Game

Part 5

Operation % AND //

15/2=? 7.5

15%2=? Modulus or Remainder 1

23%4=? 3

15//2=? Quotient 7

Question

How to line 195 squares as matrix?
Let say 15 squares in a row, and
we make 13 rows.

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(45):

    s = Square(i * 30, 0, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)


...
pygame.quit()
```

Let's create 45 square first. What do you think how the squares would appear?

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(45):

    s = Square(i * 30, 0, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)


...
pygame.quit()
```

It forms a line. That is normal. As x is going to be (0, 30, 60, 90, 120.....)

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(45):

    s = Square(i * 30, i * 30, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)


...
pygame.quit()
```

Can we try the same thing for y? Like i * 30?

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(45):

    s = Square(i * 30, i * 30, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)


...
pygame.quit()
```

It now forms a diagonal line, which is not good. But we are getting closer.

What do we want again?

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(45):

    s = Square(i * 30, i * 30, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)


...
pygame.quit()
```

We want y value to be the same for the first 15 squares and a different value for the second 15 squares. And another value for the third 15 squares.

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(45):

    s = Square(i * 30, i * 30, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)


...
pygame.quit()
```

So how does it work. How many groups of 15 do we have? In the sense of division, what are we looking for?

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(45):

    s = Square(i * 30, i // 15 * 30, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)


...
pygame.quit()
```

This // operator does exactly what we want. When i is between 0 to 14 (the first 15 squares), i // 15 gives us zero.

What does it give when i is 15-29?

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(45):

    s = Square(i * 30, i // 15 * 30, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)


...
pygame.quit()
```

So now y position seem to be good now. Let's work on x.
We need x to behave like (0, 30, 60, …., 420)
Then repeat (0, 30, 60, …., 420)
We don't want it to go beyond 420.

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(45):

    s = Square(i * 30, i // 15 * 30, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)


...
pygame.quit()
```

Remember %?
This operator doesn't care about quotient and it only cares about the remainder.

What does it mean? It does not care which group you are in, but rather the position you are at.

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(45):

    s = Square(i * 30, i // 15 * 30, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)



...
pygame.quit()
```

When i is 0 - 14
i % 15 give us (0, 1, 2,….14)
i % 15 is the order of the square in a group. It can never be greater than 14.

When i = 0, i % 15, 0
When i = 1, i % 15, 1
2, 2
3, 3,

I 15-29
15 % 15, 0
16 % 15, 1
17 % 15, 2
18 % 15, 3

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(45):

    s = Square(i * 30, i // 15 * 30, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)


...
pygame.quit()
```

I 15-29
15 % 15, 0
16 % 15, 1
17 % 15, 2
18 % 15, 3

I 30-44
30 % 15, 0
31 % 15, 1
32 % 15, 2

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(45):

    s = Square(i % 15 * 30, i // 15 * 30, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)


...
pygame.quit()
```

For the second group, meaning i is 15-29

i % 15 still gives us (0-14)

Like we said before. It does not care which group you are in. It only cares which position the square is within a group.

matrix

```
import pygame
...

allspriteslist = pygame.sprite.Group()

for i in range(195):

    s = Square(i % 15 * 30, i // 15 * 30, 20, 1, 1,(random.randint(150, 250), 0, 0))

    allspriteslist.add(s)

my_square = Square(300, 200, 40, 0, 0, (random.randint(100, 255), 100, 0))
allspriteslist.add(my_square)


...
pygame.quit()
```

Let's change it to 195 squares

We are going to display words and times...

choose your font

```
import pygame
...

pygame.init()
screen = pygame.display.set_mode([800,600])
pygame.display.set_caption('Snake Example')
clock = pygame.time.Clock()

background_colour = (0,0,0)

print(pygame.font.get_fonts())

done = False
while not done:

...
pygame.quit()
```

pygame.font.get_fonts()

let you know what fonts are available in your system.

Let's print it out and see what your have.

Create a font object ----

```
SysFont(name, size, bold=False, italic=False)
```

```
import pygame
...


print(pygame.font.get_fonts())

font = pygame.font.SysFont("comicsansmsttf", 72)
print(font)

done = False
while not done:

...
pygame.quit()
```

And we create a font object using this line of code. You can use other font if you want. 72 is the size your want it to be.

Draw text on screen 1 ----

```
render(text, antialias, color, background=None)
```

```
import pygame
...


print(pygame.font.get_fonts())

font = pygame.font.SysFont("comicsansmsttf", 72)
text = font.render('bulabula', False, (0, 255, 0), (0, 0, 255))

done = False
while not done:

...
pygame.quit()
```

Having a font object does not display text. We need to create a font object with our desired String

Draw text on screen 2 ----

```
render(text, antialias, color, background=None)
```

antialias?

```
import pygame
...


print(pygame.font.get_fonts())

font = pygame.font.SysFont("comicsansmsttf", 72)
text = font.render('bulabula', False, (0, 255, 0), (0, 0, 255))

done = False
while not done:

...
pygame.quit()
```

Antialias is to smooth your text. If you don't want it pixelated. Say True here.

