Perl Short Course: Second Session

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- In the remaining sessions, we'll look at **functions**, **references**, **modules**, **objects and classes**, take a quick tour of some of Perl's standard library, find out how to write modules and classes, then investigate some more advanced Perl topics such as functional programming, program transformations, data structures, testing and benchmarking.

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- **Perl 6**, 2001-????: The Perl developers are also working on a fundamental redesign of Perl - **Perl 6** - very different internally from Perl 5. However, it never seems to get finished! Will it ever?

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- Real literals may be written in *exponential notation*, with or without a *decimal point*: eg. `6.27`, `-2.4e30`, `7e-5`.
- A string literal can be either delimited with single-quotes or double-quotes. Different rules apply inside the two kinds of string:

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- In particular, `$` symbols are embedded as-is, and C-style escapes like `\n` do not function in a single-quoted string.

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- However, the backslash can now specify several important control or *escape* operations as follows:

\n	Newline
\t	Tab
\r	Carriage Return
\a	Ring bell
\072	Any octal ASCII value
	(7*8+2 = 58 = ':')
\x6d	Any hexadecimal ASCII value
	(6*16+13 = 109 = 'm')
\\	Backslash
\$	Dollar
\"	A double-quote
\l	Lower-case the next letter
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- Also in a double-quoted string...

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- Suppose we wish to print the value of $n immediately followed by a sequence of characters that could also form part of the variable name. If we write:

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- Fix: use {} around the variable name:

    `"you're the ${n}th person today..\n"`

- In double-quoted strings, you still need to backslash double quotes to embed them into a string. Choose your own quote character:

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my $contentslink = qq!
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- If the opening quote is an open bracket of some kind (round, curly or square), Perl uses the appropriate closing bracket as the closing quote - We could write the above as:

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- Like C, Perl provides a *modulus* operator: `10%3` gives the remainder when 10 is divided by 3. Both values are truncated to integers before this operator is applied.
- Perl provides a set of *numeric comparison* operators just like C: `<`, `<=`, `==`, `>=`, `>` and `!=` (not equals).

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- Another useful string operator is the *repetition* operator:

  "fred" x 3 gives "fredfredfred"

  (the right-hand argument is truncated to an integer before replication occurs).

- The most vital operator of all is assignment (=). For example:

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$y = $x * 7 + 5;
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- An assignment also has a value, which means you can **nest** or **chain** assignments:

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$x = $y = 17;
$y = 5 * ($a = 7 + $x);
```

  - The first example sets both $x and $y to 17.

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$y = 5 * ($a = 7 + $x);
```

    - The first example sets both $x and $y to 17.
    - The second example means: evaluate 7+$x and store the result in $a, then multiply $a by 5 and store the final result in $y.

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  ```

- **However**, never change the same variable inside two branches of the same expression:

  ```
  $a = 3;
  $b = ($a += 4) * ($a -= 2);
  ```

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Perl	Simplified Form	Effect
$a = 7;	a=7	a:7
$b = ++$a;	a++; b=a	a:8, b:8
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- Second:

Perl	Simplified	Effect
$a = 7;	a=7	a:7
$b = $a++;	b=a; a++	b:7, a:8
$c = --$b;	b--; c=b	b:6, c:6

  In both cases, $a ends up as 8.

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    If $a is less than 7, then the whole expression is bound to be true. There is no point in evaluating the rest of the expression - so Perl doesn't!
  - Similarly, consider:
    $s eq "hello" && $t ne "bonjour"
    If $s is not "hello" then the whole expression must be false. Again, there's absolutely no point in evaluating the second half.

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- Perl also provides *modifiers* for single statements:

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  <statement> if <expr> ;
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  (Perl allows `unless` to be used as a synonym for `if !`, ie. *if not true*, and `until` as a synonym for `while !`).
- A sequence of statements may be enclosed inside {} braces forming a *block*. NB: no ';' after the '}' of a block.

