PA1A Code Examples PA1A 代碼示例

1 - Structure 基本結構 | Slides 51-52

```
def setup(): # runs once
    size(800, 600) # width, height in pixels

def draw(): # runs continuously
    pass # temporary, remove when we have other codes
```

2 - Background Colour 背景顏色 | Slides 56-57

```
def setup():
    size(800, 600)
    background(100, 120, 80, 255) # Red, Green, Blue, Alpha

def draw():
    pass
```

3 - Shapes Basics 基本形狀 | Slides 59-70

```
def setup():
    size(800, 600)
    background(255, 255, 255, 255) # white background

def draw():
    stroke(0, 255, 0, 255) # colour of outline / line
    strokeWeight(1) # thickness of line
    line(30, 60, 400, 400) # draws a line: x1, y1, x2, y2

    fill(0, 0, 255, 255) # colour of shapes with area
    noStroke() # no outline
    ellipse(400, 300, 150, 80) # draws an ellipse: x, y, width, height

    noFill() # no fill colour
    stroke(200, 100, 50, 255)
    strokeWeight(10)
    rect(200, 200, 300, 100) # draws a rectangle: x, y, width, height

    point(500, 500) # draws a point: x, y
```

4 - The Bauhaus Emblem | Slides 77-93

```
def setup():
    size(400, 500)
    background(0)

def draw():

    #nose stroke
    stroke(255)
    strokeWeight(10)
    #strokeCap(SQUARE)
    line(245, 60, 245, 300)

    #nose rect
    #noStroke()
    #fill(255)
    #rect(240, 60, 10, 240)

    #yellow eye
    noStroke()
    fill(250, 210, 0)
    rect(120, 110, 60, 40)

    #blue mouth top
    fill(0, 50, 160)
    rect(220, 300, 20, 70)

    #red lip
    fill(230, 50, 10)
    rect(180, 370, 40, 40)
```

5 - Custom Shapes 自定義形狀 | Slides 96-99

```
def setup():
    size(800, 600)
    background(255, 255, 255, 255) # white background

def draw():
    fill(0, 0, 255, 255)
    stroke(255, 0, 0, 255)
    strokeWeight(5)

    beginShape() # start drawing the shape
    vertex(200, 200) # 1st point
    vertex(700, 500) # 2nd point
    vertex(300, 400) # 3rd point

    # vertex(100, 300) # 4th point (uncomment and see what happens)
    # vertex(70, 20) # 5th point (uncomment and see what happens)
    endShape(CLOSE) # finish drawing the shape, and CLOSE up the shape
```

6 - Custom Curved Shapes 自定義曲線形狀 | Slide 100

```
def setup():
    size(800, 600)
    background(255, 255, 255, 255)

def draw():
    fill(0, 0, 255, 255)
    stroke(255, 0, 0, 255)
    strokeWeight(5)

    # use at least 4 points for curved shapes
    beginShape()
    curveVertex(200, 200) # 1st point (curve shape)
    curveVertex(700, 500) # 2nd point (curve shape)
    curveVertex(300, 400) # 3rd point (curve shape)

    curveVertex(500, 200) # 4th point (curve shape)
    curveVertex(400, 100) # 5th point (curve shape)
    endShape(CLOSE)
```

7 - Bicycle Layers 單車圖層 | Slides 109-123

```
def setup():
      size(660, 450)
      background(255, 255, 200) #1

def draw():
      #2 beige ground
      noStroke()
      fill(250, 153, 0, 50)
      rect(0, 350, 660, 100)

      #3 purple small circle
      fill(120,0,80)
      ellipse(345, 260, 50, 50)

      #4 pink big triangle
      fill(255, 30, 120, 80)
      triangle(100, 0, 345, 260, 480, 0)

      #5 green trapezium
      beginShape()
      fill(50,180,180, 150)
      noStroke()
      vertex(480,0)
      vertex(345, 260)
      vertex(660,260)
      vertex(660,0)
      endShape()

      #6 pink small triangle
      fill(255, 100, 120, 200)
      triangle(242, 150, 345, 260, 402, 150)

      #7 purple parallelogram
      beginShape()
      fill(120,0,80)
      noStroke()
      vertex(340,0)
      vertex(260,150)
      vertex(402,150)
      vertex(480,0)
      endShape()

      #8 skid mark
      fill(208, 0, 0, 100)
      rect(200, 335, 660, 15)

      #9 beige wheel
      fill(250, 153, 0, 50)
      ellipse(200, 260, 180, 180)
```

```
    #10 yellow semi wheel
    fill(250, 190, 0)
    arc(200, 260, 180, 180, radians(-60), radians(120))

    #11 purple wheel
    stroke(120,0,80)
    strokeWeight(20)
    noFill()
    ellipse(480, 260, 160, 160)

    #12 green inner wheel portion
    noStroke()
    fill(0, 128, 128)
    arc(480, 260, 140, 140, radians(-126), radians(0))

    #13 green triangle
    fill(204, 255, 204, 180)
    triangle(400, 150, 345, 260, 480, 260)

    #14 red handle triangle
    fill(255,0,0,140)
    triangle(184,110, 260, 190, 300, 110)

    #15 yellow seat
    beginShape()
    fill(255,255,0,200)
    noStroke()
    vertex(370,130)
    vertex(360,150)
    vertex(410,150)
    vertex(420,130)
    endShape()

#noLoop()
```

