

# Unidades de Bootstrap

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Planos de  
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de caracteres e  
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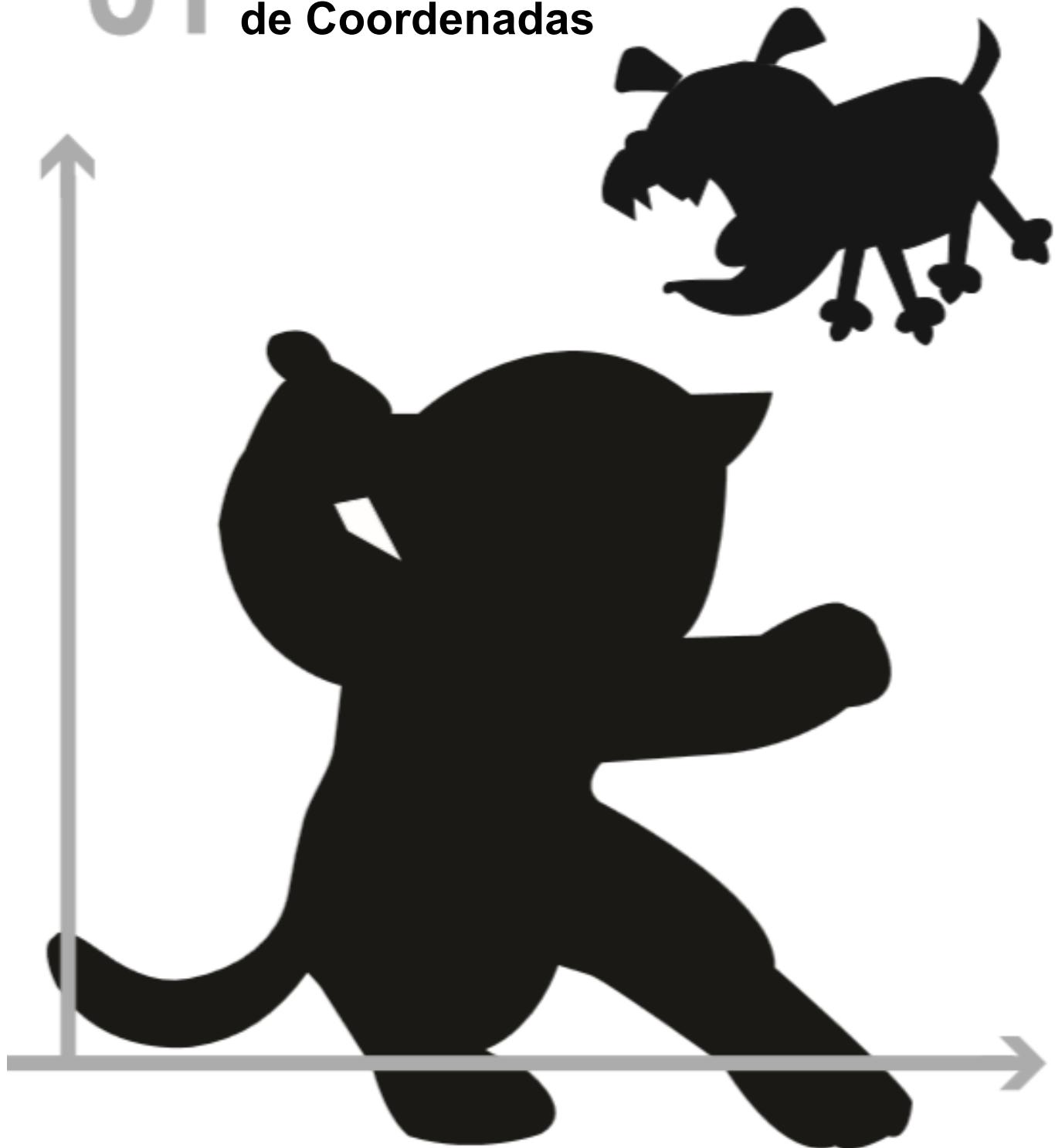
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# 01 Videojuegos y Planos de Coordenadas



## *Nuestro videojuego*

Creado por (escribe tu nombre): \_\_\_\_\_

### **El ambiente**

Nuestro juego se desarrolla en: \_\_\_\_\_  
(¿El espacio? ¿El desierto? ¿Un centro comercial?)

### **El jugador**

*El jugador es un \_\_\_\_\_.*

El jugador se mueve solamente hacia arriba y abajo.

### **El objetivo**

*Tu jugador GANA puntos cuando golpea el objetivo.*

*El Objetivo es un \_\_\_\_\_.*

El Objetivo se mueve solamente de izquierda a derecha.

### **El peligro**

*Tu jugador PIERDE puntos cuando golpea el peligro.*

*El Peligro es un \_\_\_\_\_.*

El Peligro se mueve solamente de izquierda a derecha.

### **I. Círculo de prácticas de evaluación Tiempo: 5 minutos**

No olvides usar los símbolos de la computadora para operaciones como multiplicar y dividir!

<b>Operación matemática</b>	<b>Círculo de evaluación</b>	<b>Código Racket</b>
-----------------------------	------------------------------	----------------------

$$5 \times 10$$

$$8 + (5 \times 10)$$

$$(8 + 2) - (5 \times 10)$$

$$\frac{5 \times 10}{8 - 2}$$

# Lección 2

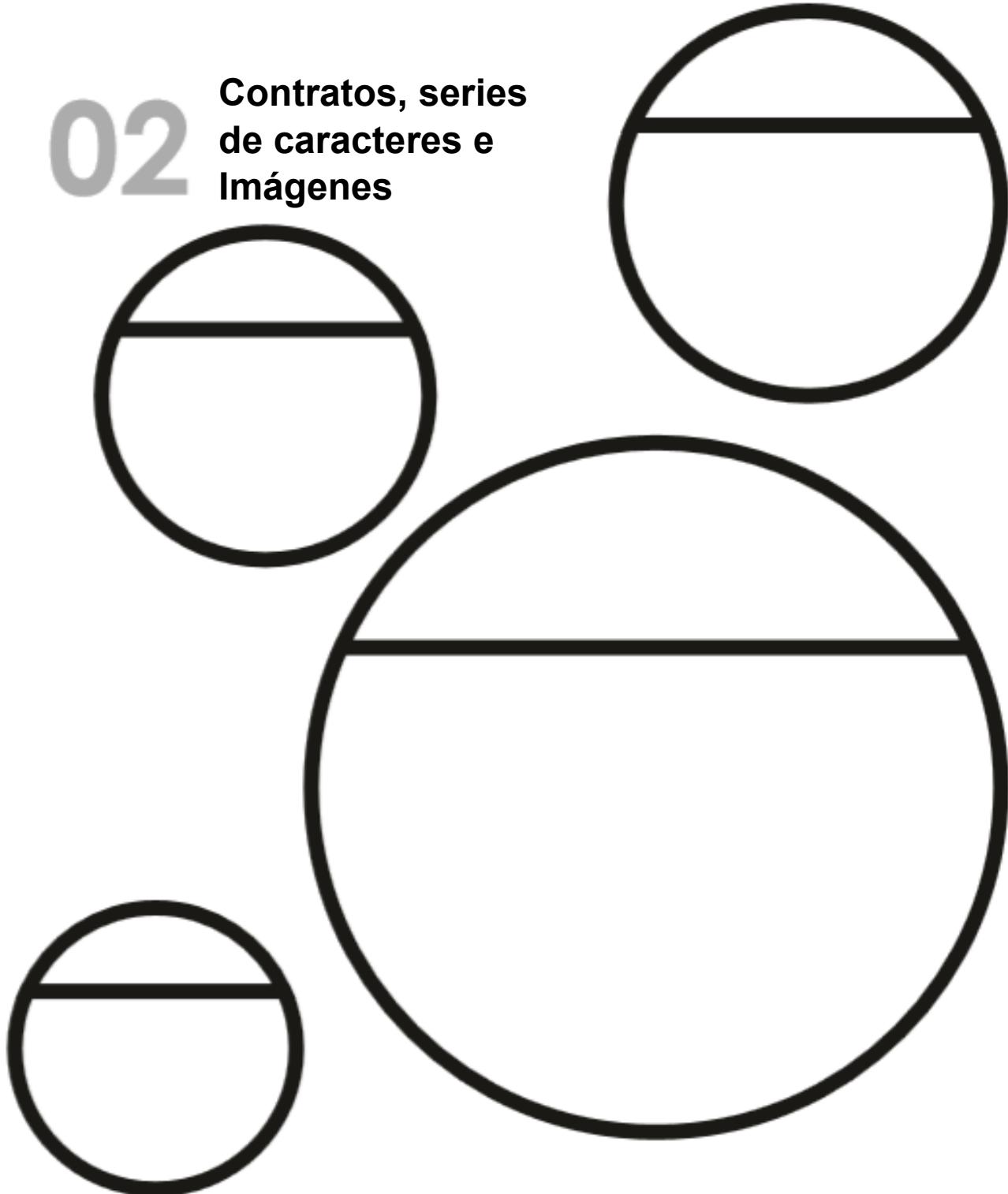
(Dibuja círculos de evaluación aquí si necesitas papel borrador adicional)

