

# Grade 3 Mid Assessment - Teacher Resource

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The following versions of this document are available:

- [Google Doc: Grade 3 Mid Assessment - Teacher Resource](#) (most accessible version)
- [PDF: Grade 3 Mid Assessment - Teacher Resource](#) (most portable version)

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## Front Matter

This assessment includes 10 items from two CT topics (4 Decomposition items; 6 Sequencing items). Three items (#2, #8, and #9) use images of the Scratch interface and/or Scratch blocks.

Each item has an exemplar response(s) and a scoring guide and/or rubric included (and when applicable, other information to help with interpreting student responses). The scoring guidance and rubrics were developed by our project to assist in coding and interpreting student responses, and are explicitly focused on using student responses to make inferences about the relevant knowledge, skills, and abilities that we identified from the learning trajectories and built into our item design process. As such, other end users of these assessment instruments may choose to adapt the scoring guidance and/or rubrics to match their purposes and students.

Two of these items (#7 and #9) have associated rubrics. **Each of those items has two rubrics that are used together to evaluate student responses.** The need for two distinct rubrics for each item was a decision we made during coding student responses, to make it easier to code and to attempt to separate the influence of mathematical knowledge/performance from computational thinking. Further details on these rubrics are provided in the items' details.

## Items

### #01

#### Meta-data

- Item code: S.06.b
- Trajectory: Sequence

#### Item

In Problem 1, circle True or False.

1) When creating a computer script in Scratch, you must select from a limited set of blocks.

- **True**
- **False**

#### Exemplar response(s)

True

#### Scoring Guidance

- True=1
- False= 0

#### Rubric(s)

None

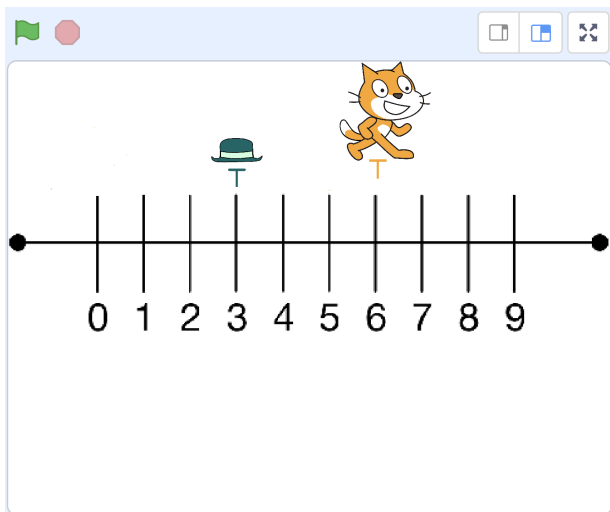
## #02

### Meta-data

- Item code: S.08.a
- Trajectory: Sequence

### Item

2) The cat wants to move his hat to be at 0 on the number line. Circle the script that would help him do that.



A.

```

when clicked
  move 1 step backward
  pick up hat
  move 2 steps backward
  move 1 step backward
  move 2 steps backward
  drop hat
  
```

B.

```

when clicked
  move 2 steps backward
  move 1 step backward
  pick up hat
  move 2 steps backward
  move 1 step backward
  drop hat
  
```

C.

```

when clicked
  move backward
  pick up hat
  move backward
  drop hat
  
```

D.

```

when clicked
  move 1 step backward
  pick up hat
  move 2 steps backward
  move 1 step backward
  drop hat
  
```

Exemplar response(s)

B

Scoring Guidance

- A=0
- B=1
- C=0

- D=0

Rubric(s)

None

### #03

Meta-data

- Item code: S.04.a
- Trajectory: Sequence

Item

3) Aisha has 8 toys that she wants to carry from the kitchen to her room. She can carry 1, 2, or 3 toys at once.

Write two different ways that Aisha can carry the 8 toys to her room.

