


Perl 5 Constants and Variables						
Perl Constants		<ul style="list-style-type: none">Perl pragma to declare constants. ⚠️ But be aware that these are still not read-only, that they inject sub-routines and have several limitations. Read the doc!!CPAN modules for defining constants by Neil Bowers . Of particular interest: Const::Fast and Attribute::Constant for efficient read-only constants.				
Perl Variables Names		Scalar Naming Conventions		Array Naming Conventions		
Case sensitive. ASCII by default, UTF-8 if the utf8 pragma is used.		<ul style="list-style-type: none">All variables: words_with_underscoresLocal variables: \$lowercaseGlobal variables: \$Title_CaseConstants: \$UPPER_CASE		Same, but array names should be plural. <ul style="list-style-type: none">@locals@Global_Arrays@CONSTANT_ARRAYS		
		<ul style="list-style-type: none">Module names are MixedCaseNoUnderscoresConstants are UPPERCASE_WITH_UNDERSCORESPackage wide vars are Mixed_Case_With_UnderscoresFunctions/methods are lowercase_with_underscores				
Perl types Scalar		\$	\$foo \$days[28] \$days{'Feb'} \${days} \$Dog::days \$Dog'days	Simple scalar value 29 th element of array @days Value associated with the Feb key of hash %days Same as \$days, use before alphanumumerics. The \$days variable inside the Dog package. Same as above. Archaic use of single quote.	\$#days \$days->[28] \$days[0][2] \$d{99}{'Feb'} \$d{99, 'Feb'}	Last index of array @days . 29 th element of array pointed to by reference \$days. Multi-dimensional array Multi-dimensional hash Multi-dimensional hash emulation
list and Array <ul style="list-style-type: none">0-based indexed (first index is 0).Last index of array @name is \$#name		@	@days @days[3,4,5] @days[3..5]	Array containing (\$days[0], \$days[1], ... \$days[\$#days]) Array slices containing (\$days[3], \$days[4], \$days[5]) Array slices containing (\$days[3], \$days[4], \$days[5])	<ul style="list-style-type: none">A list is an ordered collection of scalars (of any type).An array is a variable that contains a list.Reading beyond the end of array returns undef	
		<ul style="list-style-type: none">Negative indices used in read access from the end: -1 is last item.Use these negative indices to access from the end. Do not compute index with \$#name -3, if the list size is 2, this will give invalid results.				
<ul style="list-style-type: none">array slices LPoSimple explanation			<ul style="list-style-type: none">Use a slice to select multiple elements from a list, array, or hash.Don't use a slice when you know you need exactly one element.An lvalue slice imposes list context on the righthand side.Assign to array slice to update several values. ➡		my @extracted = (6, 2, 8, 4); my @choices = @digits[@extracted] my \$mod_time = (state \$filename)[9]; @extracted[1, 3] = (7, 9);	my @digits = (0..9); my @one2five = @digits[1..5]; my @premiers = @digit[1, 2, 3, 5, 7];
<ul style="list-style-type: none">Anonymous arrays			<ul style="list-style-type: none">What are the advantages of anonymous array? @ StackOverflowPerlref @ Perldoc, Perl reference tutorial @ Perldoc		<ul style="list-style-type: none">Anonymous array := a type of array reference. Use it to build nested data structures.Array reference allows Perl to treat the array as a single item.	
Hash/associative array Hashes @ Perl Maven		%	%days	Associative array (hash): keys-value pairs. Can be initialized as: <ul style="list-style-type: none">my %days = (Jan => 31, Feb => \$leap? 29 : 28, ...)my %days = ("Jan", 31, 'Feb', \$leap? 29 : 28, ...) Multiple values of a hash can be changed with the following construct:		Initialize a hash slice with array context: @char_to_num{'A' .. 'Z'} = 1 .. 26; my %rating = (ron =>20, al => 50, steve=80); my @names = (ron, al); @rating{ @names } = (25, 35);
hash slice LPo		➡	@days{ 'J' , 'F' }	Hash slice returning a list containing (\$days{ 'J' } , \$days{ 'F' }) .		
key-value slices LPo		➡	extract/write values:	my scores = @rating{ @names }; @rating { @names } = (45, 55);		
Subroutine		&	&foo	& is needed to create reference to subroutine.		