## Competencia de círculos Tiempo: 5 minutos

	<i>Operación</i>	<i>Círculo de evaluación</i>	<i>Código Racket</i>
Ronda 1	$(3 * 7) - (1 + 2)$		
Ronda 2	$3 - (1 + 2)$		
Ronda 3	$3 - (1 + (5 * 6))$		
Ronda 4	$(1 + (5 * 6)) - 3$		

# 02

**Contratos, series  
de caracteres e  
Imágenes**



; \_\_\_\_\_ : \_\_\_\_\_ -> \_\_\_\_\_

nombre	dominio	rango
--------	---------	-------

(EJEMPLO (\_\_\_\_\_ \_\_\_\_\_) \_\_\_\_\_)

(EJEMPLO (\_\_\_\_\_ \_\_\_\_\_) \_\_\_\_\_)

(define (\_\_\_\_\_ \_\_\_\_\_) \_\_\_\_\_)

; \_\_\_\_\_ : \_\_\_\_\_ -> \_\_\_\_\_

nombre	dominio	rango
--------	---------	-------

(EJEMPLO (\_\_\_\_\_ \_\_\_\_\_) \_\_\_\_\_)

(EJEMPLO (\_\_\_\_\_ \_\_\_\_\_) \_\_\_\_\_)

(define (\_\_\_\_\_ \_\_\_\_\_) \_\_\_\_\_)

; \_\_\_\_\_ : \_\_\_\_\_ -> \_\_\_\_\_

nombre	dominio	rango
--------	---------	-------

(EJEMPLO (\_\_\_\_\_ \_\_\_\_\_) \_\_\_\_\_)

(EJEMPLO (\_\_\_\_\_ \_\_\_\_\_) \_\_\_\_\_)

(define (\_\_\_\_\_ \_\_\_\_\_) \_\_\_\_\_)

; \_\_\_\_\_ : \_\_\_\_\_ -> \_\_\_\_\_

nombre	dominio	rango
--------	---------	-------

(EJEMPLO (\_\_\_\_\_ \_\_\_\_\_) \_\_\_\_\_)

(EJEMPLO (\_\_\_\_\_ \_\_\_\_\_) \_\_\_\_\_)

(define (\_\_\_\_\_ \_\_\_\_\_) \_\_\_\_\_)

# 03

## Introducción a las Definiciones



## Fast Functions

; gt : number -> image

name	domain	range
(EXAMPLE ( <u>gt</u> <u>500</u> )	<u>(triangle 500 "solid" "green" )</u>	
(EXAMPLE ( <u>gt</u> <u>7</u> )	<u>(triangle 7 "solid" "green" )</u>	
(define ( <u>gt</u> <u>size</u> )	<u>(triangle size "solid" "green" )</u>	

; bc : number -> image

name	domain	range
(EXAMPLE ( <u>bc</u> <u>19</u> )	<u>(circle 19 "solid" "blue" )</u>	
(EXAMPLE ( <u>bc</u> <u>43</u> )	<u>(circle 43 "solid" "blue" )</u>	
(define ( <u>bc</u> <u>size</u> )	<u>(circle size "solid" "blue" )</u>	

; double : number -> number

name	domain	range
(EXAMPLE ( <u>double</u> <u>3</u> )	<u>(* 2 3 )</u>	
(EXAMPLE ( <u>double</u> <u>9</u> )	<u>(* 2 9 )</u>	
(define ( <u>double</u> <u>num</u> )	<u>(* 2 num )</u>	

; \_\_\_\_\_ : \_\_\_\_\_ -> \_\_\_\_\_

name	domain	range
(EXAMPLE ( _____ <u>_____</u> )		<u>_____</u>
(EXAMPLE ( _____ <u>_____</u> )		<u>_____</u>
(define ( _____ <u>_____</u> )		<u>_____</u>

# Fast Functions

; \_\_\_\_\_ : \_\_\_\_\_ -> \_\_\_\_\_

name

domain

range

(EXAMPLE ( \_\_\_\_\_ \_\_\_\_\_ ) \_\_\_\_\_ )

(EXAMPLE ( \_\_\_\_\_ \_\_\_\_\_ ) \_\_\_\_\_ )

(define ( \_\_\_\_\_ \_\_\_\_\_ ) \_\_\_\_\_ )

---

; \_\_\_\_\_ : \_\_\_\_\_ -> \_\_\_\_\_

name

domain

range

(EXAMPLE ( \_\_\_\_\_ \_\_\_\_\_ ) \_\_\_\_\_ )

(EXAMPLE ( \_\_\_\_\_ \_\_\_\_\_ ) \_\_\_\_\_ )

(define ( \_\_\_\_\_ \_\_\_\_\_ ) \_\_\_\_\_ )

---

; \_\_\_\_\_ : \_\_\_\_\_ -> \_\_\_\_\_

name

domain

range

(EXAMPLE ( \_\_\_\_\_ \_\_\_\_\_ ) \_\_\_\_\_ )

(EXAMPLE ( \_\_\_\_\_ \_\_\_\_\_ ) \_\_\_\_\_ )

(define ( \_\_\_\_\_ \_\_\_\_\_ ) \_\_\_\_\_ )

---

; \_\_\_\_\_ : \_\_\_\_\_ -> \_\_\_\_\_

name

domain

range

(EXAMPLE ( \_\_\_\_\_ \_\_\_\_\_ ) \_\_\_\_\_ )

(EXAMPLE ( \_\_\_\_\_ \_\_\_\_\_ ) \_\_\_\_\_ )

(define ( \_\_\_\_\_ \_\_\_\_\_ ) \_\_\_\_\_ )

---

# 04

## Fórmula Del Diseño



1 Contrato

2 Ejemplo

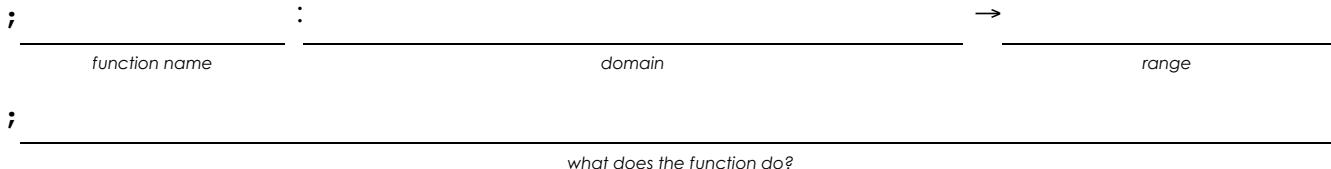
3 Definición

## Problema de palabras: rocket-height

**Direcciones:** 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.

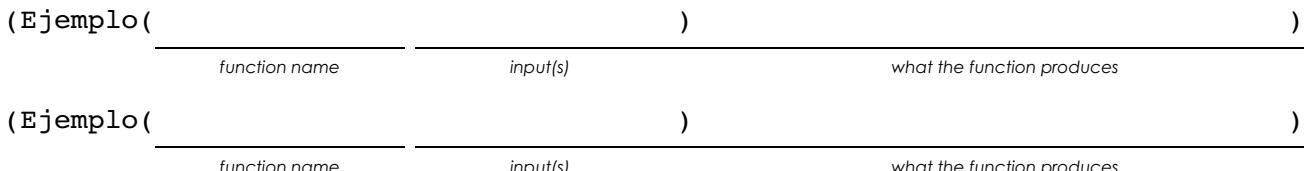
### Declaración de contrato y propósito

Todo contrato tiene 3 partes...



