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Week 4

Pseudocode

Trawsnewid Addysg; Trawsnewid Bywydau
Transforming Education; Transforming Lives



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PSEUDOCODE



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Pseudocode

- An informal language that is used to help plan out the logic (algorithm) for a problem.
- It is written in **plain English** using short statements.
- It is another method used to break a problem down into:
 - more manageable and easily understandable steps
 - and in a way that is easily understandable by a programmer to convert it to a computer solution.

Pseudocode

- Today, we are interested in pseudocode statements for:
 - Prompting for input.
 - Setting variable values – remember variables are used to store some value or item.
 - Displaying output.
 - Simple calculations and processes.

Pseudocode: Prompting for Input

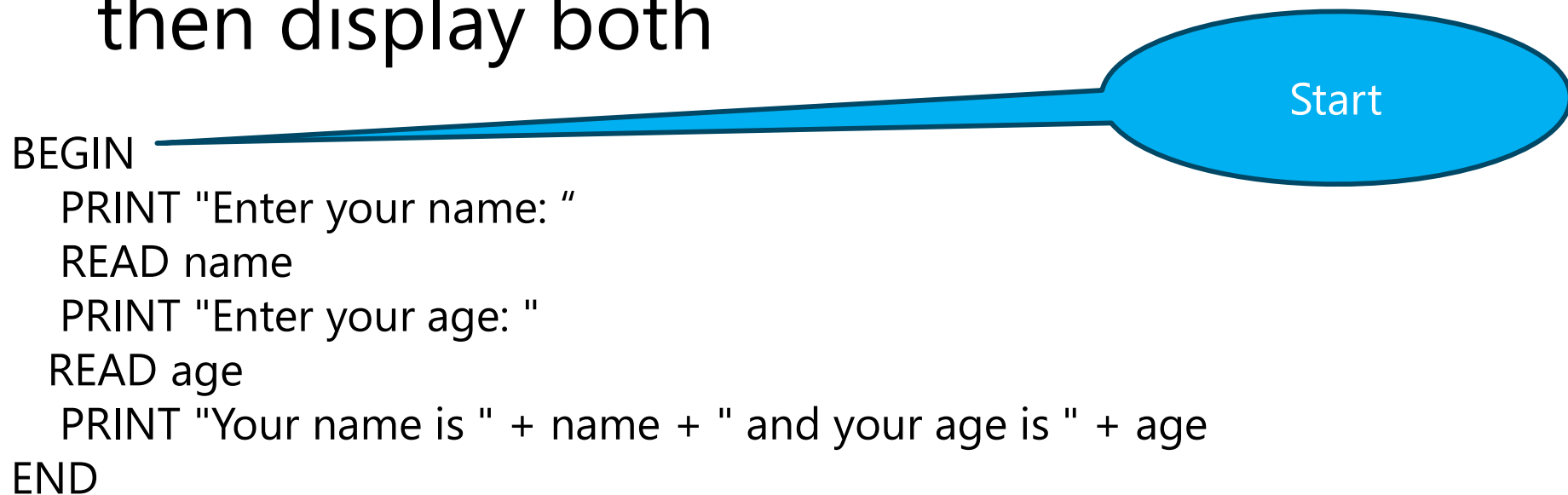
- Input operations get data into programs.
- You have to prompt users for input, so you need to **display** a message for the user to know what to input.
 - The word “**Display**”, “**Write**” or “**Output**” are commonly used in pseudocode to display/write messages to the screen.
 - The actual message is written in quotes “...**message**...”.
- Then you have to wait for the user to respond with the input.
 - The word “**Input**” followed by a **variable name** is used in pseudocode.

