Mazes

Build a gravity maze backward, then connect with friends.

GRADES K THROUGH 8 | AGES 5 TO 14 | ABOUT 45 MIN

These are the standards listed in the Mazes educator guide. Under each one is where you will see it in the activity.

Next Generation Science Standards (NGSS)

CODE	WHAT IT COVERS
K-PS2-1	Motion and Stability: Forces and Interactions
WHERE YOU'LL SEE IT (GRADES K-2): Learners **explore how gravity pulls the ball down the ramps** regardless of where they place the ball on the board - observing that a push is not needed, the ball rolls on its own because of an invisible force pulling it toward the ground, and noticing that steeper ramps make the ball move faster.	
K-2-ETS1-2	Engineering Design: Develop a simple sketch, drawing, or physical model
WHERE YOU'LL SEE IT (GRADES K-2): Learners **plan their maze by tracing a path with their finger on the board** before adding any ramps, deciding where the hoop goes, where the first ramp enters, and how the ball will travel across the board - building a physical model of their design one ramp at a time and revising it when the ball misses.	
3-PS2-1	Forces and Interactions: Cause and Effect
WHERE YOU'LL SEE IT (GRADES 3-5): Learners **investigate how ramp angle and stopper placement cause changes in the ball's path**, testing a shallow ramp versus a steep ramp and observing the cause-and-effect link between how steep a ramp is and how quickly and where the ball exits into the next section of the maze.	
3-5-ETS1-3	Plan and carry out fair tests to identify failure points
WHERE YOU'LL SEE IT (GRADES 3-5): Learners **systematically isolate which ramp is causing the ball to roll off** by rolling the ball, watching exactly where it leaves the path, and changing only that one ramp's angle or adding a single stopper - fair-testing one variable at a time instead of rebuilding the whole maze.	
MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process
WHERE YOU'LL SEE IT (GRADES 6-8): Learners **use their maze itself as the physical model they test and modify**, rolling the ball after every ramp addition, recording where it exits when a ramp fails, and changing exactly one input - a ramp's hole position, a stopper's placement - to see how the output (does the ball reach the hoop) changes, iterating toward the working three-ramp design.	
MS-ETS1-3	Analyze data from iterative tests to improve a solution
WHERE YOU'LL SEE IT (GRADES 6-8): Learners **compare the performance of their first three-ramp maze against their iterated version**, identifying which specific adjustments (ramp angle, extender position, stopper placement) improved the ball's path and which did not, then applying that pattern of improvement to the connection points in a pair or six-board combined maze.	

Common Core State Standards (Math and ELA)

CODE	WHAT IT COVERS
RI.K-2.7	Use illustrations and words in a text to describe key ideas
WHERE YOU'LL SEE IT (GRADES K-2): Learners **read the Mazes instruction sheet and the slide-deck visuals** to identify which foam pieces are "ramps," "stoppers," "extenders," and "hoop," using both the printed words and the labeled pictures to name each part before they start building.	
SL.K-2.1	Participate in collaborative conversations
WHERE YOU'LL SEE IT (GRADES K-2): Learners **explain to a partner where their hoop is and how the ball rolls into it**, using vocabulary like "ramp," "hoop," and "gravity" as they show their maze, and take turns rolling the ball through each other's designs before deciding how to connect the two boards.	
RI.3-5.3	Explain relationships between events, concepts, or steps in a text
WHERE YOU'LL SEE IT (GRADES 3-5): Learners **explain the cause-and-effect relationship between ramp angle and ball speed**, describing how shifting the top end of a ramp by one hole changes whether the ball makes it into the hoop or rolls off the edge - tracing the reverse-engineering build sequence in the order it actually happened.	
SL.3-5.1	Engage effectively in collaborative discussions
WHERE YOU'LL SEE IT (GRADES 3-5): Learners **negotiate where to connect their board to a partner's**, discussing which hoop becomes the start of the next maze and what adjustments each of them needs to make so the ball passes cleanly from one board to the next without any adult intervention.	

CODE	WHAT IT COVERS
RST.6-8.3	Follow a multistep procedure when carrying out experiments
WHERE YOU'LL SEE IT (GRADES 6-8): Learners **follow the reverse-engineering sequence precisely** - hoop at the bottom first, then one ramp, test, adjust, next ramp, test, adjust - understanding that the order matters because adding three ramps at once and then testing hides which ramp caused which failure.	
SL.6-8.1	Engage in collaborative discussions with diverse partners
WHERE YOU'LL SEE IT (GRADES 6-8): Learners **negotiate a six-board combined maze with a team**, debating how the ball should transition between each pair's section, arguing from evidence (the ball rolled off here, we adjusted and it worked) rather than preference, and building collective ownership of the shared path.	
K.MD.A.1	Describe measurable attributes of objects
WHERE YOU'LL SEE IT (GRADES K-2): Learners **compare the length of their ramps to the space between board holes**, describing whether a ramp is long enough to span two, three, or four holes and how far its end sticks out - using "longer," "shorter," "higher," and "lower" to talk about how the ramp is positioned on the board.	
K.G.A.1	Describe objects using names of shapes and relative positions
WHERE YOU'LL SEE IT (GRADES K-2): Learners **identify the triangle kickstand as a triangle** and describe spatial relationships during the build - "the hoop is at the bottom," "the ramp is above the hoop," "the extender is next to the ramp" - using positional language like above, below, next to, and between.	
4.MD.C.5	Recognize angles as geometric shapes formed wherever two rays share a common endpoint, and understand concepts of angle measurement
WHERE YOU'LL SEE IT (GRADES 3-5): Learners **recognize that each ramp and the board's vertical edge form an angle sharing a common endpoint at the hole where the ramp is threaded**, and see that pulling the ramp's top end out by a single hole changes that angle's measure - comparing a steep, narrow angle at one hole position to a wider, shallow angle two holes over, and connecting the size of the angle to how fast and how far the ball travels.	
4.OA.C.5	Generate a number or shape pattern that follows a given rule
WHERE YOU'LL SEE IT (GRADES 3-5): Learners **generate their zig-zag ramp pattern by following one rule - angle each new ramp in the opposite direction from the ramp below it** - adding a second ramp angled left after a first ramp angled right, then a third angled right again, and predicting before they test that a fourth ramp would have to angle left to keep the rule going and the ball zig-zagging into the hoop.	
6.RP.A.3	Use ratio and rate reasoning to solve real-world problems
WHERE YOU'LL SEE IT (GRADES 6-8): Learners **time how long it takes the ball to roll a fixed length of ramp** at two different ramp angles, comparing the two rates (distance per second) they measure - and use that rate reasoning to predict whether a steeper ramp will overshoot or undershoot the hoop.	
6.EE.C.9	Represent and analyze quantitative relationships between dependent and independent variables
WHERE YOU'LL SEE IT (GRADES 6-8): Learners **treat the ramp's hole position as the independent variable and the ball's landing spot as the dependent variable**, testing several hole positions for the same ramp, recording each pair in a table, and predicting how moving the ramp's top end out by one hole shifts where the ball lands on the next ramp below.	

LEARNERS EXPLORE

reverse engineering; gravity and ramp angle; iterative testing; collaborative design; cause and effect in ball-path systems