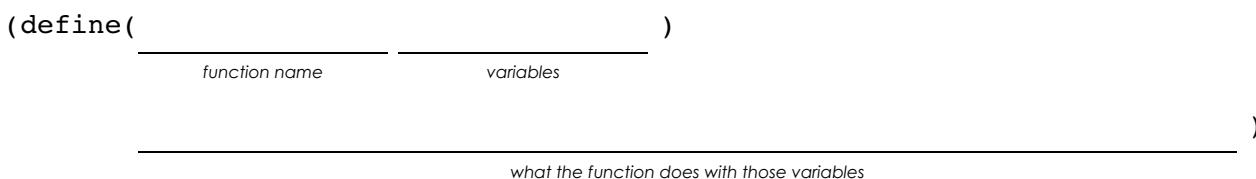
### Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...



### Definición

Escribe la definición, nombres de variables a todos sus valores de entrada...

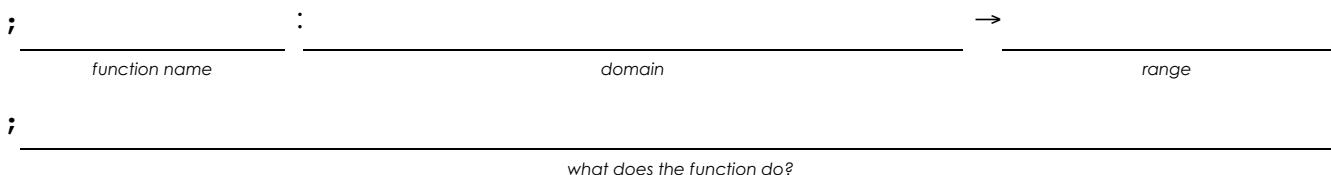


## Problema de palabras: area-cesped

**Direcciones:** Utilizando la Receta de Diseño para escribe una función 'area-cesped', la cual toma el ancho y largo de un área de césped, y calcula el área del césped. (Recuerda: área = largo \* ancho!)

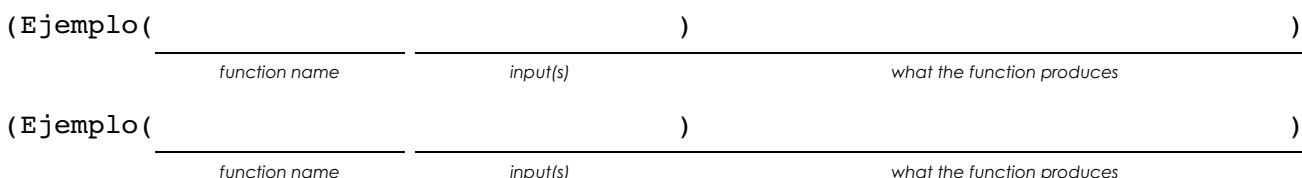
### Declaración de contrato y propósito

Todo contrato tiene 3 partes...



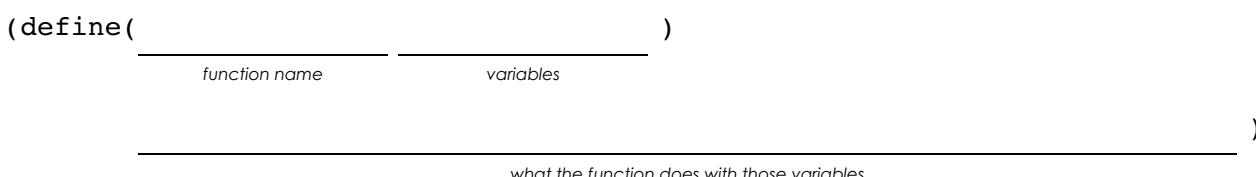
### Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...



### Definición

Escribe la definición, nombres de variables a todos sus valores de entrada...

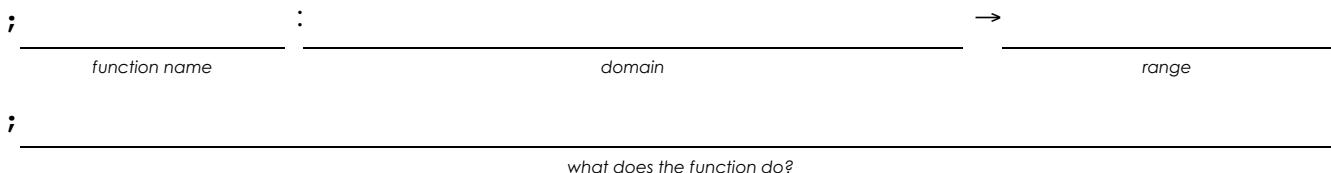


## Problema de palabras: red-square

**Direcciones:** Use the Design Recipe to write a function 'red-square', which takes in a number (the length of each side of the square) and outputs a solid red rectangle whose length and width are the same size.

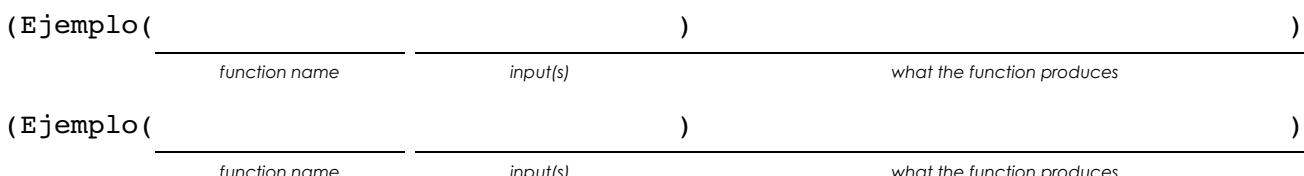
### Declaración de contrato y propósito

Todo contrato tiene 3 partes...



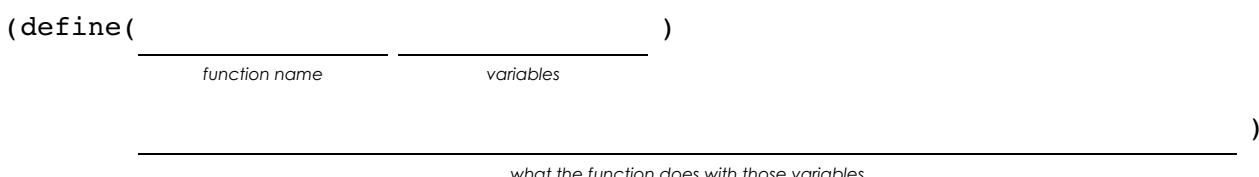
### Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...



### Definición

Escribe la definición, nombres de variables a todos sus valores de entrada...



# objetivo



# peligro



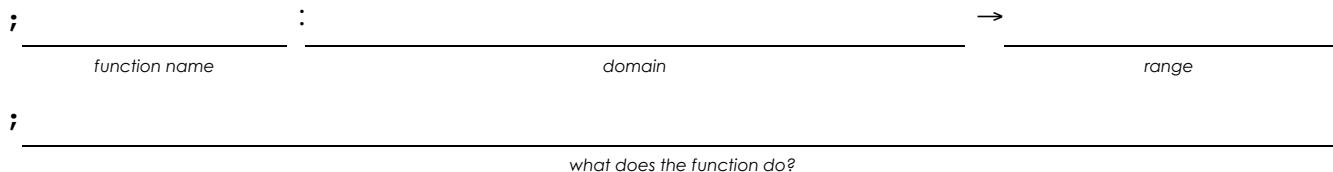
**05** Animación  
Del Juego

# Problema de palabras: update-danger

**Direcciones:** 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.

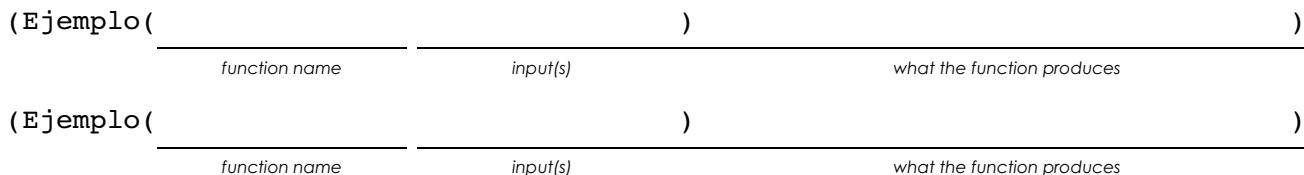
## Declaración de contrato y propósito

Todo contrato tiene 3 partes...



