

TOPIC 2

Linear Equations

MATH BACKGROUND KEY CONCEPTS

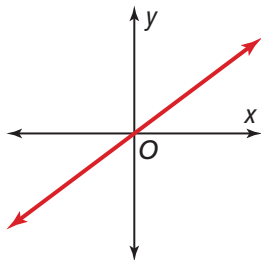
Students extend their understanding of linear equations. Students analyze descriptions and graphs of lines to write corresponding linear equations in different forms.

Relationships among Quantities

Direct Variation In Lesson 2-1, students compare changes in one variable to changes in another variable. By determining if a change in one variable implies a proportional change in another variable, students classify direct variation relationships. These relationships are then used to write and solve equations involving direct variation.

NUMBERS $y = kx$ with $k \neq 0$

GRAPH

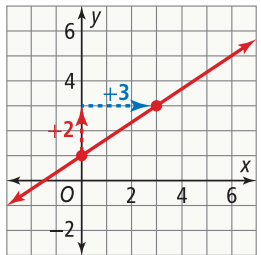


Different Forms of Linear Equations

Slope-Intercept Form In Lesson 2-2, students begin by identifying two key elements of a linear equation: its slope and y-intercept. These are used to write a corresponding equation as $y = mx + b$, where m is the slope and b is the y-intercept. Students may use a graph to write an equation or use an equation to sketch a graph.

NUMBERS $y = \frac{2}{3}x + 1$

GRAPH



The line has a slope of $\frac{2}{3}$.
The y-intercept is 1.

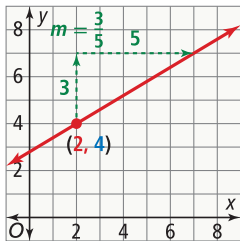
Starting with an equation, students plot the y-intercept and then use the slope to find a second point on the line. Starting with a graph, students identify the y-intercept and another point on the line. Then students count to find the rise and run between the points that they use to write the slope.

Students also find the equation of a line using two points and the slope formula, substituting the slope and one of the points into the slope-intercept form of the equation to find the y-intercept.

Point-Slope Form In Lesson 2-3, students learn that there is another form that a linear equation can take called point-slope form. Given (x_1, y_1) as a point on the line, and m for the slope, the equation in point-slope form is $y - y_1 = m(x - x_1)$. The most apparent purpose for this form is to write an equation when given a slope and a point on the line. Starting with a graph, this form is useful when the exact location of the y-intercept is unclear.

NUMBERS $y - 4 = \frac{3}{5}(x - 2)$

GRAPH



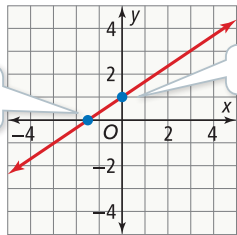
Standard Form In Lesson 2-4, students learn that the standard form of a linear equation can be used to easily identify the x- and y-intercepts. This form is also used to write the equations of vertical and horizontal lines. The equations are in the form $Ax + By = C$, where A , B , and C are integers, and A and B are not both equal to 0.

NUMBERS $2x - 3y = -3$

GRAPH

The x-intercept is $-\frac{3}{2}$, or -1.5 .

The y-intercept is 1.



Since every point on a vertical line has the same x-coordinate, the equation of a vertical line is $x = a$, where a is the x-intercept. Similarly, the equation of a horizontal line is $y = b$, where b is the y-intercept, because all of the points on the line have the same y-coordinate.

This understanding is helpful as students extend their use of equations to recognize and describe parallel and perpendicular lines in Lesson 2-5.

Students understand that an equation in any form can be rewritten in another form using the properties of equality and algebraic manipulation.

TOPIC 2

Linear Equations

MATH BACKGROUND COHERENCE

Students learn best when concepts are connected through the curriculum. This coherence is achieved within topics, across topics, across domains, and across grade levels.

MAKING MATHEMATICAL CONNECTIONS

Looking Back

How does Topic 2 connect to what students learned earlier?

