Language Basics

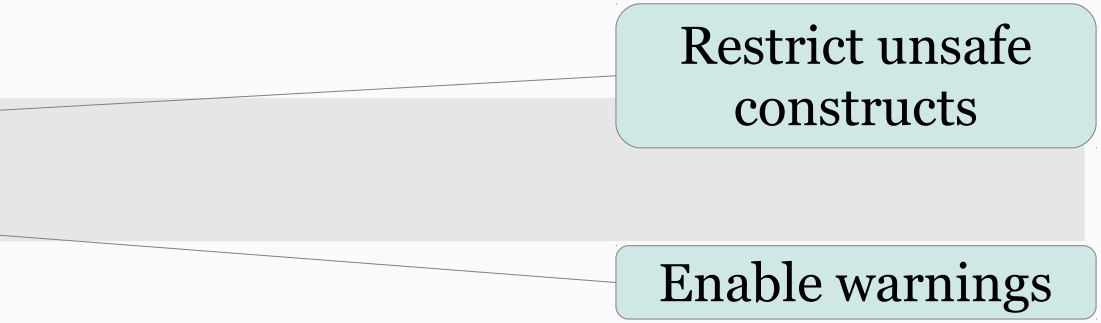
What are we covering?

- Getting started
- Data types
- Making decisions
- Flow control
- Subroutines

Boilerplate

Start our script

```
use strict;
use warnings;
```



Running our script

```
perl myscript.pl
```

Comments

- Comments start #

```
# This is a comment

my $thing = 12; # This is also a comment
```

My First Perl Script

```
use strict;
use warnings;

# Print out a message
print(“Hello workshop\n”);
```

My First Perl Script

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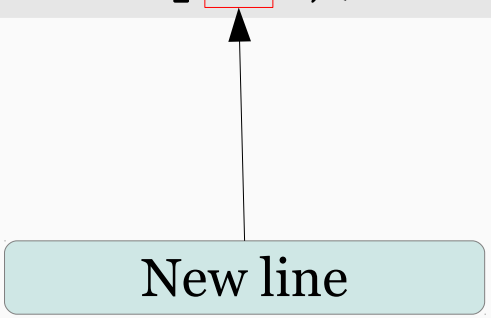


Data types

- Store data in memory
- scalars
- arrays
- hashes

Data types

- Declared with 'my'
- Type determined by first character

scalars

- Prefixed with $
- Storage of a single value
- Numbers
- Strings
- References

scalars

- Prefixed with $
- Storage of a single value
- Numbers
- Strings
- References – we'll come back to these

scalars

- Scalar declarations

```
my $text = “Hello workshop\n”;
my $number = 12;
```

My First Perl Script

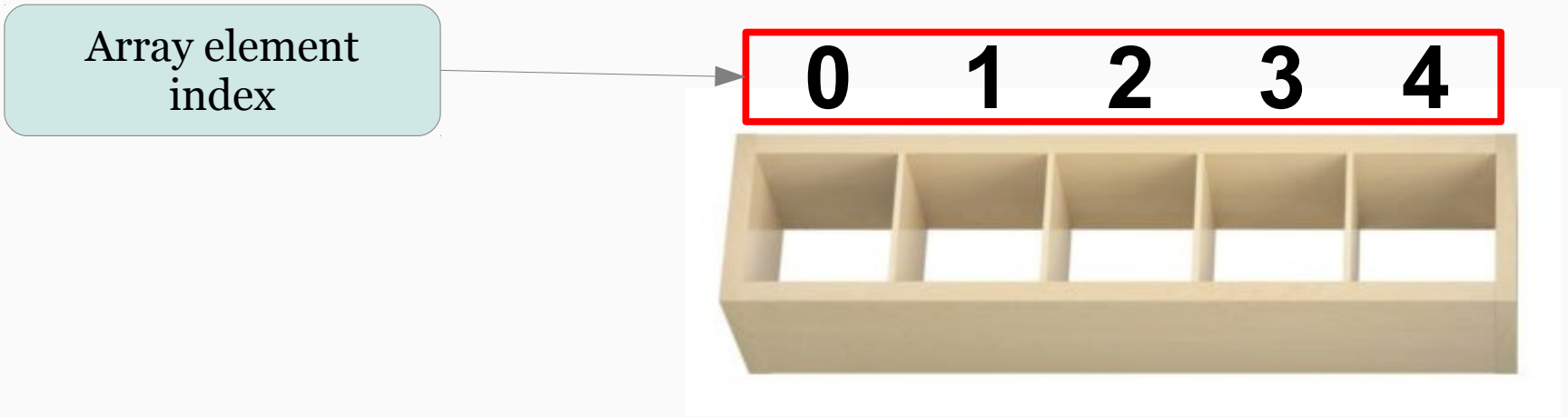
```
use strict;
use warnings;

my $text = “Hello workshop\n”;

# Print out a message
print($text);
```