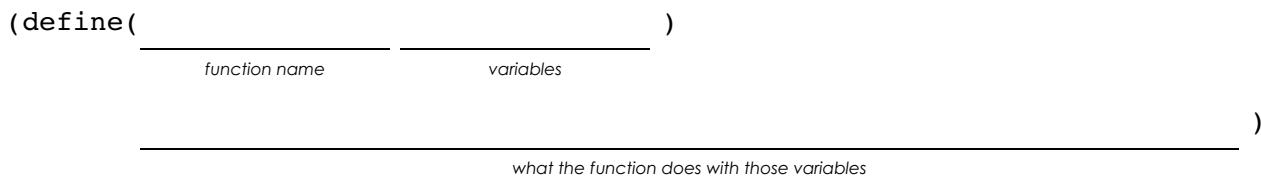
## Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...



## Definición

Escribe la definición, nombres de variables a todos sus valores de entrada...

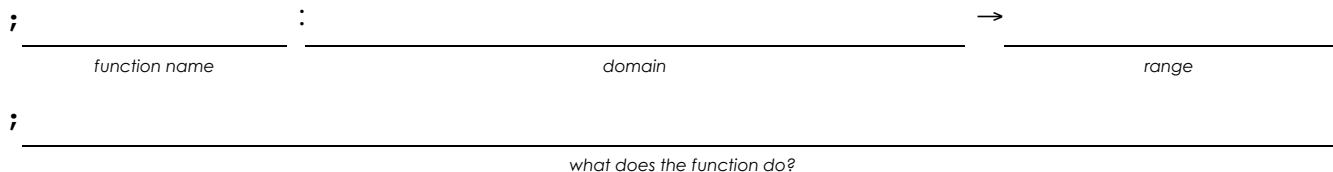


## Problema de palabras: update-target

**Direcciones:** Write a function 'update-target', which takes in the target's x-coordinate and produces the next x-coordinate, which is 50 pixels to the right.

## **Declaración de contrato y propósito**

**Todo contrato tiene 3 partes...**



## Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...

(Ejemplo( function name input(s) ) what the function produces )

(Ejemplo(	)	)
function name	input(s)	what the function produces

## Definición

Escribe la definición, nombres de variables a todos sus valores de entrada...

**(define(** \_\_\_\_\_ **)**  
                 $\overbrace{\text{function name} \quad \text{variables}}$   
**)**  
                 $\overbrace{\text{what the function does with those variables}}$



**¿“Izquierda segura”?**

**06**

**Comparando  
Funciones**

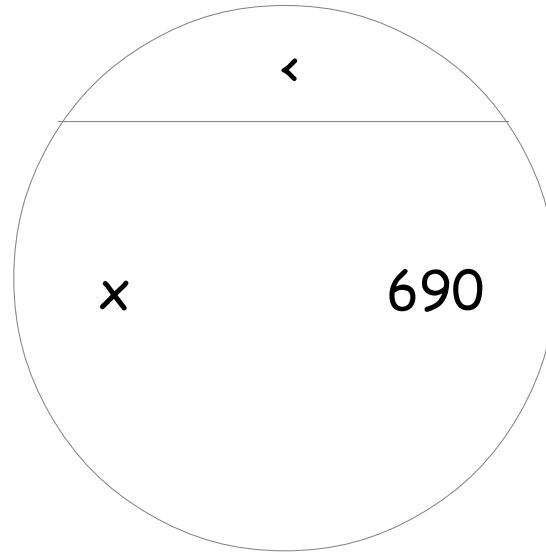
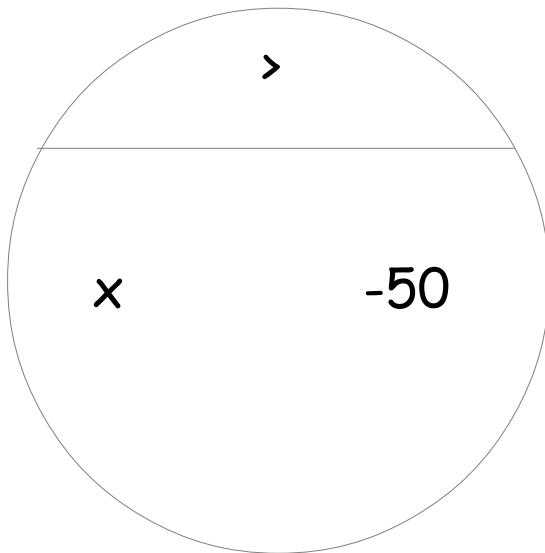
## Protecting Sam

Sam is in a  $640 \times 480$  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...  $\underline{(> \quad x \quad -50)}$

2. A piece of Sam is still visible on the right as long as...  $\underline{(< \quad x \quad 690)}$

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

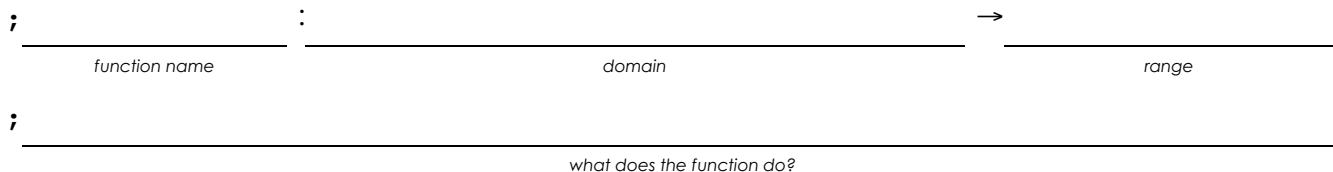


## Problema de palabras: safe-left?

**Direcciones:** 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

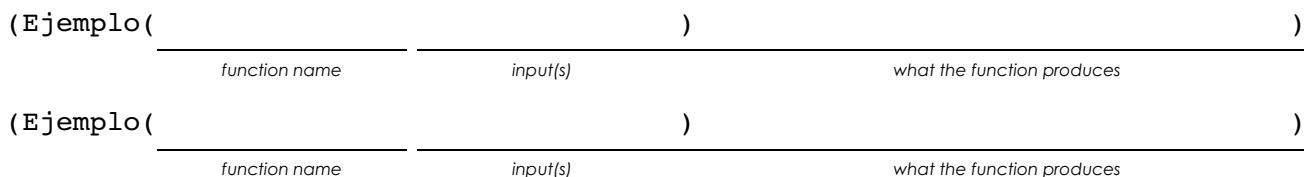
### Declaración de contrato y propósito

Todo contrato tiene 3 partes...



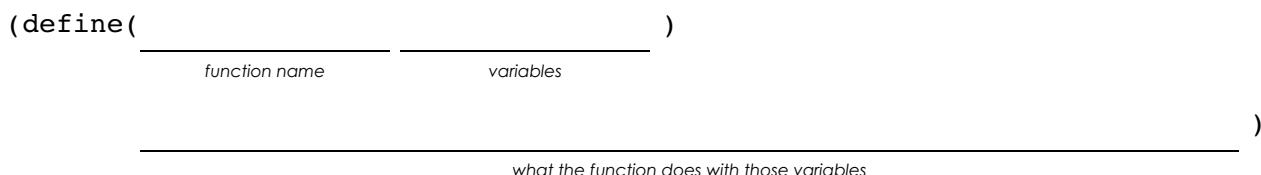
### Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...



### Definición

Escribe la definición, nombres de variables a todos sus valores de entrada...

