Contracts

Name	Domain	Range	example
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	
.:	..	↑	

Contracts

Name	Domain	Range	example
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	
:	:	↑	

Thing in the game...	What changes about it?	More specifically...
cloud	*position*	*x-coordinate*

(0,480) (640,480

The co

The co

The co

NinjaCat!   Score:10

)

te

)

(640,0)

(0,0)

Our Videogame

Created by (write your names): _____

Our game takes place in: _____
(space? the desert? a mall?)
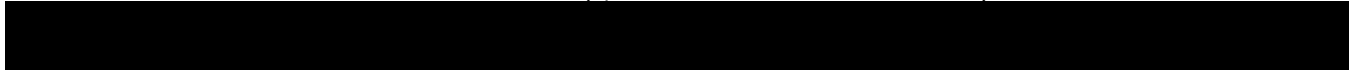
The player is a _____.

The player moves only up and down.
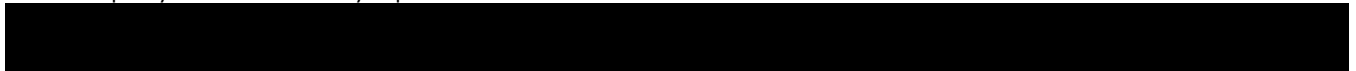
Your player GAINS points when they hit the target.

The Target is a _____.

The Target moves only to the left and right.

Your player LOSES points when they hit the danger.

The Danger is a _____.

The Danger moves only to the left and right.

Don't forget to use the computer's symbols for things like multiply and divide!

Math	Circle of Evaluation	Racket Code
5 x 10		
8 + (5 x 10)		
(8 + 2) - (5 x 10)		
5 x 10 / 8 - 2		

(draw Circles of Evaluation here if you need extra scratch paper)

	Math	Circle of Evaluation	Racket Code
Round 1	(3 * 7) - (1 + 2)		
Round 2	3 - (1 + 2)		
Round 3	3 - (1 + (5 * 6))		
Round 4	(1 + (5 * 6)) - 3		

; _____:_____ -> _____
           name   domain   range

(EXAMPLE (_____ _____) _____)

(EXAMPLE (_____ _____) _____)

(define (_____ _____) _____)

; _____:_____ -> _____
           name   domain   range

(EXAMPLE (_____ _____) _____)

(EXAMPLE (_____ _____) _____)

(define (_____ _____) _____)

; _____:_____ -> _____
           name   domain   range

(EXAMPLE (_____ _____) _____)

(EXAMPLE (_____ _____) _____)

(define (_____ _____) _____)

; _____:_____ -> _____
           name   domain   range

(EXAMPLE (_____ _____) _____)

(EXAMPLE (_____ _____) _____)

(define (_____ _____) _____)

```
; _____:_____ -> _____
        name              domain            range

(EXAMPLE (_____  _____)  _____)

(EXAMPLE (_____  _____)  _____)

(define (_____ _____) _____)


; _____:_____ -> _____
        name              domain            range

(EXAMPLE (_____  _____)  _____)

(EXAMPLE (_____  _____)  _____)

(define (_____ _____) _____)


; _____:_____ -> _____
        name              domain            range

(EXAMPLE (_____  _____)  _____)

(EXAMPLE (_____  _____)  _____)

(define (_____ _____) _____)


; _____:_____ -> _____
        name              domain            range

(EXAMPLE (_____  _____)  _____)

(EXAMPLE (_____  _____)  _____)
```

```
(define (_____ _____) _____)
```

██████████████████████████████

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Word Problem: rocket-height

A rocket blasts off, traveling at 7 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.

Every contract has three parts:

; _____ : _____ -> _____
      name   Domain   Range

; _____
                                  What does the function do?

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____)
                     the user types...

      _____)
                     .....which should become

(EXAMPLE (_____)
                     the user types...

