PRACTICE 12: ADVANCED MATH

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Advanced Math

Math is not just about solving equations or building a calculator. We use math in computer science for many things, but also to create art and games, because it helps us describe our environment.

Intro

Not only can we do math with our basic addition, subtraction, multiplication, and division, but the Math object in Small Basic has a number of operations built into it that you can use as you design art, games, and yes, even calculators!

Here is a list of just some of the operations: `ArcCos, ArcSin, ArcTan, Cos, GetDegrees, GetRadians, Log, NatualLog, Pi, Sin, Tan, Power, SquareRoot`

Each operation does something different with the numbers, and the explanations of each can be seen in Small Basic. For example, below is the description of `Math.Cos`.

As you can see, you must have the angle in radians. This can be solved by using `Math.GetRadians()` which will convert degrees to radians.

Example

Code:

```
TextWindow.Show()
angle = 45
TextWindow.WriteLine("The angle in degrees is: "+angle)
angle = Math.GetRadians(angle)
TextWindow.WriteLine("The angle in degrees is: "+angle)
```

This code first displays a text window. It then sets the angle to 45 and converts it to radians.

Output:

```
The angle in degrees is: 45
The angle in radians is: 0.785398163397448
Press any key to continue...
```

Challenge: Law of Cosines

Using your knowledge of trigonometry, create a calcultaor that will take 2 sides and an angle and solve for the length of the third side.

Here are some tips and reminders to help you start off your program:

First, it will be easiest to use the law of cosines which is:

$$c^2 = a^2 + b^2 - 2ab\cos(C)$$

You will also want to have the user give you a, b, and C. As you may remember you can prompt a user to answer by using:

```
TextWindow.Write()
```

To read the inputs, use:

```
TextWindow.Read()
```

You will also want to make sure you save the inupts with variable names that you know what they mean.

Challenge: Advanced Calculator

Create a calculator where the user can give a function like a number and returns the answer.

To get started, use the `TextWindow.Write()` and `TextWindow.Read()` to access the user input. You may want to use if statements to check what type of function the user requested. You may also need some loops if the user inputs a type of function with multiple values needed.

Discussion Questions

- What is a product that you could make with these operations?
- Could you think of any operations you use in your math class that we didn't list?
- How else could you use the trigonometric operations?

Additional Resources

- aka.ms/AdvanceMath1
- aka.ms/AdvanceMath2