Robot Games

Overview:

Challenge your school to compete in the Robot Games! Students will compete in a series of mathematics themed activities where they use Dash and Dot to solve a problem and earn points for themselves, their grade, and/or their school.

Curriculum: Mathematics

Group Size: N/A	Target Grades: 1 - 5	Time Required: 1 hour per class group

Content Standards:

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Comparing	1.NBT.B.3	NBT.A.4	3.NF.A.3.D	4.NF.A.2	5.NBT.A.3
Modelling	1.NBT.B.2	2.NBT.A.1	3.NF.A.3	4.NF.A.2	5.NBT.A.3
Measuring	1.MD.A.2	2.MD.A.1	3.MD.B.4	N/A	5.MD.B.2
Operations	1.OA.C.6	2.OA.A.1	3.NF.A.3	4.NBT.B.4/5	5.NBT.B.7
Geometry	1.G.A.1	2.G.A.1	3.G.A.1	4.G.A.2	5.G.B.3

Materials Needed:

General	**Maze to the Greatest Value**	**Square Sweeper**
• 1 score card per student	• 1 Dash + 1 bluetooth enabled tablet. • Masking tape • Maze Number Label sheets printed off and cut out	• 1 Dash + 1 bluetooth enabled tablet. • Masking Tape • 20 blocks or balls • Square Sweeper numbers sheet

	• Maze Guide	• Square Sweeper numbers guide
Shuffleboard	**Number Line Target**	**Fence it In**
• 1 Dash + 1 bluetooth enabled tablet. • Masking Tape • Shuffleboard measuring and scoring guide • Boards or ropes or books for shuffleboard chute	• 1 Dash + 1 bluetooth enabled tablet. • Masking Tape • Number line target labelling and scoring guide • Number line label sheet • Number line expressions and answer guide sheet	• 1 Dash + 1 bluetooth enabled tablet. • Masking Tape • Bulldozer attachment • Fence it in shape drawing guide • Highlighter • Stuffed animals or other objects to corral

Lesson Objectives:

- Students will compare numbers at an appropriate grade level.
- Students will model numbers at an appropriate grade level.
- Students will measure distances at an appropriate grade level.
- Students will do operations on numbers at an appropriate grade level.
- Students will draw geometrics shapes at an appropriate grade level.

Lesson Procedure:

Set up 5 games in rotating stations. Students will complete each activity and receive a stamp or stamps from each station to tally up their points for each activity. This section will include an outline of each activity. Detailed setup instructions for each activity are included in the game guides in the printout section.

Your class can compete as a group against other classes in Wonder Workshop's Robot Game but compiling your class scores on the Class Scorecard and finding average scores for you class! Check out the Teacher's Portal for more information.

- **Maze to the Greatest Value (comparing)**. In this game, students will navigate Dash through a maze with the goal of gathering as many tokens as possible until they are stuck. Students gather tokens as they move through the maze and can only pick up a token that is greater than their last token. Students need to plan their route through the maze so they can gather as many tokens as possible

AND make it to the end of the maze. Students can gather tokens that are too high and not be able to get to the exit (as it would require passing through lower tokens).
    - Students use the Go app to navigate the maze.
    - Scoring is based on the number of tokens collected and whether or not the maze is finished.
    - Numbers that students need to compare will be leveled for appropriate grades.

- **Square Sweeper (modeling)**: In this game, students use Dash with the bulldozer attachment to collect objects and use them to model numbers inside squares. Each item will represent something grade level appropriate, for example, a ten (Grade 1), a hundred (Grade 2), or a fifth (Grade 3). Students are challenged to model two different numbers using multiples of the objects (for example, 20 would be modeled by collecting two objects each representing “one ten”).
    - Students will use the Go app to control Dash.
    - Scoring is based on the number of correct numbers modeled.

- **Shuffleboard (measuring)**: In this game, students will use Dash with the bulldozer attachment to roll an object down a chute towards a shuffleboard line. Students will get 3 tries to set the speed and distance Dash will travel to launch the object closest to the center line. They will then measure the distance between their object and the center line.
    - Students will use the Blockly app to control Dash.
    - Points will be given for getting the object within certain ranges of the center line (on either side).