      _____)
                     .....which should become

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

(define (_____   _____)
             function name   variable names

      _____)
                  .....and the computer does this

Word Problem: red-square

Use the Design Recipe to write a function __red-square,__ which takes in a number (the size of the square) and outputs a solid red rectangle whose length and width are the same size.

████████████████████████

Every contract has three parts:

; _____ : _____ -> _____
    Name   Domain   Range

; _____
                          What does the function do?

████████████████████████

On the computer, write an example of your function in action, using EXAMPLE

(EXAMPLE (_____)
                          the user says…

         _____)
                          …..Racket replies

_____

(EXAMPLE (_____)
                          the user says…

         _____)
                          …..Racket turns that into

████████████████████████

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

(define (_____   _____)
            function name   variable names

         _____)
            …..and the computer does this

Word Problem: yard-area

Use the Design Recipe to write a function <u>yard-area</u>, which takes in the width and length of a yard, and returns the area of the yard.

> *(Don't forget: area = length * width !)*

■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■

Every contract has three parts:

; _____ : _____ -> _____
      name   Domain   Range

; _____
                           What does the function do?

■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____)
                       Use the function here

        _____)
               find another way to get the same result here

_____

(EXAMPLE (_____)
                       Use the function here...

        _____)
               find another way to get the same result here

■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■

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

(define (_____ _____)
         function name   variable names

       _____)
           …..and the computer does this

Word Problem: update-danger

Use the Design Recipe to write a function __update-danger__, which takes in the danger's x-coordinate and produces the next x-coordinate, which is 50 pixels to the left.

████████████████████████

Every contract has three parts:

; _____ : _____ -> _____

     name   Domain   Range

; _____

                         What does the function do?

████████████████████████

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____)

                    Use the function here

_____)

              find another way to get the same result here

(EXAMPLE (_____)

                    Use the function here...

_____)

              find another way to get the same result here

████████████████████████

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

(define (_____ _____)

          function name   variable names

_____)

        …..and the computer does this

Word Problem: update-target

Write a function <u>update-target</u>, which takes in the target's x-coordinate and produces the next x-coordinate, which is 50 pixels to the right.

Every contract has three parts:

; _____ : _____ -> _____
       name   Domain   Range

; _____
                              What does the function do?

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____)
                 Use the function here

     _____)
            find another way to get the same result here

(EXAMPLE (_____)
                 Use the function here…

     _____)
            find another way to get the same result here

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

(define (_____ _____)
          function name   variable names

   _____)
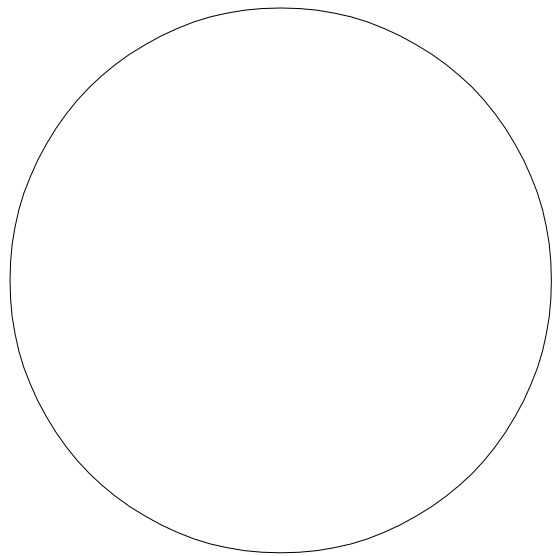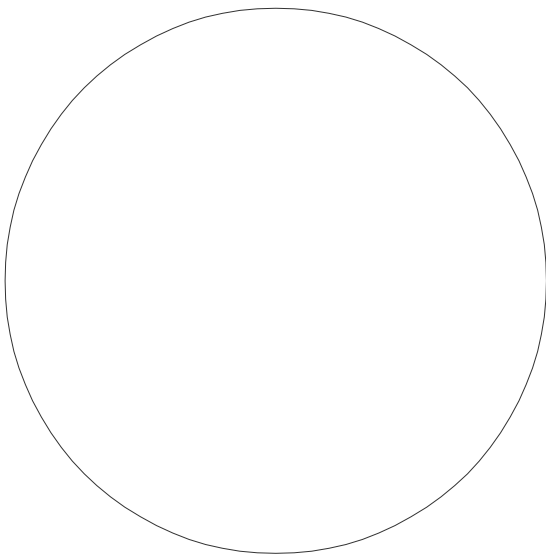   …..and the computer does this

Sam is in a 640 x 480 yard.   How far he can go to the left and right before he's out of sight?