8 - Variables - Width & Height 變量 - 寬高 | Slides 129-130

```
def setup():
    size(800, 600)
    background(255, 255, 255, 255)

def draw():
    background(255, 255, 255, 255)
    noStroke()
    fill(0, 255, 0, 255)
    ellipse(width / 2, height / 2, 100, 100) # width and height of canvas
```

9 - Variables – mouseX & Y 變量 - 滑鼠座標 XY | Slide 131

```
def setup():
    size(800, 600)
    background(255, 255, 255, 255)

def draw():
    background(255, 255, 255, 255)
    noStroke()
    fill(0, 255, 0, 255)
    ellipse(mouseX, mouseY, 100, 100) # x and y of cursor
```

10 - Variables - Colour Based on mouseX 變量 - 基於 mouseX 改變顏色 | Slide 132

```
def setup():
    size(800, 600)
    background(255, 255, 255, 255)

def draw():
    background(255, 255, 255, 255)
    noStroke()
    fill(mouseX, 255, 0, 255) # increase red with mouseX
    ellipse(width / 2, height / 2, 100, 100)
```

11 - The Rising Sun: Static 太陽：靜態 | Slide 135

```
def setup():
      size(500, 800)

def draw():
      background(255, 228, 225)
      noStroke()

      #sun
      fill(255, 69, 0)
      ellipse(width/2, 550 , 200, 200)

      #wave blue
      noStroke()
      fill(70, 130, 180)
      rect(0, 550, width, height)

      #wave navy
      noStroke()
      fill(0, 51, 102)
      rect(0, 580, width, height)

      #wave grey
      noStroke()
      fill(51, 51, 51, 160)
      rect(0, 630, width, height)
```

12 - Variables - The Rising Sun: Moving Sun mouseY 變量 - 滑鼠座標 Y 移動太陽 | Slide 137

```
def setup():
      size(500, 800)

def draw():
      background(255, 228, 225)  #1
      noStroke()

      #sun
      fill(255, 69, 0)
```

```
    #ellipse(width/2, 550 , 200, 200) #1 still sun
    ellipse(width/2, mouseY , 200, 200) #2 moving sun

    #wave blue
    noStroke()
    fill(70, 130, 180)
    rect(0, 550, width, height)

    #wave navy
    noStroke()
    fill(0, 51, 102)
    rect(0, 580, width, height)

    #wave grey
    noStroke()
    fill(51, 51, 51, 160)
    rect(0, 630, width, height)
```

13 - Variables - The Rising Sun: Sun Disappearing

mouseY 變量 - 滑鼠座標 Y 讓太陽消失 | Slide 140

```
def setup():
    size(500, 800)

def draw():
    background(255, 228, 225)  #1
    noStroke()

    #sun
    fill(255, 69, 0, mouseY) #3 sun disappearing
    ellipse(width/2, mouseY , 200, 200) #2 moving sun

    #wave blue
    noStroke()
    fill(70, 130, 180)
    rect(0, 550, width, height)

    #wave navy
    noStroke()
    fill(0, 51, 102)
    rect(0, 580, width, height)

    #wave grey
    noStroke()
```

```
    fill(51, 51, 51, 160)
    rect(0, 630, width, height)
```

14 - Make your own variables 創建並定義自己的變量 | Slide 143

```
x_pos = 400 # make a variable called x_pos and give it a value of 400
y_pos = 300 # make a variable called y_pos and give it a value of 300

def setup():
    size(800, 600)
    background(255, 255, 255, 255)

def draw():
    noStroke()
    fill(0, 255, 0, 255)
    ellipse(x_pos, y_pos, 100, 100) # use the variables here
```