Typoglob		*	*foo	See: Advanced Perl Programming , 1st Edition Section 3.2		
7 kinds of package variables types		1. scalar variables \$ 2. array variables @		3. hash variables % 4. subroutine name	5. format names (See write and select) <ul style="list-style-type: none">how to format output in Perl?, Perl-Formats	6. file handles 7. directory handles
<ul style="list-style-type: none">References Perl references intro Perl reference tutorial Reference purpose IntPo		A reference is a scalar variable whose value is a pointer to another Perl variable. Use it to build more complex data types . Make reference with \ . Stringize it with ref				
		my @array = qw(a, b, c); print \$array[1]. # b		my \$array_ref = ['a','b','c\n']; print \$\$array_ref[1]; # b print \$array_ref->[1]; # b, arrow notation	my %hash = (a=>1, b=>2, c=>3); print \$hash{c}; # 3 ⬅ arrow notation is shorter/cleaner ➡	my \$hash_ref = {a=>1, b=>2, c=>3}; print \$\$hash_ref{c}; # 3 print \$hash_ref->{c}; # 3 with arrow notation
		Store a ref to an array or hash into an array: push @array \%hash			Pass array or hash to subroutine: fct(\@a, \%h); Return from sub: return (\@a, \%h);	
Scalar values		Numeric		literals examples:	Note: leading 0 work only for literals, not for string-to-number conversions.	
<ul style="list-style-type: none">numeric: Note: underlines can be used inside decimal, hexadecimal and binary literals.		<ul style="list-style-type: none">integer : using the system's native format.<ul style="list-style-type: none">bigint - transparent big integer support.bignum - transparent big number support.floating-point : using the system's native format.<ul style="list-style-type: none">bigrat - transparent big rational number support. <i>A variable holding an integer can be converted to floating-point if the operation done to it requires it (such as dividing 1 by 2).</i>		my \$x = 12345; my \$x = 12345.67; my \$x = 6.02e23; my \$x = 0x1f.0p3; my \$x = 4_294_967_296; my \$x = 0x1234_5678; my \$x = 0377; my \$x = 0o377; my \$x = 0b1100_0010;	# integer # floating point # scientific notation # power ² exponent: <i>Perl</i> >= v5.22 # underline for legibility # underline in hex is also OK # octal # octal also <i>Perl</i> >= v5.34 # binary with underlines	<ul style="list-style-type: none">oct - supports binary, octal, hexhexPOSIX::ceilPOSIX::floorabs
<ul style="list-style-type: none">string		<ul style="list-style-type: none">double-quoted strings: perform backslash and variable interpolation of expression that begin with \$ (a scalar) or @ (an array). Hashes cannot be interpolated.single-quote strings: only perform \' and \\ substitution (to ' and \ respectively), nothing else.Single quote and double quote strings can spread multiple lines: it embeds the newline character on each new line.But \n is only expanded in double quoted strings! In single quote string it is treated as two characters; no substitution is done (as explained above).				
<ul style="list-style-type: none">Unicode support		Use Unicode literally in a program; add the utf8 pragma : use utf8 ; See: Perl Unicode Tutorial , Perl Unicode Introduction , Perl Unicode Support @ perldoc				
<ul style="list-style-type: none">Quote constructs See: <ul style="list-style-type: none">Strings in Perl: quoted, interpolated and escaped		Customary	Generic	Meaning	Interpolates?	Notes
		''	q//	Literal string	No	<ul style="list-style-type: none">Not all characters can be used as the / separator. { }, () and < > can also be used.You can use whitespace between the quote specifier and its initial bracketing character: <pre>my \$chuck_of_code = q { if (\$condition) { print "Salut!"; } };</pre>
		"""	qq//	Literal string	Yes	
		--	qx//	Command execution	Yes	
		()	qw//	World list	No	
		//	m//	Pattern match	Yes	
		s///	s///	Pattern substitution	Yes	
		tr///	y///	Character translation	No	
		""	qr//	Regular expression	Yes	
		<ul style="list-style-type: none">It's also possible to write: s<foo>(bar) and tr(a-f)[A-F] as well as separating them on 2 lines:Array variables are interpolated by joining all elements with the separator specified by the \$" special variable (\$LIST_SEPARATOR) .				
