Mathematics in Julia 🍕

This is an introduction to programming. Let's get started!

Let's make a calculator!

First let's do some simple math with setting **a = 2**, **b = 6** and **c = a * b**. What will **c** equal?

Type in the cells (with the coloured background) below and press `Shift-Enter` or the click the right-arrow button (▶️) to the right to execute the cell after changing the values.

```
a = 2
```

```
a = 2
```

```
b = 6
```

```
b = 6
```

Fix the value of `c` below to make it `c = a * b`

```
c = 12
```

```
c = a*b
```

Got it!

Great! The value of c = 12. So you now have a simple computer!

Now go back above and change the value of **a = 2** to **a = 5** and press `Shift-Enter`. What is the new value of **c**? Notice how all the values get updated in this notebook!

Now you have a calculator!

You did multiplication above. Here's how you do other mathematical operations:

Operation	Type This
add	+
subtract	-
multiply	*
divide	/
power	^

Pizza Slices

Let's try this out on a problem. Let's say you want to order pizzas for 10 people (**people = 10**) and each person wants 2.5 slices on average (**avg = 2.5**). A pizza has 8 slices per pizza (**slices = 8**). How many pizzas should you order (**pizzas = ?**)? So we have the following

Meaning	Variable
Number of people	people
Average number of slices each person eats	avg
Number of slices on a piece of pizza	slices

```
people = 10
```
```
  people = 10
```

```
avg = 2.5
```
```
  avg = 2.5
```

```
slices = 8
```
```
  slices = 8
```

Edit the equation below to calculate the number of pizzas to order using the variables above for **people**, **avg**, and **slices**:

```
pizzas = 4.0
```
```
  pizzas = ceil(people * avg / slices )
```

Got it!

Yes that is right, that's a lot of pizza! Excellent, you figured out we need to round up the number of pizzas!

Writing your own math functions

The area of a pizza is $A = \pi r^2$. Lets try calculating the area of a pizza that has a radius of 6 inches (**r = 6**). Type **pi** to get the value of π and **r^2** to get the radius squared.

```
r = 6
```

```
r = 6
```

```
A = 113.09733552923255
```

```
A =  pi * r^2
```

Got it!

Great! You figured it out. Keep going.

The diameter of a pizza is often stated on a menu so let's define a **formula** to calculate the area of a pizza given the diameter **d**.

We do this by writing a formula like this: `area(d) = pi * (d/2)^2`

Let's write that below:

```
area (generic function with 1 method)
```

```
area(d) = pi * (d / 2)^2
```

Now we have a function called **area** that we can pass any diameter and it will return the area of a pizza (or circle), let's try that with the pizza from before with `area(2*r)` to get the area of the pizza:

```
A2 = 113.09733552923255
```
```
A2 = area(2*r)
```

Got it!

Great! You got the right answer! Let's move on to the next section.

Finding the best pizza deal

Let's see if a larger pizza is a better value by calculating the price per area. There are 4 sizes: small, medium, large, extra large with the following prices:

Size	Diameter (inches)	Price ($)
small	9	13.10
medium	13	20.95
large	15	24.90
XL	17	30.95

1. How many small pizzas is the same as one XL pizza?

Edit the expression below:

```
smalls_in_xl = 3.5679012345679015
```
```
smalls_in_xl = area(17)/area(9)
```

Great! You got it right. Let's move on.

2. Calculate the cost per area of each pizza:

```
small = 0.2059189880991436
```
```
small = 13.10 / area(9)
```

```
medium = 0.15783649977634118
```
```
medium = 20.95 / area(13)
```

```
large = 0.14090517628402466
```
```
large = 24.90 / area(15)
```

```
xl = 0.1363555844621221
```
```
xl = 30.95 / area(17)
```

Which size of pizza is the best deal? Write your answer below and assign it to the variable **best_value**.

```
best_value = 0.1363555844621221
```
```
best_value = xl
```

Got it!

Great! You got the right answer! Let's move on to the next section.

3. Is this a good deal?

San Marinos has a special **"Buy two medium pizzas and save $5"**. Is this a better deal than buying a extra-large pizza?

Calculate the total cost of two medium pizzas deal (saving $5):

```
two_medium_cost = 36.9
```
```
two_medium_cost = 20.95 * 2 - 5
```

Calculate the total area of two medium pizzas:

```
two_medium_area = 265.4645792283375
```
```
two_medium_area = 2 * area(13)
```

Now calculate cost per area by taking the total cost of two medium pizzas and divide by the total area:

```
two_medium_deal = 0.13900159526842457
```
```
two_medium_deal = two_medium_cost / two_medium_area
```

Is it a better deal to get two medium pizzas for $5 off or to just buy an extra-large?

```
#No it's not.
```

4. Advanced Problem

A new worker at a pizza shop was getting paid for cutting pizza into pieces. The pieces of pizza could be any size. Calculate the maximum number of pieces the worker could make with two cuts of the pizza.

```
cuts2 = 4
```

```
cuts2 = 4
```

Got it!

Awesome!

Now what about 3 cuts across the pizza? What is the maximum number of pieces that can be made with **3 cuts**?

```
cuts3 = 7
```

```
cuts3 = 7
```

Got it!

You got it right. Now for something harder...

Now, how many pieces can be made with **4 cuts**?

```
cuts4 = 11
```

```
cuts4 = 11
```

Got it!

That was a tough question. How did you figure it out? You tried hard.

Are you starting to see a pattern? Can you figure out a formula for how many pieces of pizza can be made with "n" cuts? Make a table and fill in the number of pieces for a number of cuts and see if you can find the pattern:

Cuts	Pieces
0	1
1	2
2	4
3	
4	

Hint

[illegible]

Hint

[illegible]

To get an extra hint, figure out how many slices we can get from **5 cuts**:

```
cuts5 = 16
```

```
cuts5 = 16
```

Hint

[illegible]

Have you found the pattern? Write down the formula below:

```
pieces (generic function with 1 method)
```

```
function pieces(n)
    return n* (n+1)/2 +1
end
```

Let's test your formula!

Move the slider to change the number of cuts:

Testing...

For 25 cuts, you predict 326.0 pieces.

Got it!

Well done!