1. A piece of Sam is still visible on the left as long as...   (>   x   -50)_____

2. A piece of Sam is still visible on the right as long as...   _____

3. Draw the Circle of Evaluation for these two expressions in the circles below:

Word Problem: safe-left?

Use the Design Recipe to write a function `safe-left?`, which takes in an x-coordinate and checks to see if it is greater than -50.

Every contract has three parts:

; _____ : _____ -> _____
       name   Domain   Range

; _____
                                What does the function do?

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____)
                         Use the function here

        _____)
                find another way to get the same result here

(EXAMPLE (_____)
                         Use the function here...

        _____)
                find another way to get the same result here

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

(define (_____ _____)
          function name   variable names

        _____)

Word Problem: safe-right?

Use the Design Recipe to write a function __safe-right?__, which takes in an x-coordinate and checks to see if it is less than 690.

Every contract has three parts:

; _____ : _____ -> _____
name   Domain   Range

; _____
What does the function do?

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____)
Use the function here

_____)
find another way to get the same result here

(EXAMPLE (_____)
Use the function here…

_____)
find another way to get the same result here

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

(define (_____ _____)
function name   variable names

_____)

Write the Circles of Evaluation for these statements, and then convert them to Racket

1. Two is less than five, _and_ zero is equal to six.
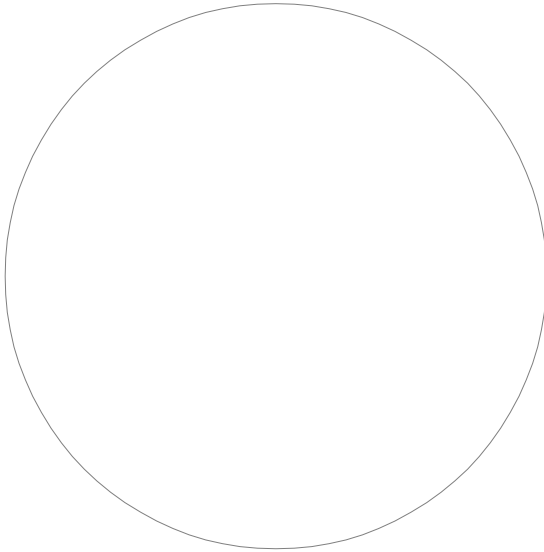
2. Two is less than four _or_ four is equal to six.

Word Problem: onscreen?

*Use the Design Recipe to write a function <u>**onscreen?**</u>, which takes in an x-coordinate and checks to see if Sam is safe on the left <u>and</u> safe on the right.*

Every contract has three parts:

; _____ : _____ -> _____
       name   Domain   Range

; _____
                                 What does the function do?

On the computer, write an example of your function in action, using EXAMPLE.