15 - Make your own variables - Ellipse move right 向右移動圓 | Slides 144-145

```
x_pos = 400
y_pos = 300

def setup():
    size(800, 600)
    background(255, 255, 255, 255)

def draw():
    global x_pos # make x_pos a global variable, we want to change it

    background(255, 255, 255, 255) # what happens if you comment this out
    noStroke()
    fill(0, 255, 0, 255)
    ellipse(x_pos, y_pos, 100, 100)
```

```
    x_pos = x_pos + 1 # add 1 to x_pos every frame
```

16 - Variables - The Rising Sun: Sun Appearing (Sunset)

變量 - 太陽出來了（日落）| Slide 149

```
y = 0 #4 define variable

def setup():
      size(500, 800)

def draw():

      global y #4 variable = change of motion

      background(255, 228, 225)  #1
      noStroke()

      #sun
      #fill(255, 69, 0, mouseY) #3 sun disappearing
      fill(255, 69, 0, y) #4 sun appearing
      #ellipse(width/2, mouseY , 200, 200) #2 moving sun
      ellipse(width/2, y , 200, 200) #4 sun to set by itself
      y = y + 1 #4

      #wave blue
      noStroke()
      fill(70, 130, 180)
      rect(0, 550, width, height)
```

```
      #wave navy
      noStroke()
      fill(0, 51, 102)
      rect(0, 580, width, height)

      #wave grey
      noStroke()
      fill(51, 51, 51, 160)
      rect(0, 630, width, height)
```

17 - Variables - The Rising Sun: Sunrise 變量 - 日出太陽 | Slide 152

```
#y = 0 #4 define variable
y = 800 #5 define variable

def setup():
      size(500, 800)

def draw():

      global y #4 variable = change of motion

      background(255, 228, 225)  #1
      noStroke()

      #sun
      #fill(255, 69, 0, mouseY) #3 sun disappearing
      fill(255, 69, 0, y) #4 sun appearing
      #ellipse(width/2, mouseY , 200, 200) #2 moving sun
      ellipse(width/2, y , 200, 200) #4 sun to set by itself
      #y = y + 1 #4
      y = y - 1 #5 sun to rise by itself

      #wave blue
      noStroke()
      fill(70, 130, 180)
      rect(0, 550, width, height)

      #wave navy
      noStroke()
      fill(0, 51, 102)
      rect(0, 580, width, height)

      #wave grey
```

```
      noStroke()
      fill(51, 51, 51, 160)
      rect(0, 630, width, height)
```

18 - Variables - The Rising Sun: Enlarging 變量 - 太陽變大 | Slide 155

```
y = 700 #6 to appear quicker
r1 = 10 #6 setting sun size to begin
r2 = 10 #6 setting sun size to begin

def setup():
      size(500, 800)

def draw():

      global y, r1, r2 #6 variables = change of motion

      background(255, 228, 225)
      noStroke()

      #sun
      fill(255, 69, 0, y)
      ellipse(width/2, y , r1, r2) #6 allow sun size to change
      y = y - 1
      r1 = r1 + 1 #6 sun enlarging
      r2 = r2 + 1 #6 sun enlarging

      #wave blue
      noStroke()
      fill(70, 130, 180)
      rect(0, 550, width, height)

      #wave navy
      noStroke()
      fill(0, 51, 102)
      rect(0, 580, width, height)

      #wave grey
      noStroke()
      fill(51, 51, 51, 160)
      rect(0, 630, width, height)
```

19 - If Else Background 根據條件改變背景 | Slide 168

```
def setup():
    size(800, 600)
    background(255, 255, 255, 255)

def draw():
    if mouseX > width / 2:
        background(0, 0, 255, 255)
    else:
        background(0, 255, 0, 255)
```

20 - If Else - Ellipse Move and Stop 圓的移動和停止 | Slide 169

```
x_pos = 0

def setup():
    size(800, 600)
    background(255, 255, 255, 255)

def draw():
    global x_pos

    background(255, 255, 255, 255)
    fill(128, 24, 51, 255)
    ellipse(x_pos, 300, 100, 100)

    if x_pos < 250:
        x_pos = x_pos + 1
```