- **Number Line Target (number operations):** In this game, students attempt to get Dash as close as they can to a target number on a number line. They get that target number by evaluating a grade level appropriate expression. Students will announce their target number and be given the opportunity to fix it if they are incorrect. A target circle will be placed on that number.
    - Students will use the Path app to control Dash.
    - Scoring is based on how many wheels of Dash’s are inside the target circle.

- **Fence it in:** In this game, students are challenged to draw a fence, of a particular shape, to corral a group of objects. With a pen attached, students will program Dash to draw the shape around a small group of objects.
    - Students use the Blockly app to control Dash.
    - Scoring is based on the correctness of the shape and the number of objects that have been corralled.

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Class Scorecard

Student	Sweeper	Bulldozing	Shuffleboard	Target	Fence It in
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
Total					
Average					

Student Scorecard

Student Name:			**Class:**	
Maze to the Greatest Value	Square Sweeper	Shuffleboard	Number Line Target	Fence It in

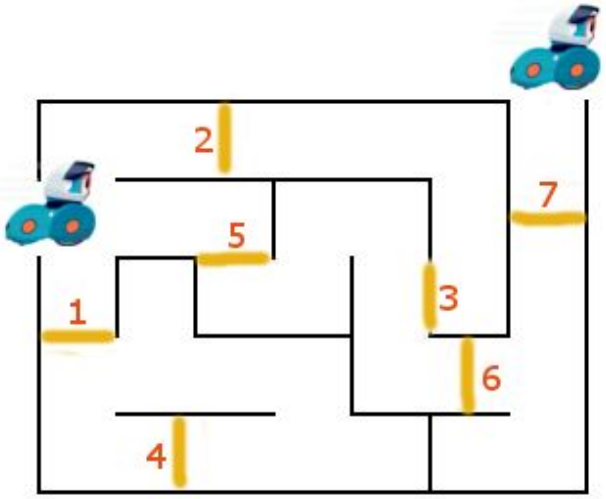
Student Name:			**Class:**	
Maze to the Greatest Value	Square Sweeper	Shuffleboard	Number Line Target	Fence It in

Student Name:			**Class:**	
Maze to the Greatest Value	Square Sweeper	Shuffleboard	Number Line Target	Fence It in

Student Name:			**Class:**	
Maze to the Greatest Value	Square Sweeper	Shuffleboard	Number Line Target	Fence It in

Maze to the Greatest Value Guide

Setup:



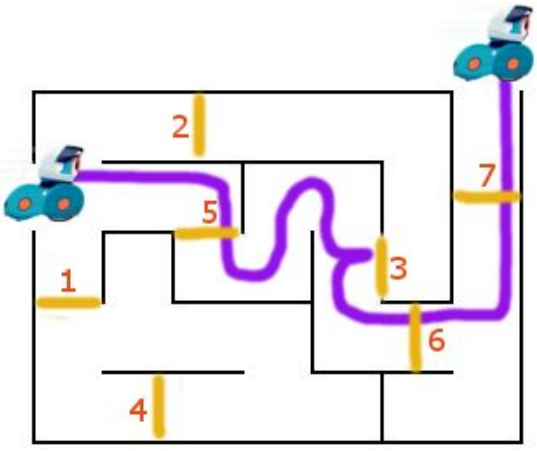
Using tape, mark out the boundary lines of the maze.

For the maze ,first tape a rectangle approximately 56” wide and 40” high. Then place the internal lines evenly spaced if possible.

The total width and height are calculated using about an 8 inch width for the ‘hallways’. You or the students can use a ruler to try and make the lines as even as possible.

Cut out the number markers for the appropriate grade (s). Keep each grade separated into different bags or envelopes so they don’t get mixed up. Each number marker is ranked from least to greatest. Write the ranking of this number (from 1 to 7) on the back of the number marker in a light color. This will help with resetting the maze. Place the ranked markers (number up, ranking down) on the positions shown in the given pictures. The yellow lines and number represent the location of the markers and the rank of the number that belongs there.