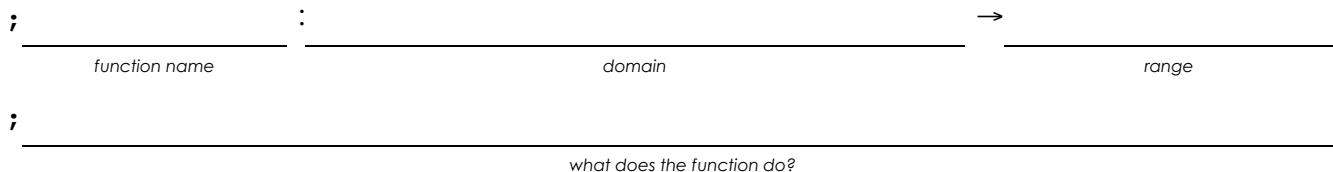


# Problema de palabras: safe-right?

**Direcciones:** 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.

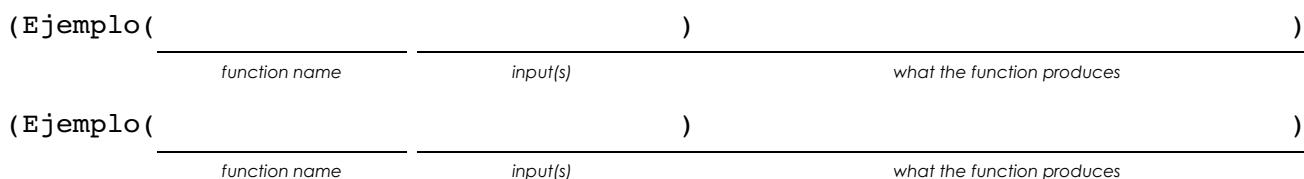
## Declaración de contrato y propósito

Todo contrato tiene 3 partes...



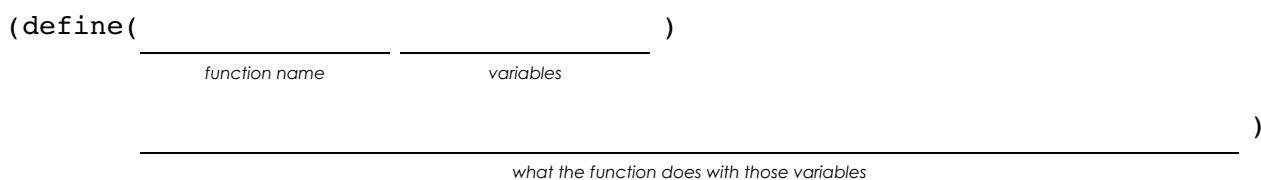
## Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...



## Definición

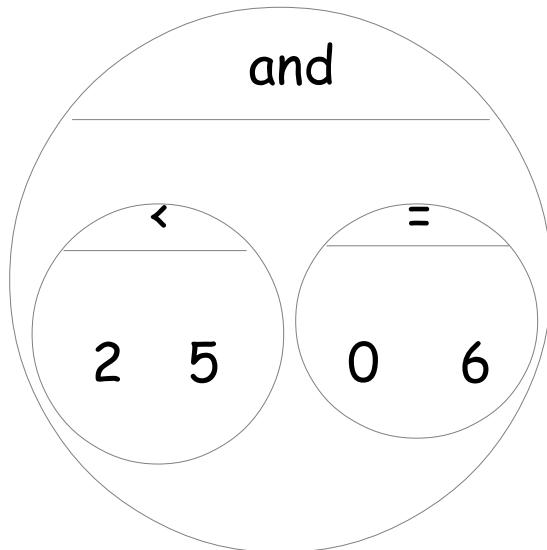
Escribe la definición, nombres de variables a todos sus valores de entrada...



and / or

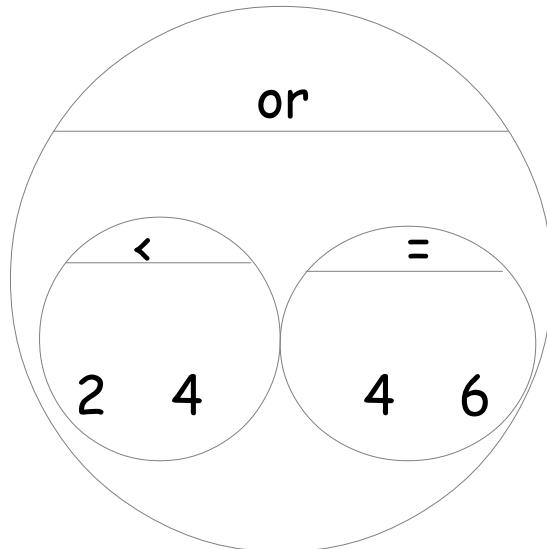
**Write the Circles of Evaluation for these statements, and then convert them to Racket**

1. Two is less than five, and zero is equal to six.



(**and** (< 2 5) (= 0 6))

2. Two is less than four or four is equal to six.



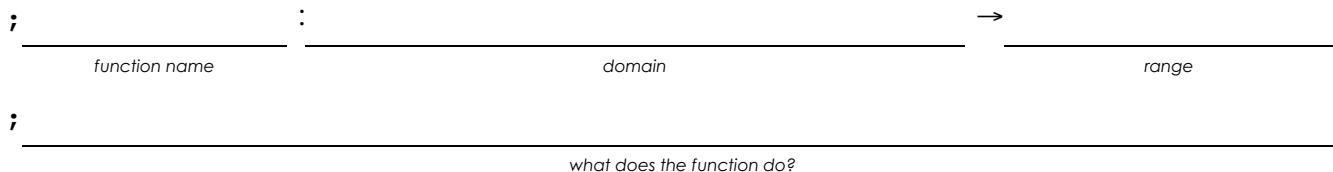
(**or** (< 2 4) (= 4 6))

## Problema de palabras: onscreen?

**Direcciones:** Use the Design Recipe to write a function 'onscreen?', which takes in the x-coordinate and checks to see if Sam is safe on the left AND safe on the right.

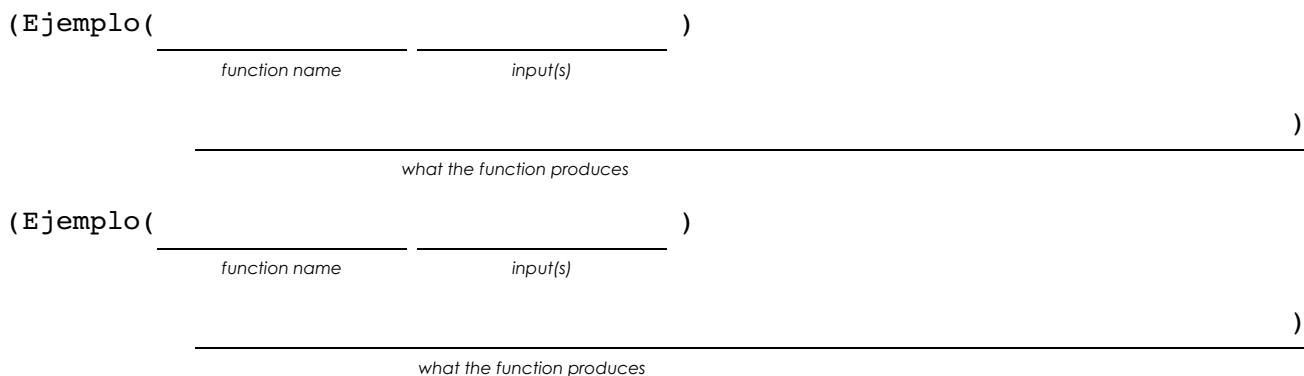
### Declaración de contrato y propósito

Todo contrato tiene 3 partes...



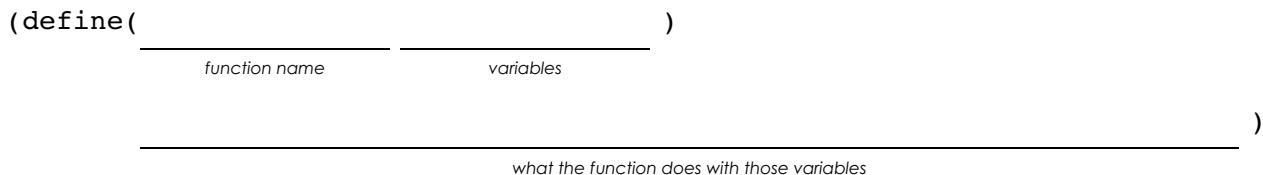
### Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...

