

explosions.py

```
#!/usr/bin/env python3

import pygame, sys, time, random
from pygame.locals import *

ramp_one, ramp_two, ramp_three = None, None, None

wood_light = (166, 124, 54)
wood_dark = (76, 47, 0)
blue = (0, 100, 255)
dark_red = (166, 25, 50)
dark_green = (25, 100, 50)
dark_blue = (25, 50, 150)
black = (0, 0, 0)
white = (255, 255, 255)
```

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```
width, height = 1024, 768
screen = None


maxRadius = 60
allExplosions = []
delay = 100    # number of milliseconds delay before generating a USEREVENT

class explosion:
    def __init__ (self, pos):
        self._radius = 1
        self._maxRadius = maxRadius
        self._increasing = True
        self._pos = pos
```

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```
def update (self):
    if self._increasing:
        pygame.draw.circle (screen, white, self._pos, self._radius, 0)
        self._radius += 1
        if self._radius == self._maxRadius:
            self._increasing = False
    else:
        pygame.draw.circle (screen, black, self._pos, self._radius, 0)
        self._radius -= 1
        if self._radius > 0:
            pygame.draw.circle (screen, white, self._pos, self._radius, 0)
        else:
            globalRemove (self)
```

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```
def createExplosion (pos):  
    global allExplosions  
    allExplosions += [explosion (pos)]  
    pygame.time.set_timer (USEREVENT+1, delay)  
  
def globalRemove (e):  
    global allExplosions  
    allExplosions.remove (e)
```

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```
def updateAll ():  
    if allExplosions != []:  
        for e in allExplosions:  
            e.update ()  
        pygame.display.flip ()  
        pygame.time.set_timer (USEREVENT+1, delay)
```

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```
def wait_for_event ():
    global screen
    while True:
        event = pygame.event.wait ()
        if event.type == pygame.QUIT:
            sys.exit(0)
        if event.type == KEYDOWN and event.key == K_ESCAPE:
            sys.exit (0)
        if event.type == pygame.MOUSEBUTTONDOWN and event.button == 1:
            createExplosion (pygame.mouse.get_pos ())
        if event.type == USEREVENT+1:
            updateAll ()
```

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```
def main ():  
    global screen  
    pygame.init ()  
    screen = pygame.display.set_mode ([width, height])  
    wait_for_event ()  
  
main ()
```

Homework

- firstly get the `explosions.py` to work
- now comment each function
- comment each class and its use
- familiarise yourself with the game missile command
- see if you can extend this code to place six cities and 3 missile silos statically at the bottom of the screen

Homework 2

- write a Python program to print out all permutations of a string

- for example ab



```
ab  
ba
```

Homework 2

- for example abc



```
abc  
acd  
bac  
bca  
cab  
cba
```

- your program should be able to take any size string with unique characters and print out all permutations