The Game:



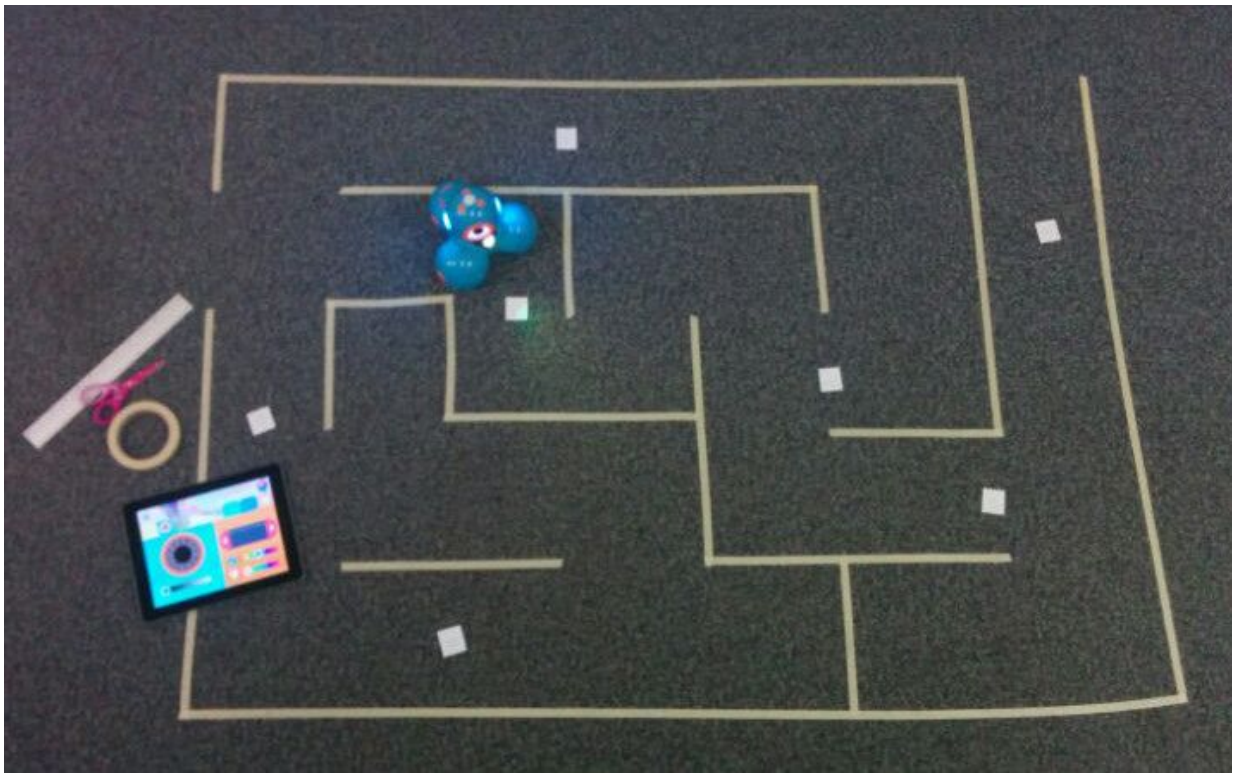
Students start by placing Dash at the entrance of the maze. They then use the Blockly App to navigate Dash through the maze, gathering markers as they pass through areas of the maze. Note that the Go App could be used for very young students with less familiarity with Blockly. When a student passes over a marker, it is collected. Students can only collect markers that have a ranking that is greater than ones they have already collected. Students cannot pass over markers that have a lower ranking.

For example, a student may pick up marker 5, then try to go through marker 3. Since 3 is less than 5, the student can't pass through that marker, but they can go through 6 and 7. Once a marker is picked up, students can pass back through that area freely. If the student passes over a smaller marker (making a mistake) they are out. Give leeway here for mistakes in steering using the app.

The goal for students is to consider the values on the number markers and plot a path through the maze that get them the most number of markers possible and gets them out of the maze. This will involve comparing numbers at a grade appropriate level.

Scoring:

- 1 pt: 1 - 3 markers collected
- 2 pt: 3 - 5 markers collected
- 3 pt: 6 - 7 markers collected
- +1 bonus point for completing the maze.



