CT-STEM

Computational Thinking in Science, Technology, Engineering, and Mathematics

Computer Science Skills: Part 1

Version 0.1

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Student Information

First Name: First

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Student ID:

School Name:

Grade:

Date of Birth: mm/dd/yyyy

Sex:

Race / Ethnicity (check all that apply)

- ☐ Native American
- ☐ Mexican American or Chicano
- ☐ Pacific Islander
- ☐ Puerto Rican
- ☐ Asian American
- ☐ Other Latin American
- ☐ White (Caucasian)
- ☐ Black or African American

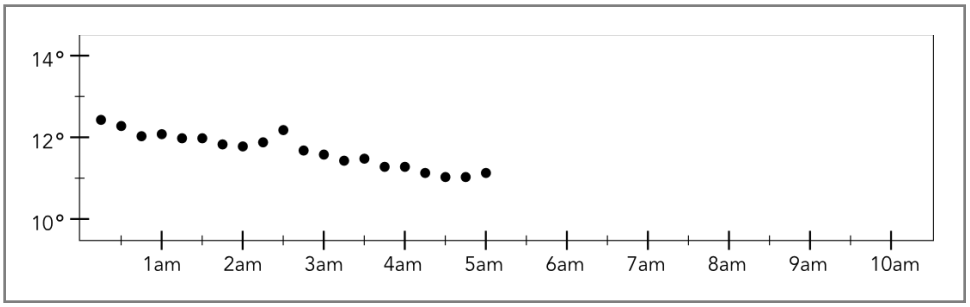
Other:

A climate scientist wrote this computer program to measure air temperatures at a weather station.

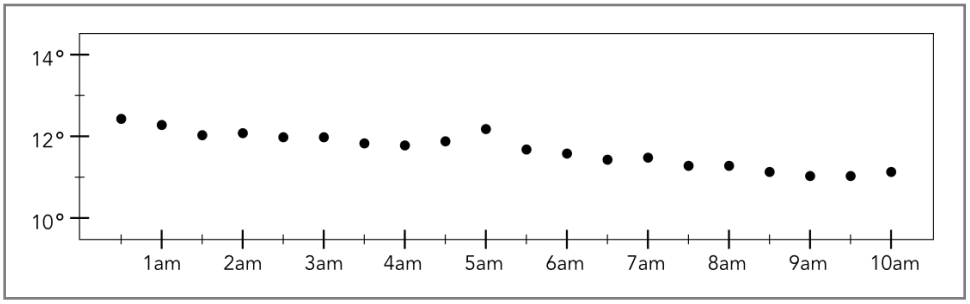
```
repeat 20 times:
   pause-seconds(450)
   record-temperature
```

Item 1: Which of these plots shows her measurements?

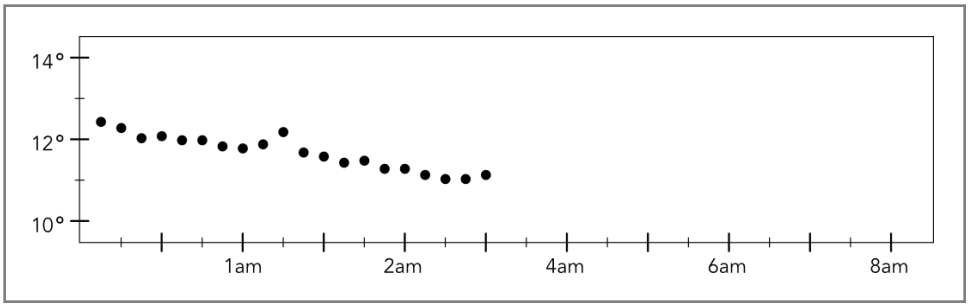
A.



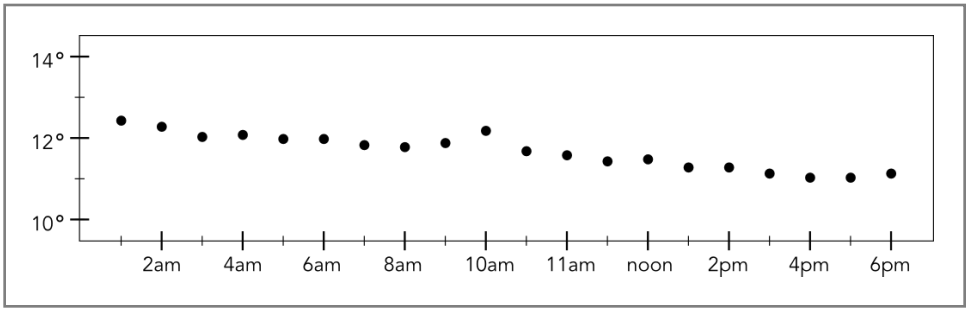
B.