- Perl provides a conventional **if.. elsif.. elsif.... else** statement, to choose between two or more alternatives:

```
if( $i < 20 || $j > 7.4 )
{
        print "case one\n";
} elsif( $i > 40 && $j > 0 )
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        print "case two\n";
} else
{
        print "case three\n";
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```
my $w = $x; my $h = 1;
while ( abs($w-$h) > 0.001 )
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        $w = ($w+$h)/2;
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- The above algorithm happens to find the square root of $x!

- Perl provides a *test at the bottom* loop, two forms:

```
do {
        $y *= $x;
        $x += 2;
} while( $x < 15 );
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- A C-style *counting loop*:

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for( my $sum = 0, my $i = 1; $i <= 10; $i++ )
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- A very useful *for each element in a list/array* loop:

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foreach my $x ( 1, 3, 7, 5, 4, 54 )
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(We'll see more about arrays next session).

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- Exercise: Try writing a little Perl program that reads in a number and computes the square root using the while loop on the previous slide, printing out a message like "The square root of $x is $w".

Lets consider getting input from the keyboard, and reporting results to the screen.

- The <> operator (pronounced *diamond* or *getline*) fetches a line of input from a filehandle - STDIN is a filehandle, which represents the standard input (normally the keyboard). So:

  `$name = <STDIN>;`

  reads an entire line of input, up to and including a newline, and then stores the input in the variable (including the newline).

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  - Perl 4 provided chop($name) which removes the last character from the named variable and returns the character removed.
  - Perl 5 added chomp($name) which deletes a trailing newline or does nothing.

- Use chomp everywhere; it's safer and more portable (it will remove the newline from the string even if the newline convention on the OS you're using is not a single character!).

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- Here's an example (**eg1**), allowing you to investigate different expressions:

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  print "Please enter x: ";
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  print "Please enter y: ";
  my $y = <STDIN>;
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  my $z = $x + $y;
  print "\n$x + $y = $z\n";
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- Try various **+=** and **++** types of operators to get clear exactly what they do.

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- More typically, you test for *not eof*, which is written `if( $line ne "" )` or simply `if( $line )`.

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while( my $line = <STDIN> )   # for each line from stdin
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- At the end, add `print "total: $sum\n"`.

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- Then to open `fred`:
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  my $in = new IO::File( "fred" );
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  If the file `"fred"` doesn't already exist, **new IO::File** will fail, returning 0 - a boolean false - so check for success by testing the result. Or check for failure by testing `unless( $in )`.

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  If the file `"fred"` doesn't already exist, **new IO::File** will fail, returning 0 - a boolean false - so check for success by testing the result. Or check for failure by testing `unless( $in )`.
- Often, handling the failure is done by printing an error message (on STDERR) and exiting - use `die`:
  ```
  my $in = new IO::File( "fred" );
  unless( $in )
  {
          die "can't open fred\n";
  }
  ```

- Better still, use conditional modifier syntax:

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- A typical *read every line* program looks like **eg3**:

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use IO::File;
my $in = new IO::File( "fred" ) || die "can't open fred\n";
while( my $line = <$in> )
{
        chomp $line;
        print "read '$line'\n";
}
$in->close;
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- Note: As well as die there's a function warn which prints a message to STDERR but doesn't exit.

- To open a file for writing (overwriting the old contents):

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my $out = new IO::File( "> bob" ) || die "sob.. can't create bob\n";
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- You can also open a pipe to/from a Unix pipeline for reading/writing:

  - `my $in = new IO::File( "ls | sort -r |" );`
    If the last character is a '|', then we can read data from the pipeline: Any output that ls | sort -r prints onto its STDOUT will be available for us to read via <$in>.

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  - `my $out = new IO::File( "| expand" );`
    If the first character is a '|', then we can write data to the pipe: expand will perceive a stream of data coming from its STDIN, but it'll really be whatever we write to `$out`.

- Exercise: Merge **eg2** and **eg3** to sum up the leading numbers in a specific named file.
- Exercise: Write a program that reads every line from STDIN, lower-cases it using `lc()` and writes the lower-cased lines into a file called `lower`. You might call such a program `mklower`.
- Exercise: modify `mklower` slightly: remove the word STDIN from the `<STDIN>` getline call, leaving the mysterious syntax `<>`. We'll explain next session what this syntax means - for now, try to work it out for yourself by experimenting with `mklower`'s behaviour.