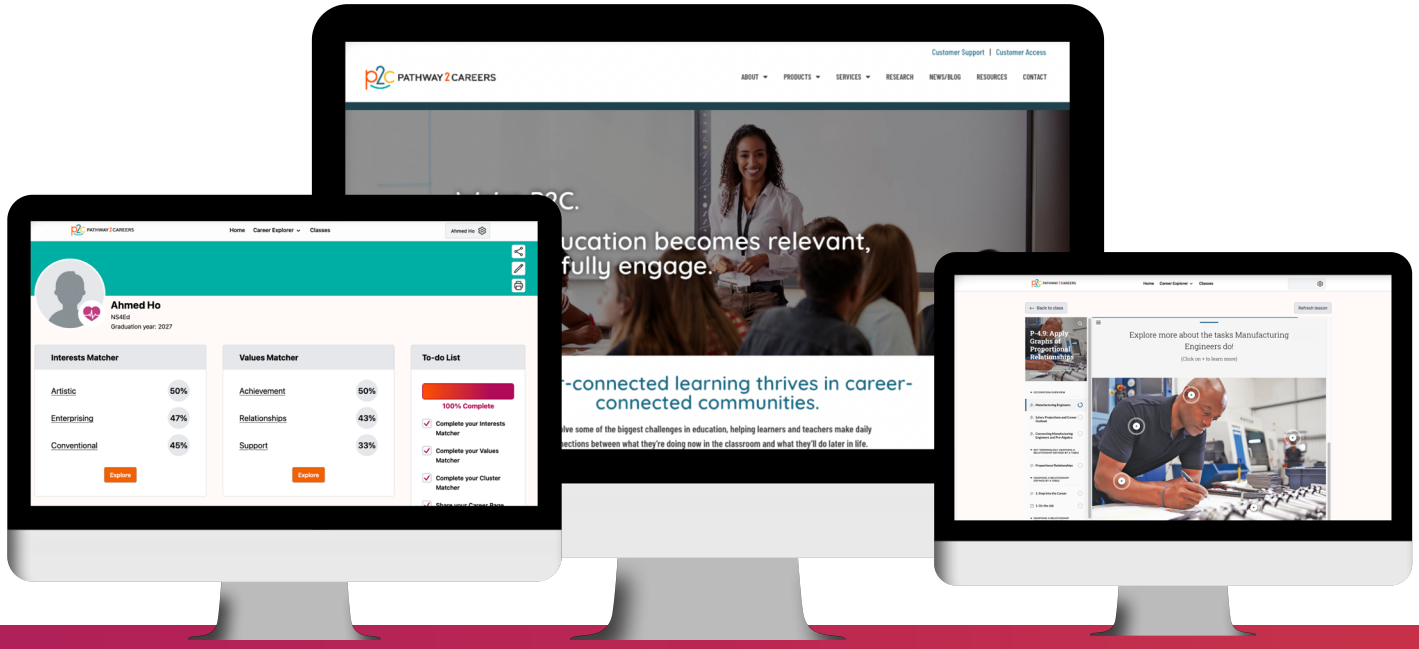












Career-Connected Learning

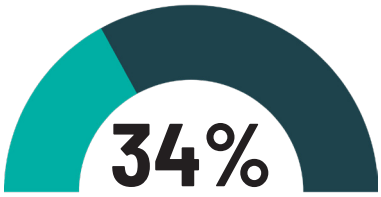
P2C Math modernizes math by bringing comprehension to the forefront. **When students find purpose in their learning, they perform better in school.** The digital curriculum provides teachers with flexible delivery options to connect careers to math learning and demonstrate how mathematical concepts relate to real-world occupations.

The comprehensive P2C Math allows students to interact with more than 650 unique jobs and receive an in-depth look at math concepts within a specific high-value career with nearly 200 application lessons. Lessons embed state-specific career data, such as salary projections and career outlook information allowing students to discover high-value careers from their region.

P2C Math includes an innovative assessment that indicates students' readiness for more complex skills. The **Quantile® Framework for mathematics** also includes the Quantile® Career Database that shows students how to apply their current math aptitude and set pathway goals. This invaluable information increases students' awareness of the skills and concepts needed to reach their career goals.

