

Making a Profit

Fill in the circle by the correct answer. Then write the answers to numbers 3, 4, and 5.

1. Business owners who calculate their business's average weekly income _____.
 (A) must have a successful business
 (B) probably make business decisions without considering records
 (C) cannot estimate how much their expenses will be per week
 (D) can estimate how much money the business makes in a year
 2. A business is not profitable if _____.
 (A) the expenses are covered by the income
 (B) the owner has too few staff members
 (C) its expenses exceed its income
 (D) its income exceeds its expenses
 3. Explain how math plays a role in a business owner's decision making.
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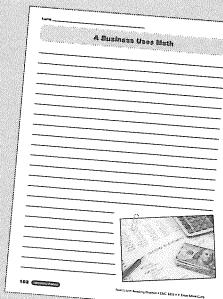
4. Why is time an important consideration for business owners?
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5. Could a business owner be successful without financial records? Explain your answer.
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Write About the Topic

Use the Writing Form to write about what you read.

Describe an idea for your own business. Tell what its purpose is and other details. Explain how you'd use math to make a profit.



Video Game Development

Level 1

Words to Know list, Reading Selection, and Reading Comprehension questions

Level 2 ■ ■

Words to Know list, Reading Selection, and Reading Comprehension questions

Level 3

Words to Know list, Reading Selection, and Reading Comprehension questions

Assemble the Unit

Reproduce and distribute one copy for each student:

- Visual Literacy page: Video Game Development, page 111
 - Level 1, 2, or 3 Reading Selection and Reading Comprehension page and the corresponding Words to Know list
 - Graphic Organizer of your choosing, provided on pages 180–186
 - Writing Form: Video Game Development, page 112

Introduce the Topic

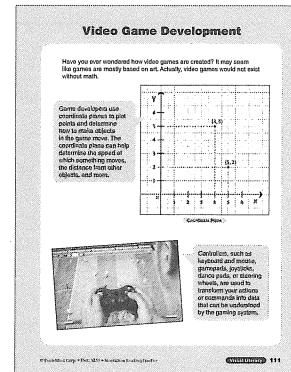
Read aloud and discuss the Video Game Development text and graphics. Explain that the one thing that all video games have in common is math and movement. Video games are based on images moving on the screen; the images are controlled by a player's game controller. Math is required to make that possible.

Read and Respond

Form leveled groups and review the Words to Know lists with each group of students. Instruct each group to read their selection individually, in pairs, or as a group. Have students complete the Reading Comprehension page for their selection.

Write About the Topic

Read aloud the leveled writing prompt for each group. Tell students to use the Graphic Organizer to plan their writing. Direct students to use their Writing Form to respond to their prompt.