TOPIC 1

- **Solving Linear Equations** Students used the properties of equality to find the value of a variable. Students now apply this concept to solve equations for y when they rewrite equations in slope-intercept form. (A.5A) Using these same skills, when given two points on a line, students find the slope and then use one set of points and the slope to find the y -intercept. (A.5B)
- **Literal Equations** Students rewrote a literal equation to solve for a specified variable. In Topic 1, students similarly manipulate the information they have about a line to rewrite the equation of the line in a specific form. (A.12E)

IN THIS TOPIC

How is content connected within Topic 2?

- **Direct Variation** In Lesson 2-1, students extend their work with equations to write and solve equations involving direct variation. They begin by recognizing direct variation relationships and identifying the constant of proportion. Students then write direct variation equations, use direct variation models, and apply their understanding to real-world situations. (A.2D)
- **Writing Equations in Different Forms** In Lessons 2-2 through 2-4, students learn three forms for linear equations: slope-intercept form, point-slope form, and standard form. Students choose and apply the appropriate form based on the information given in the problem. (A.2B)

Slope-Intercept Form: $y = mx + b$
Point-Slope Form: $y - y_1 = m(x - x_1)$
Standard Form: $Ax + By = C$
- **Using Standard Form** In Lesson 2-4, students use the standard form of a linear equation to solve real-world application problems. (A.2C)
- **Parallel and perpendicular lines.** In Lesson 2-5, students write equations to represent lines that are parallel or perpendicular to a given line. They then use graphing to show the relationship between the slopes of parallel and perpendicular lines, and solve real-world problems involving them.

MAKING MATHEMATICAL CONNECTIONS

Looking Ahead

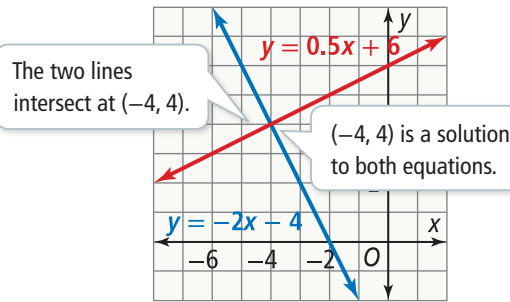
How does Topic 2 connect to what students will learn later?

Topic 3

- **Lines of Fit** When working with a data set that has a linear association, the data can be represented by a line of fit. In Topic 3, students will apply their knowledge of linear equations to find the equation of the line of best fit by choosing two points and calculating the slope. Then students will use point-slope form to find the y -intercept so that they can write the equation of the line in slope-intercept form. (A.4C)

Topic 4

- **Solving Systems of Equations by Graphing** In Lesson 4-1, students apply what they have learned about linear equations in slope-intercept form to solve systems of equations. Students solve systems by transforming equations into slope-intercept form so that they can graph them easily and find the point where the lines intersect. (A.2I)



Topic 8

- **Quadratic Equations** In Topic 8, students will learn that, as with linear equations, there are also different forms of quadratic equations: standard form, vertex form, and factored form. Students will be prepared to work with different forms of equivalent equations. (A.7B)

TOPIC 2

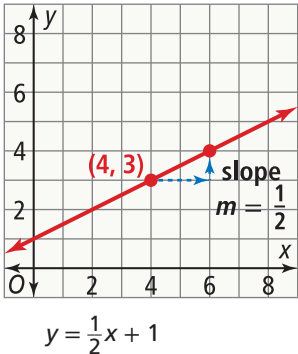
Linear Equations

MATH BACKGROUND BALANCE

A rigorous curriculum emphasizes conceptual understanding, procedural skill and fluency, and applications.

Conceptual Understanding

- Different Forms of Equations** Students understand that linear equations can be represented by three forms. The choice of form is dependent on the given information. Any form can be converted to another form using the properties of equality. They also learn that the graphs of equations in the form $x = n$ are vertical lines. Different forms of equations reveal different elements, such as slope and intercepts. When given a graph or scenario, these elements determine which form of the equation to use.



Procedural Skill

- Graphing Equations** For equations in slope-intercept form, students plot the y -intercept and then use the slope to find a second point on the line. For equations in point-slope form, students plot the point (h, k) from the equation and then use the slope and that point to find another point on the line. When an equation is in standard form, students find the x - and y -intercepts to graph the line.
- Converting Forms** Students fluently convert between the forms of a line, often putting equations that are in point-slope form or standard form into slope-intercept form.
- Writing Equations** In order to write an equation, students may need to calculate the slope using the slope formula. They also may need to solve a slope-intercept equation for b in order to identify the y -intercept.

