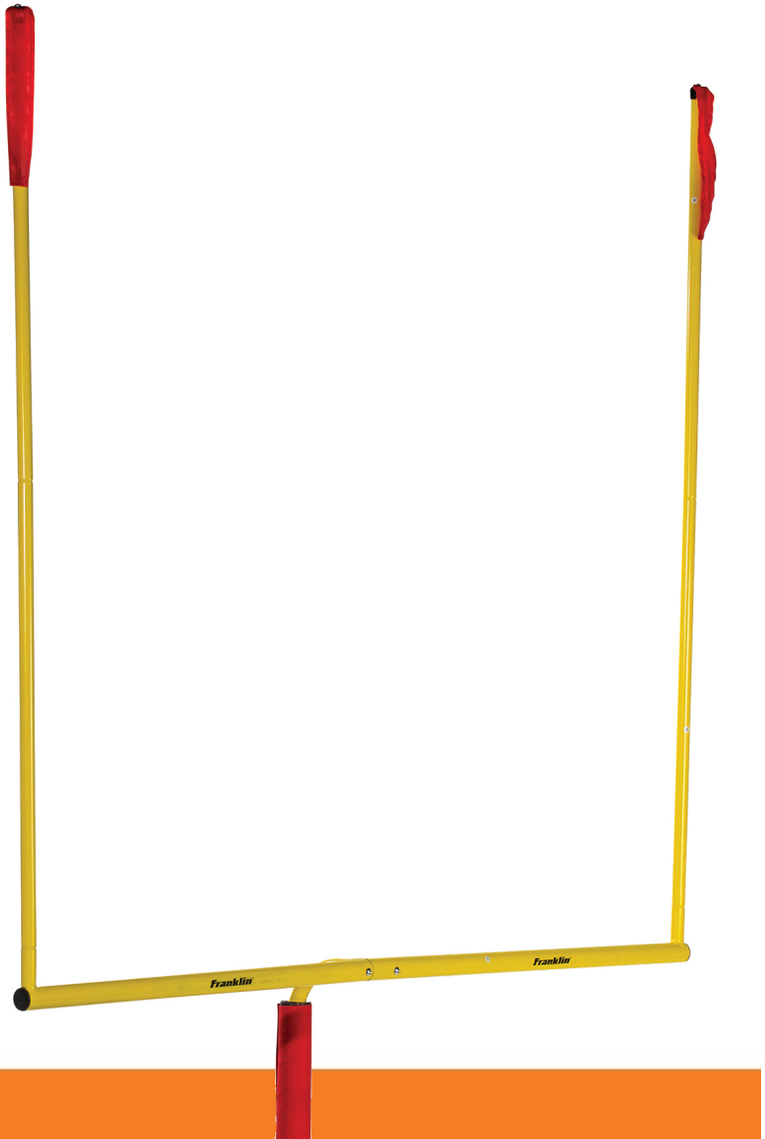
Collections

Develop Intelligence

Goals

1. Describe how to slice an array
2. Explain Enumeration
3. Give the PROs and CONs of dictionaries



Roadmap

1. Arrays
2. Enumeration
3. Hash Tables

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Arrays

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Overview

- Based on .NET `Object[]`
  - Contiguous memory
  - Heterogeneous
- Powershell makes them
  - Ergonomic
  - Sometimes weird

Syntax

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```
$as = 1,2,3
$bs = @(1, 2, 3)
$cs = 1..3

$xs = 'danish','strudle',3.14
$ys = @(1)
$zs = ,'chicken'
```

Nested Syntax

- aka 'Jagged' is a kind of multi-dimensional array
- Width and depth may not be the same

```
$lists = @(
  @('a','b','c'),
  @('A','B','C'),
  @('X','Y','Z')
)

foreach($list in $lists){
  Write-Host -ForegroundColor Green "Here's a list:"
  Write-Host $list
}
```

Indexing

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- Zero-based

```
$colors = 'red','green','purple','orange'
$first =  $colors[0]
$last = $colors[$colors.Length-1]
$alsoLast = $colors[-1]
```

Mutation

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```
$colors = @()

# Actual mutation
$colors[0] = 'forestGreen'
$colors.Clear()

# Fake mutation
$colors += 'green'
$colors += 'blue', 'brown'
```

Fancy Indexing

- The subscript of an array... can be another array

```
#Arbitrary elements
$letters = 'a', 'b', 'c', 'd', 'e'
$letters[0, 2, 4]

#Array as an index
$places = 'ocean', 'mountains', 'desert', 'jungle', 'forest', 'city'
$indexes = 0, 3, 0, 4
$places[$indexes]
```