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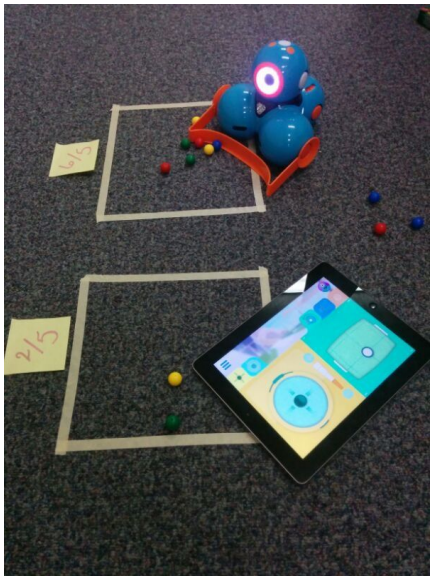
Maze to the Greatest Value - Number Markers

Grade 1	11	16	25
33	41	52	74
Grade 2	48	156	291
478	623	895	901
Grade 3	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{4}{6}$
$\frac{5}{6}$	$\frac{8}{6}$	$\frac{10}{6}$	$\frac{12}{6}$
Grade 4	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$
$\frac{2}{3}$	$\frac{3}{4}$	$\frac{4}{4}$	$\frac{3}{2}$
Grade 5	0.024	0.056	0.11
0.113	0.303	0.4	0.721

Square Sweeper Guide



Setup:
Tape two 10” x 10” squares onto the floor 8” to 10” apart. Place one number label above each square.

Place around 15 small light objects (like marbles or lego blocks). Space them out randomly outside of the squares so that it is easier for students to scoop up individual or small groups of objects easily.

The Game:
Students are told that each object represents some value, and shown the numbers that they have to model. Values are grade appropriate.

- The object values are “one ten”, “one hundred”, “one fifth”, “one eighth”, and “one hundredth” for Grades 1 - 5 respectively.

Students use Dash (with Bulldozer attachment) and the Go App to push a certain number of objects into each square. If each object is “one ten” and students are asked to model 20, then students would try to push exactly 2 objects into the 20 square. They would repeat this with the other square.

The “slow” speed setting for Dash in the Go App is recommended for control.

Scoring:

- 1 pt for getting any number of marbles in the squares
- 2 pts for getting one of the squares correct
- 3 pts for getting both squares correct

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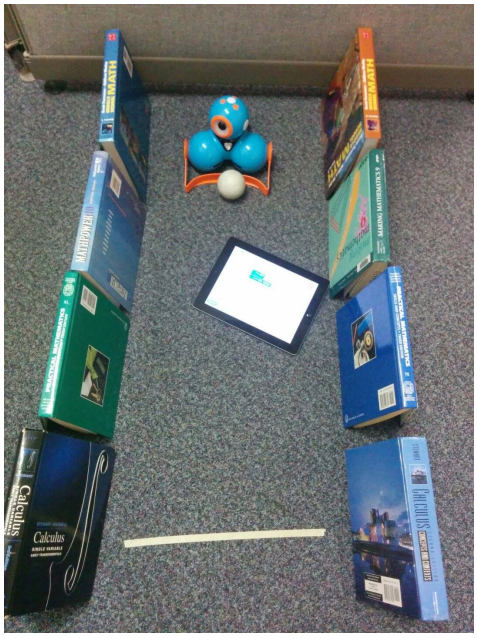
Square Sweeper Number Square Markers

Grade 1: Each object represents “one ten”				
40	10	70	90	20
Grade 2: Each object represents “one hundred”				
100	300	500	600	1000
Grade 3: Each object represents “one fifth”				
$\frac{1}{5}$	$\frac{3}{5}$	$\frac{5}{5}$	$\frac{2}{5}$	$\frac{6}{5}$
Grade 4: Each object represents “one eighth”				
$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{6}{8}$	$\frac{1}{8}$
Grade 5: Each ball is “one hundredth”				
0.1	0.04	0.05	0.01	0.03

Shuffleboard Guide

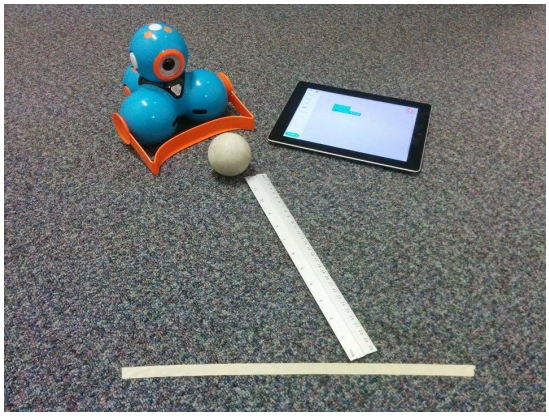


Setup:
Set up a 1.5 ft to 2 ft wide shoot using books or other handy classroom objects to make a barrier.

