Computer Science in Algebra
powered by Bootstrap

Student Workbook
<table>
<thead>
<tr>
<th>Thing in the game...</th>
<th>What changes about it?</th>
<th>More Specifically...</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
Video Game Planning
Code.org Computer Science in Algebra

Use this form to plan out your video game. Once your game is complete, the player will move up and down, the target and danger will move from left and right, and you will earn points by touching the target, and lose points by touching the danger.

Created by:

The game takes place in:
(This will be the background image in your game)

The player is a:
(The player moves up and down)

The target is a:
(The Target moves left and right)

The danger is a:
(The Danger moves left and right)
Create the evaluation blocks for the provided equations.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2 \times 5$</td>
<td><img src="image1" alt="Diagram" /></td>
</tr>
<tr>
<td>$32 \div 3$</td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
<tr>
<td>$4 - (3 \div 2)$</td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
<tr>
<td>$(25 + 14) - 12$</td>
<td><img src="image4" alt="Diagram" /></td>
</tr>
<tr>
<td>$(3 + 12) \times 16$</td>
<td><img src="image5" alt="Diagram" /></td>
</tr>
<tr>
<td>$(23 \times 14) \times (3 + 2)$</td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
<tr>
<td>$1 + (15 \times 5)$</td>
<td><img src="image7" alt="Diagram" /></td>
</tr>
<tr>
<td>$19 - (12 + 11)$</td>
<td><img src="image8" alt="Diagram" /></td>
</tr>
<tr>
<td>$(2 + 17) \times (12 - 8)$</td>
<td><img src="image9" alt="Diagram" /></td>
</tr>
<tr>
<td>$4 - (6 - 17)$</td>
<td><img src="image10" alt="Diagram" /></td>
</tr>
<tr>
<td>$(12 \times 4) \div 3$</td>
<td><img src="image11" alt="Diagram" /></td>
</tr>
</tbody>
</table>
### Fast Functions!

**Stage 9**

*Code.org Computer Science in Algebra*

<table>
<thead>
<tr>
<th>name</th>
<th>domain</th>
<th>range</th>
</tr>
</thead>
</table>

**Example:**

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</table>

**Stage 9**

*Fast Functions!*
The Design Recipe
Code.org Computer Science in Algebra

Description:

Contract and Purpose Statement

Every contract has three parts...

_________________ : ____________________________________ -> ________________
function name     domain     range

___________________________________________________________________________
what does the function do?

Examples

Write some examples for your function in action...

Example: ________________ ( _______________ ) =  ______________________________
function name  input(s)      what the function produces

Example: ________________ ( _______________ ) =  ______________________________
function name  input(s)      what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: ________________ ( _______________ ) = ______________________________
function name        variables

___________________________________________________________________________
what the function does with those variables
The Design Recipe

Description:

Contract and Purpose Statement

Every contract has three parts...

function name : domain -> range

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Write some examples for your function in action...

Example: function name (input(s)) = what the function produces

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Define: function name (variables) =

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The Design Recipe
Code.org Computer Science in Algebra

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Contract and Purpose Statement

Every contract has three parts...

function name : domain -> range

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Examples

Write some examples for your function in action...

Example: function name (input(s)) = what the function produces

Example: function name (input(s)) = what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: function name (variables) = 

what the function does with those variables
Description: A rocket blasts off, traveling at 15 meters per second. Write a function called `rocket-height` that takes in the number of seconds that have passed since the rocket took off, and which produces the height of the rocket at that time.

**Contract and Purpose Statement**

*Every contract has three parts...*

```
function name : domain -> range
```

what does the function do?

**Examples**

*Write some examples for your function in action...*

**Example:**

```
function name (input(s)) = what the function produces
```

**Definition**

*Write the definition, giving variable names to all your input values*

**Define:**

```
function name (variables) = what the function does with those variables
```
Description: Write a function `update-target` which takes in the target’s x-coordinate and produces the next x-coordinate, which is 10 pixels to the right.

Contract and Purpose Statement

*Every contract has three parts...*

```
function name : domain -> range
```

what does the function do?

Examples

*Write some examples for your function in action...*

**Example:** ________________ ( _______________ ) =  ______________________________

function name  input(s) what the function produces

**Example:** ________________ ( _______________ ) =  ______________________________

function name  input(s) what the function produces

Definition

*Write the definition, giving variable names to all your input values*

**Define:** ________________ ( _______________ ) =

function name variables

what the function does with those variables
Description: Write a function `update-danger` which takes in the danger’s x-coordinate and produces the next x-coordinate, which is 10 pixels to the left.