arrays

- Prefixed with @
- Storing multiple scalars
- Ordered

arrays

- Indexed by number



arrays

- Array declaration

```
my @shopping = (“Bread\n”, “Butter\n”, “Jam\n”);
```

- Print can take an array

```
print(@shopping);
```

arrays

- Plural – the whole array

```
my @shopping = (“Bread\n”, “Butter\n”, “Jam\n”);
print(@shopping);
```

- Singular – an element of the array

```
$shopping[0] = “Brown bread”;
print($shopping[0]);
```

hashes

- Prefixed with %
- Indexed storage of scalars
- Unordered

hashes

- Indexed by a string
- Kind of like a card index

hashes

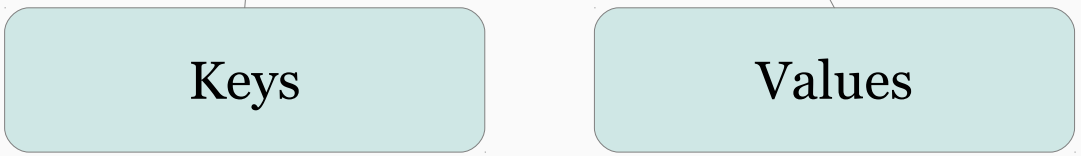
- Hash declaration

```
my %months = (
   “January”   ,     31,
   “March”     ,     31,
   “April”     ,     30,
);
```

hashes

- Hash declaration

```
my %months = (
    “January”   ,     31,
    “March”     ,     31,
    “April”     ,     30,
);
```



hashes

- Hash declaration

```
my %months = (
   “January”   ,     31,
   “March”     ,     31,
   “April”     ,     30,
);
```

- This format is error prone

```
Odd number of elements in hash assignment
```

hashes

- Hash declaration

```
my %months = (
   “January”   =>    31,
   “March”     =>    31,
   “April”     =>    30,
);
```

hashes

- Hash declaration

```
my %months = (
    “January”   =>    31,
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    “April”     =>    30,
);
```
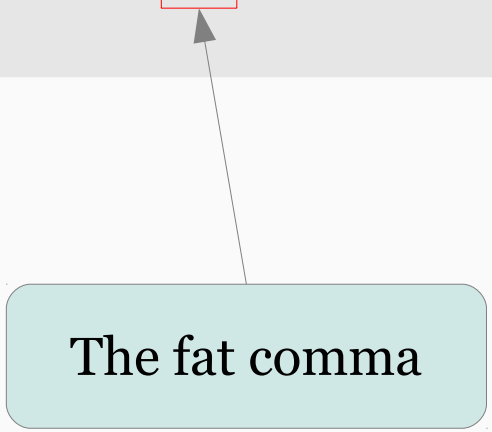



hashes

- Hash declaration

```
my %months = (
   “January”   =>    31,
   “March”     =>    31,
   “April”     =>    30,
);
```

hashes

- Hash declaration

```
my %months = (
    January    =>    31,
    March      =>    31,
    April      =>    30,
);
```

hashes

- Hash declaration

```
my %months = (
    January    =>    31,
    March      =>    31,
    April      =>    30,
);
```

- Quotation marks gone
- Assuming keys with no spaces
- Easier to read

hashes

- Plural – the whole hash

```
my %months = (
    January    =>    31,
    March      =>    31,
    April      =>    30,
);
```

- Singular – an element of the hash

```
$months{“May”} = 31;
print($months{“May”});
```

Data types

Type	Prefix	Index	Element brackets	Contents ordered
Scalar	$	-	-	-
Array	@	Numeric	[ ]	Yes
Hash	%	String	{ }	No

references

- Two shopping lists
- Supermarket
- Giftshop

references

- We can use arrays!

```
my @shopping1 = (“Bread”, “Butter”, “Jam”);
my @shopping2 = (“Paper”, “Card”, “Sellotape”);
```

references

- We can use arrays!

```
my @shopping1 = (“Bread”, “Butter”, “Jam”);
my @shopping2 = (“Paper”, “Card”, “Sellotape”);
```

- Scales really badly

references

We should put the arrays…

In a hash…!