Pseudocode: Example

Pseudocode to get the user's name and age,
then display both

Pseudocode: Example

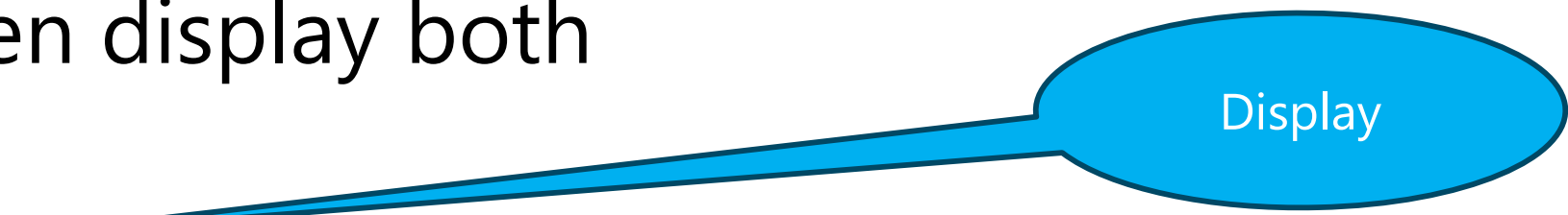
Pseudocode to get the user's name and age, then display both



Pseudocode: Example

Pseudocode to get the user's name and age, then display both

```
BEGIN
  PRINT "Enter your name: "
  READ name
  PRINT "Enter your age: "
  READ age
  PRINT "Your name is " + name + " and your age is " + age
END
```



Display

Pseudocode: Example

Pseudocode to get the user's name and age, then display both

BEGIN

PRINT "Enter your name: "

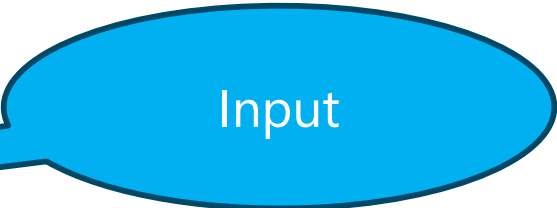
READ name

PRINT "Enter your age: "

READ age

PRINT "Your name is " + name + " and your age is " + age

END

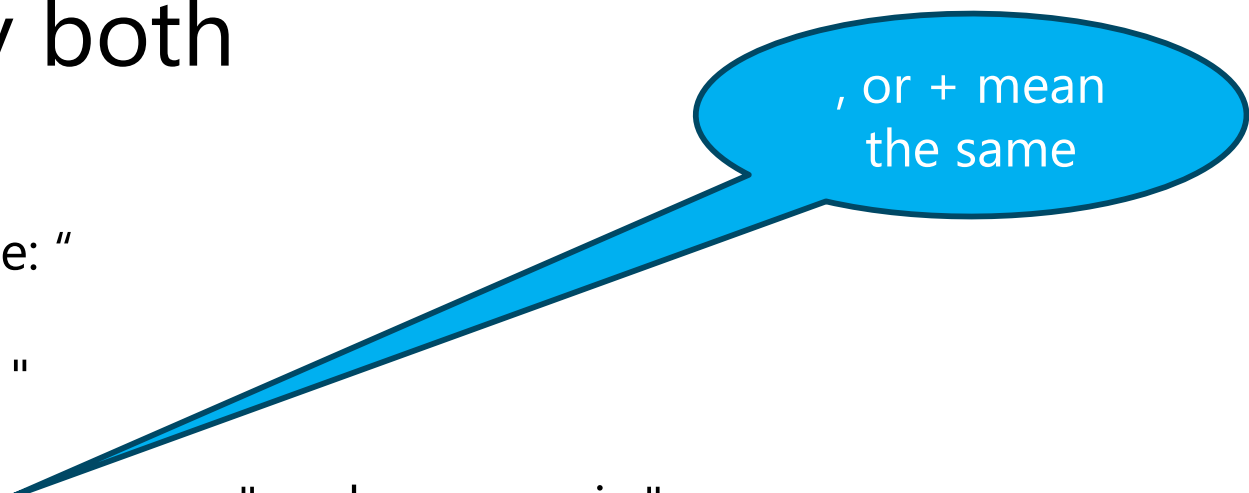


Input

Pseudocode: Example

Pseudocode to get the user's name and age, then display both

```
BEGIN
  PRINT "Enter your name: "
  READ name
  PRINT "Enter your age: "
  READ age
  PRINT "Your name is " + name + " and your age is " + age
END
```