(EXAMPLE (_____)
                       Use the function here

      _____)
                find another way to get the same result here

(EXAMPLE (_____)
                       Use the function here…

      _____)
                find another way to get the same result here
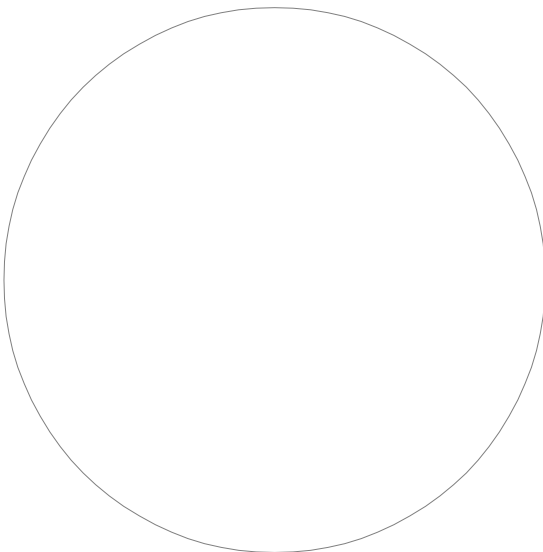
Write the definition, giving variable names to all your input values.

(define (_____ _____)
            function name   variable names

      _____)

Word Problem: cost

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.

; _____ : _____ -> _____
     name   Domain   Range

On the computer, write an example of your function for <u>each topping</u>, using EXAMPLE.

(EXAMPLE (<u>cost   "pepperoni"</u>) _____)
                       Use the function here   What should the function produce?

(EXAMPLE (_____) _____)
                       Use the function here   What should the function produce?

(EXAMPLE (_____) _____)
                       Use the function here   What should the function produce?

(EXAMPLE (_____) _____)
                       Use the function here   What should the function produce?

(define (_____ _____)
           function name   variable names

_____

)

Word Problem: update-player

Write a function called <u>update-player</u>, which takes in the player's y-coordinate and the name of the key pressed, and returns the new y-coordinate.

; _____ : _____ -> _____
    name   Domain   Range

Finish the two examples we've started for you, and make two more

(EXAMPLE (<u>update-player   128   "up"</u>) _____)
                   Use the function here   What should the function produce?

(EXAMPLE (<u>update-player   451 "down"</u>) _____)
                   Use the function here   What should the function produce?

(EXAMPLE (_____) _____)
                   Use the function here   What should the function produce?

(EXAMPLE (_____) _____)
                   Use the function here   What should the function produce?

(define (_____ _____)
             function name   variable names

   _____

)

Write a function called <u>line-length</u>, which takes in two numbers and returns the difference between them. It should always subtract the smaller number from the bigger one.

Every contract has three parts:

; _____ : _____ -> _____
       name   Domain   Range

(EXAMPLE <u>(line-length   10   5   )</u>   <u>(-   10   5)   </u>)
                      Use the function here   What should the function produce?

(EXAMPLE <u>(line-length   2   8   )</u>   <u>(-   8   2)   </u>)
                      Use the function here   What should the function produce?

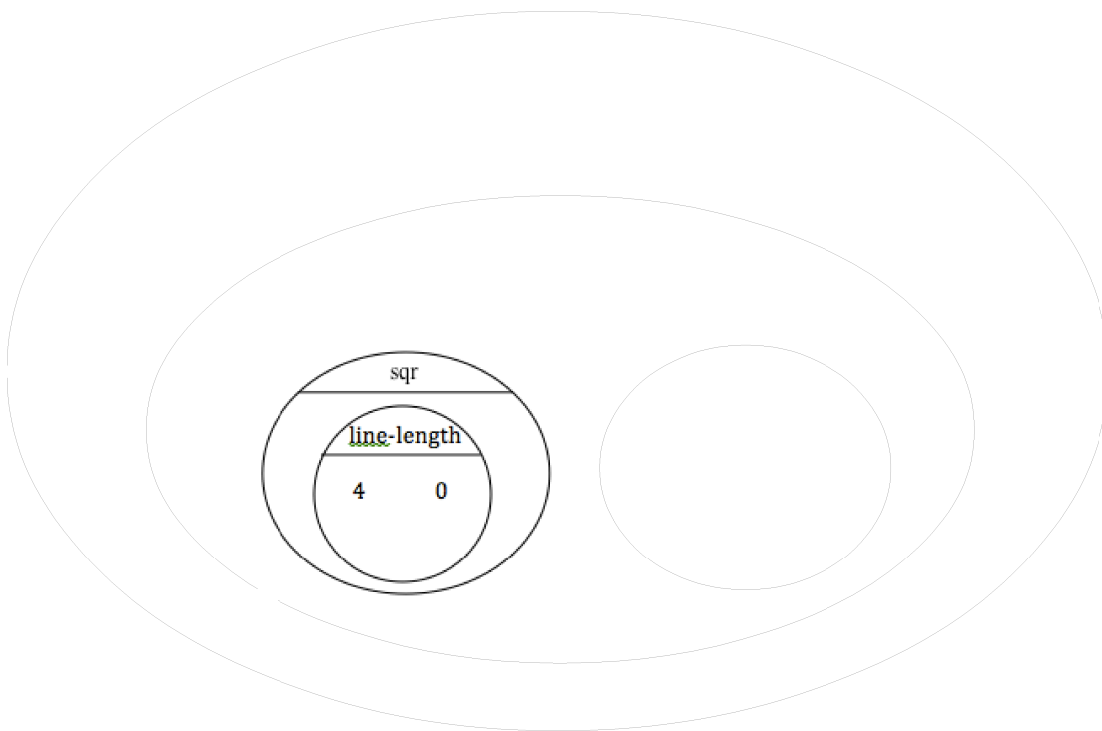Write the definition, giving variable names to all your input values.