<ul style="list-style-type: none">Character escapes (only inside double quoted strings)		\a	Alert (bell)	\e	ESC character	Any Unicode code point, by name: \N{LATIN SMALL LETTER E WITH ACUTE} é \N{ U+E9 } é
		\b	Backspace	\033	ESC in octal	
		\e	ESC character	\o{33}	ESC in octal	
		\f	Form feed	\x7f	DEL in hexadecimal	
		\n	Newline (usually LF)	\x{263a}	Character number 0x263A	
		\r	Carriage return (Usually CR)	\cC	Control-C	
		\t	Horizontal tab			
<ul style="list-style-type: none">translation escapes (inside double quoted strings)		\u	Force next character to titlecase	\U	Force all following characters to uppercase. Ends at \E	\E Ends \U, \L, \F or \Q
		\l	Force next character to lowercase	\L	Force all following characters to lowercase. Ends at \E	
				\F	Force all following characters to Unicode fold case. Ends at \E	
				\Q	Backslash all following non alphanumeric characters. Ends at \E	
<ul style="list-style-type: none">bareword		In Perl, a <i>bareword</i> refers to a sequence of characters suitable for an identifier. It's not quoted. By default Perl allows barewords to behave like strings. <ul style="list-style-type: none">This is not allowed when any of use strict; or use strict "subs"; or use v5.12; is specified.				
<ul style="list-style-type: none">Here documentsHere docs @ Perl mavenPerl here doc @Wikipedia		Perl here-documents are a form of line oriented quoting. There are several forms of here documents, where the identifier (like EOF used below, but can be any word) must be placed at the beginning of the terminating line: <ul style="list-style-type: none">Default : <<EOF; Supports variable interpolation.Double quotes: <<"EOF"; Supports variable interpolation. Can also be written with whitespace as in << "EOF";Single quotes: <<'EOF'; Does not support interpolation. Can also be written with whitespace as in << 'EOF';backticks: <<`EOF`; Execute commands in a shell and return text printed on stdout. Can also be written with whitespace as in << `EOF`;indented: <<~EOF; Allows indenting the here-doc string. Can also use the ~ with the other forms: <<~\EOF, <<~"EOF", <<~"EOF", <<~`EOF`They can also be stacked and text can be transformed. See the documentation.				
<ul style="list-style-type: none">Perl Regexp		Regexp Tutorial, Learn PCRE in X minutes, PCRE cheatsheet,				Debuggex regexp tester, regex101, RegEx Pal
<ul style="list-style-type: none">index/substr		\$pos = index(\$page, \$line);	\$last_slash = rindex("/usr/bin/ls", "/");	\$part = substr(\$text, \$pos, \$len)	A value of -1 in pos identifies last character.	
<ul style="list-style-type: none">Replacementmanipulate strings with substr LPo		my \$pref = "I like awk and erlang"; substr(\$pref, index(\$pref, "awk"), length("awk")) = "Perl"; substr(\$pref, 0, 0) = "Sally and "; # insert text anywhere			substr(\$pref, -15) =~ s/Perl/Perl5/g; # replace text inside a restricted portion of the string.	

<div>Perl Special Variables</div> <div><div>• Perl Variables</div></div>	<div>To get information about a Perl special variable from the command line use the perldoc -v '\$<'.</div> <div>To get information about \$< use: perldoc -v '\$<'</div>					
<div><div>• Deprecated and removed variables:</div></div>	\$#	\$*	\$	\${^ENCODING}	\${^WIN32_SLOPPY_STAT}	
<div><div>• General variables</div></div>						
default input and pattern searching space	• \$ARG • \$_		subroutine parameters		• @ARG • @_	
list separator	• \$LIST_SEPARATOR • \$"		Subscript separator for multidimensional array emulation		• \$SUBSCRIPT_SEPARATOR • \$SUBSEP • \$;	
Name of executed program	• \$PROGRAM_NAME • \$0		Name used to execute the current copy of Perl		• \$EXECUTABLE_NAME • \$^X	
Perl process ID	• \$PROCESS_ID • \$PID • \$\$		Process real GiD	• \$REAL_GROUP_ID • \$GID • \$(Process effective GiD	• \$EFFECTIVE_GROUP_I D • \$EGID • \$)
Process real UID	• \$REAL_USER_ID • \$UID • \$<		Process effective UID		• \$EFFECTIVE_USER_ID\$ • \$EUID • \$>	
Special variables in sort	• \$a The Perl sort function uses global variables \$a and \$b. sort sorts strings. Pass a sorting function that uses the <=> equality operator to force numerical comparisons: • \$b @sorted = sort { \$a <=> \$b } @unsorted;					
Current environment	%ENV		Environment variable accessed as an associative array (a hash). • See: Perl: How to access shell environment variables through Perl associative arrays.			
