Homework 1

Math 3607, Summer 2021

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Problem 1.

This problem asks for a script that takes an input in degrees Fahrenheit and converts it to degrees Celsius.

```
tempFah = input('Give me a temperature in Fahrenheit: ');
tempCel = (tempFah-32)*(5/9);
disp(['The temperature in Celsius is: ',num2str(tempCel)])
```

```
The temperature in Celsius is: 18.8889
```

Problem 2.

This problem asks for a script that takes an input for both the equatorial and polar radii and calculates both the area and the approximate area of Earth.

```
format long g
r1 = input('Give me the equatiorial radius: ');
r2 = input('Give me the polar radius: ');
gamma = acos(r2/r1);
area = 2*phi * (r1^2 + ((r2^2)/sin(gamma))*log(cos(gamma)/(1 - sin(gamma))));
approx = 4*phi*(((r1+r2)/2)^2);
disp(['The area is: ', num2str(area)])
```

```
The area is: 510065604.9442
```

```
disp(['The area approximation is :', num2str(approx)])
```

```
The area approximation is :509495321.6397
```

Problem 3.

This problem asks for a script that can take any year as an input and check if it is a leap year.

```
year = input('Give me a year: ');
if rem(year,100) == 0                               % check if century year
    if rem(year,400) == 0                           % if century year is divisible by 4, th
        disp([num2str(year),' is a leap year'])
    else                                            % otherwise, century year is not a leap
        disp([num2str(year),' is not a leap year'])
```

```
            end
    else                                        % not a century year
        if rem(year,4) == 0                     % if non-century year is divisible by 4
            disp([num2str(year),' is a leap year'])
        else                                    % otherwise, non-century year is not a
            disp([num2str(year),' is not a leap year'])
        end
    end
```

```
1900 is not a leap year
```

Problem 4.

This problem asks for a script that takes Cartesian coordinates and changes them to spherical coordinates.

```
x = input('Give me the x-coordinate: ');
y = input('Give me the y-coordinate: ');
z = input('Give me the z-coordinate: ');

rho = sqrt(x^2+y^2+z^2);

if x>0 && y>0                  % first quadrant use atan
    theta = atan(y/x);
elseif x>0 && y<0              % fourth quadrant use atan
    theta = atan(y/x);
else                          % second and third quadrants use atan2
    theta = atan2(y,x);
end

phi = acos(z/(sqrt(x^2+y^2+z^2)));

fprintf('The spherical coordinates are: (%f, %f, %f) \n', rho, theta, phi)
```

```
The spherical coordinates are: (5.385165, -2.214297, 1.190290)
```

Problem 5.

This problem asks for a script that calculates the probability of winning a game called 3-Stick where three sticks are picked randomly from an interval of [0,1]. If a triangle can be formed between the three sticks, you win. Otherwise, you lose.

```
n = 0;
for k = 1:1000000                              % runs code block 1000000 times
    x = rand;
    y = rand;
    z = rand;
    if (x+y)>z && (x+z)>y && (y+z)>x           % checks if triangle requirements are met
        n=n+1;                                 % increments n if a triangle is formed
    end
end
prob = n/1000000;
disp(['The probability of winning the game is: ', num2str(prob)])
```

```
The probability of winning the game is: 0.49987
```