Applications

- Interpreting Slopes and y -Intercepts** In a problem involving a constant rate, students interpret the slope and y -intercept within the context of the problem.
- Modeling with Linear Equations** Throughout Topic 2, students apply linear equations in various forms and their characteristics to real-world scenarios. The result is a linear model for the situation. In Lesson 4, students interpret the C in the standard form, $Ax + By = C$, as the constraint in a problem involving annual passes to a state park.

day pass price • x day passes

+ \$100 • y annual passes

= \$110,000

17.5 • x

+ 100 • y

= 110,000

TOPIC 2

Linear Equations

MATHEMATICAL PROCESS STANDARDS

Math Processes Within Topic 2 Lessons

The mathematical process standards describe the behaviors and habits of mind that mathematically proficient students demonstrate when actively engaged in mathematics work. Opportunities to develop expertise with the important behaviors and thinking habits of all the math processes exist throughout the topic and the program.

In this topic, you may choose to focus on developing and assessing proficiency with process standards A.1G and A.1F. As students use equations and inequalities to represent real-world and mathematical problems, look for the following behaviors to assess and identify students who demonstrate proficiency with these math processes.

Highlighted Math Processes Within Topic 2 Lessons	
The student is expected to display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication. (A.1G)	The student is expected to analyze mathematical relationships to connect and communicate mathematical ideas. (A.1F)
Mathematically proficient students:	Mathematically proficient students:
• Use stated mathematical assumptions about equality in the solution process to justify their critique of the flawed logic in other students' solutions to linear equations.	• See that linear equations in various forms are composed of several parts that can be manipulated to reveal the slope and intercepts of the equation.
• Construct mathematical arguments to explain how linear equations written in different forms can be equivalent.	• Connect the concept of substitution and solutions to equations in one variable to solving for the y-intercept.
• Explain what they considered when determining what form of an equation is most useful.	• Make observations about the relationship between a linear equation in point-slope form and a linear equation in slope-intercept form.
• Use the mathematical definition of constraint to understand the limitation of numbers in real-world situations.	• Apply their previous understanding of positive and negative slopes of lines to check the accuracy of their written equations.

Help students become more proficient with explaining mathematical ideas and analyzing mathematical relationships.

If students do not understand how to identify and use appropriate strategies for understanding and solving problems involving linear equations, then use these questioning strategies to help them develop their proficiency with justifying arguments and analyzing relationships as they solve problems throughout the topic.

- Q: How can you use slope to prove that two figures on a coordinate plane are parallelograms?

Q: How do you know that the different forms of equations for linear equations are equivalent?

Q: How are the graphs and equations of linear equations related?

Q: What criteria help you decide which form of the linear equation to use?
- Q: What are the main characteristics of a linear equation and how are they shown in an equation?

Q: What steps would you take to write the equation of a line that is parallel to a given line through a specified point?

Q: How is the equation in point-slope form related to the equation in slope-intercept form?

Q: In what ways is the standard form of a linear equation helpful?

TOPIC 2

Linguistic Accommodations

LINEAR EQUATIONS

Language Accommodations and Oral/Written Discourse

There are many opportunities to interact with the topic’s vocabulary words: by using the Vocabulary Builder activity, the Language Routines, as you Talk About Math Ideas, and review of vocabulary learned in the topic in the Topic Review, the Math Literacy and Vocabulary activity, the student prompts in the margins, the math games, and more.

Activities in this topic offer diverse and engaging experiences with math vocabulary to build confidence and support for all, but particularly for Emergent Bilingual (EB) students in developing both their academic and language skills.