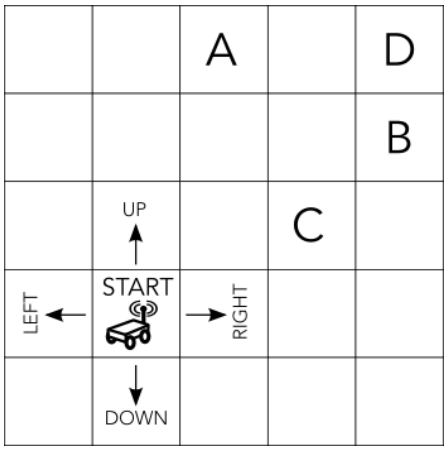
C.



D.



A team of engineering students is building an autonomous robot for a contest. To win, they must program their robot to move around a grid while avoiding obstacles. The robot moves exactly one square at a time either up, down, left, or right.



The team started by writing this program to move their robot.

```
move-up
move-right
move-up
move-right
move-right
```

Item 2a: After running the program, which square will the robot stop on.

A. ◯ Square A

B. ◯ Square B

C. ◯ Square C

D. ◯ Square D

The team tried changing their program to this:

```
move-up
move-right
move-up
move-up
```

Item 2b: Now where will the robot stop?

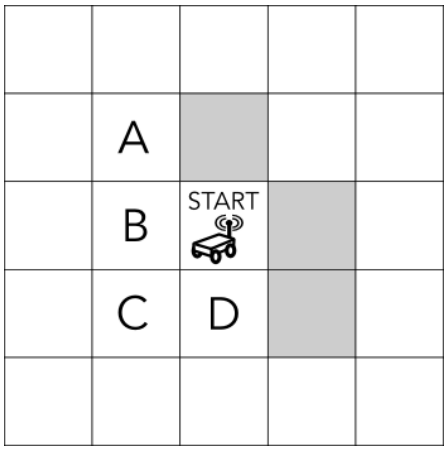
A. ◯ Square A

B. ◯ Square B

C. ◯ Square C

D. ◯ Square D

The team of engineering students added sensors to their robot to help it avoid obstacles (shown as grey squares on the grid). Then they wrote this program:




```
if obstacle-left then:
   move-right
if obstacle-up then:
   move-down
if obstacle-right then:
   move-left
if obstacle-down then:
   move-up
```

Item 3a: On which square will the robot stop?

A. ◯ Square A

B. ◯ Square B

C. ◯ Square C

D. ◯ Square D

The students then changed their program to this:

```
if obstacle-left then:
   move-right
else if obstacle-up then:
   move-down
else if obstacle-right then:
   move-left
else:
   move-up
```

Item 3b: Now where will the robot stop?

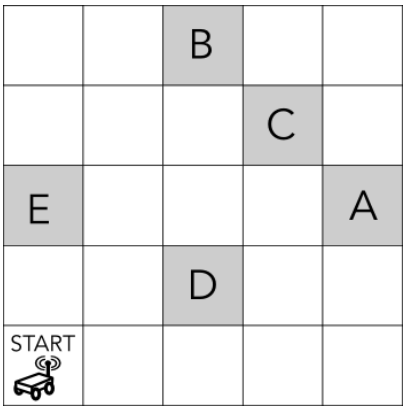
A. ◯ Square A

B. ◯ Square B

C. ◯ Square C

D. ◯ Square D

The students now want to make the robot move in a bigger world. They tried this program, but the robot ran into an obstacle.




```
repeat forever:
   move-up
   move-right
```

Item 4a: Which obstacle did the robot hit?

A. ◯ Square A
B. ◯ Square B
C. ◯ Square C
D. ◯ Square D
E. ◯ Square E

They tried a different program, but the robot ran into an obstacle again.

```
repeat forever:
   move-right
   move-up
   move-up
```

Item 4b: Which obstacle did the robot hit this time?

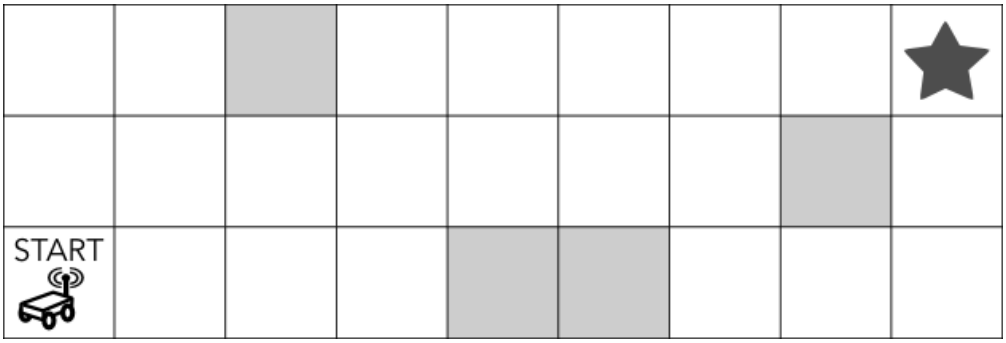
A. ◯ Square A
B. ◯ Square B
C. ◯ Square C
D. ◯ Square D
E. ◯ Square E

They tried one more program, but the robot still hit an obstacle.

```
repeat forever:
   move-up
   repeat-until obstacle-right:
      move-right
```

Item 4c: Which obstacle did the robot hit this time?