Perl interpreter revision, version and subversion	• \$OLD_PERL_VERSION • \$]		Perl interpreter revision, version and subversion		• \$PERL_VERSION • \$^V	
Maximum file descriptor	• \$SYSTEM_FD_MAX • \$^F		Fields of each line when auto-split mode is on.		@F	
Include Directories	@INC	Included filenames	%INC	Hook localization (?)	\$INC	
inplace-edit extension value	• \$INPLACE_EDIT • \$^I	Package's class parent classes	@ISA	Emergency memory pool	\$^M	
Maximum block nesting	\${^MAX_NESTED_EVAL_BEGIN_BLOCKS}			Time when program began running	• \$BASETIME • \$^T	
Name of OS where this Perl was built	• \$OSNAME • \$^O	Signal handlers	%SIG	Coderefs for various perl keywords	%{^HOOK}	
<div><div>• Regexp Variables</div></div>						
captured sub-patterns	\$<digit>(\$1, \$2, ...)		Capture buffer content		@{^CAPTURE}	
String matched	• \$MATCH • \$&		String matched (compiled regexp)		\${^MATCH}	
String preceding match	• \$PREMATCH • \$`		String preceding match (compiled regexp)		\${^PREMATCH}	
String following match	• \$POSTMATCH • \$'		String following match (compiled regexp)		{^POSTMATCH}	
Last capture group	• \$LAST_PAREN_MATCH • \$+		Most recently closed capture group		• \$LAST_SUBMATCH_RESULT • \$^N	
Match capture key values	• %{^CAPTURE} • %LAST_PAREN_MATCH • %+		Maximum regexp nested group		\${^RE_COMPILE_RECURSION_LIMIT}	
Match start offsets	• @LAST_MATCH_START • @-	Match ends offsets	• @LAST_MATCH_END • @+	Named captured groups	• %{^CAPTURE_ALL} • %-	
Last successful pattern	\${^LAST_SUCESSFUL_PATTERN}		Result of last successful regexp assertion		• \$LAST_REGEXP_CODE_RESULT • \$^R	
regexp debug flag	\${^RE_DEBUG_FLAG}		regexp internal optimization/memory		\${^RE_TRIE_MAXBUF}	
<div><div>• Format Variables</div></div>						
Current value of the write() accumulator for format() lines.	• \$ACCUMULATOR • \$^A					
Form feed format, defaults to \f	• IO::Handle->format_formfeed(EXPR) • \$FORMAT_FORMFEED • \$^L		Set of characters after which a string may be broken to fill continuation fields		• IO::Handle->format_line_break_characters EXPR • \$FORMAT_LINE_BREAK_CHARACTERS • \$:	
Number of lines left on the page on currently selected output channel	• HANDLE->format_lines_left(EXPR) • \$FORMAT_LINES_LEFT • \$-		Current page length of current output channel		• HANDLE->format_lines_per_page(EXPR) • \$FORMAT_LINES_PER_PAGE • \$=	
Name of current top-page format of output channel	• HANDLE->format_top_name(EXPR) • \$FORMAT_TOP_NAME • \$^		Report format name of output channel		• HANDLE->format_name(EXPR) • \$FORMAT_NAME • \$~	
<div><div>• Error Variables</div></div>	The variables \$@, \$!, \$^E, and \$? contain information about different types of error conditions that may appear during execution of a Perl program. They correspond to errors detected by the Perl interpreter, C library, operating system, or an external program, respectively.					