Draw text on screen 3 ----

`render(text, antialias, color, background=None)`

```
import pygame
...


print(pygame.font.get_fonts())

font = pygame.font.SysFont("comicsansmsttf", 72)
text = font.render('bulabula', False, (0, 255, 0), (0, 0, 255))

done = False
while not done:

...
pygame.quit()
```

You need to give it a colour of course. But the second colour is optional you don't have to give the second colour if you don't want any background colour on your text.

Draw text on screen 4 ----

`render(text, antialias, color, background=None)`

```
import pygame
...


print(pygame.font.get_fonts())

font = pygame.font.SysFont("comicsansmsttf", 72)
text = font.render('bulabula', False, (0, 255, 0), (0, 0, 255))
print(text.get_width())
print(text.get_height())

done = False
while not done:

...
pygame.quit()
```

Width? height?

Text object also has its function too. So let's try to see how big the text is on the screen.

Draw text on screen 5 ---- `blit`

```
import pygame
...
font = pygame.font.SysFont("comicsansmsttf", 72)
text = font.render('bulabula', False, (0, 255, 0), (0, 0, 255))


done = False
while not done:
...

    screen.fill(background_colour)
    screen.blit(text, (320 - text.get_width() // 2, 240 - text.get_height() // 2))
    allspriteslist.draw(screen)

    clock.tick(120)
...
pygame.quit()
```

Last step:

You will need to display your text with this screen.blit() function

It takes two argument (String, Tuple)

What is Tuple? A set of value like list but you can't change it later. So it would be (String, (int , int))

Be careful with the bracket.

Challenge

How to move the text in the front of square?

How to change the background of text as transparent?

How to make the text bigger?

Answer

```
import pygame
...
font = pygame.font.SysFont("comicsansmsttf", 100)
text = font.render('bulabula', False, (0, 255, 0))


done = False
while not done:
...

    screen.fill(background_colour)
    allspriteslist.draw(screen)
    screen.blit(text, (320 - text.get_width() // 2, 240 - text.get_height() // 2))

    clock.tick(120)
...
pygame.quit()
```

Add TIME 1 pygame.time.get_ticks (get the time in milliseconds)

```
import pygame
...

done = False
while not done:
...
    screen.fill(background_colour)
    allspriteslist.draw(screen)
    screen.blit(text, (320 - text.get_width() // 2, 240 - text.get_height() // 2))

    print(pygame.time.get_ticks()//1000)

    clock.tick(120)
...
pygame.quit()
```

Remember how to get elapsed time in pygame?

pygame.time.get_ticks()

This comes in millisecond.

What is one second in millisecond?

Add TIME 2 create time object

```
import pygame
...

done = False
while not done:
...
    screen.fill(background_colour)
    allspriteslist.draw(screen)
    screen.blit(text, (320 - text.get_width() // 2, 240 - text.get_height() // 2))

    print(pygame.time.get_ticks()//1000)
    time = font.render(pygame.time.get_ticks()//1000, False, (0, 255, 0), (0, 0, 255))


    clock.tick(120)

...
pygame.quit()
```

Oh wait! Can you use this directly?

This render function takes a String for the first argument. We need to convert it.

Add TIME 3 create time object

```
import pygame
...

done = False
while not done:
...
    screen.fill(background_colour)
    allspriteslist.draw(screen)
    screen.blit(text, (320 - text.get_width() // 2, 240 - text.get_height() // 2))

    print(pygame.time.get_ticks()//1000)
    time = font.render(str(pygame.time.get_ticks()//1000), False, (0, 255, 0), (0, 0, 255))

    clock.tick(120)
...
pygame.quit()
```

Wrapping the previous expression in str() should do the trick.

Convert int to string

Add TIME 4 draw the time

```
import pygame
...

done = False
while not done:
...
    screen.fill(background_colour)
    allspriteslist.draw(screen)
    screen.blit(text, (320 - text.get_width() // 2, 240 - text.get_height() // 2))

    time = font.render(str(pygame.time.get_ticks()//1000), False, (0, 255, 0), (0, 0, 255))
    screen.blit(time, (100, 100))


    clock.tick(120)

...
pygame.quit()
```

Nothing needs to be changed inside the blit function. It is just taking whatever the variable time is, and display it.

It is doing its job.

A little interaction with the course

Your input could change the game.
I want each of you to suggest some idea on how the game should be. Just one line of sentence is fine. We will decide and see if it is something we can accomplish in other lessons. Type it in the chat. Maybe it is a brilliant idea!

Some example could be score system. Time restriction system. Or maybe even square has lives and different colours if you clicked on them. Any idea is welcome