references

- Hashes contain scalars

- Scalars contain:
- Strings
- Numbers
- References

references

- Hashes contain scalars

- Scalars contain:
- Strings
- Numbers
- References – The one we've come back to

references

We can only include an array in a hash

by reference

references

- Two ways to create a reference
- From an existing variable
- Anonymously

references

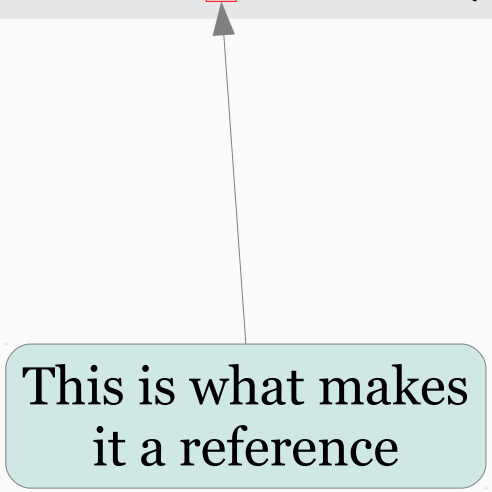
- Existing variable

```
my $array_ref = \@shopping;
my $hash_ref  = \%months;
```

references

- Existing variable

```
my $array_ref = \@shopping;
my $hash_ref  = \%months;
```



references

- Anonymous array reference

```
my $array_ref = [ “Bread”, “Butter”, “Jam” ];
```

- Anonymous hash reference

```
my $hash_ref = {
   January  => 31,
   March    => 31,
   April    => 30,
};
```

references

- Anonymous array reference

```
my $array_ref = [ “Bread”, “Butter”, “Jam” ];
```

- Anonymous hash reference

```
my $hash_ref = {
   January  => 31,
   March    => 31,
   April    => 30,
};
```

- So what's different?

references

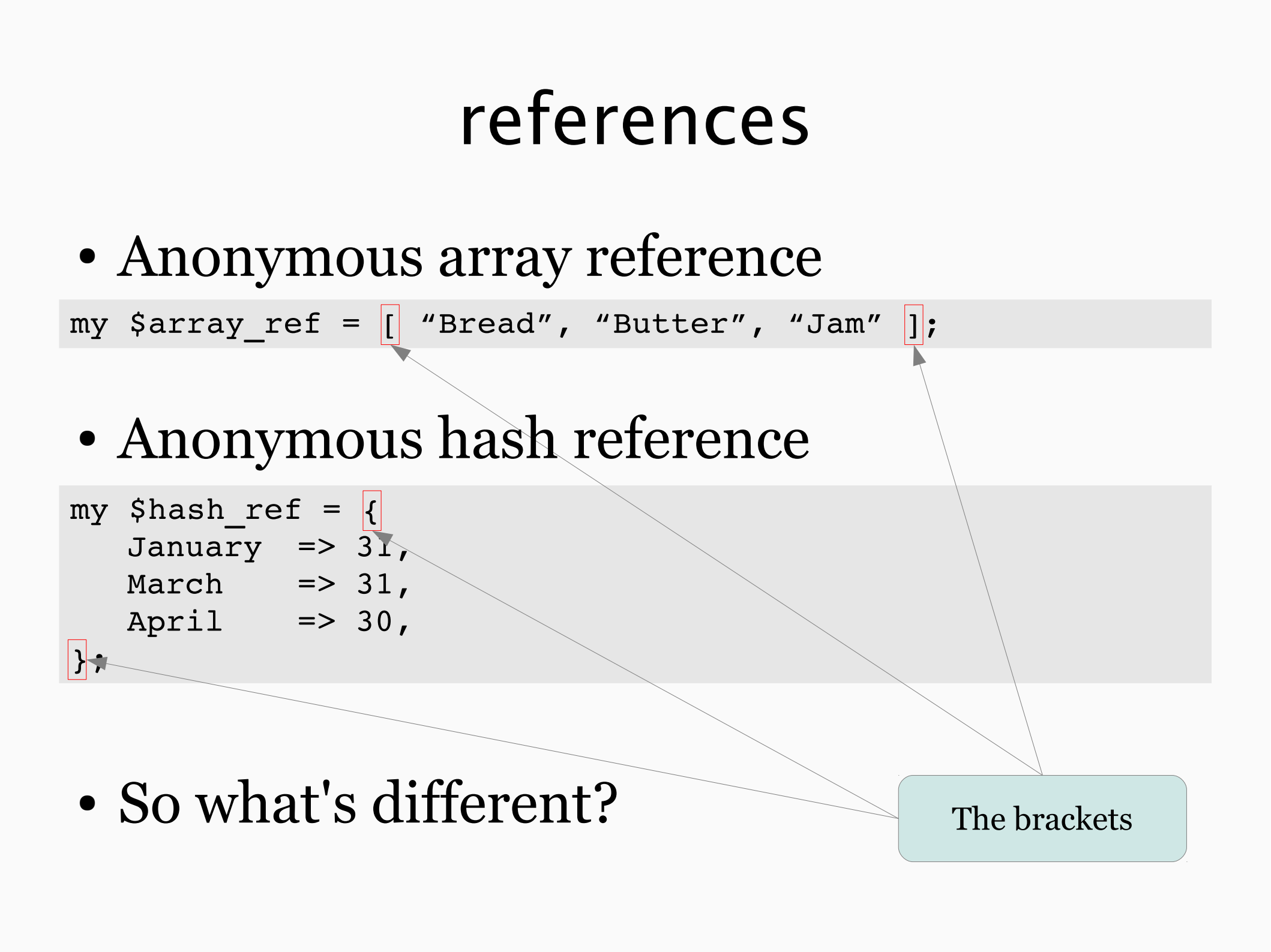
- Anonymous array reference

```
my $array_ref = [ “Bread”, “Butter”, “Jam” ];
```