Mark a start position for Dash. This is where Dash will be placed at the beginning of each round. Mark the “release by” line 100 cm from that start position. Dash must not pass this line, or their attempt won’t count.

Set a target line a good distance from the release by line. How far this line will be away will depend on the slipperiness of the floor and the friction of the moving object on the floor. Play with this distance and the object until it will naturally stop within close enough range for your space limitations.

The Game:
Students will start by placing Dash on the start position. Students will use Blockly to program Dash to travel a distance less than or equal to 100 cm at a selected speed. When Dash stops the ball/object will continue sliding or rolling forward until it comes to a stop. Students will then measure how far the ball is away from the line. Have students repeat this two more times, adjusting their program to get the ball as close to the target line as possible.

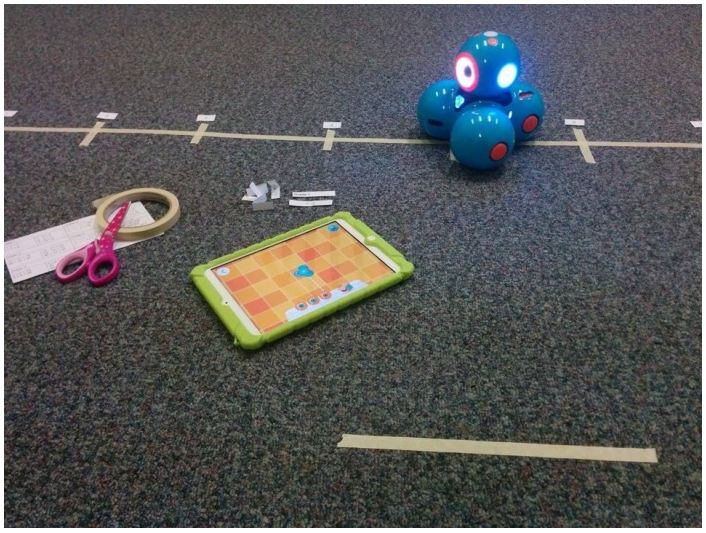


Grade 1 and 2 students measure to whole numbers. Grade 3 and 4 students measure using whole numbers, halves, and quarters. Grade 5 students measure to the most accurate measure on the measuring device.

Scoring:

- 3 pts for within 6” of the line
- 2 pts for between 6” and 18” of the line
- 1 pt for participating

Number Line Target Guide



Setup:

Using tape, mark out a number line on the floor, 6’ wide. Place 11 tick marks down, evenly spaced, using Dash as a spacer (that is, the tick marks should be exactly one Dash length apart). Make a Dash starting line 21” perpendicular to the center of the number line. If set up properly, Dash should be 3 Path app squares away from the number line, and each tick mark is one Path app square apart.

Print, cut out, and place the grade level number line labels at each tick mark.
Print, cut out, and place the grade level student expressions in individual bags. Print off an extra copy with the answers to give to those helping to run the game.

The Game:

Students place Dash on the start line. They then draw an expression from the pile of expressions for their grade. Reading the expression, they tell you what they think the answer is. Lastly, using Path, students draw the path for Dash to take. They get two path movements to get any part of their robot on top of the answer.

Scoring:

- 1 point for participation
- 1 point for getting the correct answer to the simplification
- 1 point for getting any part of Dash on top of the answer that they give.

This means that students could give the wrong answer, but land exactly on that wrong answer to get 2 points. Or they could get the right answer but fail to get Dash to land on it to get 2 points. Or they could get the correct answer and placement for a full 3 points.