- One way:
  - Carry \_ toys to room
  - Carry \_ toys to room
  - Carry \_ toys to room
- Another way:
  - Carry \_ toys to room
  - Carry \_ toys to room
  - Carry \_ toys to room

Exemplar response(s)

Answers will vary. Students can provide any combination such that when summed they equal

8. Sample answer:

- One way: 3,3,2
- Another way: 2,3,3

Scoring Guidance

- 2 correct ways=1
- incorrect way(s)/only 1 way=0

Rubric(s)

None

## #04

### Meta-data

- Item code: DC.08.b
- Trajectory: Decomposition

### Item

4) Decomposing means breaking something down into parts. Decompose the number 12 into equivalent parts.

### Exemplar response(s)

Answers will vary. Sample answers:

- 6, 6
- 3, 3, 3, 3
- 4, 4, 4

### Scoring Guidance

- Lists (or represents/draws) a set of equal values that sum to 12 (like the examples in exemplar responses) = 1
- Values aren't equivalent and/or don't sum to 12 = 0
- Note: If a student response indicates that the number of **equal** parts that should be used, that is enough to give credit (e.g, break 12 into 6 equal parts)

### Rubric(s)

None

## #05

### Meta-data

- Item code: DC.02.b
- Trajectory: Decomposition

### Item

5) List the steps you would use to solve this multi-step problem:  
 $(5 \times 2) + (3 \times 2) = ?$

### Exemplar response(s)

Answers will vary. Sample answers:

Example 1:

1.  $5 \times 2 = 10$

2.  $3 \times 2 = 6$
3.  $10 + 6 = 16$

Example 2:

$$5 + 5 + 3 + 3 = 16$$

#### Scoring Guidance

- Correct way=1
- Incorrect way=0
- If there is a simple calculation error (or use an incorrect operator, e.g., \* instead of +) but still shows decomposition then we score it as correct.
- If they describe the steps they would use, rather than execute the steps, then they get credit so long as their descriptions of the steps illustrate decomposition.
- If they just solve the problem (e.g., "16" or " $10 + 6 = 16$ ") without breaking into multiple steps then score = 0.

Rubric(s)

None

## #06

Meta-data

- Item code: DC.03.b
- Trajectory: Decomposition

Item

6) Decomposing a problem means breaking it down into smaller problems. Why should you decompose a problem? CIRCLE ALL CORRECT ANSWERS.

- A. Sometimes it is easier for me to solve several smaller problems than one big problem.
- B. I know I will find the correct answer.
- C. It is the last step in solving a problem.
- D. Sometimes it is faster to solve several smaller problems

Exemplar response(s)

Answer: A & D

Scoring Guidance

- Choice is exactly "A,D"=1
- Any other choice(s)= 0



Rubric(s)

None

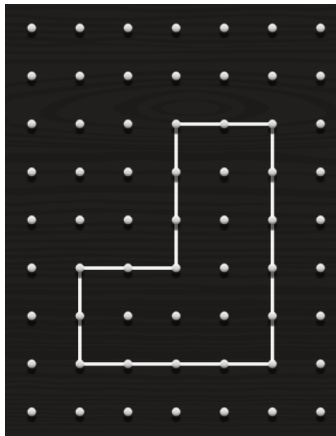
## #07

Meta-data

- Item code: DC.06.c
- Trajectory: Decomposition

Item

7) Pretend you want to find the area of the shape outlined in white



This problem requires multiple steps. Break down the problem into steps. Describe your steps.

Exemplar response(s)

Student answers will vary, they should list different steps in solving the problem.

1. Divide the shape into a square and a rectangle.
2. Find the length of one side of the square.
3. Find the area of the square.
4. Find the length of each side of the rectangle.
5. Find the area of the rectangle.
6. Add the areas of the square and the rectangle.