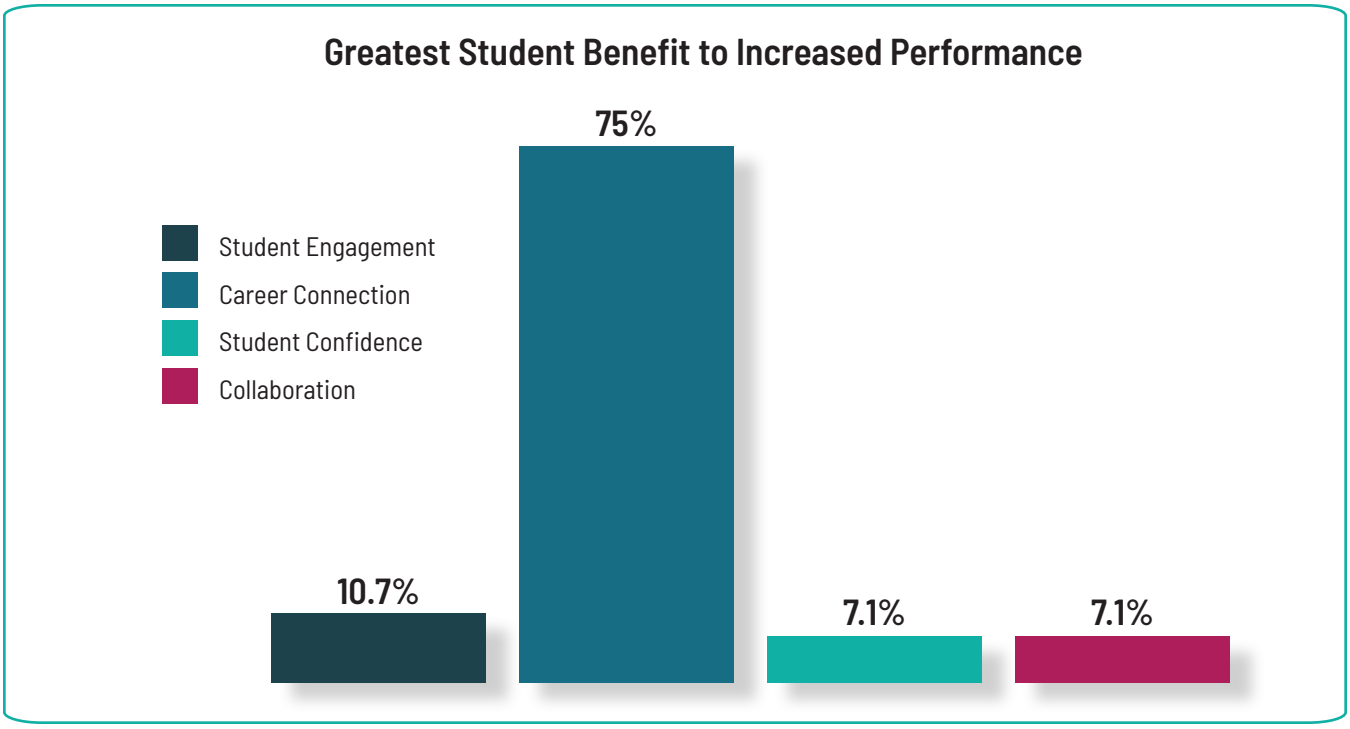
In addition to math curriculum, **P2C includes tailored career exploration.** Designed for grades 6-12, guided exploration curriculum includes STEM career activities and financial literacy learning. By connecting learning to careers students can discover opportunities and create their path to success.

In 2019, the US scored an average of just



in terms of eight-grade public-school students performing at or above The National Assessment of Educational Progress' "proficient" level in mathematics.

> The real problem is changing the behavior the students have towards math. We keep trying to think up a better math problem, and we think that if we put it in a textbook, that'll fix it. What we really have to do is take a step back and ask: **'How do we engage students differently about mathematics?'**
>
> Dr. Joseph Goins
> P2C CEO & Founder



Education that improves attitudes and motivates students.

Authentic career readiness resources help students understand "the why behind the what," and this realization can motivate them. Possibly the most popular question asked in math classrooms across the country is, "When will I ever use this?" We can help students connect mathematic and scientific concepts to use in hundreds of high-value careers and aid our students to find purpose. When they understand how they will use the mathematical skills, attitudes change, and performance improves.