(define (_____   _____)
          function name   variable names

_____

)

The distance between the points (0, 0) and (4, 3) is given by:

$$\sqrt{(line-length\ 4\ \ 0)^2 + (line-length\ 3\ \ 0)^2}$$

Convert the formula above into a Circle of Evaluation. (We've already gotten you started!)

Convert the Circle of Evaluation into Racket code:

Write a function <u>distance</u>*, 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 return the distance between the two, using the Distance formula. (HINT: look at what you did on page 27!)

; _____ : _____ -> _____
<div align="center">name   Domain   Range</div>

; _____
<div align="center">What does the function do?</div>

(EXAMPLE (_____)
<div align="center">Use the function here</div>

_____)
<div align="center">find another way to get the same result here</div>

(EXAMPLE (_____)
<div align="center">Use the function here…</div>

_____)
<div align="center">find another way to get the same result here</div>

(define (_____ _____)
<div align="center">function name   variable names</div>

_____)

████████████████████████████

Write a function <u>collide?</u>,*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 return `true` if the coordinates of the player are within 50 **pixels** of the coordinates of the other character. Otherwise, `false`.

████████████████████████████

; _____ : _____ -> _____
       name   Domain   Range

; _____
                                What does the function do?

████████████████████████████

(EXAMPLE (_____)
                      Use the function here

        _____)
                   find another way to get the same result here

(EXAMPLE (_____)
                      Use the function here...

        _____)
                   find another way to get the same result here

████████████████████████████

(define (_____ _____)
            function name   variable names

    _____)

Catchy Intro:

_____

_____

Name, Age, Grade: _____

Game Title: _____

Back Story: _____

_____

_____

_____

Characters: _____
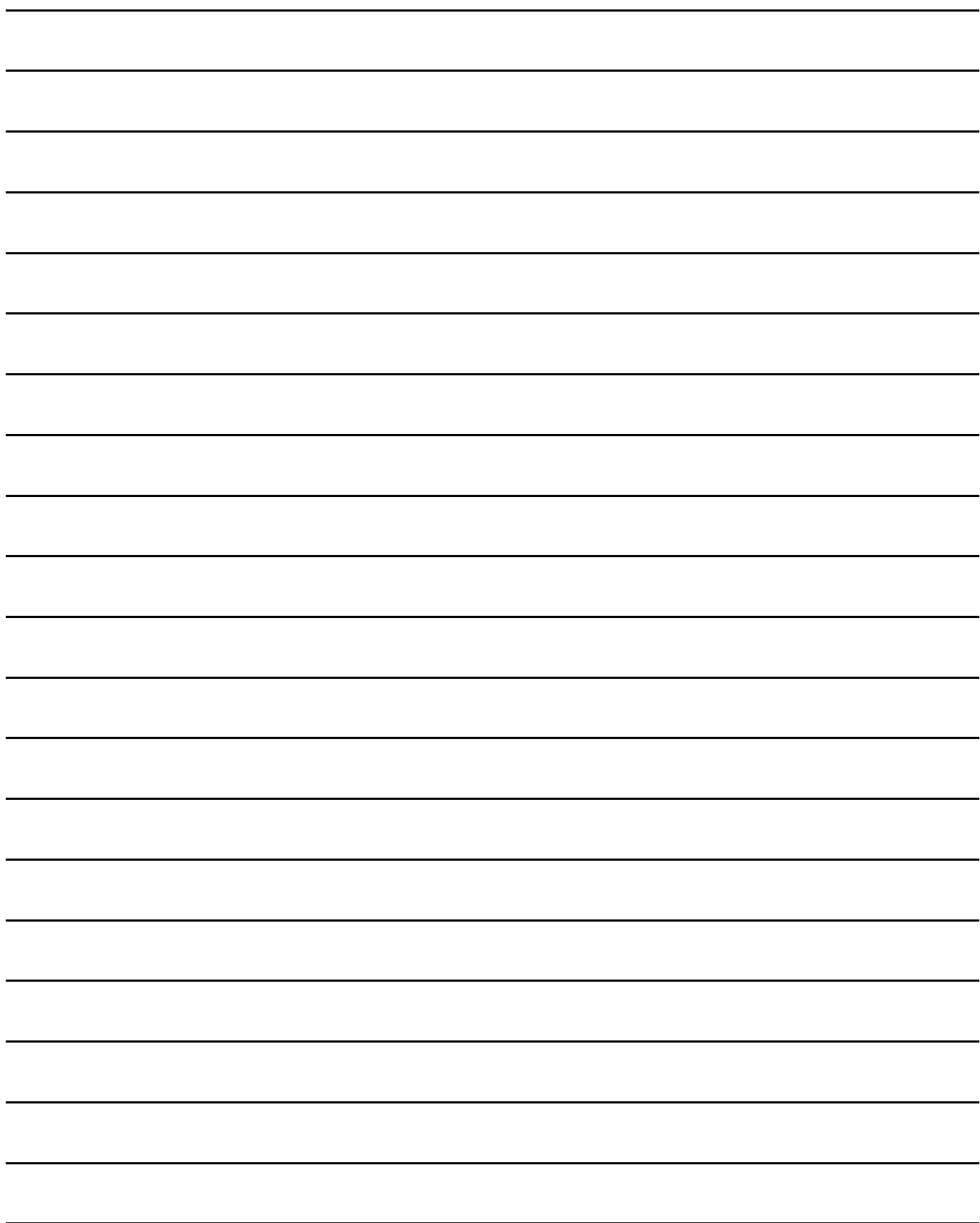
_____

_____

_____

Explain a piece of your code: _____

_____

_____

_____

For each question, circle the answer that fits best.

Was the introduction catchy?   No way!   A little.   Definitely!

Did they talk about their characters? No way!   A little.   Definitely!

Did they explain the code well?   No way!   A little.   Definitely!

Did they speak slowly enough?   No way!   A little.   Definitely!

Did they speak loudly enough?   No way!   A little.   Definitely!

Were they standing confidently?   No way!   A little.   Definitely!

Did they make eye contact?   No way!   A little.   Definitely!

For each question, circle the answer that fits best.

Was the introduction catchy?   No way!   A little.   Definitely!

Did they talk about their characters? No way!   A little.   Definitely!

Did they explain the code well?   No way!   A little.   Definitely!

Did they speak slowly enough?   No way!   A little.   Definitely!

Did they speak loudly enough?   No way!   A little.   Definitely!

Were they standing confidently?   No way!   A little.   Definitely!

Did they make eye contact?   No way!   A little.   Definitely!