21 - If Else - The Rising Sun: Day / Night 根據條件改變 -

太陽日與夜 | Slide 175

```
y = 700
r1 = 200 #7
r2 = 200 #7

def setup():
      size(500, 800)

def draw():

      global y, r1, r2

      if y > 550: #7 change background colour when sun rises
      background(51, 51, 51) #7 change background colour when sun rises
      else: #7 otherwise remains
      background(255, 228, 225) #7 otherwise remains

      #sun
      noStroke()
      fill(255, 69, 0, y)
      ellipse(width/2, y , r1, r2)
      y = y - 1

      #wave blue
      noStroke()
      fill(70, 130, 180)
      rect(0, 550, width, height)

      #wave navy
      noStroke()
      fill(0, 51, 102)
      rect(0, 580, width, height)

      #wave grey
      noStroke()
      fill(51, 51, 51, 160)
      rect(0, 630, width, height)
```

22 - If Else - The Rising Sun: Sun Suspended 根據條件改變 - 太陽停頓 | Slide 177

```
y = 700
```

```
r1 = 200 #7
r2 = 200 #7

def setup():
      size(500, 800)

def draw():

      global y, r1, r2

      if y > 550: #7 change background colour when sun rises
      background(51, 51, 51) #7 change background colour when sun rises
      else: #7 otherwise remains
      background(255, 228, 225) #7 otherwise remains

      #sun
      noStroke()
      fill(255, 69, 0) #8 omit alpha y
      ellipse(width/2, y , r1, r2)
      y = y - 1

      if y < 150: #8 stop when sun reaches 150
      noLoop() #8

      #wave blue
      noStroke()
      fill(70, 130, 180)
      rect(0, 550, width, height)

      #wave navy
      noStroke()
      fill(0, 51, 102)
      rect(0, 580, width, height)

      #wave grey
      noStroke()
      fill(51, 51, 51, 160)
      rect(0, 630, width, height)
```

23 - For-Loop 用循環畫圓 | Slide 189

```
def setup():
    size(800, 600)
    background(255, 255, 255, 255)

def draw():
    for x in [100, 200, 300]:
        ellipse(x, 300, 80, 80) # draws 4 ellipses at x=100, 200, 300
```

24 - For Loop Rect 用循環畫方形 | Slides 190-193

```
myList = [100, 200, 300, 400] # make a list called myList

def setup():
    size(800, 600)
    background(255, 255, 255, 255)

def draw():
    for x in [100, 200, 300, 400]:
        rect(x, 100, 50, x) # draws 4 rect at x=100, 200, 300, 400
```

25 - For Loop If Else 循環與條件 | Slide 194

```
myList = [100, 200, 300, 400]

def setup():
    size(800, 600)
    background(255, 255, 255, 255)

def draw():
    for x in [100, 200, 300, 400]:
        if x == 200:
            fill(255, 0, 0, 255) # red if x = 200
        else:
            noFill() # no fill otherwise
        rect(x, 100, 50, x)
```

26 - Range Rect 用 Range 畫方形 | Slide 199

```
def setup():
    size(800, 600)
    background(255, 255, 255, 255)

def draw():
    for x in range(6):
        rect(100 * x, 100, 50, 50)
```

Make Art - Flower

27 - Make Art - Background 背景 | Slide 205

```
def setup(): # comment
    size(800, 600)
    background(0, 0, 0, 255)

def draw():
    pass
```

28 - Make Art - Custom Circle 自定義圓 | Slides 209-211, 220

```
r = 300 # define r as the radius of the circle

def setup():
    size(800, 600)
    background(0, 0, 0, 255)

def draw():
    beginShape()
    for a in range(360): # loop for 360 times (360 degrees)
        x = r * cos(a) # calculate x from radius (r) and angle (a)
        y = r * sin(a) # calculate y from radius (r) and angle (a)
        curveVertex(x, y) # use x, y for curveVertex
    endShape(CLOSE) # close up the circle
```

29 - Make Art - Angles to Radians 將角度更改為弧度 | Slide 230

```
r = 300

def setup():
    size(800, 600)
    background(0, 0, 0, 255)

def draw():
    beginShape()
    for a in range(360):
        x = r * cos(radians(a)) # convert a to radians
        y = r * sin(radians(a)) # convert a to radians
        curveVertex(x, y)
    endShape(CLOSE)
```

30 - Make Art - Center the Circle 圓圈置中 | Slide 231

```
r = 300

def setup():
    size(800, 600)
    background(0, 0, 0, 255)

def draw():
    beginShape()
    for a in range(360):
        x = width / 2 + r * cos(radians(a)) # move circle to centre
        y = height / 2 + r * sin(radians(a)) # move circle to centre
        curveVertex(x, y)
    endShape(CLOSE)
```