An alternate answer with fewer steps could be:

1. Find the area of the 2 x 2 square
2. Find the area of the 5 x 2 rectangle
3. Add the areas of the square and the rectangle

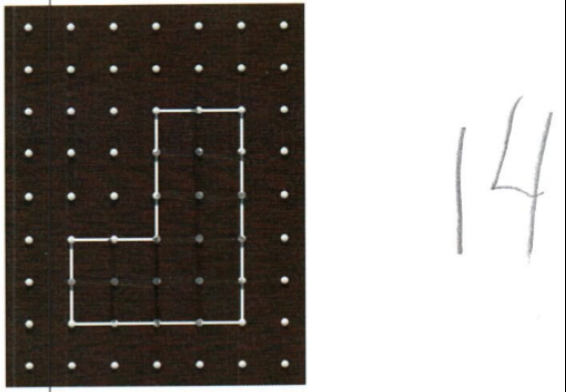
Scoring Guidance

See Rubric

## Rubric(s)

This item has two rubrics to aid in the process of making sense of students' responses. In our research, we found that many students attempted to solve for perimeter rather than area. As a result, we found that scoring the students' decomposition approach was easier if we first used Rubric A to classify the type of problem solving approach the student was engaged in, and then use Rubric B to assess whether they were able to describe a process of breaking the problem down into smaller parts, solve those smaller parts, and use those smaller parts to build back up to a whole. This decomposition rubric (Rubric B) is therefore general, in order to handle both students' area-based or perimeter-based approaches.

Rubric A (Math-focus) is used to classify students' problem solving approach. This is done by identifying whether they were using an area-based approach (as required by the item) or a perimeter-based approach (which many students did, seemingly confusing area and perimeter), and then determining whether their approach would lead to an accurate measure (Level 4 or Level 2), or would lead to an incorrect measure (Level 3 or Level 1) when executed. Students' unclassifiable, incorrect, and/or hybrid approaches are assigned Level 0.

Rubric A (Math-focus)		
Score	Description	Example Student Responses
4	Area-type algorithm/approach which would produce an accurate measure of area if executed*	<div data-bbox="857 1016 1425 1260"> <p>Describe your steps.</p> <p>① Spilt it in half            ② look at the outside of the top shape and count the sides            ③ there's a 4 going Down and 3 going across            ④ solve <math>4 \times 3 = ?</math>            ⑤ go down to the other shape            ⑥ count the sides            ⑦ there's 3 going down and 5 going across.            ⑧ <math>3 \times 5 = ?</math>            ⑨ Add <math>12 + 15 = ?</math></p> <p>version 10/14/19  <small>G3 Mid Assessment</small></p> <p><math>A = 27</math></p> </div> <div data-bbox="857 1270 1425 1375"> <p>Describe your steps.</p> <p>Divide the shape into groups on the inside, then count the squares or just add 8 and 6.</p> </div> <div data-bbox="863 1396 1425 1785">  </div> <ul style="list-style-type: none"> <li>Note regarding this student response: Although it's faint, the</li> </ul>

		<p>student has drawn lines to subdivide the figure into 14 squares. Those individual squares, when summed, equals '14' as written by the student to the right of the drawing.</p>
3	<p>Area-type approach, but one that would produce an inaccurate measure of area if executed (e.g., calculates area of 2 rectangles but multiplies them, instead of adding; leaves out a portion of the compound shape when calculating area)</p>	<p>Describe your steps. So I counted 6 and then I counted and added the 6. So 6 + 6 = 12 so the Area is 12.</p> <p>version 10/14/19 G3 Mid Assessment 3</p>
2	<p>Perimeter-type algorithm/approach which would produce an accurate measure of area if executed*</p>	<p>This problem requires multiple steps. Break down the problem into steps. Describe your steps. I counted every little line.</p> <p>1. first count the number of dots on the white line.</p> <p>2. <math>P = 18</math></p> <p>ersion 10/14/19 G3 Mid Assessment</p>
1	<p>Perimeter-type approach, but one that would produce an inaccurate measure of area if executed (e.g., doesn't include all sides when calculating perimeter)</p>	<p>19   I counted all the circles.</p>
0	<p>Neither (or unclear) (i.e., it's unclear what student is doing AND/OR not calculating Area or Perimeter)</p>	<p>First I counted the dots + that the line was all and got 18. The dots in the middle and got 6. <math>18 + 6 = 24</math></p>