Word Problem: red-shape

Write a function called <u>red-shape</u>, which takes in the name of a shape ("circle", "triangle", "star" or "rectangle"), and draws that shape. All shapes should be solid and red, and can be whatever size you choose

; _____ : _____ -> _____
      name   Domain   Range

; _____
                      What does the function do?

Write some examples of red-shape below. The first one has already been done for you.

(EXAMPLE <u>(red-shape   "circle"   )</u>   <u>(circle 50 "solid" "red")</u>)
             Use the function here   What should the function produce?

(EXAMPLE (_____) _____)
             Use the function here   What should the function produce?

(EXAMPLE (_____) _____)
             Use the function here   What should the function produce?

(EXAMPLE (_____) _____)
             Use the function here   What should the function produce?

III.   Definition

(define (_____ _____)
          function name   variable names
    <u>(cond</u>

```
                                    (circle 50 "solid" "red")
```

)

Translating Value Definitions from Code to Algebra

Racket Code	Algebra
`(define x 10)`	x = 10
`(define y (* x 2))`	y = x*2
`(define z (+ x y))`	
`(define age 14)`	
`(define months (* age 12))`	
`(define days (* months 30))`	
`(define hours (* days 24))`	
`(define minutes (* hours 60))`	

Translating Function Definitions from Code to Algebra

Racket Code	Algebra
`(define (area length width)` `    (* length width))`	area(length, width) = length * width
`(define (circle-area radius)` `    (* pi (sq radius)))`	

`(define (distance x1 y1 x2 y2)`
`    (sqrt (+ (sq (- x1 x2))`
`            (sq (- y1 y2)))))`	

A rocket is flying from Earth to Mars at 80 miles per second. Write a function that describes the **distance** *D* that the rocket has traveled, as a function of **time** *t*.

Every contract has three parts:

; _____D_____ : _____ -> _____
       name   Domain   Range

; _____
                                  What does the function do?

Write an example of your function for <u>some sample inputs</u>

_____D(1)_____ = _____
Use the function here   What should the function produce?

_____D(2)_= _____
Use the function here   What should the function produce?

_____D(   )_____ = _____
Use the function here   What should the function produce?

_____ = _____
Use the function here   What should the function produce?

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

D(   ) = _____

A rocket is traveling from Earth to Mars at 80 miles per second. Write a function that describes the **_time_** the rocket has been traveling, as a function of **_distance_**.

████████████████████████████

Every contract has three parts:

; _____ : _____ -> _____
       name   Domain   Range

; _____
What does the function do?

████████████████████████████

Write an example of your function for <u>some sample inputs</u>

                =
_____
Use the function here   What should the function produce?

                =
_____
Use the function here   What should the function produce?

                =
_____
Use the function here   What should the function produce?

                =
_____
Use the function here   What should the function produce?

████████████████████████████

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

                =
_____

A rocket leaves Earth, headed for Mars at 80 miles per second. **At the exact same time**, an asteroid leaves Mars traveling towards Earth, moving at 70 miles per second. If the distance from the Earth to Mars is 50,000,000 miles, how long will it take for them to meet?

██

Every contract has three parts:

; _____ : _____ -> _____
       name   Domain   Range

; _____
What does the function do?

██

Write an example of your function for <u>some sample inputs</u>

_____ = _____
Use the function here   What should the function produce?

_____ = _____
Use the function here   What should the function produce?

_____ = _____
Use the function here   What should the function produce?

_____ = _____
Use the function here   What should the function produce?

██

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

_____ = _____

Every contract has three parts:

; _____ : _____ -> _____
       name   Domain   Range

; _____

What does the function do?

Write an example of your function for <u>some sample inputs</u>

_____ = _____
Use the function here   What should the function produce?

_____ = _____
Use the function here   What should the function produce?

_____ = _____
Use the function here   What should the function produce?

_____ = _____
Use the function here   What should the function produce?

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

_____ = _____