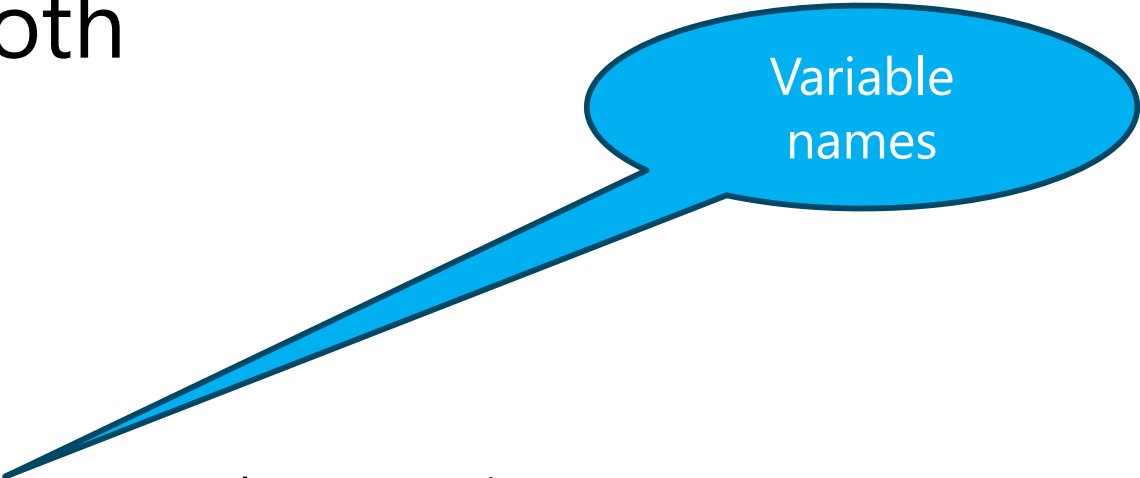


, or + mean
the same

Pseudocode: Example

Pseudocode to get the user's name and age, then display both

```
BEGIN
  PRINT "Enter your name: "
  READ name
  PRINT "Enter your age: "
  READ age
  PRINT "Your name is " + name + " and your age is " + age
END
```



Variable
names

Pseudocode: Example

Pseudocode to get the user's name and age, then display both

```
BEGIN
  PRINT "Enter your name: "
  READ name
  PRINT "Enter your age: "
  READ age
  PRINT "Your name is " + name + " and your age is " + age
END
```



stop

Pseudocode: Prompting for Input

- For example

Pseudocode	Explanation
Display "What is your age"	<i>Message prompting the user for input</i>
Input age	<i>Waiting for input to be stored in variable, age.</i>

- The pseudocode prompts the user for input by displaying a helpful message first.
- The user's input is stored in a variable called **age**.
 - **Note:** variables are not written in quotes.

Pseudocode: Displaying Output

- So what words do you think are used to display output to users in pseudocode?
- We have actually already used this already:
 - “Display” or “Write” or “Output”.
- My examples use “**Display**”.

Pseudocode: Input and Output

- Extending the previous example, Pseudocode:
 1. Display "What is your age?"
 2. Input age
 3. Display "Here is the value you entered:"
 4. Display age
- The result of the pseudocode in the example when converted to a program may be:

Program Output (Input shown in bold)

```
What is your age?
```

```
24 [Enter]
```

```
Here is the value that you entered:
```

```
24
```

Pseudocode: Input and Output

If we extend the previous example:

Pseudocode	<i>Explanation</i>
Display "What is your age"	<i>Message prompting the user for input</i>
Input age	<i>Waiting for input to be stored in variable, age.</i>
Display "Here is the value you entered:"	<i>Output message to show user what they input and so they know what is being displayed.</i>
Display age	Displaying the value stored in the variable, age.