Visual Literacy

Name _____

Video Game Development

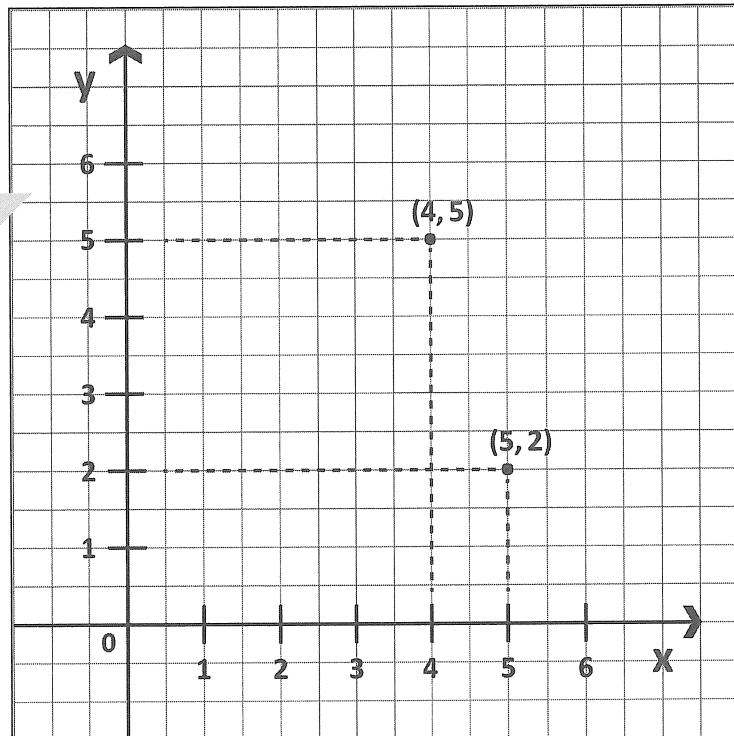


Writing Form

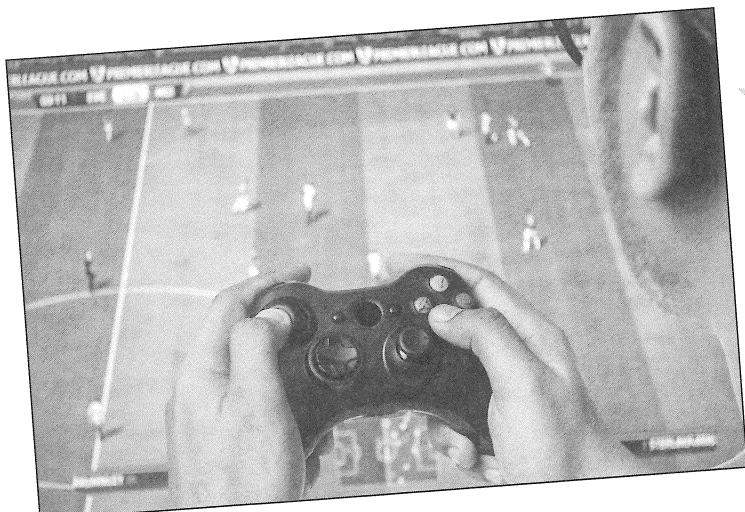
Video Game Development

Have you ever wondered how video games are created? It may seem like games are mostly based on art. Actually, video games would not exist without math.

Game developers use coordinate planes to plot points and determine how to make objects in the game move. The coordinate plane can help determine the speed at which something moves, the distance from other objects, and more.



Coordinate Plane



Controllers, such as keyboard and mouse, gamepads, joysticks, dance pads, or steering wheels, are used to transform your actions or commands into data that can be understood by the gaming system.

Video Game Development

A black and white photograph showing a person's hands holding a white video game controller, likely an Xbox One, in the foreground. In the background, there is a wall decorated with various items: a trophy on top of a stack of speakers, two framed certificates or diplomas, a large framed landscape painting, a desk lamp, a soccer ball, a basketball hoop, a tennis racket, a checkered flag, and a white t-shirt hanging on a hanger. The wall has a textured, possibly brick-like appearance.



Words to Know

Math and Video Games

developers

physics

variables

linear algebra

vectors

values

coordinate plane

defines

pathfinding

artificial intelligence

side-scroller

acceleration

Words to Know

Math at Play

gamer

strategy

resources

directives

variables

input

linear algebra

vectors

coordinate plane

pathfinding

artificial intelligence

algebraic

side-scroller

simulation

Words to Know

The Game Developer's Toolkit

gamer

directives

hard-coding

variables

input

executing

coordinate plane

pathfinding

artificial intelligence

algebraic

side-scroller

simulation

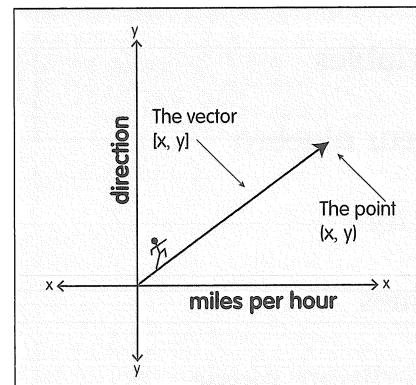


Math and Video Games

Game developers use math to do their jobs. And not just simple addition and subtraction—we're talking algebra, geometry, and physics!

Where Algebra Comes In

Have you ever played a video game where you moved something from one place to another? You decided how fast you wanted it to move, and in what direction. Sounds simple enough, right? When developers create a game, they don't know what you're going to do, so they use "variables." Variables are empty containers that wait for data from your game controller before they complete an action. This is what algebra is all about! Game developers use linear algebra. Linear algebra involves "vectors," which are objects that hold at least two values on a coordinate plane. This particular vector is waiting for you to decide in what direction and at what speed you want to go. Your movement is now a vector, and it can interact with other objects in the game!