Perl error from the last eval operator	• \$EVAL_ERROR • \$@		Current state of interpreter		• \$EXCEPTIONS_BEING_CAUGHT • \$^S	
Current value of C errno integer variable	• \$OS_ERROR • \$ERRNO • \$!	\$! returns the system variable errno when used in a numeric context, but returns the string from perlerror() when used in string context.	Hash of error names to 0 or 1, set to 1 if current error is this error.		• %OS_ERROR • %ERRNO • %!	
OS detected error	• \$EXTENDED_OS_ERROR • \$^E					
Status returned by last pipe close, backtick command, wait, waited, or system() call.	• \$CHILD_ERROR • \$?		native status returned by last pipe close , backtick command, wait() or waitpid() or system() call		\${^CHILD_ERROR_NATIVE}	

Current value of warning switch	<ul style="list-style-type: none">• \$WARNING• \$^W	Current set of warning checks enabled by the use warnings pragma	{^WARNING_BITS}		
<ul style="list-style-type: none">• Variables related to the interpreter state	These variables provide information about the current interpreter state.				
Flag associated with the -c switch	<ul style="list-style-type: none">• \$COMPILING• \$^C	The current value of the debugging flags	<ul style="list-style-type: none">• \$DEBUGGING• \$^D		
Current phase of the perl interpreter	^{GLOBAL_PHASE}	Debugging support. Internal variable.	<ul style="list-style-type: none">• \$PERLDB• \$^P		
Compile-time hints for the perl interpreter. Internal use only	^H	Values of compiled statements	%^H		
Taint mode	^{TAINT}	Safe locale operations availability	{^SAFE_LOCALES}		
Input/Output Layers. Internal use by PerlIO only.	^{OPEN}	Unicode Settings of Perl	{^UNICODE}		
Internal UTF-8 offset caching code state	^{UTF8CACHE}	State of UTF-8 locale detected by perl at startup.	{^UTF8LOCALE}		
<ul style="list-style-type: none">• File handle Variables	See also: Perl File Handles The following variables are used in the Input/Output handling as well as program arguments.				
Name of current file read from <>	\$ARGV	Command line arguments of the script ← See diamond operator <>. →	@ARGV	Number of arguments minus one	\$#ARGV
Special file handle that iterates over command-line filenames in @ARGV	ARGV	Special file handle that points to currently open output file when doing edit-in-place processing	ARGVOUT		
Output field separator for the print operator	<ul style="list-style-type: none">• IO::Handle->output_field_separator(EXPR)• \$OUTPUT_FIELD_SEPARATOR• \$OFS• \$,	Current line number for the last file handled accessed	<ul style="list-style-type: none">• HANDLE->input_line_number(EXPR)• \$INPUT_LINE_NUMBER• \$NR• \$.		
Input record separator (newline by default)	<ul style="list-style-type: none">• IO::Handle->input_record_separator(EXPR)• \$INPUT_RECORD_SEPARATOR• \$RS• \$/	Output record separator	<ul style="list-style-type: none">• IO::Handle->output_record_separator(EXPR)• \$OUTPUT_RECORD_SEPARATOR• \$ORS• \$\		
Auto-flush control <ul style="list-style-type: none">• order of output @ Perl Maven• Suffering from Buffering?	<ul style="list-style-type: none">• HANDLE->autoflush(EXPR)• \$OUTPUT_AUTOFLUSH• \$!	Perl activates file buffering by default. Assign 1 to \$! to activate auto-flush.	Last read file handle	{^LAST_FH}	

Perl 5 Input/Output 🚧

References	<ul style="list-style-type: none">• open @ perldoc browser• Writing to files with Perl @ Perl Maven• open file in-memory @ stackOverflow• Stupid open() tricks @Perl.com:<ul style="list-style-type: none">• No explicit filename• create an anonymous temporary file• print to a string• read lines from a string				
print, printf, sprintf	print, printf, sprintf (which describes the format) . Note: print , a list operator, is more efficient than printf . print and printf output to stdout by default, but accept a file handle as the first argument if it is NOT followed by a separating comma! (a ' , puts it in the list to print!)				
diamond operator <>	Both <> and <<>> operators read the content of files listed on the command line via @ARGV. Nothing or - on the command line identifies stdin. The <> operator supports shell redirection and pipe operations which <<>> does not allow (for security reasons).				
