Day 3: Collections

Suggested reading:
Learning Perl (4th Ed.)
Chapter 3: Lists and Arrays
Chapter 6: Hashes

Turn In Homework

Homework Review

Write code.
At least a little.
Every day.

$

$: Scalar Variables

- **$** prefix means *scalar*
- Holds one value
- Usually a number or string
- What if we want to ***collect*** values?

@

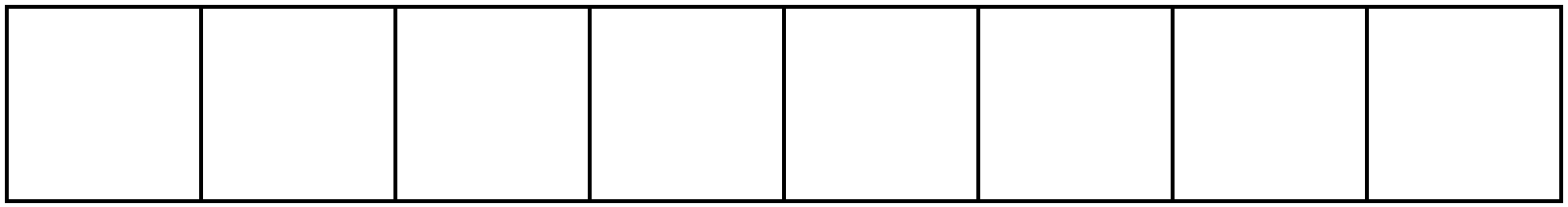
@: Array

@ prefix means ***array*** (aka *list*, sequence, tuple)

Ordered collection of scalar elements

Can mix element types in one list

0–*n* elements, bounded by memory



Making Arrays

- array literal syntax: `(…, …, …)`
- can assign lists … even to a list of scalars
- beware of flattening

```
my @bike_gear = ('helmet', 'lock');
my @stuff = ('backpack', @bike_gear);

  @stuff => ('backpack', 'helmet', 'lock')

my ($first, $second) = @stuff;
my ($start, @rest) = @stuff;
my ($one, $two, $three) = @bike_gear;
```

Using Arrays

- prefix with **@**
- on first use, declare with **my**
- reference an element with **[…]** (and **$**)
- element indexes start at **0**

```
my @array;
$array[0] = 'CS 301';
$array[1] = 'CS 367';
print "First class: $array[0]\n";
$array[1] .= ' (data structures)';
print "Whole array: @array\n";
```

```
@array
```

```
$array[n]
```

Array Bounds

- arrays grow to fit maximum index
- limited only by memory
- accessing new or unassigned index => **undef**

```
my @array;
defined($array[0]);  => undef
$array[42] = 'The Answer';
defined($array[41]); => undef
defined($array[42]); => 1
defined($array[43]); => undef
```

Useful Array Operations

```
my @stack = (1, 2, 3);
my $top = pop @stack;     # @stack = (1, 2)
push @stack, 4;         # @stack = (1, 2, 4)

my @queue = (1, 2, 3);
my $next = shift @queue;    #         (2, 3)
push @queue, 4;             #      (2, 3, 4)
unshift @queue, 5;          #  (5, 2, 3, 4)

print join(' : ', @queue) . "\n";
# => "5 : 2 : 3 : 4\n"
```

%

%: Hash

% prefix means ***hash*** (aka hash table, map, dictionary)

Arbitrary association from ***string*** key to scalar

Scalar values can be any type

0–*n* key-value pairs, bounded by memory

access is ***O***(1), on average

Making Hash(es)

- literal: **(** *key*$_1$ **=>** *value*$_1$**,** *key*$_2$ **=>** *value*$_2$**,** … **)**
- can use array literals (taken in pairs) — confusing!
- ***caution:*** order of keys is lost

```
my %map = (
    '1289'    => 'CS 368, Section 1',
    4265      => "Tim's office",
    'CS 1240' => 'fancy lecture hall'
);
```

Using Hashes

- prefix with **%**
- on first use, declare with **my**
- reference an element with **{…}** (and **$**)
- keys are unique

```
my %hash = ('2001' => 'Arthur Clarke');
print "2001's author: $hash{'2001'}\n";
$hash{'I, Robot'} = 'Issac Asimov';

my %tallies;
$tallies{'foo'} = 1;
++$tallies{'foo'};
```

```
%hash
```

```
$hash{key}
```

Useful Hash Operations

see if a key exists

```
if (exists($my_hash{'ThisKey'}) { … }
```

delete a key-value pair

```
delete $my_hash{'Goner'}
```

get all keys (as array in arbitrary order)

```
my @key_list = keys %my_hash
```

Hashes as Sets

- set all values to (e.g.) 1
- easy and fast to check set membership
- great for finding unique things

```
my %seen;  # set of observed names
foreach my $name (@names) {
  $seen{$name} = 1;
}

if ($seen{$new_name}) {
  print "I have already seen $new_name\n";
}
```

```
$foo ≠ @foo ≠ %foo
```

Size of Array or Hash

use **`scalar`** for array size

```
my $size = scalar(@array);
```

for hash, **`keys`** is array…

```
my $size = scalar(keys %hash);
```

`length` is ***only*** for strings

```
my $len = length($some_string);        # OK
my $len = length(@array);    # horribly bad
my $len = length(%hash);     # horribly bad
```

Loops

```
for (my $i = 0; $i < scalar(@x); $i++) {
  print "element $i = $x[$i]\n";
}

foreach my $e (@x) {
  print "$e\n";
}

foreach my $key (keys %hash) {
  print "$key => $hash{$key}";
}

while (my ($key, $value) = each %hash) {…}
```

Phew!

Other Scripting Languages

- All have arrays and associative arrays
- Check for different or additional:
  - **Terminology** (list, map, dictionary, …)
  - **Syntax** (`[]` vs. `{}`, `len(array)` vs. `array.length`)
  - **Operations** (sort, unique elements, flatten, shuffle)
  - **Collections** (e.g., set)

Homework

- Implement a primitive Metacritic-like system
  - Collect reviewer names and scores
  - Report scores and average score
- BE SURE TO LABEL YOUR PRINTOUT!!!

```
#!/usr/bin/perl

# Homework for CS 368-1
# Assigned on Day 03, 2010-07-15
# Written by Your Name Here

use strict;
use warnings;
```