31 - Make Art - Change Colour 改變顏色 | Slides 232

```
r = 300

def setup():
    size(800, 600)
    background(0, 0, 0, 255)
    noFill()
    stroke(0, 255, 255, 255)

def draw():
    beginShape()
    for a in range(360):
        x = width / 2 + r * cos(radians(a))
        y = height / 2 + r * sin(radians(a))
        curveVertex(x, y)
    endShape(CLOSE)
```

32 - Perlin Noise Perlin 噪聲函數 | Slide 239

```
r = 300
def setup():
    size(800, 600)
    background(0, 0, 0, 255)
    noFill()
    stroke(0, 255, 255, 255)

def draw():
    beginShape()
    for a in range(360):
        noise_factor = noise(a) # change noise with a
        x = width / 2 + r * cos(radians(a)) * noise_factor # include noise
        y = height / 2 + r * sin(radians(a)) * noise_factor # include noise
        curveVertex(x, y)
    endShape(CLOSE)
```

33 - Modifying Noise 修改噪音 | Slide 240

```
r = 300
def setup():
    size(800, 600)
    background(0, 0, 0, 255)
    noFill()
    stroke(0, 255, 255, 255)
def draw():
    beginShape()
    for a in range(360):
        noise_factor = noise(a * 0.05) # lowe noise change with a
        x = width / 2 + r * cos(radians(a)) * noise_factor
        y = height / 2 + r * sin(radians(a)) * noise_factor
        curveVertex(x, y)
    endShape(CLOSE)
```

34 - Change Noise with Time 隨時間改變噪音 | Slide 242

```
r = 300
def setup():
    size(800, 600)
    background(0, 0, 0, 255)
    noFill()
    stroke(0, 255, 255, 255)

def draw():
    beginShape()
    for a in range(360):
        noise_factor = noise(a * 0.05, frameCount * 0.05)
        x = width / 2 + r * cos(radians(a)) * noise_factor
        y = height / 2 + r * sin(radians(a)) * noise_factor
        curveVertex(x, y)
    endShape(CLOSE)
```

35 - Change Alpha 改變透明度 | Slide 243

```
r = 300

def setup():
    size(800, 600)
    background(0, 0, 0, 255)
    noFill()
    stroke(0, 255, 255, 25) # lower alpha to 25

def draw():
    beginShape()
    for a in range(360):
        noise_factor = noise(a * 0.05, frameCount * 0.05)
        x = width / 2 + r * cos(radians(a)) * noise_factor
        y = height / 2 + r * sin(radians(a)) * noise_factor
        curveVertex(x, y)
    endShape(CLOSE)
```

36 - Shrink Radius 收縮半徑 | Slide 244

```
r = 300

def setup():
    size(800, 600)
    background(0, 0, 0, 255)
    noFill()
    stroke(0, 255, 255, 25)

def draw():
    global r # make r global variable to change it

    beginShape()
    for a in range(360):
        noise_factor = noise(a * 0.05, frameCount * 0.05)
        x = width / 2 + r * cos(radians(a)) * noise_factor
        y = height / 2 + r * sin(radians(a)) * noise_factor
        curveVertex(x, y)
    endShape(CLOSE)

    r = r - 1 # decrease r by 1 every frame
```

37 - Stop Animation 停止動畫 | Slide 245

```
r = 300

def setup():
    size(800, 600)
    background(0, 0, 0, 255)
    noFill()
    stroke(0, 255, 255, 25)

def draw():
    global r

    beginShape()
    for a in range(360):
        noise_factor = noise(a * 0.05, frameCount * 0.05)
        x = width / 2 + r * cos(radians(a)) * noise_factor
        y = height / 2 + r * sin(radians(a)) * noise_factor
        curveVertex(x, y)
    endShape(CLOSE)

    r = r - 1

    if r < 0:
        noLoop() # stop when radius goes to negative
```

38 - Final Modifications 最終修改 | Slide 246

```
r = 500 # changed radius

def setup():
    size(800, 600)
    background(0, 0, 0, 255)
    noFill()
    stroke(0, 255, 255, 25)

def draw():
    global r

    beginShape()
    for a in range(360):
        noise_factor = noise(a * 0.03, frameCount * 0.01) # changed rates
        x = width / 2 + r * cos(radians(a)) * noise_factor
        y = height / 2 + r * sin(radians(a)) * noise_factor
        curveVertex(x, y)
    endShape(CLOSE)

    r = r - 1

    if r < 0:
        noLoop()
```