		<div data-bbox="906 212 1097 457"> </div> <div data-bbox="1230 233 1344 436"> </div> <div data-bbox="873 478 1317 516"> <p>This problem requires multiple steps. Break down the problem into steps. Describe your steps.</p> </div> <div data-bbox="898 531 1295 604"> <p><math>2 \times 4 = 8</math> and <math>3 \times 6 = 18</math> then <math>3 \times 3 = 9</math>  <math>50 \ 15 \ 18 =</math></p> </div> <div data-bbox="862 621 1425 772"> <p>Describe your steps. Start from the top left corner over 9 dots I went over 3 dots 5 dots over 4 dots then went down dots up 3 dots up 2 dots over 2</p> </div> <div data-bbox="898 783 1385 947"> <ul style="list-style-type: none"> <li>Note regarding this student response: This example does not indicate the student is doing anything more than tracing the outline</li> </ul> </div>
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\*This level does not require that the student actually executes the algorithm (e.g., students don't necessarily need to solve for area and show their work).

Rubric B (CT-focus)		
Score	Description	Example Student Responses
2	Builds back up, using smaller parts	<div data-bbox="857 1241 1425 1507"> </div> <div data-bbox="857 1518 1425 1738"> </div> <div data-bbox="857 1707 963 1728"> <p>ersion 10/14/19</p> </div> <div data-bbox="1239 1707 1377 1728"> <p>G3 Mid Assessment</p> </div>

		<p>Describe your steps.</p> <p>① Spilt it in half          ② look at the outside of the top shape and count the sides          ③ there's a 4 going Down and 3 going Across          A = 27</p> <p>④ solve <math>4 \times 3 = ?</math>          ⑤ go down to the other side          ⑥ count the sides          ⑦ there's 3 going down and 5 going across.          ⑧ <math>3 \times 5 = ?</math>          ⑨ Add <math>12 + 15 = ?</math></p> <p>version 10/14/19 G3 Mid Assessment 3</p>
1	Breaks problem down into smaller parts	<p>This problem requires multiple steps. Break down the problem into steps. Describe your steps.</p> <p>I counted every little line.</p> <p>Step 1 break the shape into 2 rectangles,          Step 2 find the area of one of the rectangles          Step 3 double the area of the first rectangle.</p> <p>version 10/14/19 G3 Mid Assessment 3</p>
0	No indication of decomposition approach	<p>This problem requires multiple steps. Break down the problem into steps. Describe your steps.</p> <p>there are 6 in all  <math>3 + 3 = 6</math></p>

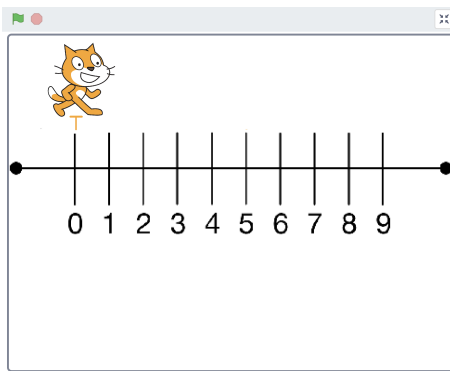
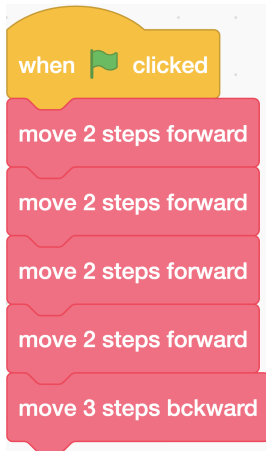
## #08