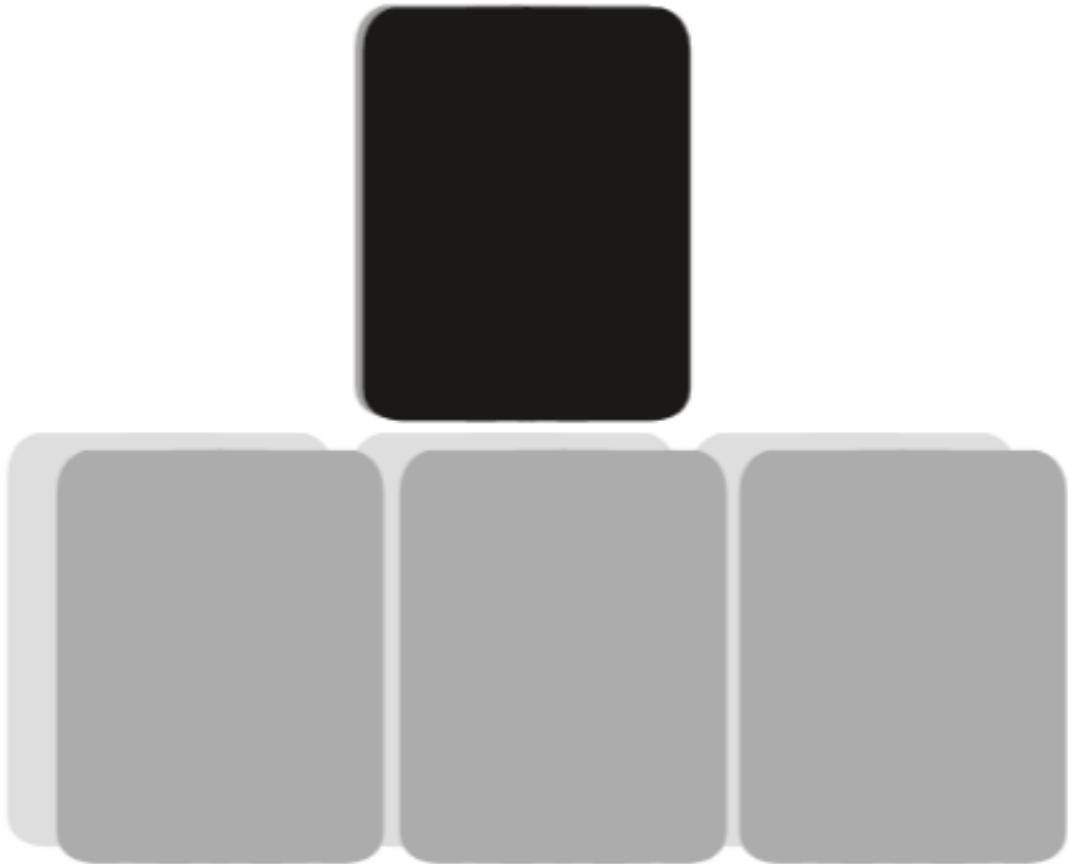


### Definición

Escribe la definición, nombres de variables a todos sus valores de entrada...



# 07 Bifurcación Condicional

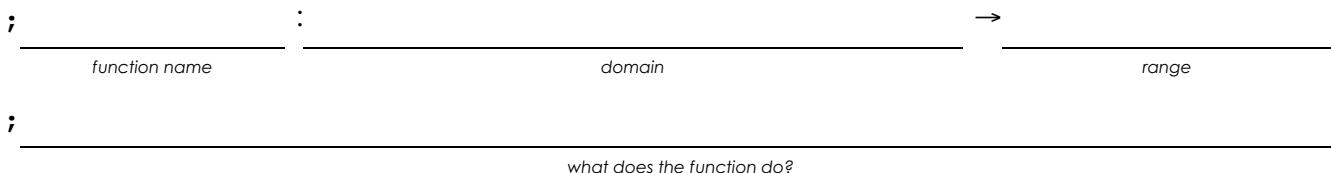


## Problema de palabras: cost

**Direcciones:** 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.

### Declaración de contrato y propósito

Todo contrato tiene 3 partes...



### Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...

(Ejemplo(	cost	"pepperoni"	)
function name	input(s)	what the function produces	
(Ejemplo(		)	)
function name	input(s)	what the function produces	
(Ejemplo(		)	)
function name	input(s)	what the function produces	
(Ejemplo(		)	)
function name	input(s)	what the function produces	

### Definición

Escribe la definición, nombres de variables a todos sus valores de entrada...

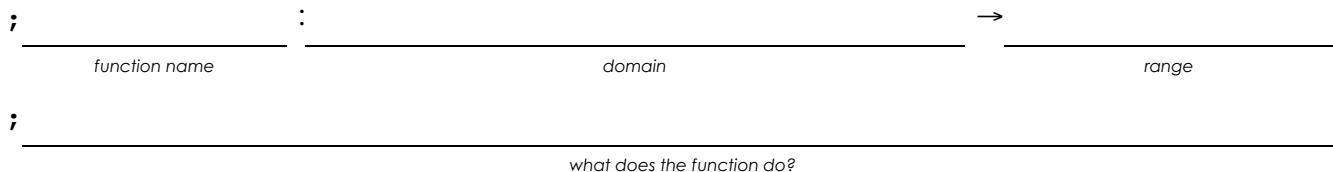
(define(	)
function name	variables
(cond	
[	]
[	]
[	]
[	]
[	))

## Problema de palabras: update-player

**Direcciones:** Write a function called *update-player*, which takes in the player's y-coordinate and the name of the key pressed, and returns the new y-coordinate.

### Declaración de contrato y propósito

Todo contrato tiene 3 partes...



### Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...

(Ejemplo(	update-player	320 "up" )	)
	function name	input(s)	what the function produces
(Ejemplo(	update-player	100 "up" )	)
	function name	input(s)	what the function produces
(Ejemplo(		)	)
	function name	input(s)	what the function produces
(Ejemplo(		)	)
	function name	input(s)	what the function produces

### Definición

Escribe la definición, nombres de variables a todos sus valores de entrada...

(define(		)	)
	function name	variables	
(			)
[			]
[			]
[			))

## 08 Detección de Colisiones

# colisión



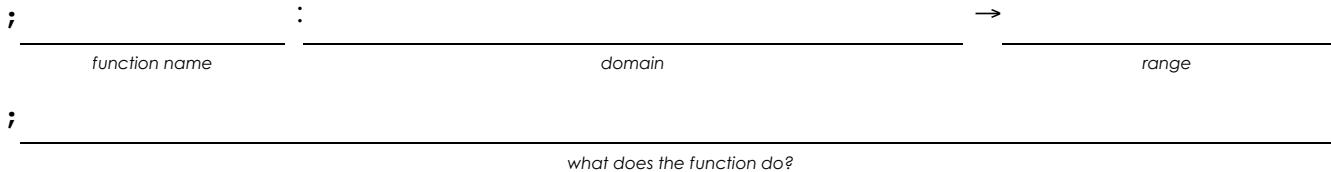
distancia

## Problema de palabras: line-length

**Direcciones:** Write a function called 'line-length', which takes in two numbers and returns the \*positive difference\* between them. It should always subtract the smaller number from the bigger one, and if they are equal it should return zero.

### Declaración de contrato y propósito

Todo contrato tiene 3 partes...



### Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...