A. ◯ Square A
B. ◯ Square B
C. ◯ Square C
D. ◯ Square D
E. ◯ Square E

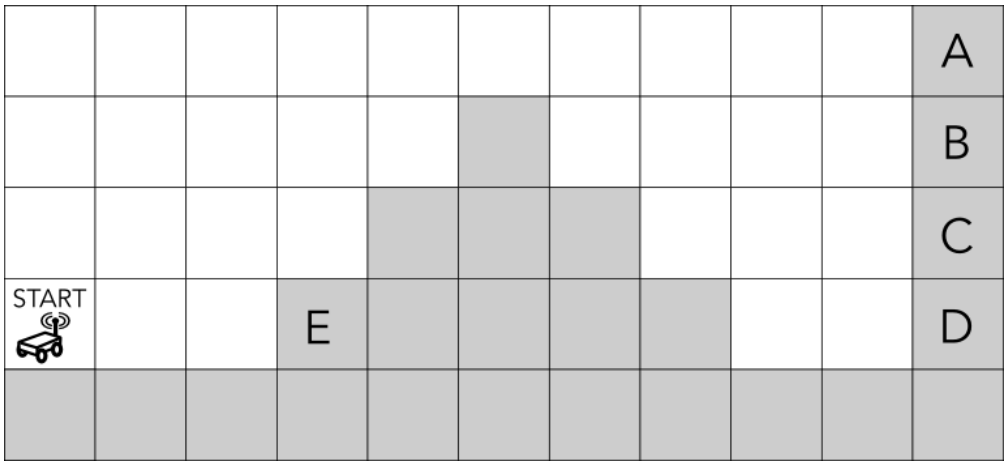


Item 5: Try changing this program to move the robot to the STAR.

```
repeat-forever:
   move-up
   move-right

```

Here are the commands that the robot knows:

```
move-up           move-down
move-left         move-right

obstacle-up       obstacle-down
obstacle-left     obstacle-right

repeat-forever:   repeat-until

if: else if: else:
```

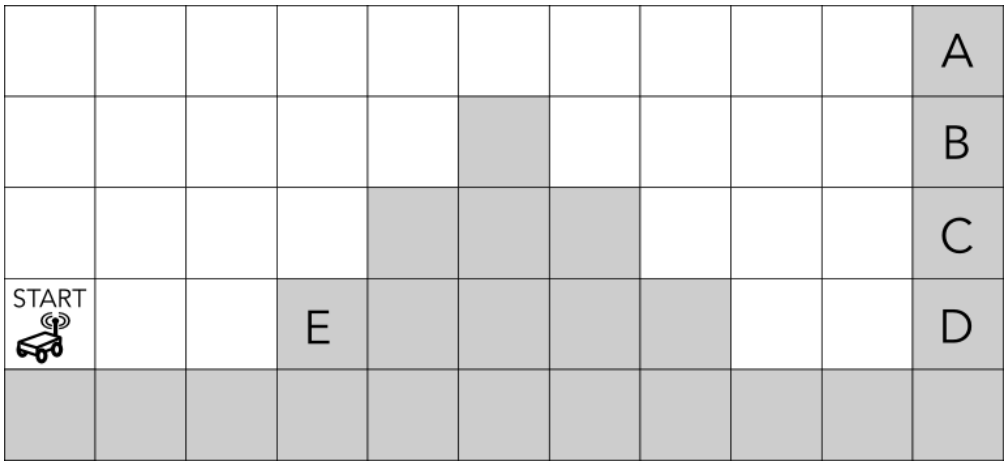


The team has now tried to get the robot to start avoiding obstacles with this program:

```
define climb-stair-up:
   move-up
   move-right

define climb-stair-down:
   move-right
   move-down

define walk-right:
   if obstacle-right then:
      climb-stair-up
   else:
      right

repeat forever:
   walk-right
```

Item 6: Which obstacle will the robot hit when it runs this program?

A. ◯ Square A
B. ◯ Square B
C. ◯ Square C
D. ◯ Square D
E. ◯ Square E



They tried changing their program:

```
define climb-stair-up:
   move-up
   move-right

define climb-stair-down:
   move-right
   move-down

define walk-right:
   if obstacle-right then:
      climb-stair-up
   else if obstacle-down then:
      right
   else:
      climb-stair-down

repeat forever:
   walk-right
```

Item 7: Which obstacle will the robot hit this time?

A. ◯ Square A
B. ◯ Square B
C. ◯ Square C
D. ◯ Square D
E. ◯ Square E

Congratulations!

You're finished. Use any remaining time to go back and check your answers.