EXPLORING CIRCLES BY USING COMPUTER PROGRAMMING

Learning from pre-written computer programs is more engaging and rewarding than hand calculations and manual plotting

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Overview

- Purpose
  - Demonstrate math concepts using computer programming
- Plan of Action
  - Draw a smiley face with circles
    - This demonstrates the behavior of a circle with offsets
  - Use pre-written computer program to teach math ideas and simple programming language features
  - English and Music composition parallels
- Execution of Plan
  - Explain math/language features in context of larger goal (smiley face)
  - Learn how to dissect or experiment with program to understand steps
  - Let the computer do the hard work
- Evaluation of Results
  - Which method is more engaging and more intuitive?
- Presentation of Solution and Summary

Plan of Action

- Language features
  - Language has graphics primitives (able to draw)
  - Language is easy to remember, intuitive
    - 'Apostrophe(Comment)
    - STOP (Cease execution of steps)
    - SLEEP (Pause execution of steps)
    - Loop :
      - For I = 1 to 5: Next I (Repeat execution of steps)
    - PSET(X,Y) [put a point on the screen]
    - SQR (Square root)
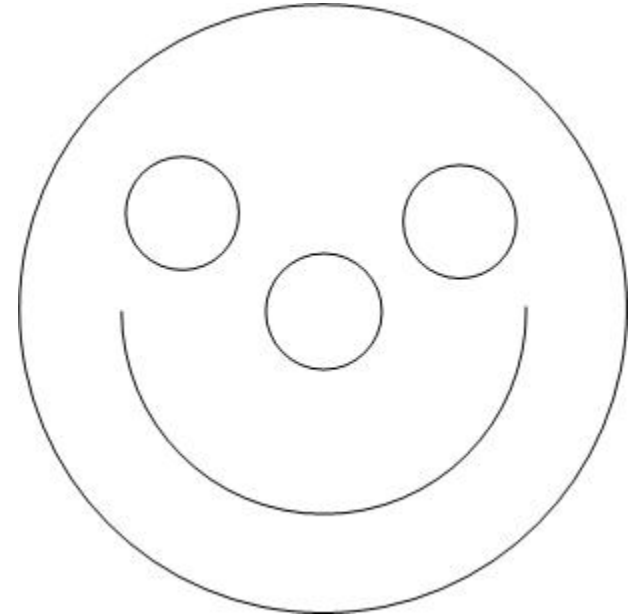
Plan of Action

- Circle equation, $x^2 + y^2 = R^2$
- Circle equation with an offset (it is shifted to h, k position)
  - $(x-h)^2 + (y-k)^2 = R^2$
    - Where x, and y are variables (they change)
    - Radius, R ,and offsets h and k are constants (they don't change)
  - Solve for y in terms of x
    - $y = k + SQR(R^2-(x-h)^2)$,
    - $y = f(x)$, y is dependent upon x
- Put this equation in a do loop and change y by changing x,

Execution of Plan

- Run Entire Program
- Use comments to explain phases using apostrophe.
- Stop program to explain phases, use "STOP"
- Pause program using "SLEEP"
- Change constants and variables to understand trends
- Edit program to explore other functions and language features

Evaluation of Results

- When you compare manual (conventional) method vs. computer assisted method
  - Which method is more engaging?
  - Which method is more intuitive?
  - Which requires the most preparation time to teach?
  - Which enhances programming skills better?

Conclusions

- Computer program reduces the burden upon math teachers to convey math concepts.
- It encourages the development of programming skills because students see a purpose for them
- It teaches students to be purposeful (objective oriented) while meticulous (detail oriented)
- CANVAS
  - A term coined for this approach
    - Computers, Algebra, Numbers, Visual Aids for Science (C.A.N.V.A.S)
  - The computer screen is used like a canvas in art