- Anonymous hash reference

```
my $hash_ref = {
    January  => 31,
    March    => 31,
    April    => 30,
};
```

- So what's different?



references

Type	Anonymous reference creation	Element brackets
Array	[ ]	[ ]
Hash	{ }	{ }

references

- Making our shopping anonymous arrays

```
my $shopping1 = [ “Bread”, “Butter”, “Jam” ];
my $shopping2 = [ “Paper”, “Card”, “Sellotape” ];
```

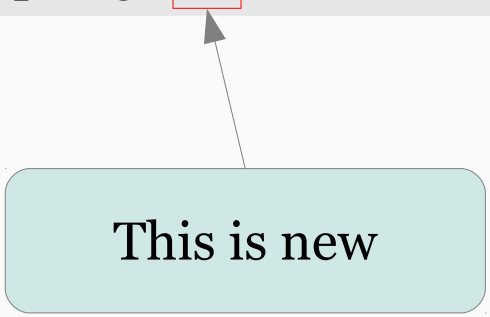
references

- Making our shopping anonymous arrays

```
my $shopping1 = [ “Bread”, “Butter”, “Jam” ];
my $shopping2 = [ “Paper”, “Card”, “Sellotape” ];
```

- How we access an element now changes

```
my $element0 = $shopping1->[0];
```



references

- So long hand...

```
# Declare arrays shopping1 and shopping2
my @shopping1 = (“Bread”, “Butter”, “Jam”);
my @shopping2 = (“Paper”, “Card”, “Tape”);

# Declare hash shopping with keys supermarket & giftshop
# pointing to the arrays shopping1 and shopping2
my %shopping = (
   supermarket => \@shopping1,
   giftshop    => \@shopping2,
);
```

references

- Change to references for arrays

```
# Declare anonymous arrays shopping1 and shopping2
my $shopping1 = [“Bread”, “Butter”, “Jam”];
my $shopping2 = [“Paper”, “Card”, “Tape”];

# Declare hash shopping with keys supermarket & giftshop
# pointing to the arrays shopping1 and shopping2
my %shopping = (
   supermarket =>  $shopping1,
   giftshop    =>  $shopping2,
);
```

references

- Loose the named references

```
# Declare hash shopping with keys supermarket & giftshop
# pointing to the arrays shopping1 and shopping2
my %shopping = (
   supermarket =>  [“Bread”, “Butter”, “Jam”],
   giftshop    =>  [“Paper”, “Card”, “Tape”],
);
```

references

- We can get our array back

```
# Declare hash shopping with keys supermarket & giftshop
# pointing to the arrays shopping1 and shopping2
my %shopping = (
   supermarket =>  [“Bread”, “Butter”, “Jam”],
   giftshop    =>  [“Paper”, “Card”, “Tape”],
);

my @shopping1 = @{$shopping{“supermarket”}};
```

references

- Seem complex
- Really aren't anything magic
- Take things apart to help yourself

Making decisions

- Context
- Looping
- Flow control

context

- Perl cares about how we ask a question
- Not just what we ask

- void
- scalar
- list

context

- void

```
print(“Hello\n”);
```

- scalar

```
my $count = length(“Hello”);
```

- list

```
my @array = (1, 2, 3);
my ($val1, $val2, $val3) = @array;
my ($val1) = @array;
```

context

Functions can and will behave differently based on the context in which you call them