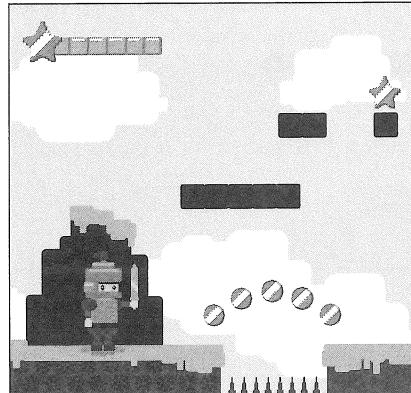


It's All About Geometry

Remember that you are trying to move something from one location to another. A game developer uses geometry to build obstacles in the game. Geometry defines and builds relationships between points, lines, surfaces, and shapes in space. Geometry really kicks into high gear with something called "pathfinding." Pathfinding is a form of artificial intelligence. You tell your in-game character where to go, and the developer's math finds the best route.

Enter Physics

Have you ever thought about why you can't walk through walls in a 3-D adventure game, or how you always come down from a solid jump in a side-scroller? Physics! Physics is applied math in the real world; it's science AND math. When two objects come into contact, their shape, size, speed, and direction all begin playing within the laws of gravity, force, and acceleration. Suddenly the scene comes alive.



The Magic of Math

In every job, you need tools, procedures, or methods to get the job done. Game developers need math to create strategy, adventure, or simulation games. The next time you are playing a video game, remember that what you are really playing with is math!

Math and Video Games

Fill in the circle by the correct answer. Then write the answers to numbers 3, 4, and 5.

1. Video game developers use variables _____.
Ⓐ to receive data
Ⓑ to operate a game controller
Ⓒ to hold values on a coordinate plane
Ⓓ to apply geometry
2. The main idea of this text is that math _____.
Ⓐ has nothing to do with art in video games
Ⓑ doesn't affect video game players
Ⓒ is helpful but not necessary in creating a video game
Ⓓ is essential in creating a video game
3. Describe a video game you are familiar with and how geometry is used.

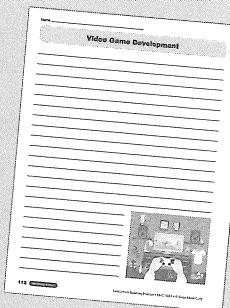
4. How does physics affect your game play?

5. Based on the text, what inference can you make about video game developers?

Write About the Topic

Use the Writing Form to write about what you read.

Compare and contrast how you use math skills at school with how a game developer uses math skills.

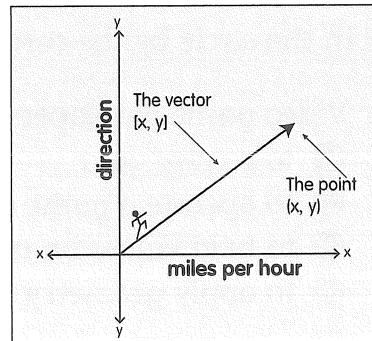


Math at Play

Are you a gamer? If the answer is “yes,” you must love math! Don’t believe it? Let’s play a strategy game.

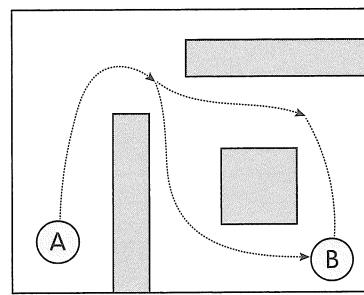
Algebra in Play

So you need to move your troops to a nearby town to pick up more resources? Tell your commander how fast you want to move, and in what direction! For a game developer, it’s not that easy. When developers create a game, they have no idea what your directives are going to be. Instead of trying to anticipate every possibility, developers use “variables.” Variables are empty containers that wait for input from your controller before completing a function. This is what algebra is all about! Linear algebra, for example, studies “vectors,” which are objects that hold at least two values on a coordinate plane. The vector in this game is waiting for you to tell it your speed and direction. Your troops’ movement is now a vector, and it can interact with other objects in the game.



Geometry Is a Must

Remember that nearby town? Your buddy in another state has sacked the town, taken the resources, and headed north. Your commander’s mission is to find the shortest route and claim those resources. The developer has used geometry to build the obstacles you’ll encounter along the way. Geometry involves defining and building relationships between points, lines, surfaces, and shapes in space. Geometry really kicks into high gear with something called “pathfinding,” a form of artificial intelligence. You tell your commander where to go, and the developer’s math finds the best route.



Pathfinding: The developer’s code evaluates every option and finds the best route.