Topic Vocabulary Support

Topic Vocabulary			
Constant of Variation		Point-Slope Form	
Direct Variation		Standard Form of a Linear Equation	
y-Intercept			
Prior Terms			
Element of a Set	Set	Identity	Literal Equation
Real Numbers	Subset	Formula	Compound Inequality
Upcoming Terms			
Continuous	Zero of a Linear Function	Sequence	Correlation Coefficient
Discrete	Transformation	Term of a Sequence	Extrapolation
Domain	Translation	Negative Association	Interpolation
One-to-One	Arithmetic Sequence	No Association	Line of Best Fit
Range	Common Difference	Positive Association	Linear Regression
Function Notation	Explicit Formula	Trend Line	Residual
Linear Function	Recursive Formula	Causation	
Vocabulary in Context			
Word	Math Meaning	Other Meaning(s)	
Rule	A statement of what is possible	Control; the government of a country	
Forms	Different ways something is written or organized	Documents to fill out with information	
Standard	A specific format	A flag that is used during official ceremonies	
Context Setting Vocabulary			
Students will encounter the following terms in this topic, be sure they understand their meaning to make sense of the problem situation.			
Lesson 1 constant of variation and direct variation		Lesson 4 slope, x- and y-intercept	
Lesson 2 linear equations in two variables, interpret		Lesson 5 parallel lines, perpendicular lines, reciprocal, intersection, rotation, negative reciprocal, parallelism, solar panels	
Lesson 3 point-slope form, slope- intercept form			

Metalinguistic Transfer to Spanish

Transferrable Skills
Both English and Spanish follow a similar grammatical structure. A factory makes blankets./ <i>Una fábrica hace mantas.</i>
Non-Transferrable Skills
In Spanish, subject pronouns are often omitted because the verb conjugation indicates the subject, whereas in English, subject pronouns must be explicitly stated. They expect to sell 10 times as many day passes as annual passes./ <i>[Ellos] esperan vender 10 veces más pases diarios que pases anuales.</i> ('Ellos' it's optional).

Cognates

Cognates in this Topic	
Forms : Formas	Standard : Estándar
Panels : Paneles	Solar : Solar
Horizontal : Horizontal	
False Cognates	
Rule A statement that explains a pattern or relationship between numbers.	Rate A ratio that compares two different kinds of quantities.
Rulo A roll or curl of something, like hair or a coiled object.	Rata A small rodent similar to a mouse but larger.

Academic Vocabulary

Recommended Terms
Although the academic vocabulary can be used anytime during the year, you may emphasize the terms below in written and oral opportunities:
Relate To show or make a connection between two or more things.
Graph To create a visual representation of data or equations on a coordinate system.

English Language Proficiency Standards (ELPS)				
Lesson	(1) Listening	(2) Speaking	(3) Reading	(4) Writing
Lesson 1	1C			
Lesson 2			3F	
Lesson 3		2F		
Lesson 4	1D			
Lesson 5			3F	

TOPIC 2

Linear Equations

TOPIC OVERVIEW

Lesson	2-1 Direct Variation	2-2 Slope-Intercept Form	2-3 Point-Slope Form	2-4 Standard Form
	2 DAYS	2 DAYS	2 DAYS	2 DAYS
Essential Understanding	A situation represented by two variables is a direct variation when the ratio of one variable to the other is always equal to a constant of variation.	When a linear equation is written in slope-intercept form, $y = mx + b$, m is the slope, and the line intersects the y -axis at $(0, b)$, so the y -intercept is b .	The point-slope form of a linear equation is used to write the equation of a line using the slope and any point on the line.	The standard form of a linear equation is helpful for identifying the x - and y -intercepts. These are used to graph the line and to aid in understanding the constraints within a real-world context.
Mathematics Objectives	- Identify situations that can be modeled by a direct variation. - Write equations involving direct variation. - Solve equations involving direct variation.	- Write linear equations in two variables using slope-intercept form to represent the relationship between two quantities. - Interpret the slope and the intercept of a linear model.	- Write and graph linear equations in point-slope form. - Analyze different forms of a line to interpret the slope and y-intercept of a linear model in the context of data.	- Write and graph linear equations in standard form. - Use linear equations in standard form to interpret both the x- and y-intercepts in the context of given data.
Language Objective	Use mathematical language to explain whether a situation or a table of values represents a direct variation.	Use accurate mathematical language to justify each step when writing an equation and graphing a line.	Use accurate mathematical language to distinguish between forms of a linear function equation.	Write and graph linear equations in standard form by reading and identifying the parts of the problem that are related to the parts of standard form.
Vocabulary	New Vocabulary constant of variation, direct variation	Reinforce Vocabulary slope-intercept form	New Vocabulary point-slope form	New Vocabulary standard form of a linear equation
TEKS & ELPS	TEKS A.2D Mathematical Process Standards A.1A, A.1C, A.1E, A.1F, A.1G ELPS Listening 1C	TEKS A.2B, A.2C*, A.2E, A.2F, A.2G, A.3A Mathematical Process Standards A.1A, A.1D, A.1E, A.1F ELPS Reading 3F	TEKS A.2B, A.2C*, A.3A Mathematical Process Standards A.1A, A.1C, A.1D, A.1E, A.1G ELPS Speaking 2F	TEKS A.2B, A.2C*, A.2G A.3A, A.3C* Mathematical Process Standards A.1A, A.1B, A.1D, A.1E, A.1F, A.1G ELPS Listening 1D