### Meta-data

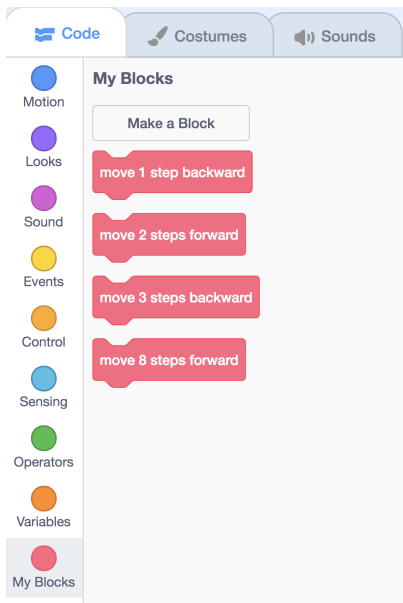
- Item code: S.10.a
- Trajectory: Sequence Item

### Item

8) Below is code for the cat to move so that he eventually lands at 5 on the number line.



Create a different way for the cat to land at 5. You may use any of the blocks below.



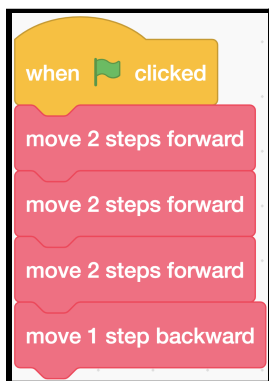
Write or draw your script below.



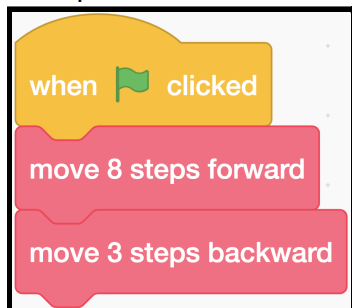
### Exemplar response(s)

There are multiple ways students can accomplish this, but they must limit their drawings to the blocks provided in the item. Sample answers:

#### Example 1:



#### Example 2:



### Scoring Guidance

- Correct way (similar to exemplar)=1
- Incorrect/use non-given blocks=0

### Rubric(s)

None

## #09

### Meta-data

- Item code: S.02.a
- Trajectory: Sequence

### Item

9) The cat forgot his hat! **Using the blocks shown**, make him walk back, pick up his hat, and then walk forward until he stops at 6 on the number line.

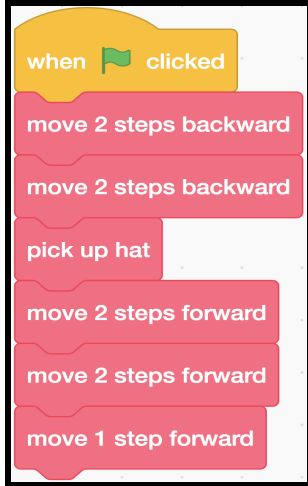
The image shows the Scratch code editor interface. On the left, the 'My Blocks' palette contains several blocks: 'when clicked', 'move 1 step backward', 'move 1 step forward', 'move 2 steps backward', 'move 2 steps forward', and 'pick up hat'. The main stage area displays a number line from 0 to 9. A green hat is positioned at 1, and a cat sprite is positioned at 5. The 'when clicked' block is placed on the stage. The bottom right panel shows the 'Sprite' properties for 'Sprite1', with x-coordinate 31, y-coordinate 123, size 100, and direction 90. The 'Stage' and 'Backdrops' panels are also visible.

Write or draw your script below.



Exemplar response(s)





Note: Student can replace any/all of the “move 2 steps” blocks with two “move 1 step” blocks and/or reorder the move 1 step forward block as long as it occurs after the “pick up hat” block.