Contract and Purpose Statement

Every contract has three parts...

```
function name : domain -> range
```

what does the function do?

Examples

Write some examples for your function in action...

Example:

```
function name (input(s)) = what the function produces
```

Example:

```
function name (input(s)) = what the function produces
```

Definition

Write the definition, giving variable names to all your input values

Define:

```
function name (variables) = what the function does with those variables
```

Description: Write a function safe-left?, which takes in an x-coordinate and checks to see if it is greater than 50.

Contract and Purpose Statement

Every contract has three parts...

function name : domain -> range

what does the function do?

Examples

Write some examples for your function in action...

Example: ________________ ( _______________ ) = ________________

function name  input(s)      what the function produces

Example: ________________ ( _______________ ) = ________________

function name  input(s)      what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: ________________ ( _______________ ) = ________________

function name  variables

what the function does with those variables
**Description:** Write a function `safe-right?`, which takes in an x-coordinate and checks to see if it is less than 350.

**Contract and Purpose Statement**

Every contract has three parts...

```
function name : domain -> range

what does the function do?
```

**Examples**

Write some examples for your function in action...

**Example:**

```
function name (input(s)) = what the function produces
```

**Definition**

Write the definition, giving variable names to all your input values

```
Define: function name (variables) = what the function does with those variables
```
Description: Write a function `onscreen?`, which takes in a character’s x-coordinate and checks to see if it is safe on the left and on the right.

Contract and Purpose Statement

*Every contract has three parts...*

_________________ : ____________________ -> _______________
function name     domain     range

___________________________________________________________________________
what does the function do?

Examples

*Write some examples for your function in action...*

**Example:** ______________ ( _______________ ) =  ______________________________
function name  input(s)      what the function produces

**Example:** ______________ ( _______________ ) =  ______________________________
function name  input(s)      what the function produces

Definition

*Write the definition, giving variable names to all your input values*

**Define:** ______________ ( _______________ ) =
function name        variables

___________________________________________________________________________
what the function does with those variables
**Description:** Luigi's Pizza has hired you as a programmer. They offer “pepperoni” ($10.50), “cheese” ($9.00), “chicken” ($11.25), and “broccoli” ($10.25). Write a function called **cost** which takes in the name of a topping and outputs the cost of a pizza with that topping.

**Contract and Purpose Statement**

*Every contract has three parts…*

```
function name : domain -> range
```

what does the function do?

**Examples**

*Write some examples for your function in action…*

Example: ________________ ( _______________ ) = ________________

Example: ________________ ( _______________ ) = ________________

Example: ________________ ( _______________ ) = ________________

Example: ________________ ( _______________ ) = ________________

**Definition**

*Write the definition, giving variable names to all your input values*

Define: ________________ ( _______________ ) =

```
When you press a key on your keyboard, a unique numeric code is sent to your computer, which is then translated into a letter, number, or command. Use this handy key code reference sheet to make your Player sprite respond to different key presses.

<table>
<thead>
<tr>
<th>Key</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>left arrow</td>
<td>37</td>
</tr>
<tr>
<td>up arrow</td>
<td>38</td>
</tr>
<tr>
<td>right arrow</td>
<td>39</td>
</tr>
<tr>
<td>down arrow</td>
<td>40</td>
</tr>
<tr>
<td>0</td>
<td>48</td>
</tr>
<tr>
<td>1</td>
<td>49</td>
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<tr>
<td>2</td>
<td>50</td>
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<td>3</td>
<td>51</td>
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<td>E</td>
<td>69</td>
</tr>
<tr>
<td>F</td>
<td>70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
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<td>87</td>
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<td>X</td>
<td>88</td>
</tr>
<tr>
<td>Y</td>
<td>89</td>
</tr>
<tr>
<td>Z</td>
<td>90</td>
</tr>
</tbody>
</table>
**Description:** Write a function called `update-player`, which takes in the key code of the key pressed and the player’s y-coordinate, and returns the new y-coordinate.

**Contract and Purpose Statement**

Every contract has three parts...