Pseudocode:

Setting Variables and Calculations

- Variables are not always set through input.
 - They can be set to an initial value
 - They can be set through a calculation
- To set a variable in pseudocode, you use the word **"Set"**.
- For example:
 - Set price = 20
 - Setting the variable to a constant value
 - Set sum = number1 + number2
 - Setting the variable based on a calculation using other variables

Pseudocode for getting name, marks in 5 subjects and print the names and total marks



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Pseudocode for getting name, marks in 5 subjects and print the names and total marks

BEGIN

PRINT "Enter your name: "
READ name

PRINT "Enter marks for subject 1: "
READ mark1

PRINT "Enter marks for subject 2: "
READ mark2

PRINT "Enter marks for subject 3: "
READ mark3

PRINT "Enter marks for subject 4: "
READ mark4

PRINT "Enter marks for subject 5: "
READ mark5

SET totalMarks = mark1 + mark2 + mark3 + mark4 + mark5

PRINT "Student Name: " + name
PRINT "Total Marks: " + totalMarks
END

Pseudocode: Calculations

- Calculations are performed using math operators.
- We will only be looking at simple ones 😊

Symbol	Operator	Description	Examples
+	Addition	Adds two numbers	$2 + 3 = 5$
-	Subtraction	Subtracts one number from the other	$7 - 3 = 4$
*	Multiplication	Multiplies one number by another	$5 * 4 = 20$
/	Division	Divides one number by another	$12 / 3 = 4$
%	Modulus	Divides one number by another and give the remainder	$14 \% 3 = 2$

- The resulting value of the calculation is normally stored in variables.

About that dodgy % operator

- The modulus operator, %, returns the remainder after dividing one number by another.
 - $15 \% 2 = \mathbf{1}$ $15 / 2 = 7$ remainder **1**
 - $39 \% 4 = \mathbf{3}$ $39 / 4 = 9$ remainder **3**
 - $21 \% 7 = \mathbf{0}$ $21 / 7 = 3$ remainder **0**
- The modulus operator has many uses which are not immediately obvious.
- For example, to test for an even or odd number.
 - Let n represent any number
 - If $n \% 2 = 1$, the number is odd
 - If $n \% 2 = 0$, the number is even

Get Name and Favorite Color, then Display Both



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Get Name and Favorite Color, then Display Both

BEGIN

PRINT "Enter your name: "

READ name

PRINT "Enter your favorite color: "

READ color

PRINT "Your name is " + name + " and your favorite color is " + color

END

Calculate the Sum of Two Numbers

Calculate the Sum of Two Numbers

BEGIN

PRINT "Enter first number: "

READ num1

PRINT "Enter second number: "

READ num2

SET sum = num1 + num2

PRINT "The sum is: " + sum

END

1. Start
2. Input two numbers (num1, num2)
3. Compute $\text{sum} = \text{num1} + \text{num2}$
4. Display sum
5. End

Calculate the Area of a Rectangle

BEGIN

END

Calculate the Area of a Rectangle

BEGIN

PRINT "Enter length of the rectangle: "

READ length

PRINT "Enter width of the rectangle: "

READ width

SET area = length * width

PRINT "The area of the rectangle is: " + area

END

Check if a Number is Even or Odd

BEGIN

END

Check if a Number is Even or Odd

BEGIN

PRINT "Enter a number: "

READ num

IF num MOD 2 = 0 THEN

PRINT "The number is Even"

ELSE

PRINT "The number is Odd"

END IF

END

Simple Temperature Converter (Celsius to Fahrenheit)

BEGIN

END

Simple Temperature Converter (Celsius to Fahrenheit)

BEGIN

PRINT "Enter temperature in Celsius: "

READ celsius

SET fahrenheit = $(\text{celsius} * 9/5) + 32$

PRINT "Temperature in Fahrenheit: " + fahrenheit

END

Challenge Task: Swapping the values in the variables and printing them

$a = 5$

$b = 10$

Before swapping: $a = 5$ $b = 10$

After swapping: $a = 10$ $b = 5$

1: **a** and **b** are initialized with values **5** and **10** respectively.