Application Lessons

Application lessons spotlight **one high-value occupational connection to the mathematical concepts being taught in the lesson.** In these lessons, students receive details about the occupation—including a description of the occupation, details on what a person in the career would do on a regular basis, salary, career projections, and a video of someone in the career talking about what they do. These lessons give students a deeper understanding of the connection between the occupation and the concept.

The following pages provide a sample student lesson in PDF format[2] for Pre-Algebra/8th Grade Math.

[2]*Digital lessons are also available.*

LESSON 4.9

Apply Graphs of Proportional Relationships

CAREER SPOTLIGHT: Manufacturing Engineers

Occupation Description

Industrial engineers find ways to eliminate wastefulness in production processes. They devise efficient systems that integrate workers, machines, materials, information, and energy to make a product or provide a service.

Some industrial engineers, called manufacturing engineers, focus entirely on the automated aspects of manufacturing processes. They design manufacturing systems to optimize the use of computer networks, robots, and materials.

Education

Industrial engineers typically need a bachelor's degree in industrial engineering or industrial engineering technologies. However, many industrial engineers have degrees in mechanical engineering, electrical engineering, manufacturing engineering, or general engineering. Interested students should take high school courses in mathematics, such as algebra, trigonometry, and calculus; computer science; and sciences such as chemistry and physics.

Potential Employers

The largest employers of industrial engineers are as follows:

Transportation equipment manufacturing	18%
Computer and electronic product manufacturing	13%
Professional, scientific, and technical services	12%
Machinery manufacturing	8%
Fabricated metal product manufacturing	6%

Watch a Video about industrial engineers: https://cdn.careeronestop.org/OccVids/OccupationVideos/17-2112.00.mp4

Career Cluster

Science, Technology, Engineering & Mathematicss

Career Pathway

Engineering and Technology

Career Outlook

- Salary Projections:
  Low-End Salary, $57,950
  Median Salary, $88,950
  High-End Salary, $136,930
- Jobs in 2019: 295,800
- Job Projections for 2029: 325,800 (increase of 10%)

Algebra Concepts

- Make, use, and interpret graphs of proportional relationships.

Is this a good career for me?

Manufacturing engineers:

- Analyze operational data to evaluate operations, processes or products.
- Resolve operational performance problems.
- Develop technical methods or processes.
- Implement design or process improvements.
- Determine operational methods.

Photo credit: Monkey Business Images/Shutterstock.com

Lesson Objective

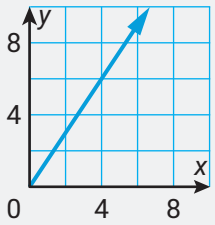
In this lesson, you will look at how manufacturing engineers use proportional relationships to model manufacturing problems and use graphs of these relationships to make predictions and solve the problems.

The following information will be used to solve problems in this lesson.

Proportional Relationships

The graph of a proportional relationship is a straight line through the origin that has a slope equal to the unit rate of the proportional relationship.

The graph shown has a slope of 1.5, so the unit rate is 1.5.

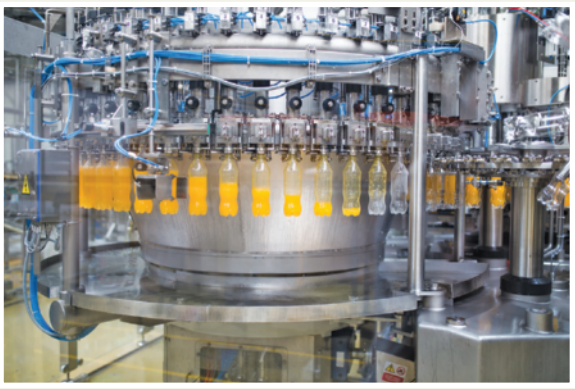


1 Step Into the Career: Graphing a Relationship Defined by a Table

Ravi is a manufacturing engineer who oversees the orange juice bottling operation at a factory. The table gives the number of bottles y the factory can produce in x hours.

Hours, x	3	7	11	19	23
Thousands of Bottles, y	3.6	8.4	13.2	22.8	27.6

Graph the given relationship. Then use the graph to determine whether the factory can produce enough bottles in one work week (40 hours) to fill an order for 50,000 bottles.



