

Rensselaer Polytechnic Institute

MATH 1020 - Project 1

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Name (PRINT): Anna Foody RIN: 662046160
Name (PRINT): Ali Brooks RIN: 662041253

Pledge of Academic Honesty

I affirm that I will not copy this project from any other resources and that all work will be
my own.

Signature: Anna Foody
Signature: Ali Brooks

Abstract:

Both authors are Computer Science majors, but Anna is a dual with GSAS while Ali is a dual with ITWS. The following project lets the user pick how many numbers they wish to see from four specific sequences until they wish to quit the program. These are the Padovan Sequence, the Catalan Sequence, the Perrin Sequence, and the Fermat Sequence. Each is given an explanation before the user selects the sequence.

PROJECT- (No more than 2 pages)

```
import math

looping = True
while looping:
    # choosing the sequence
    chosenSequence = 0
    print("Which series/sequence would you like to calculate?")
    print("1) Padovan Sequence")
    print("2) Catalan Numbers")
    print("3) Perrin Numbers")
    print("4) Fermat Numbers")

    while chosenSequence <= 0 or chosenSequence >= 5:
        chosenSequence = int(input(">"))
        if chosenSequence <= 0 or chosenSequence >= 5:
            print("Not a valid Series.")

    # printing the explanation
    if chosenSequence == 1:
        print("The Padovan Sequence is a sequence named after Richard Padovan.")
        print("It is a series of integers defined by the recursive formula  $P(n) = P(n-2) + P(n-3)$ ." )
        print("It's values can create a triangular spiral, similar to how Fibonacci can create a square spiral.")

    elif chosenSequence == 2:
        print("The Catalan Numbers is a sequence named after Eugene Charles Catalan.")
        print("It is a series of integers defined by the formula  $\frac{(2n)!}{((n+1)! * n!)}$ , which is equivalent to the product summation (capital pi) of  $n+k/k$  from  $k=2$  to  $n$ ." )
        print("It has many applications in combinatorics.")

    elif chosenSequence == 3:
        print("The Perrin Numbers is a sequence named after François Olivier Raoul Perrin.")
        print("It is often shown as a spiral of equilateral triangles and is defined by the recursive formula  $P(n) = P(n-2) + P(n-3)$  for  $n > 2$  with the initial values of  $P(0) = 3, P(1) = 0, P(2) = 2$ ." )

    else:
        print("The Fermat Sequence is a sequence of positive integers after Pierre de Fermat.")
        print("Each individual number can be defined by  $2^{2^n} + 1$ , but the sequence can be recursively defined in various ways as well.")
        print("These get large very quickly.")

    # Choosing the number of terms
    numTerms = 0
    print("How many terms?")
    while numTerms <= 0:
        numTerms = int(input(">"))
        if numTerms <= 0:
            print("Not a valid number of terms")

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```

```

# calculating the sequences
count = 0
if chosenSequence == 1:
    # Padovan Calculation
    prev, prevPrev, current, next = 1, 1, 1, 1
    while count < numTerms:
        if count < 3:
            print(1)
        else:
            next = prevPrev + prev
            prevPrev = prev
            prev = current
            current = next
            print(next)
        count += 1
elif chosenSequence == 2:
    # Catalan Calculation
    while count < numTerms:
        top = (math.factorial(count*2))
        bottom = (math.factorial(count+1)*math.factorial(count))
        print(int(top/bottom))
        count += 1
elif chosenSequence == 3:
    # Perrin Calculation
    prev1, prev2, prev3, temp = 2, 0, 3, 0
    while count < numTerms:
        if count == 0:
            print(3)
        elif count == 1:
            print(0)
        elif count == 2:
            print(2)
        else:
            temp = prev2+prev3
            print(temp)
            prev3 = prev2
            prev2 = prev1
            prev1 = temp
        count += 1
else:
    # Fermat Calculation
    while count < numTerms:
        fermat = pow(2, pow(2, count)) + 1
        print(fermat)
        count += 1

# Continuing the Loop
print("Would you like to calculate some more? Y/N")
choice = input(">")
if choice == "Y" or choice == "y":
    print("Sounds good!")
elif choice == "N" or choice == "n":
    print("Thank you for calculating with us!")
    looping = False
else:
    print("Unknown input, exiting.")
    looping = False

```