(Ejemplo(	line-length	10 5 ) ( - 10 5 )	)
	function name	input(s)	what the function produces
(Ejemplo(	line-length	2 8 ) ( - 8 2 )	)
	function name	input(s)	what the function produces

### Definición

Escribe la definición, nombres de variables a todos sus valores de entrada...

```
(define( _____ )  
  _____  
(cond  
  _____  
 [ _____ ] )  
 [ _____ ] ))
```

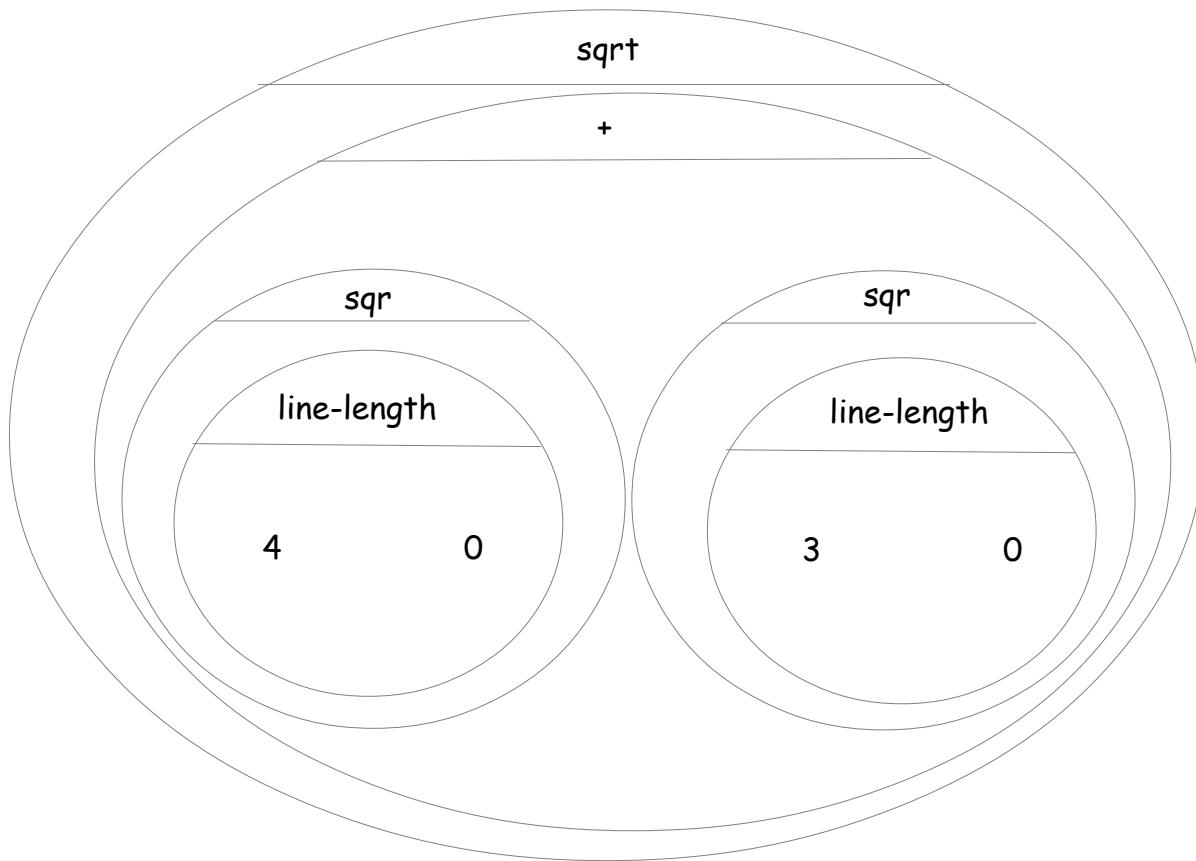
## The Distance Formula (an example)

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:

```
(sqrt (+  (sqr (line-length 4 0))
      (sqr (line-length 3 0)))))
```

## Problema de palabras: distance

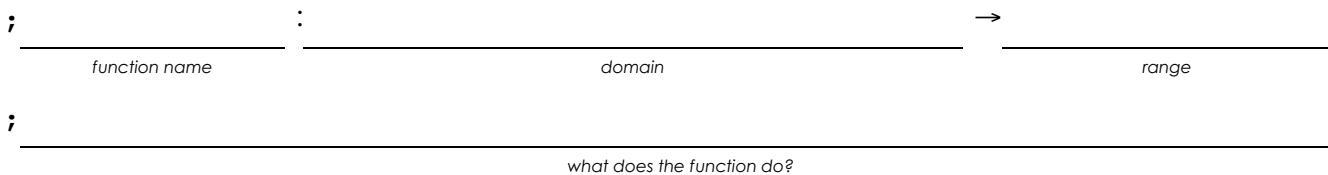
**Direcciones:** Write a function *distance*, which takes FOUR inputs:

- *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 return the distance between the two, using the Distance formula. (HINT: look at what you did on the previous page!)

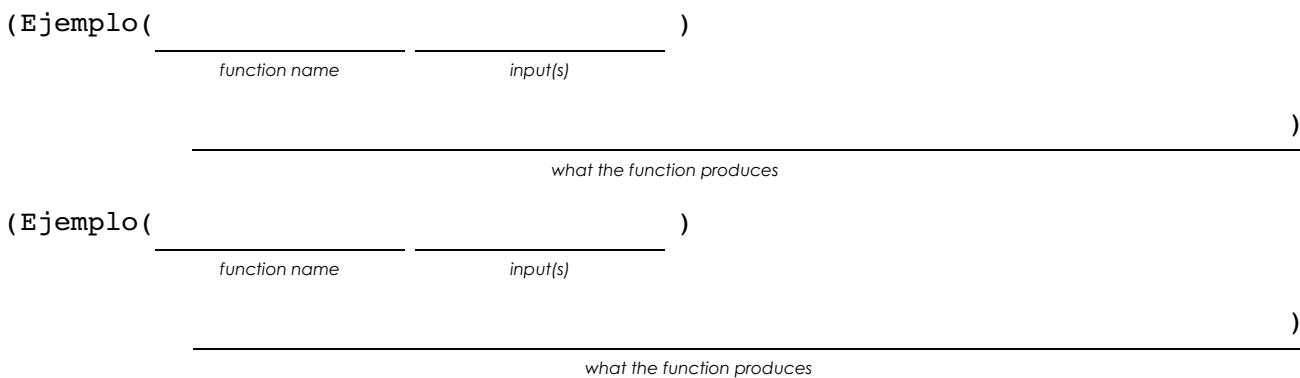
### Declaración de contrato y propósito

Todo contrato tiene 3 partes...



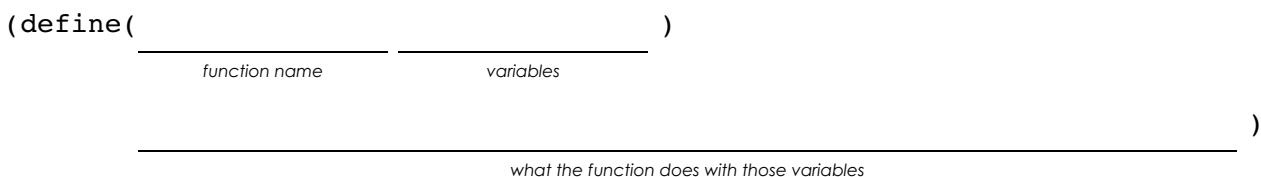
### Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...



### Definición

Escribe la definición, nombres de variables a todos sus valores de entrada...



## Problema de palabras: collide?

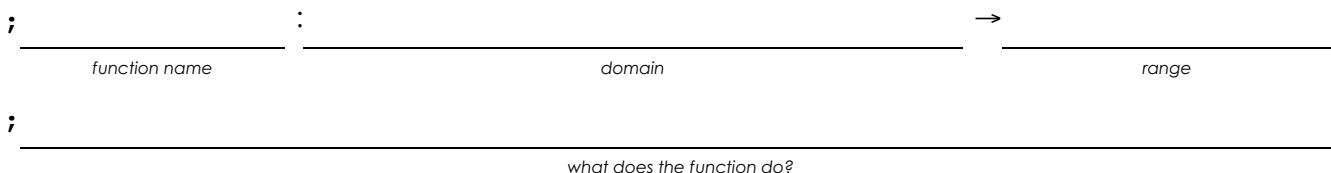
**Direcciones:** Write a function `collide?`, which takes FOUR inputs:

- `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

Are the coordinates of the player within 50 pixels of the coordinates of the other character?