Slicing

- Also zero based
- Reversable
- Inclusive index
- Operator + enables multi-array subscripts

```
$colors = 'red','green','purple','orange', 'blue'
$head =  $colors[0]
$tail = $colors[1..-1]

$pairs = $xs[0..1+-2..-1]
```

Destructuring

- Use assignment to grab elements from the array

```
$xs = 1, 2, 3
$head, $tail = $xs
"Head: $head"
"Tail: $tail"
```

```
$brown = 165, 42, 42
$red, $green, $blue = $brown
```

Gotcha: Resizing

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- The += operator creates a whole new array
- This gets expensive for long lists
- `ArrayList` can be quicker
- **But** it's less ergonomic

```
$colors = [System.Collections.ArrayList]::new()
$colors.Add('red')
$colors.Add('green')
$colors.Add('blue')
```

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Enumeration

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Overview

When executing a pipeline, PowerShell automatically enumerates any type that implements the IEnumerable interface and sends the members through the pipeline one at a time. ***The exception is [hashtable]****...*

- *Strings are also not enumerated

Example

```powershell
$thingArray = 'dog', 'planet', 'rag'

$thingTable = @{
  items='dog','planet','rag'
}

Write-Host "`nThings:" -ForegroundColor Green
$thingArray | Write-Output

Write-Host "`nMore Things:" -ForegroundColor Green
$thingTable | Write-Output
```

Opting Out

*However, there's an important difference. When you **pipe** multiple objects to a command, PowerShell sends the objects to the command one at a time. When you use a **command parameter**, the objects are sent as a single array object. **This minor difference has significant consequences.***

Example

- If `process` looks weird, pretend it's magic-- for now.

```
function Get-Count($Target){
  process{
    if($Target -is [array]){
      return "Got an array with $($Target.Length) items."
    }
    return "Got 1 item."
  }
}
Write-Host "`nPiped things:" -ForegroundColor Green
1,2,3 | Get-Count

Write-Host "`n Param things:" -ForegroundColor Green
Get-Count 1,2,3
```

Gotcha: Automatic Enumeration

```powershell
#1
'a','b','c' | Get-Member

#2
function Get-Self([array]$Self){
  return $Self
}
(Get-Self @('x','y','z')).GetType()
(Get-Self @('x')).GetType()
```

Example #2

```powershell
function Get-Self{
  param(
    $Self
  )
  return $Self
}

$a = 1, 2, 3
$b = Get-Self $a

$a[0] = 'chicken'

"`nHere is a: $a"
"`nHere is b: $b"
```

Return and Pipeline

When you return a collection from your script block or function, PowerShell automatically unrolls the members and passes them one at a time through the pipeline. This is due to PowerShell's one-at-a-time processing.

Fix: NoEnumerate

```powershell
function Get-Self{
  param(
    $Self
  )
  Write-Output $Self -NoEnumerate
}

$a = 1, 2, 3
$b = Get-Self $a

$a[0] = 'chicken'

"`nHere is a: $a"
"`nHere is b: $b"
```

Takeaway

- **Piped arguments** get passed one at a time
  - Opt-out by using parameters instead
- **Returned values** get passed one at a time
  - Opt-out by using `Write-Output -NoEnumerate`

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Hash Tables

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Overview

- Associates keys with values
- Also known as
  - Map
  - Dictionary
  - Associative array
- Rules
  1. Keys should be immutable-- usually strings
  2. Values are anything

Syntax

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```powershell
# Multiline
$words = @{
  fancy = 'plethora', 'eschew'
  plain = 'big', 'lots', 'some'
}

# Oneline
$user = @{id=12;name='jbloggs'}

# Setting things later
$user.createdOn = Get-Date

# Alternative syntax via subscript
$user['createdOn'] = Get-Date
```

Non-String Keys

- Literal syntax doesn't work

Bork!

```
$enrollmentByGrade=@{
  4=233
  5=232
}
```

Ok

```
$gradeEnrollment=@{}
$gradeEnrollment.Add(4, 233)
$gradeEnrollment.Add(5, 232)
```

Complaints

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- No metadata!

```
$users = @(
  @{id=11;login='jbloggs';roles='admin','remoteUser'},
  @{id='yes';login='jdoe';roles='admin','contractor'}, #Type issue
  @{id=13;login='ksun';} #Missing field
)
```

Alternatives (Preview)

- Make a simple class
- Cast from hash table
- Stay tuned for more!

```powershell
class Account{
  [int]$id
  [string]$login
  [string[]]$roles
}

$users = @(
  [Account]@{id=11;login='jbloggs';roles='admin','remoteUser'},
  [Account]@{id=12;login='jdoe';roles='admin','contractor'},

  [Account]@{id=13;login='ksun';}
```

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Review

1. Describe how to slice an array
2. Explain Enumeration
3. Give the PROs and CONs of dictionaries