If in doubt, check the manual

Looping

- for
- foreach
- while
- until

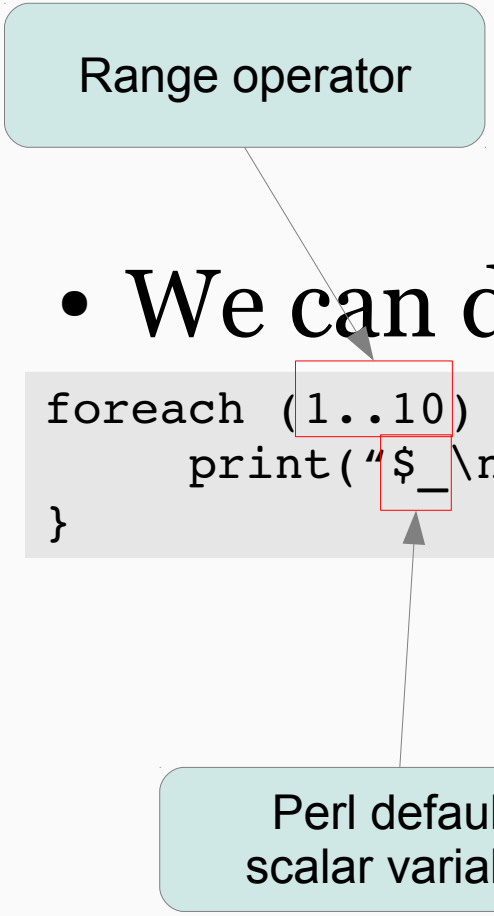
for

- for(initialisation ; test ; operation)

```
for (my $i = 1 ; $i <= 10 ; $i++) {
     print("$i\n");
}
```

Short hand for
$i = $i + 1;

foreach



- We can do the same slightly differently

```
foreach (1..10) {
      print(“$_\n”);
}
```

foreach

- Providing a variable

```
foreach my $i (1..10) {
     print(“$i\n”);
}
```

- Using an array

```
foreach my $i (@shopping1) {
     print(“$i\n”);
}
```

while

- While $i is less than or equal to 10.

```
my $i = 1;

while($i <= 10) {
    print(“$i\n”);
    $i++;
}
```

until

- Until $i is equal to 10.

```
my $i = 1;

until($i == 10) {
    print(“$i\n”);
    $i++
}
```

Flow control Comparisons

Numeric	String	Explanation
==	eq	Equals
!=	ne	Not equals
<	lt	Less than
>	gt	Greater than
<=	le	Less than or equal to
>=	ge	Greater than or equal to

if

- if

```
if($value == 0) {
    print(“Value is zero\n”);
}
```

if, elsif

- if, elsif

```
if($value == 0) {
    print(“Value is zero\n”);
}

elsif($value == 1) {
    print(“Value is one\n”);
}
```

if, elsif, else

- if, elsif, else

```
if($value == 0) {
    print(“Value is zero\n”);
}

elsif($value == 1) {
    print(“Value is one\n”);
}

else {
    print(“Value was something else\n”);
}
```

unless

- Unless is a neat shortcut
- Same as writing:

```
if($value != 0) {
    print(“Value is not zero\n”);
}
```

- Syntactically nicer to read:

```
unless($value == 0) {
    print(“Value is not zero\n”);
}
```

Subroutines

- Modular & reusable code
- Writing a subroutine
- Arguments to a subroutine

Modular & reusable code

- Counting from 1 to N
- Do it more than once
- Copy and paste nastiness

Writing a subroutine

- Defined with the “sub” keyword

```
sub count {
    for( my $i = 0 ; $i <= 10 ; $i++ ) {
        print(“$i\n”);
    }
}
```

- Call our new subroutine

```
count();
```

- But we can still only count to 10

Arguments to a subroutine

- Our call should be

```
count(20);
```

- Default array variable @_
- We unpack @_ with shift

```
sub count {
    my $max = shift;

    for( my $i = 0 ; $i <= $max ; $i++ ) {
        print(“$i\n”);
    }
}
```

Arguments to a subroutine

- If we have more arguments
- How do we remember which number?
- What if some are optional?
- Named arguments to the rescue.

Arguments to a subroutine

- Pass an anonymous hash reference

```
count({ max => 20 });
```

- So our subroutine now looks like this

```
sub count {
    my $args = shift;
    my $max = $args->{“max”};

    for( my $i = 0 ; $i <= $max ; $i++ ) {
        print(“$i\n”);
    }
}
```

- And this is why references are important