Challenge Task: Swapping the values in the variables and printing them

$a = 5$

$b = 10$

Before swapping: $a = 5$ $b = 10$

After swapping: $a = 10$ $b = 5$

- 1: a and b are initialized with values 5 and 10 respectively.
- 2: The values are printed before swapping.
- 3: A temporary variable $temp$ is used to temporarily hold the value of a . a is then assigned the value of b .
- 4: Finally, b is assigned the value originally held by a (stored in $temp$).

Challenge Task: Swapping the values in the variables and printing them

```
// Initialize variables
```

```
a <- 5
```

```
b <- 10
```

```
// Display values before swapping
```

```
Display "Before swapping:"
```

```
Display the value of the variable a
```

```
Display the value of the variable b.
```

Can you swap it without using temp variable?

```
// Swap values using a temporary variable
```

```
temp <- a
```

```
a <- b
```

```
b <- temp
```

```
// Print values after swapping
```

```
print("\nAfter swapping:")
```

```
print("a =", a)
```

```
print("b =", b)
```

Challenge Task: Swapping the values in the variables and printing them

```
// Initialize variables
```

```
a <- 5
```

```
b <- 10
```

```
// Display values before swapping
```

```
Display "Before swapping:"
```

```
Display the value of the variable a
```

```
Display the value of the variable b.
```

```
// Swap values using a temporary variable
```

```
// Print values after swapping
```

```
print("\nAfter swapping:")
```

```
print("a =", a)
```

```
print("b =", b)
```

Challenge Task: Swapping the values in the variables and printing them

```
// Initialize variables
```

```
a <- 5
```

```
b <- 10
```

```
// Display values before swapping
```

```
Display "Before swapping:"
```

```
Display the value of the variable a
```

```
Display the value of the variable b.
```

```
// Swap values using a temporary variable
```

```
a <- a + b
```

```
b <- a - b
```

```
a <- a - b
```

```
// Print values after swapping
```

```
print("\nAfter swapping:")
```

```
print("a =", a)
```

```
print("b =", b)
```

Pseudocode: Input, Process & Output

- Returning to our tip calculator problem (slightly modified).

Create a simple tip calculator. It should prompt for a bill amount and a tip to pay. The calculator will then calculate the tip amount and display both the tip amount and the final, total bill amount.

- Write a solution for this problem using pseudocode.

Pseudocode: Tip Calculator Problem

Begin

Display "What is the Bill Amount?"

Input billAmount

Display "What tip amount would you like to give?"

Input tipAmount

Set totalBillAmount = billAmount + tipAmount

Display "You chose to pay the following tip:"

Display tipAmount

Display "Your final, total bill amount to pay is:"

Display totalBillAmount

End

Pseudocode: Tip Calculator Problem

- Pseudocode

1. **Display** "What is the Bill Amount?"
2. *Input* billAmount
3. **Display** "What tip amount would you like to give?"
4. *Input* tipAmount
5. *Set* totalBillAmount = billAmount + tipAmount
6. **Display** "You chose to pay the following tip:"
7. **Display** tipAmount
8. **Display** "Your final, total bill amount to pay is:"
9. **Display** totalBillAmount

- Possible output (input shown in bold)

What is the Bill Amount?
500 [Enter]
What tip amount would you like to give?
10 [Enter]
You chose to pay the following tip:
10
Your final, total bill amount to pay is:
510

Pseudocode: Tip Calculator Problem

- Pseudocode

1. **Display** "What is the Bill Amount?"
2. *Input* billAmount
3. **Display** "What tip amount would you like to give?"
4. *Input* tipAmount
5. *Set* totalBillAmount = billAmount + tipAmount
6. **Display** "You chose to pay the following tip:"
7. **Display** tipAmount
8. **Display** "Your final, total bill amount to pay is:"
9. **Display** totalBillAmount

- Possible output (input shown in bold)

What is the Bill Amount?
500 [Enter]
What tip amount would you like to give?
10 [Enter]
You chose to pay the following tip:
10
Your final, total bill amount to pay is:
510

Pseudocode: **Discount Calculator** Problem

- Create a simple discount calculator. It should prompt for an original price and a discount percentage. The calculator will then calculate the discount amount and display both the discount amount and the final, total price after the discount.