*Readiness Standard

The suggested pacing for each lesson is shown for a 45-minute class. In addition, allow 1 day for the Topic Review and 1 day for the Topic Assessment.

For planning information such as timing of lesson components and student materials required, find an editable **LESSON PLAN** for each lesson on SavvasRealize.com.

- Topic Assessment Options
- in Assessment Sourcebook and Online
- Topic Readiness Assessment

• Topic Assessment

• Topic Performance Task

• Benchmark Assessment (Topics 1–2)

TOPIC OVERVIEW

Lesson	Math Modeling in 3 Acts	2-5 Parallel and Perpendicular Lines
	1 DAY	2 DAYS
Essential Understanding	Many real-world problem situations can be represented with a mathematical model, but that model might not represent the real-world situation exactly.	The equations of lines can be used to help identify whether the lines are parallel or perpendicular. Parallel lines have the same slope but different x- or y-intercepts; perpendicular lines have slopes that are negative reciprocals.
Mathematics Objectives	• Use mathematical modeling to represent a problem situation and to propose a solution. • Test and verify the appropriateness of their math models. • Explain why the results from their mathematical models might not align exactly with the problem situation.	• Create equations to represent lines that are parallel or perpendicular to a given line. • Graph lines to show an understanding of the relationship between the slopes of parallel and perpendicular lines. • Solve real-world problems with parallel or perpendicular lines.
Language Objective	• Explain why the results from their mathematical models may differ from the exact answer.	• Read and describe parallel and perpendicular lines.
Vocabulary	Reinforce Vocabulary model	Reinforce Vocabulary parallel, perpendicular
TEKS & ELPS	TEKS A.5B Mathematical Process Standards A.1A	TEKS A.2E, A.2F, A.2B, A.2C*, A.2G, A.3A Mathematical Process Standards A.1A, A.1B, A.1C, A.1D, A.1F, A.1G ELPS Reading 3F

TOPIC 2

Linear Equations

TOPIC OVERVIEW

DIGITAL	Print and Digital Resources	LESSON	TOPIC	PROGRAM
	Student and Teacher's Edition			
•	Math Walk and Video		•	
•	Pick a Project		•	
•	Math Modeling in 3 Acts		•	
•	Practice & Problem Solving	•		
•	Concept Summary	•		
•	Topic Review		•	
•	Visual Glossary (English and Spanish)			•
	Resource Originals			
•	Reteach to Build Understanding	•		
•	Additional Practice	•		
•	Mathematical Literacy and Vocabulary	•		
•	Enrichment	•		
•	Pick a Project		•	
•	Amazing Contributions	•	•	•
•	Math Walk		•	
•	Game Cards and Instructions for Hands-On Games	•	•	
	Assessment Sourcebook			
•	Course Readiness Assessment			•
•	Progress Monitoring Assessments A, B, C			•
•	Topic Readiness Assessment		•	
•	Exit Ticket	•		
•	Quick Check	•		
•	Topic Assessment		•	
•	Topic Performance Tasks		•	
•	Cumulative/Benchmark Assessments			•
•	Item Analysis Charts and Scoring Guides	•	•	•