```
function name : domain -> range
```

What does the function do?

**Examples**

Write some examples for your function in action...

**Example:** `update-player ( 38 240 ) = 240 + 10`

**Example:** `update-player ( 40 240 ) = 240 - 10`

**Example:** `update-player ( 38 250 ) =`

**Example:** `update-player ( 40 250 ) =`

**Definition**

Write the definition, giving variable names to all your input values.

Define: ________________ ( _______________ ) =

```
function name ( variables ) =
```

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________
Graph #1

On the graph:
Label the right angle as C
Label segment AB as c
Label segment AC as b
Label segment CB as a

1. What is the radius of circle A? ___________
2. What is the radius of circle B? ___________
3. What is Radius A + Radius B ___________
4. Do the circles overlap? (true/false) __________
5. What is the length of side a? ___________
6. What is the length of side b? ___________
7. Estimate the length of side c? ___________
8. What is $a^2 + b^2$ ___________
On the graph:
Draw a segment from point A to point B
Label segment AB as c
Draw a right triangle using segment c as the hypotenuse.
Label the right angle as C
Label segment AC as b
Label segment CB as a

1. What is the radius of circle A? ___________
2. What is the radius of circle B? ___________
3. What is Radius A + Radius B ___________
4. Do the circles overlap? (true/false) ___________
5. What is the length of side a? ___________
6. What is the length of side b? ___________
7. Estimate the length of side c? ___________
8. What is $a^2 + b^2$ ___________
Graph #3

On the graph:
- Draw a segment from point A to point B
- Label segment AB as c
- Draw a right triangle using segment c as the hypotenuse.
- Label the right angle as C
- Label segment AC as b
- Label segment CB as a

1. What is the radius of circle A? ___________
2. What is the radius of circle B? ___________
3. What is Radius A + Radius B ___________
4. Do the circles overlap? (true/false) ___________
5. What is the length of side a? ___________
6. What is the length of side b? ___________
7. Estimate the length of side c? ___________
8. What is $a^2 + b^2$ ___________
Description: Write a function called line-length, which takes in two numbers and returns the difference between them. It should always subtract the smaller number from the bigger one.

Contract and Purpose Statement

Every contract has three parts...

function name : domain -> range

what does the function do?

Examples

Write some examples for your function in action...

Example: \( \text{line-length} (10, 5) = 10 - 5 \) what the function produces

Example: \( \text{line-length} (2, 8) = 8 - 2 \) what the function produces

Definition

Write the definition, giving variable names to all your input values

Define: \( \text{line-length} (\text{variables}) = \)
The distance between two points (25, 50) and (300, 400) can be calculated with the distance formula as

\[
\sqrt{\text{line-length}(25, 300)^2 + \text{line-length}(50, 400)^2}
\]

Convert the formula in a circle of evaluation.
### Description:
Write a function **distance**, which takes four inputs:
- `px`: The x-coordinate of the player
- `py`: The y-coordinate of the player
- `cx`: The x-coordinate of another game character
- `cy`: The y-coordinate of another game character

It should use the Distance formula to return the distance between both points.

### Contract and Purpose Statement

*Every contract has three parts...*

<table>
<thead>
<tr>
<th>function name</th>
<th>domain</th>
<th>range</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

**what does the function do?**

### Examples

*Write some examples for your function in action...*

**Example:** ________ (___________) = ________

<table>
<thead>
<tr>
<th>function name</th>
<th>input(s)</th>
<th>what the function produces</th>
</tr>
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<tbody>
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**Example:** ________ (___________) = ________

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### Definition

*Write the definition, giving variable names to all your input values*

**Define:** ________ (___________) = ________

<table>
<thead>
<tr>
<th>function name</th>
<th>variables</th>
<th>what the function does with those variables</th>
</tr>
</thead>
</table>
**Description:** Write a function `collide?`, which takes four inputs:
- `px`: The x-coordinate of the player
- `py`: The y-coordinate of the player
- `cx`: The x-coordinate of another game character
- `cy`: The y-coordinate of another game character

Is the player’s x and y within 100 pixels of the other character’s x and y?

**Contract and Purpose Statement**

*Every contract has three parts...*

```
function name : domain -> range
```

what does the function do?

**Examples**

*Write some examples for your function in action...*

**Example:**
```
function name ( input(s) ) = what the function produces
```

**Definition**

*Write the definition, giving variable names to all your input values*

**Define:**
```
function name ( variables ) = what the function does with those variables
```
<table>
<thead>
<tr>
<th>Contract Log</th>
<th>Domain</th>
<th>Range</th>
<th>Example</th>
</tr>
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<tbody>
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<td></td>
<td></td>
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<td>Example</td>
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