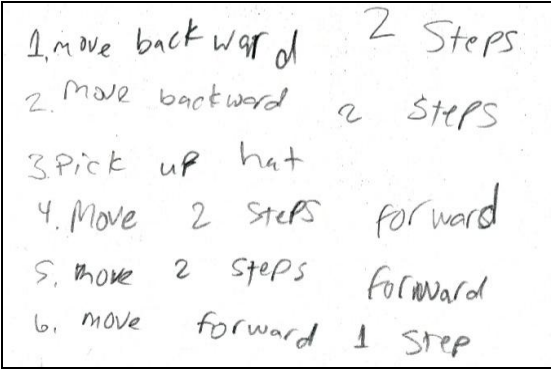
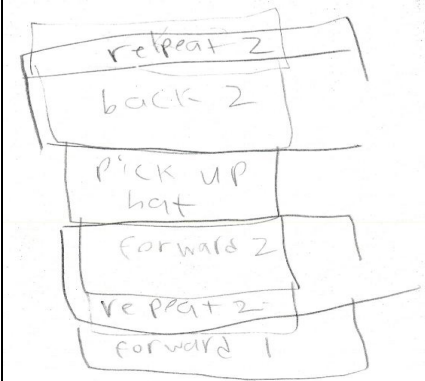
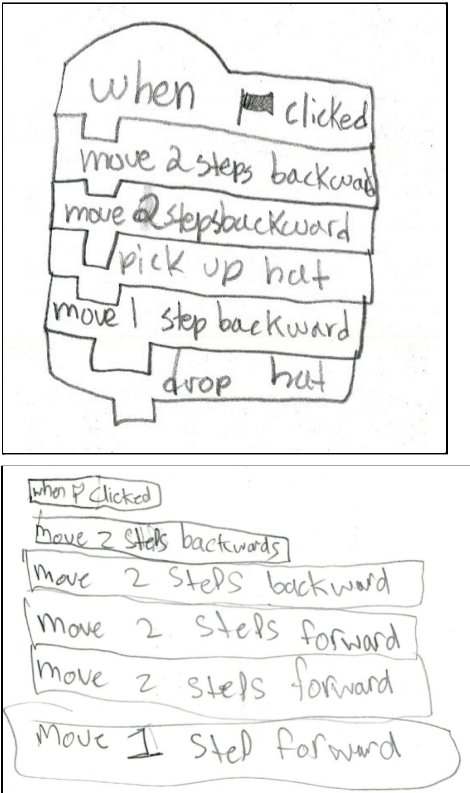
### Scoring Guidance

See Rubric

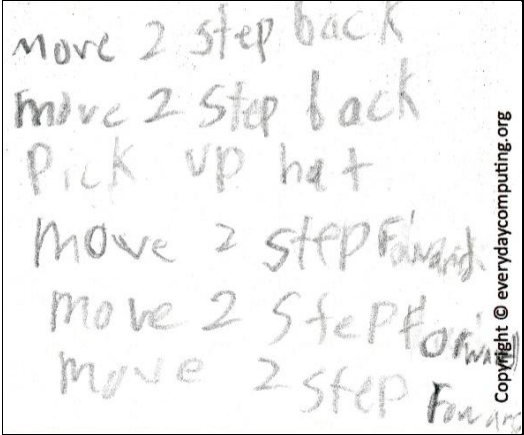
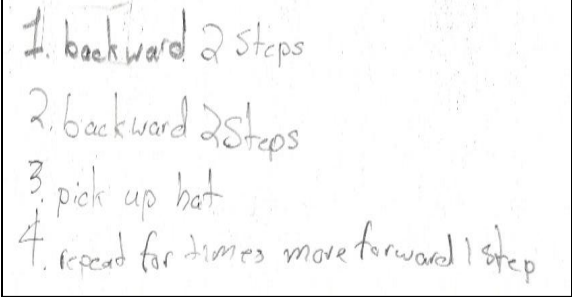
### Rubric(s)