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Number Line Target: Number Line Labels

Grade 1: Adding and Subtracting within 10

0	1	2	3	4	5
6	7	8	9	10	

Grade 2: Adding and Subtracting within 100
Grade 3: Multiplying and Dividing within 100
Grade 4: Two-step arithmetic problems within 100
Grade 5: Two-step arithmetic problems with decimals within 100

0	10	20	30	40	50
60	70	80	90	100	

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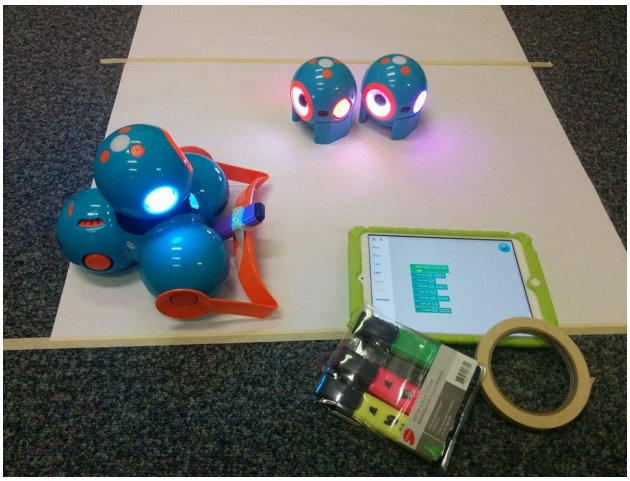
Number Line Target: Expression Tables and Answer Guide

Grade 1	4 + 3	1 + 7
7 - 2	5 - 4	2 + 6
Grade 2	15 + 21	55 + 32
74 - 51	25 - 13	46 + 51
Grade 3	5×5	6×8
9×6	$45 \div 9$	$63 \div 7$
Grade 4	$2 \times 5 + 15$	$6 \times 7 - 4$
$24 \div 8 + 5$	$60 \div 10 - 2$	$12 \times 5 + 18$
Grade 5	$2 \times 5.5 + 15.25$	$6 \times 7 - 4.5$
$30 \div 12 + 5$	$27 \div 6 - 1$	$2 \times 5.25 + 45$

Answer Guide:

Grade 1:		Grade 4:	
4 + 3 = 7 1 + 7 = 8	7 − 2 = 5 5 − 4 = 1 2 + 6 = 9	$2 \times 5 + 15 = 25$ $6 \times 7 - 4 = 38$	$24 \div 8 + 5 = 8$ $60 \div 10 - 2 = 4$ $12 \times 5 + 18 = 78$
Grade 2:		Grade 5:	
15 + 21 = 16 55 + 32 = 87	74 − 51 = 23 25 − 13 = 12 46 + 51 = 97	$2 \times 5.5 + 15.25 = 26.25$ $6 \times 7 - 4.5 = 37.5$	$30 \div 12 + 5 = 7.5$ $27 \div 6 - 1 = 3.5$ $2 \times 5.25 + 45 = 55.5$
Grade 3:			
5 x 5 = 25 6 x 8 = 48	9 x 6 = 54 45 ÷ 9 = 5 63 ÷ 7		

Fencing In Guide



Setup:
Tape multiple big sheets of paper to the floor or a large flat surface. Place 2 or 3 objects, such as small stuffed animals or Dots, in an area of the paper.

Using the bulldozer attachment, lean a marker against the bulldozer attachment on the inside, pointing the tip of the marker underneath Dash. The marker could also be taped to Dash or built out of lego like this https://www.makewonder.com/play/ideas/23
Note that the closer to directly underneath Dash the marker is position, the more accurate the size and the shape of the figure.

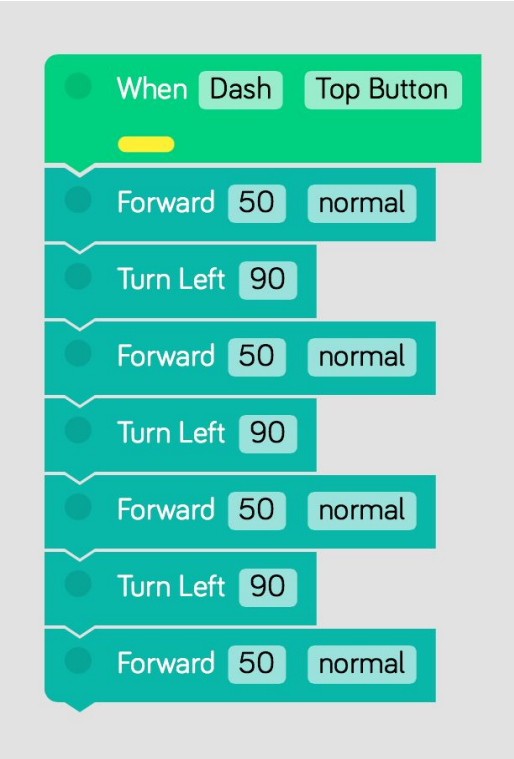
The Game:

Students are given a grade appropriate shape to draw. They can place Dash in any starting position. Using the Blockly app, the students design the path for Dash that matches the given shape. Younger students will be given a template. They then run the program to have Dash draw the shape.

- Grade 1 and 2: Square or Rectangle
- Grade 3: square, rectangle, rhombus, trapezoid, parallelogram
- Grade 4 and 5: square, rectangle, rhombus, trapezoid, parallelogram, right and non-right triangles

Scoring:
- 3 pts for drawing the correct shape around all objects
- 2 pts for drawing the correct shape
- 1 pt for drawing any shape
- +1 bonus point for:
    - drawing a square, rectangle or rhombus using a loop, or
    - drawing a parallelogram that is not a rhombus, or
    - correctly drawing a trapezoid (the most difficult shape)

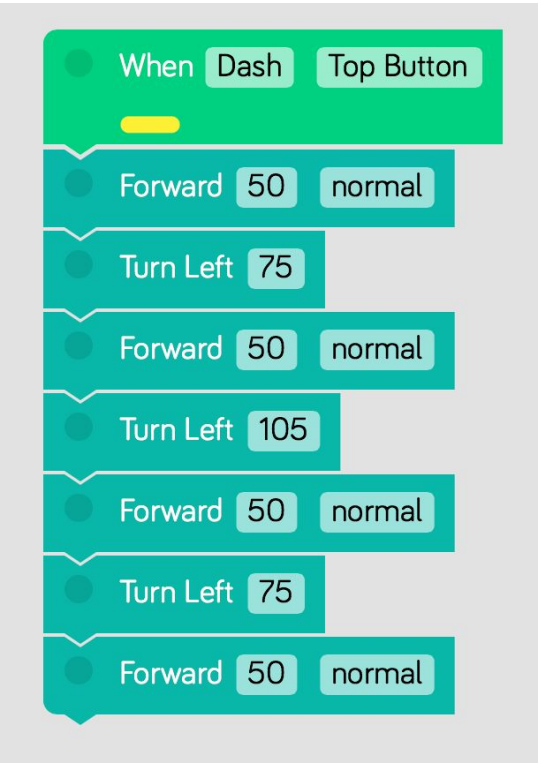
Fencing In Guide - Example and Template Blockly Code



Square - Rectangle
To draw a square or a rectangle students will need four movements (one for each side) and three 90 degree turns.

For a square, all four movement distances are the same. For a rectangle, non-adjacent side lengths will be equal.

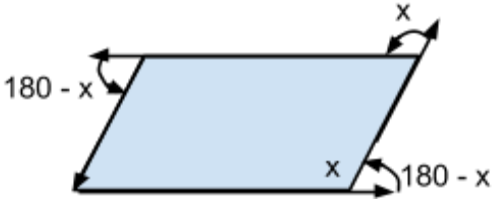
This sample will produce a square that has side lengths all of 50 cm.



Parallelogram - Rhombus.
To draw a parallelogram or a rhombus, students will need four movements and three turns. Exactly 2 of these turns are equal in measure. The two unequal turns must add up to 180 degrees.

A parallelogram has two sets of parallel lines. A rhombus is a parallelogram where all sides are the same length.

Because Dash's turns are measured from straight ahead, when drawing 60 degrees, Dash actually needs to make a 180 - 60 = 120 degree turn.



Trapezoid
A trapezoid is any quadrilateral where there is exactly two parallel lines. The non-parallel lines do not need to be equal in length, but sometimes they are.

Because Dash's turns are measured from straight ahead, when drawing 60 degrees, Dash actually needs to make a 180 - 60 = 120 degree turn.