VELA PROJECT DIGITAL ACTIVITY CHEATSHEETS

These draft lesson plans, worksheets, worksheet solution guides, and review sheets are intended to accompany digital activities developed as part of *Thinking Outside the Box: Integrating Dynamic Mathematics to Advance Computational Thinking for Diverse Student Populations*, a National Science Foundation's STEM+C/Core R&D Programs #1543062. These draft versions correspond to those used in classroom research February - March 2017. As drafts, no warrants are made about these materials' completeness or correctness.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.
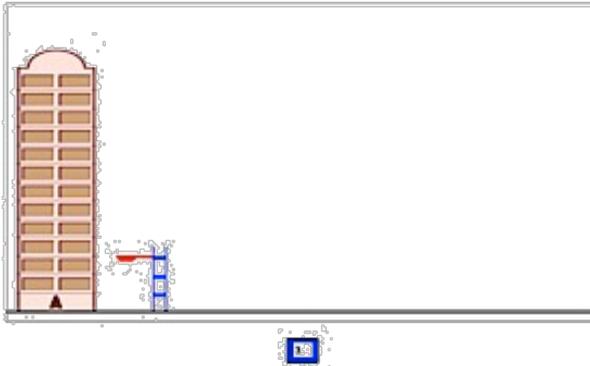
December 2017
SRI International
http://csforall.sri.com

Cats & Ladders
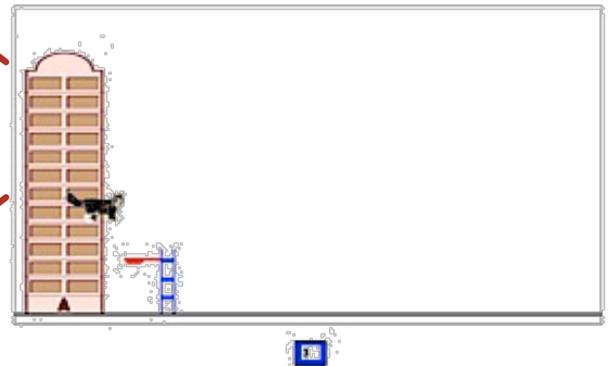
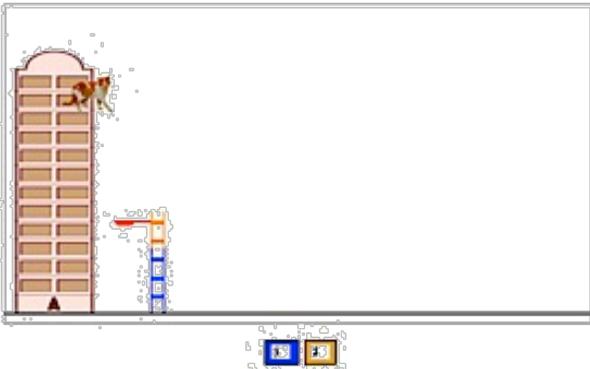## 1. Experiment with the blue ladder.

passcode:
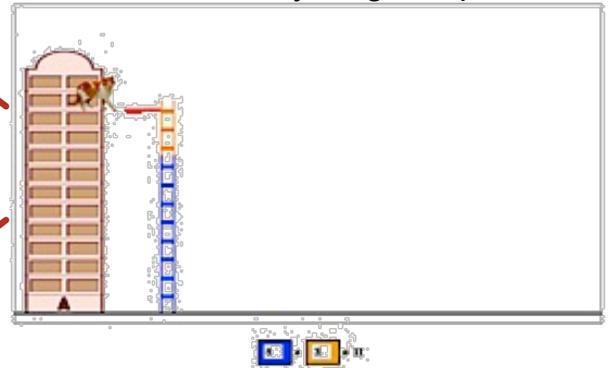**meow**

2. Rescue cats.

passcode:
orange

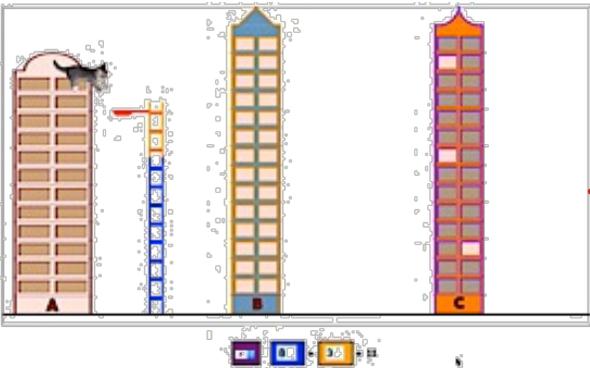## 3. Reach higher floors with the double ladder.