DIGITAL	Digital-only Resources	LESSON	TOPIC	PROGRAM
	Savvas Realize			
	Interactive Student Edition	•	•	•
	Student Edition eBook	•	•	•
	Teacher's Edition eBook	•	•	•
	Program Overview			•
	Student Companion	•		
	Lesson Plans	•		
	Math Talks	•		
	Vocabulary Builder Activities	•		
	Interactives powered by Desmos® Calculators and Tools	•		
	Lesson Presentation Slides	•		
	Interactive Practice	•		
	Spiral Review	•		
	Skills Review & Practice	•	•	•
	Digital Math Games		•	
	Student Tutorial Videos	•		
	Interactive Answers & Solutions	•	•	
	Adaptive Practice	•		
	Test Generator	•	•	•
	Family Engagement	•	•	•
	Classroom Videos			•
	Topic Overview Teacher Support Video		•	
	Multilingual Handbook			•
	Problem Solving Model			•
	Scope and Sequence	•	•	•
	Pacing Guide		•	•
	Internalization Protocols			•
	Student and Teacher Progress Trackers	•	•	•
	Editable Assessments and Resource Originals	•	•	•

TOPIC 2

Linear Equations

TOPIC OPENER

TOPIC ESSENTIAL QUESTION

Why is it useful to have different forms of linear equations?

Revisit the Topic Essential Question throughout the topic. See the Topic Review for notes about answering the Topic Essential Question.

Math Walk

 **Math Walk Video** Generate excitement about the topic by having students watch the Math Walk video.

Question in the Video
Does thicker bamboo always have longer segments?

Questions for Students
You might give students copies of these Math Walk questions or project them and have students turn and talk to a partner followed by a whole-class discussion.

- What did you notice?
- What did you wonder?
- What question in the video is the person trying to answer?
- What did you see in the video that would help you answer the question?
- What other information do you need to answer the question?
- What math do you already know that can help you answer the question?
- What math questions do you have about what you saw in the video?

Later in the Topic
Any time after Lesson 2-3 show the video again.

Ask: What math did you learn that could help you answer the question or find the answer in a different way?

TOPIC
2

Linear Equations

TOPIC ESSENTIAL QUESTION

Why is it useful to have different forms of linear equations?



MATH WALK

Standing Tall
Watch the video to see where you might find linear equations while on a math walk. What do some building materials, water filters, and lightweight fabrics have in common? The answer is bamboo. What math questions come to mind when you think about bamboo?



54 TOPIC 2 Linear Equations

TOPIC 2

Linear Equations



Pick a Project

Overview

A variety of rich projects is provided for each topic. Students may select the project that is most interesting to them.

Project	Different Engaging Contexts	Different Activity Modalities	Different Final Products
2A	Real World	Create	Math Walk
2B	Solar Energy	Design	Drawing
2C	Chess	Play	Analysis
2D	Dance	Choreograph	Performance

Selecting a Project

Introduce each project option with the students. Sharing the resource masters with students might help them choose.

During the Project

Pacing Projects will be completed over a number of lessons. The amount of time students spend on each project will vary. You may wish to let early finishers choose an additional project.

Grouping You might have students work independently, with a partner, or in small groups.

Content Projects are related to the content of this topic. As students continue their work on projects throughout the topic, new math ideas should be incorporated.

Project Sharing Invite students to share their completed projects with a partner, a small group, or with the whole class. Encourage students to discuss how they demonstrated math processes during the project. Provide students an opportunity for reflection by asking what interesting information they learned and what math they used in the project.

Extension Suggestions are included for each project.

Scoring Guide

Provide a scoring rubric to students as they begin work on the project. A full and editable version can be found online. For students who score Emerging on any goal, review the rubric score with them in detail. Encourage them to update their project, or select a different project, to demonstrate their understanding of the mathematics in this topic.

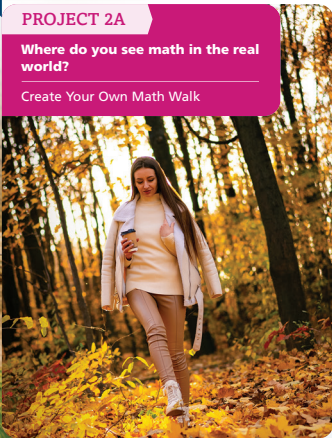
AVAILABLE ONLINE

PICK A PROJECT

PROJECT 2A

Where do you see math in the real world?

Create Your Own Math Walk



PROJECT 2B

How steep are the roofs in your neighborhood?