Pseudocode: **Discount Calculator** Problem

BEGIN

PRINT "Enter the original price: "

READ originalPrice

PRINT "Enter the discount percentage: "

READ discountPercentage

SET discountAmount = (originalPrice * discountPercentage) / 100

SET finalPrice = originalPrice - discountAmount

PRINT "Discount Amount: " + discountAmount

PRINT "Final Price after Discount: " + finalPrice

END

Pseudocode: Sales Tax Calculator Problem

- Create a simple sales tax calculator. It should prompt for a bill amount and a sales tax percentage. The calculator will then calculate the tax amount and display both the tax amount and the final, total bill amount.

Pseudocode: Sales Tax Calculator Problem

BEGIN

PRINT "Enter the bill amount: "

READ billAmount

PRINT "Enter the sales tax percentage: "

READ taxPercentage

SET taxAmount = (billAmount * taxPercentage) / 100

SET totalAmount = billAmount + taxAmount

PRINT "Sales Tax Amount: " + taxAmount

PRINT "Total Bill Amount (including tax): " + totalAmount

END

Pseudocode: **Currency Conversion Calculator** Problem

- Create a simple currency conversion calculator. It should prompt for an amount in the source currency and a conversion rate. The calculator will then calculate the converted amount and display it.

Pseudocode: **Currency Conversion Calculator** Problem

BEGIN

PRINT "Enter the amount in source currency: "

READ sourceAmount

PRINT "Enter the conversion rate: "

READ conversionRate

SET convertedAmount = sourceAmount * conversionRate

PRINT "Converted Amount: " + convertedAmount

END

Pseudocode: **Loan Interest Calculator** Problem

- Create a simple loan interest calculator. It should prompt for the loan amount and an annual interest rate. The calculator will then calculate the interest amount for one year and display both the interest amount and the total amount to be paid after one year.

Pseudocode: **Loan Interest Calculator** Problem

BEGIN

PRINT "Enter the loan amount: "

READ loanAmount

PRINT "Enter the annual interest rate (in %): "

READ interestRate

SET interestAmount = $(\text{loanAmount} * \text{interestRate}) / 100$

SET totalAmount = loanAmount + interestAmount

PRINT "Interest Amount for One Year: " + interestAmount

PRINT "Total Amount to be Paid After One Year: " + totalAmount

END

Pseudocode: **Monthly Savings Calculator** Problem

- Create a simple monthly savings calculator. It should prompt for a monthly saving amount and a number of months. The calculator will then calculate the total savings and display it.

List the variables and datatypes

Draw IPO chart

Write Pseudocode

Pseudocode: **Monthly Savings Calculator** Problem

BEGIN

PRINT "Enter the monthly saving amount: "

READ monthlySaving

PRINT "Enter the number of months: "

READ numMonths

SET totalSavings = monthlySaving * numMonths

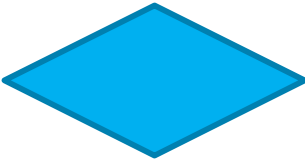
PRINT "Total Savings after " + numMonths + " months: " + totalSavings

END

Flowcharts

- A diagram that visually shows the steps to take in a computer problem solution.
- It is an alternative method of showing the logical flow of steps for a solution.
- It uses connected symbols to show the sequence of steps, any repetition and alternative steps.
- Some people find flowcharts easier than writing pseudocode for algorithms.
- And many use a combination of both.

Basic Flowchart Symbols

Symbol	Name	Description
	Terminator	Used to indicate the start or end
	Input/output t	Represents an input or output operation
	Process	Represents processes e.g. a calculation, initialising (setting) variables
	Decision	Represents a branch point i.e. different alternatives
	Connector	An entry to, or from a particular step. Commonly used if the flowchart cannot fit on one page.

Flowchart Examples

- We will look at creating flowcharts for the pseudocode examples and exercises from the last lecture.

Activity

- Based on the problem, draw the flowchart and write pseudo code
- Present your work for the rest of the class using powerpoint

Lab Exercise

- Download instructions from Moodle