Devise a Plan

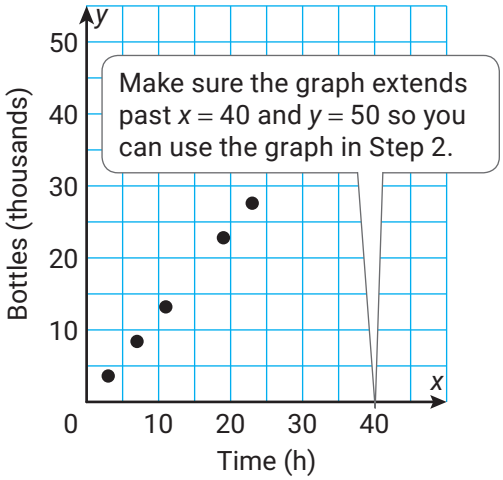
Step 1: Graph the relationship defined by the table.

Step 2: Use the graph to predict how long it will take the factory to produce 50,000 bottles.

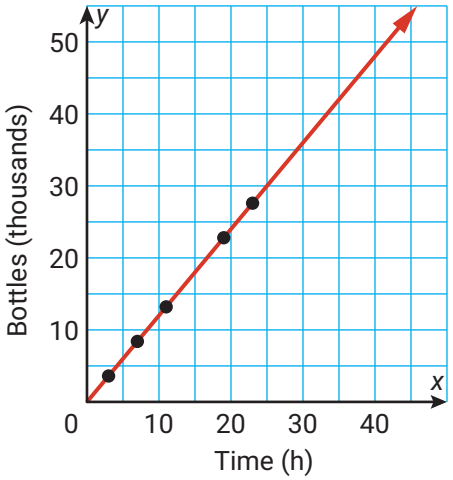
Walk Through the Solution

Step 1: Graph the relationship defined by the table.

Plot the points on a coordinate plane.



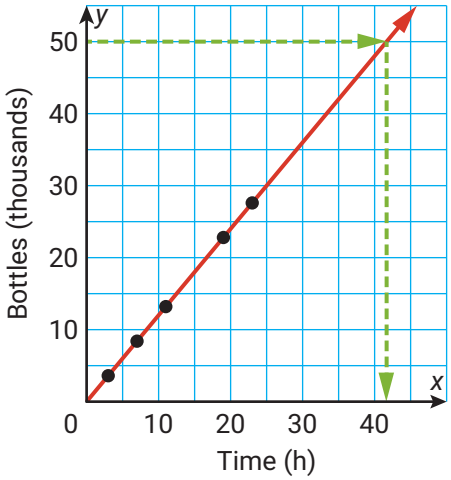
Draw a line that starts from the origin through all the plotted points.



Step 2: Use the graph to predict how long it will take the factory to produce 50,000 bottles.

Draw a horizontal line from $y = 50$ on the y-axis to the graph. Then draw a line down to the x-axis to see if the corresponding x-value is greater than, less than, or equal to 40.

The factory will take about 42 hours to produce 50,000 bottles, so the factory will be unable to produce the needed number of bottles in one work week.



On the Job: Apply Graphing a Relationship Defined by a Table

1. Diana is a manufacturing engineer who oversees the bottling operation at a factory. The table gives the number of bottles y the factory can produce in x hours.

Hours, *x*	5	12	18	27	34
Thousands of Bottles, *y*	1.5	3.6	5.4	8.1	10.2

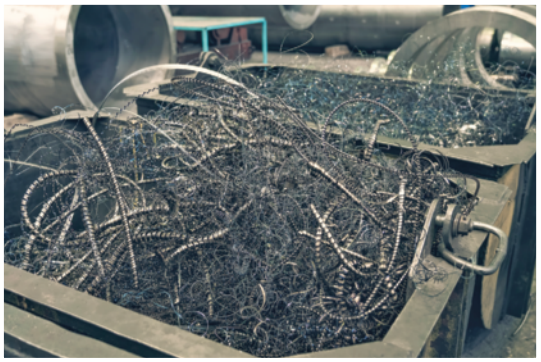
a. Graph the given relationship.

b. Use the graph to determine how many bottles the factory can produce if the factory is in operation for 50 hours.

Photo credit: Mongkolchon Akesin/Shutterstock.com

2 Step Into the Career: Graphing a Relationship Defined by an Equation

Fernando is a manufacturing engineer who is trying to reduce waste for a machine that shaves metal off of aluminum discs to create car parts. The machine produces y kilograms of waste every x hours according to the equation $y = \frac{7}{3}x$. How long does it take the machine to create 56 kg of waste?