Design a Pitched Roof



PROJECT 2C

What rules do chess pieces follow during a game?

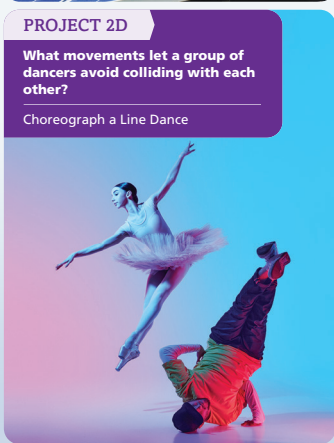
Play a Game of Chess



PROJECT 2D

What movements let a group of dancers avoid colliding with each other?

Choreograph a Line Dance



TOPIC 2 Pick a Project 55

Sample Scoring Rubric

Emerging (1 point)	Developing (2 points)	Proficient (3 points)	Advanced (4 points)
		Mathematical Concepts Demonstrates understanding of a key mathematical concept from the topic with minimal or no errors.	
		Context Connects mathematical concepts to the project context in a logical and natural way.	
		Presentation Presentation is clear and coherent.	

TOPIC 2

Linear Equations



Pick a Project

Project 2A A.1A

Materials video recording device

Guidelines Students may brainstorm locations and objects for their Math Walk throughout the topic.

Extension Ask students to explore other questions inspired by their Math Walk.

Project 2B A.1A

Materials graphing technology (optional); grid paper

Guidelines Discuss with students why a roof might need to be pitched. In cold climates, steep roofs keep the snow load light. In places like Bermuda, sloped roofs aid in water collection. Flat roofs can be used for gardens and patios. Today, solar panel use determines the pitch of some new roofs. Students can begin their projects at any point in the topic.

Extension If you were building a house, what sort of roof would you put on it, and why? If you were planning to put solar panels on the roof, would that change your plan for the roof? Why or why not?

Project 2C A.1F

Materials chess board and pieces; video recorder

Guidelines Students should play a game of chess and model the movements of the chess pieces with linear functions. Make sure they understand that the final product is a video of the game and the functions that model the movements of their pieces.

Extension Have students analyze a game played during a chess tournament. While the functions will be the same, the game itself will be different. Have students compare the tournament game to the game they played.

enVision Algebra 1

SavvasRealize.com

Name _____

Topic 2 Pick a Project A
Create Your Own Math Walk

To find math all around you, just take a walk!

Math Walks can focus on many different themes, including nature, art, design, computation, community, or careers.

There are a few criteria for a successful Math Walk.

- It prompts a question that can be solved using math.
- It is a real-world situation or spot.
- You can observe important information during your math walk.

.....

Plan Your Math Walk

What's your question?

.....

What location will you include in your Math Walk?

.....

Answer Your Question

Use math you know to answer your question.

.....

enVision® Algebra 1 • Pick a Project

enVision Algebra 1

SavvasRealize.com

Name _____

Topic 2 Pick a Project C
Checkmate Champ

Chess is a two-player board game played by millions of people across the world. Chess likely originated in India in the 6th century and slowly expanded and evolved into the game it is today. Now, chess spans the globe and play ranges from casual online matches to the World Chess Championship, which crowns the best player in the world every two years.

Chess is played on an eight-by-eight square checkboard. Each player controls a set of pieces composed of eight pawns, two rooks, two knights, two bishops, one queen, and one king. There are specific starting locations for each piece type and rules for how each piece can move (e.g. direction, number of spaces). Players alternate turns. The goal of the game is for a player to checkmate their opponent, which means the opponent cannot prevent an attack on their king.

.....

Your Project Play a Game of Chess

Research where each piece (pawn, rook, knight, bishop, queen and king) begins a game and how each moves. Consider the board a coordinate grid. Give the coordinates of the starting location for each of the 32 pieces. Then give an example describing a possible movement for one of each piece type, using vocabulary terms relating to linear functions (e.g. slope, intercept, rise, run).

Create video of yourself playing a game of chess. Model each move with a linear function. Be sure to give the equation for each linear function.

.....

enVision® Algebra 1 • Pick a Project

Project 2D A.1G

Materials video recorder

Guidelines Students may begin work on their dance choreography at any point in the topic. They should revise their dances after each lesson.

