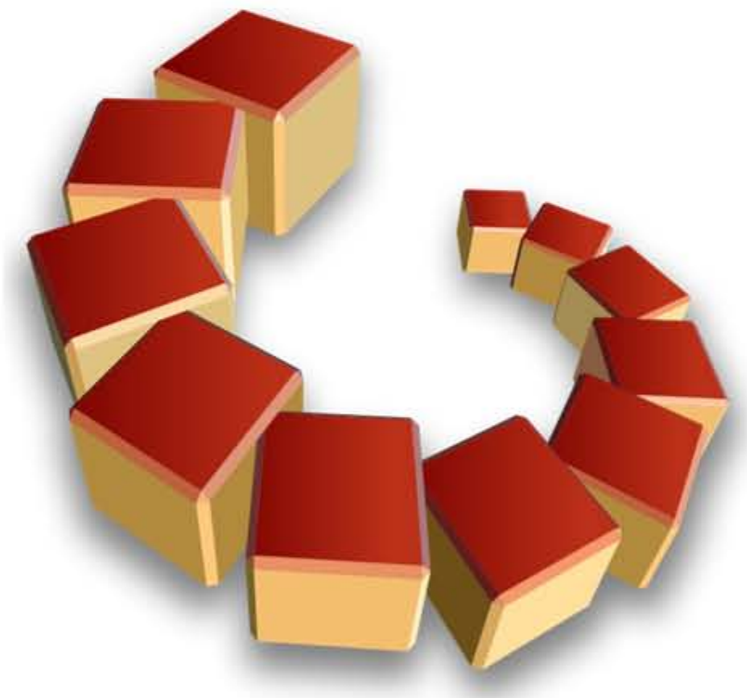
# Data Structures



# Data Structures

When programming, it is often necessary to store multiple related values.

One option is to use multiple variables; alternatively, a data structure could be used. A data structure allows multiple values to be stored under one identifier (name).

A commonly used data structure is the array.

# Arrays

An array allows a set of related values to be stored in the form of a list under one identifier.

Each position in an array has a unique index which allows it to be accessed.

This is an array that stores the top scores for an online game.

| Index | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Value | 24 | 98 | 21 | 44 | 76 |

This value can be accessed using: **scores[3]**

# Creating an Array

In pseudocode we create an array by placing the values in square brackets separated by commas.

The pseudocode for creating the scores array is shown below:

| Index | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Value | 24 | 98 | 21 | 44 | 76 |

```
scores = [24, 98, 21, 44, 76]
```

The pseudocode for creating an empty array with 4 elements is:

```
scores[1:4]
```

# Arrays and FOR Loops

A FOR loop can be used to cycle through each value in an array.

This example can be used to cycle through each value in the 1D scores array.

| Index | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Value | 24 | 98 | 21 | 44 | 76 |

| Score | 24 |
|---|---|

Output

```
FOR i ← 1 TO LENGTH(scores)
        PRINT scores[i]
ENDFOR
```

# Arrays and FOR Loops

A FOR loop can be used to cycle through each value in an array.

This example can be used to cycle through each value in the 1D scores array.

| Index | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Value | 24 | 98 | 21 | 44 | 76 |

| Score | 24 |
|---|---|

**Output**

24

```
FOR i ← 1 TO LENGTH(scores)
        PRINT scores[i]
ENDFOR
```

# Arrays and FOR Loops

A FOR loop can be used to cycle through each value in an array.

This example can be used to cycle through each value in the 1D scores array.

| Index | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Value | 24 | 98 | 21 | 44 | 76 |

| Score | 98 |
|---|---|

| Output |
|---|
| 24 |

```
FOR i ← 1 TO LENGTH(scores)
        PRINT scores[i]
ENDFOR
```

# Arrays and FOR Loops

A FOR loop can be used to cycle through each value in an array.

This example can be used to cycle through each value in the 1D scores array.

| Index | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Value | 24 | 98 | 21 | 44 | 76 |

| Score | 98 |
|---|---|

| Output |
|---|
| 24<br>98 |

```
FOR i ← 1 TO LENGTH(scores)
        PRINT scores[i]
ENDFOR
```

# Arrays and FOR Loops

A FOR loop can be used to cycle through each value in an array.

This example can be used to cycle through each value in the 1D scores array.

| Index | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Value | 24 | 98 | 21 | 44 | 76 |

| Score | 21 |
|---|---|

**Output**

24
98

```
FOR i ← 1 TO LENGTH(scores)
        PRINT scores[i]
ENDFOR
```

# Arrays and FOR Loops

A FOR loop can be used to cycle through each value in an array.

This example can be used to cycle through each value in the 1D scores array.

| Index | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Value | 24 | 98 | 21 | 44 | 76 |

| Score | 21 |
|---|---|

**Output**

24
98
21

```
FOR i ← 1 TO LENGTH(scores)
        PRINT scores[i]
ENDFOR
```

# Arrays and FOR Loops

A FOR loop can be used to cycle through each value in an array.

This example can be used to cycle through each value in the 1D scores array.

| Index | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Value | 24 | 98 | 21 | 44 | 76 |

| Score | 44 |
|---|---|

**Output**

24
98
21

```
FOR i ← 1 TO LENGTH(scores)
        PRINT scores[i]
ENDFOR
```

# Arrays and FOR Loops

A FOR loop can be used to cycle through each value in an array.

This example can be used to cycle through each value in the 1D scores array.

| Index | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Value | 24 | 98 | 21 | 44 | 76 |

| Score | 44 |
|---|---|

| Output |
|---|
| 24<br>98<br>21<br>44 |

```
FOR i ← 1 TO LENGTH(scores)
        PRINT scores[i]
ENDFOR
```

# Arrays and FOR Loops

A FOR loop can be used to cycle through each value in an array.

This example can be used to cycle through each value in the 1D scores array.

| Index | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Value | 24 | 98 | 21 | 44 | 76 |

| Score | 76 |
|---|---|

**Output**

24
98
21
44

```
FOR i ← 1 TO LENGTH(scores)
        PRINT scores[i]
ENDFOR
```

# Arrays and FOR Loops

A FOR loop can be used to cycle through each value in an array.

This example can be used to cycle through each value in the 1D scores array.

| Index | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Value | 24 | 98 | 21 | 44 | 76 |

| Score | 76 |
|---|---|

**Output**

24
98
21
44
76

```
FOR i ← 1 TO LENGTH(scores)
        PRINT scores[i]
ENDFOR
```