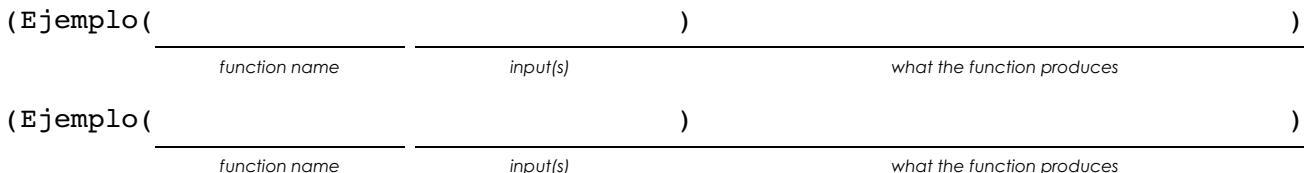
### Declaración de contrato y propósito

Todo contrato tiene 3 partes...



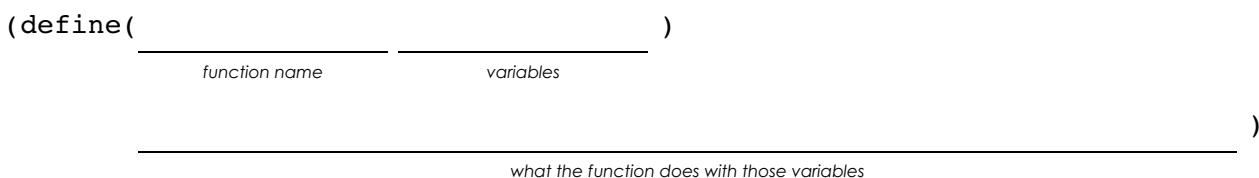
### Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...



### Definición

Escribe la definición, nombres de variables a todos sus valores de entrada...





## 09 Preparación de la presentación



# Lesson 9

Catchy Intro: Feel like you never get enough to eat? So does Leo. Come catch your prey, and escape the zookeeper!

---

Name, Age, Grade: Jessica Programmer, 12, 7<sup>th</sup> grade

---

Game Title: Run for your Supper

---

Back Story:One day, a young lion was sitting in his cage. He saw an escaped gazelle come running past. It was lunch time, and he was hungry, so he leapt out to catch food. He has to run fast to grab food and escape the evil zookeeper.

---

Characters: Player: Leo the lion.

---

Danger: Zoe Zookeeper.

---

Target: Gary Gazelle

---

Explain a piece of your code: My update-danger function takes in the current x coordinate of the gazelle, and adds 50 to it. This moves the gazelle 50 pixels to the right.

---

---



## Presentation Feedback

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!

## Presentation Feedback

For each question, circle the answer that fits best.

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

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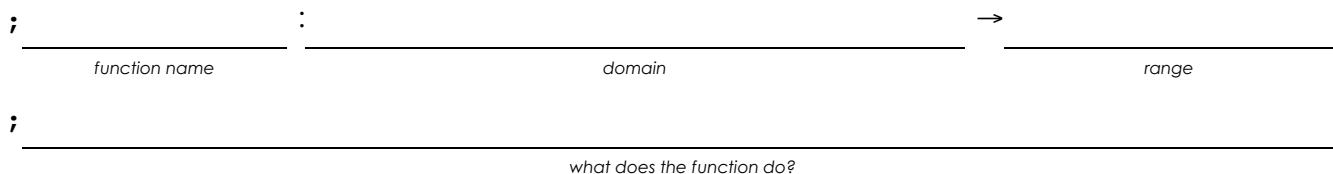
Did they make eye contact?      No way!      A little.      Definitely!

## Problema de palabras: red-shape

**Direcciones:** Write a function called red-shape, which takes in the name of a shape and draws that shape (solid and red). Add an else clause that produces a sensible output.

## **Declaración de contrato y propósito**

**Todo contrato tiene 3 partes...**



## Ejemplos

Escribe algunos ejemplos, luego circula y marca los cambios...

(Ejemplo(	<u>red-shape</u>	"circle"	)	(circle 50 "solid" "red")	)
	function name	input(s)		what the function produces	
(Ejemplo(			)		)
	function name	input(s)		what the function produces	
(Ejemplo(			)		)
	function name	input(s)		what the function produces	
(Ejemplo(			)		)
	function name	input(s)		what the function produces	

## Definición

Escribe la definición, nombres de variables a todos sus valores de entrada....

```
(define( _____ )  
  _____  
  
(cond  
  _____  
  
  [ _____ (circle 50 "solid" "red") ]  
  
  [ _____ ]  
  
  [ _____ ]  
  
  [ _____ ]  
  
  [ _____ ]))
```

# Translating into Algebra

## Value Definitions

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

## Function Definitions

Racket Code	Algebra
(define (area length width) (* length width))	$area(length, width) = length \cdot width$
(define (circle-area radius) (* pi (sqr radius)))	$circle-area(radius) = \pi \cdot radius^2$
(define (distance x1 y1 x2 y2) (sqrt (+ (sqr (- x1 x2)) (sqr (- y1 y2))))))	$distance(x_1, y_1, x_2, y_2) = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

# Design Recipe

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**  $t$ .

## I. Contract+Purpose Statement

Every contract has three parts:

$; \underline{D} :$	<b>Number</b>	$\rightarrow$	<b>Number</b>
	name	Domain	Range
$; \underline{\text{Given the number of seconds, produce the height of the rocket if it moves at 80mi/sec}}$			<i>What does the function do?</i>

## II. Give Examples

Write an example of your function for some sample inputs

$$D(1) = 80 * 1$$

Use the function here

What should the function produce?

$$D(2) = 80 * 2$$

Use the function here

What should the function produce?

$$D(3) = 80 * 3$$

Use the function here

What should the function produce?

$$D(4) = 80 * 4$$

Use the function here

What should the function produce?

## III. Definition

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

$$D(\text{time}) = 80 * \text{time}$$

# Design Recipe

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.

## I. Contract+Purpose Statement

Every contract has three parts:

;	<b>time</b>	:	<b>Number</b>	->	<b>Number</b>
	name		Domain		Range
;	<u>Given the distance, produce the time-traveled if it moves at 80mi/sec</u>				
	<i>What does the function do?</i>				

## II. Give Examples

Write an example of your function for some sample inputs

**time(0) = 0/80**

Use the function here	What should the function produce?
-----------------------	-----------------------------------

**time(10) = 10/80**

Use the function here	What should the function produce?
-----------------------	-----------------------------------

**time(80) = 80/80**

Use the function here	What should the function produce?
-----------------------	-----------------------------------

**time(190) = 190/80**

Use the function here	What should the function produce?
-----------------------	-----------------------------------

## III. Definition

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

$$\text{time}(\text{distance}) = \text{distance}/80$$

# Design Recipe

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?

## I. Contract+Purpose Statement

**Every contract has three parts:**

; **collide** : **Number** -> **Number**

name	Domain	Range
------	--------	-------

; Given the distance between a rocket (moving at 80mi/sec) & asteroid (70mi/sec), when will they collide?  
What does the function do?

## II. Give Examples

Write an example of your function for some sample inputs

collide(0) = 0/150

Use the function here      What should the function produce?

`collide(150) = 150/150`

---

Use the function here      What should the function produce?

`collide(700) = 700/150`

Use the function here      What should the function produce?

`collide(50,000,000) = 50,000,000/150`

Use the function here      What should the function produce?

### III Definition

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

`collide(distance-between) = distance-between/150`

# Design Recipe

## I. Contract+Purpose Statement

Every contract has three parts:

; \_\_\_\_\_ : \_\_\_\_\_ -> \_\_\_\_\_  
name Domain Range

; \_\_\_\_\_  
*What does the function do?*

## II. Give Examples

Write an example of your function for some sample inputs

=  
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?

## III. Definition

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

=  
\_\_\_\_\_

# Design Recipe

## I. Contract+Purpose Statement

Every contract has three parts:

;  
; \_\_\_\_\_  
*What does the function do?*

## **II. Give Examples**

Write an example of your function for some sample inputs

=  
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?

### **III. Definition**

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

## Contracts

## Contracts