Devise a Plan

Step 1: Graph the relationship defined by the equation.

Step 2: Use the graph to predict how long it will take the machine to produce 56 kilograms of waste.

Walk Through the Solution

Step 1: Graph the relationship defined by the equation.

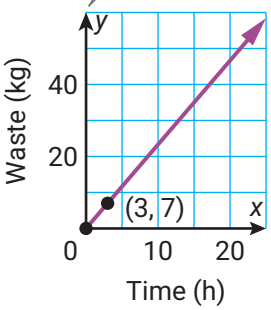
Make sure the graph extends past $y = 56$ so you can use the graph in Step 2.

Plot the point (0, 0) on a coordinate plane because every proportional relationship includes (0, 0). Substitute a convenient number into the equation to find a second point, such as $x = 3$.

$y = \frac{7}{3}x$ Write the equation.

$y = \frac{7}{3}(3)$ Substitute 3 for x.

$y = 7$ Multiply.



Plot the point (3, 7) on the coordinate plane. Draw a line through the two points.

Step 2: Use the graph to predict how long it will take the machine to produce 56 kilograms of waste.

Draw a horizontal line from $y = 56$ on the y-axis to the graph. Then draw a line down to the x-axis to determine the corresponding value of x.

The machine will take 24 hours to produce 56 kilograms of waste.

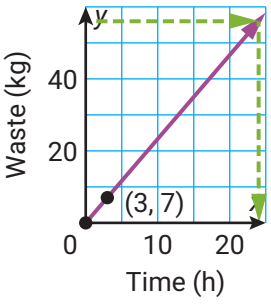


Photo credit: DedMityay/Shutterstock.com

On the Job: Graphing a Relationship Defined by an Equation

2. Fernando is a manufacturing engineer who is trying to reduce waste at a sawmill. The mill generates sawdust and wood chips as waste according to the equation $y = 1.8x$, where y is the mass of wood waste in kilograms and x is the number of hours of production.

a. Graph the proportional relationship defined by the equation.

b. How long does it take the mill to produce 63 kilograms of waste?

3 Step Into the Career: Graphing a Relationship Defined by a Description

Val is a manufacturing engineer who is determining the costs of production at a bread factory. The cost of packaging a certain type of Italian bread at the factory is $6.30 for every 300 loaves of bread produced. Determine whether an order of 2,000 loaves of bread can be filled with $42 of packaging.

Devise a Plan

Step 1: Graph the relationship defined by the verbal description.

Step 2: Use the graph to predict how many loaves of bread can be packaged for $42.

Walk Through the Solution

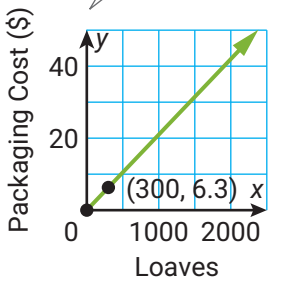
Step 1: Graph the relationship defined by the verbal description.

Let x represent the number of loaves produced and y represent the cost of packaging.

Plot the point (0, 0) on a coordinate plane, because every proportional relationship includes (0, 0).

The verbal description represents a second point on the graph, (300, 6.3). So, plot the point (300, 6.3). Then draw a line through the two points.

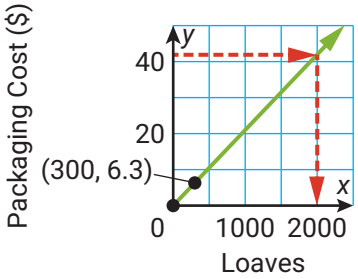
Make sure the graph extends past $y = 42$ so you can use the graph in Step 2.



Step 2: Use the graph to predict how many loaves of bread can be packaged for $42.

Draw a horizontal line from $y = 42$ on the y-axis to the graph. Then draw a line down to the x-axis to determine the corresponding value of x.

$42 is just enough to package 2,000 loaves of bread, so the order can be filled using $42 of packaging.



On the Job: Graphing a Relationship Defined by a Description

3. Demetrius is a manufacturing engineer who is overseeing production of cartons of milk. The cartons are shipped in palettes such that each palette contains 25 boxes which contain a grand total of 500 cartons of milk.

a. Graph the proportional relationship between the number of boxes and the number of cartons of milk.

b. How many boxes are needed to package 12,000 cartons of milk?