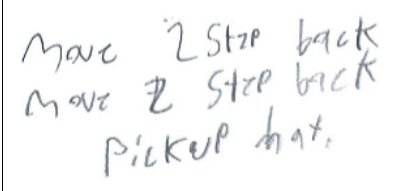
This item has two rubrics to aid in the process of making sense of students’ responses. If you are using this assessment to assign students a grade (or to otherwise evaluate their performance), be aware that Rubric B is “reverse-scored”—a “1” is assigned if the student makes a math error (i.e., miscounted steps). If you are using this instrument only to assess students’ CT proficiencies, Rubric B is still helpful when interpreting students’ responses, but the students’ scores on Rubric B may then be disregarded. In other words, having a separate rubric (Rubric B) to capture miscounting errors allows one to focus on the primary rubric (Rubric A) to assess students’ ability to create a sequence of steps to achieve an outcome.

Rubric A (CT-focus)		
Score	Description	Example Student Responses

2	Provides a correct way to produce the intended sequence using the given blocks (or provides what would be a correct way, if not for miscounting by at most 1 step)	 <p>1. move backward 2 steps  2. move backward 2 steps  3. pick up hat  4. move 2 steps forward  5. move 2 steps forward  6. move forward 1 step</p>
1	Provides a correct way to produce the intended sequence by using <i>non-given blocks</i> (or provides what would be a correct way, if not for miscounting (off by 1, in one, or both steps))	 <p>repeat 2  back 2  pick up hat  forward 2  repeat 2  forward 1</p>
0	Response does not produce the intended sequence (top & middle example); or miscounts by more than 1 step (top example); or is incomplete (bottom example).	 <p>when clicked  move 2 steps backward  move 2 steps backward  pick up hat  move 1 step backward  drop hat</p> <p>when clicked  move 2 steps backward  move 2 steps backward  move 2 steps forward  move 2 steps forward  move 1 step forward</p>

		
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Rubric B (Math-focus)		
Score	Description	Example Student Responses
1	Response would be correct (CT), but includes miscount (off by 1) in one (or both) steps.	 

0	Response would be incorrect (CT) anyway, or no miscounting.	 
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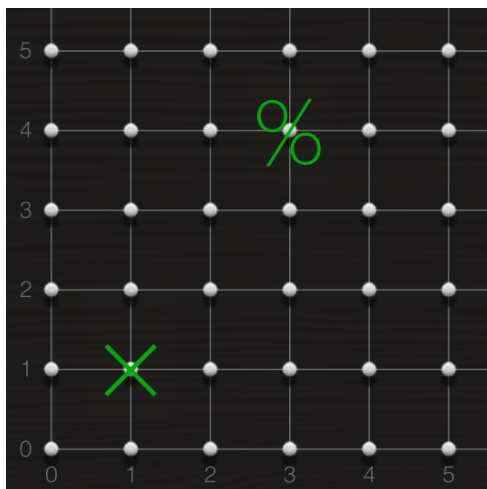
## #10

### Meta-data

- Item code: S.12.b
- Trajectory: Sequence

### Item

10) Pretend you are standing at the **X**. You can only move up, down, left, or right. Write instructions for moving from the **X** to the **%**.



Your instructions:

Exemplar response(s)

Answers will vary but should cover a path from X to the %. Students may express the instructions in multiple ways.

Example 1

1. Move 3 dots up
2. Move 2 dots right

Example 2

1. Move right 2
2. Move up 3

Example 3

1. Up
2. Up
3. Up
4. Right
5. Right

Scoring Guidance

- Must provide complete directions to move from the X to the % = 1 (see exemplars); incorrect/incomplete directions (and/or steps) = 0
- If response clearly indicates a left/right reversal error AND that is the only problem with the directions, then score = 1 (i.e., can ignore a left/right error)

Rubric(s)

None