passcode:
add

4. Verify height expression.

passcode:
city

5. Target buildings as well as ladder heights for "rescue" solutions.
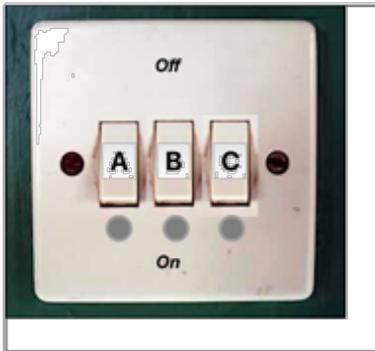
passcode:
end

6. Done!

1. Introduce Boolean switches A, B, C, controlling green indicators beneath buttons. Students find which switch or combination of switches illuminates large lightbulb on the right.

Challenge #1

passcode: **2**

2. Same setup, different wiring. Which switches turn on bulb now? ("OR" logic)

Challenge #2

passcode: **3**

3. Another challenge, more difficult... ("AND" logic)

Challenge #3

Explore

passcode: **4**

Challenge #4

4. Final challenge! ("NOT" logic)

- -

passcode:
values

5. Verify your answers against the table of *Boolean expressions* that *control the light* in different challenges

**Validate**

Name	Expression	Value	Controls Light	
A		false (off)	⬜	
B		false (off)	◯	
C		false (off)	⬜	
	A OR C	false (off)	◯	Answer to Challenge 2
	B AND C	false (off)	◯	Answer to Challenge 3
	NOT A	true (on)	🔵	Answer to Challenge 4

Answer to Challenge 1

- -

passcode:
new

6. Create your own rules for controlling the light, by defining (and naming) new Boolean expressions

Create

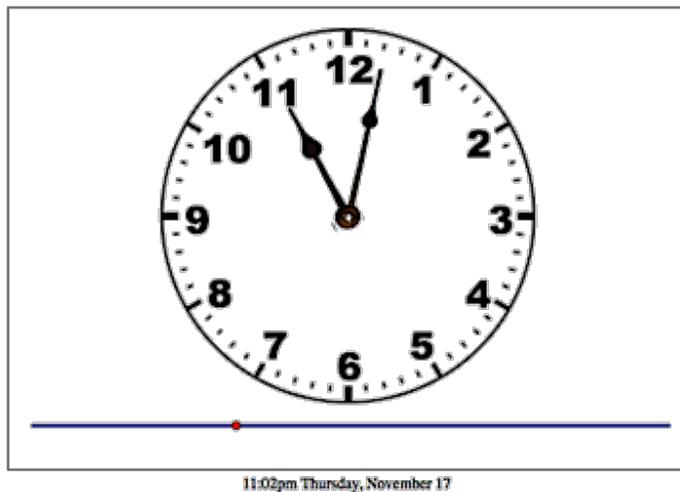| AllThreeTurnedOn | : | | A AND (B AND C) | false (off) | 🔵 | ➖ |

New Boolean Expressions

A	AND	B	➕
A	OR	B	➕
NOT	A		➕
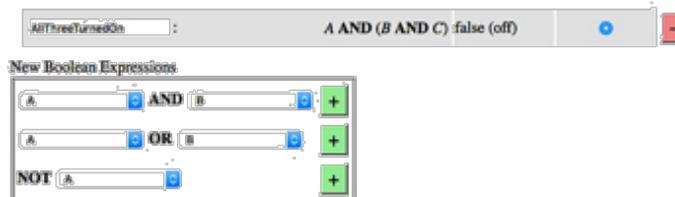
7. Done!

1. Explore the alarm clock and describe "how it works."

Alarm Clock

11:02pm Thursday, November 17

Fast
Slow
Stop

passcode:
values

2. Investigate how one (possible) set of variables might describe the clock's state.

Values

Name	Value
minute	2
hour	11
dayOfMonth	17

passcode:
new

3. Make a *new* value—by creating one more Boolean expressions—that will *ring the alarm* when it is time to get up for school!

| timeToGetUp | : | $(hour = 7)$ **AND** $(minute = 15)$ | false |

Add New Value
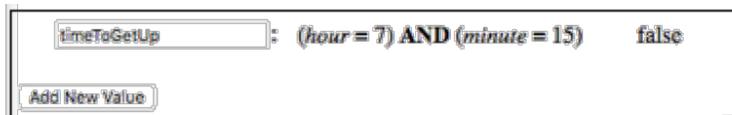
optional passcode:
strings

ringing because
timeToGetUp
is *true*

4. *(Optional)* Use additional *string variables* in more complex expressions to ring the alarm only in the morning, or only on schooldays.

phase	pm
dayOfWeek	Thursday

Done!