Career Spotlight: Practice

4. Ysenia is a manufacturing engineer at a factory that makes parts for automobiles. The company produces shock absorbers according to the table shown.

a. Graph the proportional relationship defined by the table.

b. How many shock absorbers does the factory produce in one day?

c. How many days would it take the factory to produce 34,000 shock absorbers?

Days, *x*	2	5	10	17	28
Number of parts, *y*	800	2000	4000	6800	11,200

5. A praline factory packs pralines in boxes according to the equation $y = 16x$, where y is the number of pralines and x is the number of boxes.

a. Graph the proportional relationship defined by the equation.

b. Use the graph to determine whether 30 boxes of pralines is enough to feed a party that requires 500 pralines.

QUICK TIP

In part (b), you can start with the given y-value and find the corresponding x-value, or you can start with the given x-value and find the corresponding y-value.

6. Pablo is a manufacturing engineer at a computer chip production plant. The plant can produce 120 computer chips per hour. If a computer company orders 3500 computer chips, can they receive the order in 4 working days? Assume that the plant operates 8 hours per day.

Devise a Plan

Step 1: Graph the proportional relationship defined by the verbal description.

Step 2: _____?_____

Step 3: _____?_____

Career Spotlight: Check

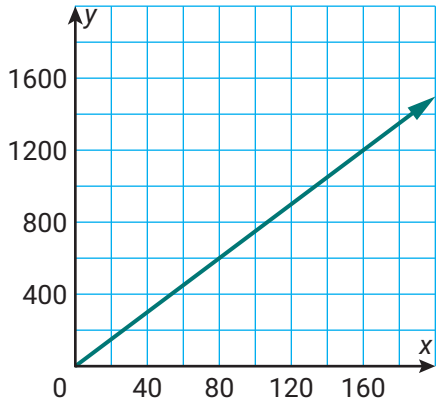
7. Jabari is a manufacturing engineer who operates a factory that makes television sets. The factory produces y televisions in x hours according to the equation $y = 28x$. Jabari receives a work order that asks for the production of a certain number of televisions in a 40-hour work week. Which of the following work orders could be completed in a work week? Select all that apply.

a. 800 **b.** 900 **c.** 1000 **d.** 1100 **e.** 1200 **f.** 1300

8. Sari is a manufacturing engineer at a factory that makes window panes. The number of window panes that the factory can produce in a day is directly proportional to the number of workers that day. During the previous day, the factory produced 24 window panes with 10 people working. How many people does Sari need in the factory to produce 60 window panes?

A. 25 **B.** 36 **C.** 46 **D.** 50

9. A factory packages 5-pound bags of apples that are sold in grocery stores. The factory produces bags of apples according to the proportional relationship shown in the graph, where x is the time in minutes and y is the number of bags of apples produced. Complete the table with the correct amounts to describe the proportional relationship.



Minutes, x	Bags Produced, y
40	300
	750
160	
	1425

10. Jamal is a manufacturing engineer at a facility that produces cars. His team can assemble the frames of a car at a rate that allows them to produce 21 car frames in 2 hours. Complete the sentence by selecting values from the panel so that it is true.

Jamal's team can assemble enough car frames to complete an order of _____ car frames in _____ hours and 40 minutes.

6	8	10
56	70	105

Exploration Lessons

Exploration lessons spend more time **demonstrating skills.** They instruct students on the structure of the mathematics through notes and examples. These lessons indicate multiple examples of occupations that utilize the skills taught in the lesson. Additionally, each of these lessons include at least two real-world problems that ask students to demonstrate how certain occupations use the mathematical concepts of the lesson.

Interested in viewing exploration lessons? Contact us to receive sample exploration lessons.

Get Started!

Ignite student learning and **close the gap between education and industry** with Pathway2Careers. Explore our solutions and bring career-connect learning to your students.

Learn more at p2c.org/get-started.

PATHWAY 2 CAREERS

Our Commitment

Through our commitment to drive results, our partnerships have led us to building comprehensive career and college education solutions. We focus on solutions relevant to education practices and ensure a seamless approach to support career readiness efforts in schools everywhere. Our innovative approach focuses on delivering the best possible solutions to support long-term student success.

> We used to **tell** them what they would use math for, now we **show** them what the math is for.
>
> Dr. Joseph Goins
> P2C CEO & Founder

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