Physics Makes It Happen

You’ve had a long night traveling through the geometric canyons painted by math. You see flashes of algebraic movement from your buddy’s troops. Time to get those resources! But how? Have you ever thought about why you can’t walk through walls in a 3-D adventure game, or how you always come down from a solid jump in a side-scroller? Physics! Physics is applied math in the real world; it’s science AND math. When two objects collide, their shape, size, speed, and direction all begin playing within the laws of gravity, force, and acceleration.

It’s All About the Math

Think of math as a game developer’s “toolkit.” Need to adjust the balance in your strategy game? Tinker with algebra. Want more obstacles in your adventure game? Nail them down with geometry. Looking to fine-tune your simulation game? Ratchet up your physics. The next time you are playing a video game, remember that what you are really playing with is math!

Math at Play

Fill in the circle by the correct answer. Then write the answers to numbers 3, 4, and 5.

1. Video game developers use variables _____.
Ⓐ to make a coordinate plane
Ⓑ to follow the laws of physics
Ⓒ instead of trying to anticipate every possibility
Ⓓ to interact with objects in a game
2. We see physics as applied math in the real world when we _____.
Ⓐ see obstacles in a game
Ⓑ run into something
Ⓒ see how colorful a game environment is
Ⓓ choose a character to play the game as or with
3. Describe a video game you are familiar with and how geometry is used.

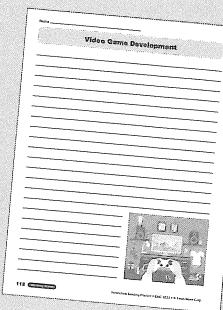
4. What is the main idea of this text?

5. Could a video game be created without using math? Explain why or why not.

Write About the Topic

Use the Writing Form to write about what you read.

Describe what a video game would be like if the developer used inaccurate math. Use your own examples and text details.



The Game Developer's Toolkit

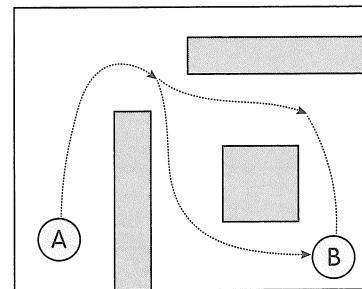
If you're a gamer, you love math. Don't believe it? Let's play a strategy game!

Tinkering with Algebra

So you need to move your troops to a nearby town to pick up more resources? Tell your commander how fast you want to move, and in what direction! Sounds simple enough, right? When developers create a game, they have no idea what your directives are going to be. Instead of hard-coding every possibility, developers use "variables." Variables are empty containers that wait for input from a controller before executing a function. This is what algebra is all about! Algebra has many specialties, but for this game, the developer used linear algebra. This branch uses "vectors," objects that hold at least two values on a coordinate plane. The vector in your game is waiting for you to tell it your speed and direction. Your troops' movement is now a vector, and it can interact with other objects in the game.

Nailing It Down with Geometry

Remember that nearby town? Your buddy in another state has sacked the town, taken the resources, and headed north. Your commander's mission? Find the shortest route and claim those resources! The developer has used geometry to build obstacles you'll need to overcome along the way. Geometry involves defining and building relationships between points, lines, surfaces, and shapes in space. Geometry really kicks into high gear with something called "pathfinding." You tell your commander where to go, and the developer's math finds the best route. Pathfinding is a form of artificial intelligence (AI), and it plays a big role in video games.



Pathfinding: The developer's code evaluates every option and finds the best route.

Ratcheting It Up with Physics

Dawn arrives. You see flashes of algebraic movement from your buddy's troops. Time to get those resources! Ah, but the developer wants this moment to be as immersive as possible for you, so out come the tools of physics. Have you ever thought about why you can't walk through walls in a 3-D adventure game, or how you always come down from a solid jump in a side-scroller? Physics! Physics is applied math in the real world; it's science AND math. When two objects collide, their shape, size, speed, and direction all begin playing within the laws of gravity, force, and acceleration.

Math and Video Game Development

Think of math as a game developer's "toolkit." Need to adjust the balance in your strategy game? Tinker with algebra. Want more obstacles in your adventure game? Nail them down with geometry. Looking to fine-tune your simulation game? Ratchet up your physics. And as a player, the next time you sit down with your friends for an epic night of gaming, remember that what you're really playing with is MATH.