Extension Have students teach their dance to the class.

enVision Algebra 1

SavvasRealize.com

Name _____

Topic 2 Pick a Project B
Soaking Up Solar

It takes about eight minutes and 19 seconds for the sun's rays to travel the 93 million miles to Earth. The amount of solar energy that hits Earth in one hour is enough to meet the energy demands of the world's population for a year.

Solar panels are a collection of solar cells, which convert sunlight to electricity. In 2004, about 15,000 homes in the United States had solar panels. By the start of 2024, about 4,200,000 homes had solar panels.

The steepness, or pitch, of a roof affects many things, including the installation of solar panels. Roof pitch is closely related to slope and is often written as a ratio of rise to run. For example, a roof with a pitch of 1:12 rises one foot for every 12 feet of run.

.....

Your Project Design a Pitched Roof

Begin by sketching six roofs with different pitches (from 1:12 to 12:12). Use a protractor to determine the angle of each roof.

Choose a local building with a pitched roof. Draw the roof on a coordinate plane with the lower-left corner of the roof at the origin. Draw lines for each part of the roof. Write the equations of the lines. Determine the point of intersection of the lines, which should be the peak of the roof.

Research the roof pitches that work well with solar panels. Then design a roof to include solar panels. Calculate the pitch and roof angle. Draw your roof both from the side and from the front. Indicate where the solar panels will be placed and which direction (north, south, east, or west) the panels will face.

.....

enVision® Algebra 1 • Pick a Project

enVision Algebra 1

SavvasRealize.com

Name _____

Topic 2 Pick a Project D
Getting in Line

Have you been to wedding or a country-western dance hall? If so, you may have seen or participated in a line dance. You may even have learned a line dance in a Physical Education class. A line dance is a choreographed dance in which rows of dancers repeat sequences of steps. Line dances are often associated with a specific song, which may give instructions for the dance in the lyrics.

.....

Your Project Choreograph a Line Dance

Research some line dances to get an idea of the steps and moves they may involve. Select music or create a rap or song. Then choreograph a line dance including moves where dancers demonstrate linear equations. Concepts you may want to incorporate include parallel and perpendicular lines, y-intercept, slope-intercept form, and so on. Perform the dance for the class. Be sure to include narration identifying the concepts as they occur in the dance moves.

.....

enVision® Algebra 1 • Pick a Project

TOPIC 2

Linear Equations

TOPIC OPENER

Generate excitement about the upcoming Math Modeling in 3 Acts lesson by having students read about the math modeling problem for this topic.

Expand the Learning with Math Games

Encourage students to engage with the math in this topic and further develop their understanding of linear equations by taking on the challenge of the Math Games.

There are multiple types of games throughout the program that provide students with more opportunities for playful exploration and skill practice. For guidance on these games, see the Expand the Learning section in Step 4 of the lesson.

Building grit in your students as they work with different linear forms is crucial for growing confidence in math. Encourage students to see mistakes, such as miscalculating slope by transposing variables, as opportunities to advocate for themselves by asking for help. Students will apply linear concepts throughout their high school math courses.

Encourage students to see the process of forming conjectures as an opportunity for growth. As they ask questions and gather information, they can refine their ideas and move towards stronger conjectures.

To boost resilience in students, use a graphing tool like Desmos to demonstrate how the greater difference in y-coordinates compared with the difference in x-coordinates impacts slope. This can make abstract ideas more concrete. By guiding them through these challenges, you are helping them boost their grit through resilience.

Help your students build confidence by breaking down linear forms into manageable steps. Remind students what they already know about slopes of lines. Then demonstrate writing equations by replacing variables in the formulas with values that are given.

Encourage your students to develop strong time management skills by organizing their work. Using strategies like writing out the definition of variables and color-coding their work helps to keep everything clear.

Instructional Routines in This Topic

Lesson	Language Routines	Math Talk / Data Talk
1	Stronger and Clearer Each Time	Slow Reveal Graph
2	Compare and Connect	Which One Doesn't Belong?
3	Critique Correct, and Clarify	Equation Detective
4	Compare and Connect	Find a Rule
5	Three Reads	Every Picture Tells a Story