The double diamond, a more secure <> (Perl >= v5.22)	print <>;	← Simple implementation of /bin/cat	print <<>>;	← safer one	Redirection cannot be forced via file names embedding them with. the <<>> operator.
	print sort <>;	← Simple implementation of /bin/sort	print sort <<>>;	← safer one	
 In-place-editing ↔ The <> operator tries to duplicate the original file's permission and ownership.	Set \$^I to a backup file extension (such as Emacs "~" or ".bak") to change the behaviour of the <> and <<>> operators and print. In a while (<>) {...} loop, when \$^I is not undef (its default), Perl: <ul style="list-style-type: none">• renames currently processed file with the specified extension added,• opens a new file with the original name• prints into the new file.• Any modification goes into the new file: in-place-editing it!		<pre>use strict; \$^I = "~"; # rename old file: add '~' to it's name (Emacs-style backup) while (<>) { s/something/Something else/; # perform any substitution print; }</pre>		
perl -i cmdline option	It's also possible to do this on the command line! For example:		perl -p -i- -w -e 's/something/Something else/g' data*.dat		
Special filehandle names	ARGV	The special filehandle that iterates over command-line filenames in @ARGV. Usually written as the null filehandle in the angle operator <> (or <<>>)			
Also See: • File handle Variables section above.	ARGVOUT	The special filehandle that points to the currently open output file when doing edit-in-place processing with <u>i</u> . <ul style="list-style-type: none">• Useful when you have to do a lot of inserting and don't want to keep modifying \$_<u></u>			
	STDIN	<STDIN> : line input operator for the STDIN filehandle (for the standard input). <ul style="list-style-type: none">• Each time <STDIN> is used in scalar context, Perl reads 1 complete line of the standard input and uses it as the value of <STDIN>.<ul style="list-style-type: none">• The string includes a line termination character. Use the chomp built-in function to strip it off the variable.• If <STDIN> is read in list context, it returns all lines inside a list! For example, foreach (<STDIN>) { ... } reads the entire stdin in 1 step: \$_<u></u> holds it all! <div><pre>while (<STDIN>) { # print all print; # lines of # stdin }</pre><pre>while (defined(\$_ = <STDIN>)) { print \$_; }</pre></div>			
		The code in the left-most cell is the shortest form. It is equivalent to the code beside it; each line of stdin is stored in the default variable \$_ <u></u> and the loop stops on end at which time <STDIN> returns undef.			
	STDOUT	standard output			
	STDERR	standard error	Note: generally STDERR is not buffered, while STDOUT is buffered by default. Text sent on STDERR may show up before STDOUT. <ul style="list-style-type: none">• Print a new line on STDOUT to help flushing it or assign 1 to \$ to activate auto-flush.		
	DATA				
say	• say use feature qw(say); or use v5.10; (or higher). Like print, but implicitly appends a newline at the end of the list.				
open					

Perl 5 Statements ⚠️

Loop control	See perlsyn for more information on Perl syntax which includes declarations, blocks, loops, labels, subroutines, etc...		
		The last , next , and redo loop control keywords work in the following constructs:	Notes: <ul style="list-style-type: none">The while and foreach loops may have a continue block: executed before evaluating condition again, which corresponds to the 3rd part of a for loop statement. See this @ stackOverflow.Blocks can be labelled g as targets to last, next, and redo
	loop control keywords: <ul style="list-style-type: none">last g: exits the loop.next g: starts the next iteration of the loop.redo g: restarts the loop block without evaluating the condition again.	<ul style="list-style-type: none"><code>while (condition) { ... }</code><code>until (condition) { ... }</code><code>for (init; condition; continue) { ... }</code><code>foreach array { ... }</code>naked block: <code>{ ... }</code>	
Statement modifiers	<ul style="list-style-type: none"><code>if EXPR</code><code>unless EXPR</code><code>while EXPR</code><code>until EXPR</code><code>for LIST</code><code>foreach LIST</code><code>when EXPR</code>	The <code>for</code> and <code>foreach</code> statements impose a list context ; the complete list is processed. Therefore a loop like the following trying to stop on a line that has " <code>__END__</code> " on it will not work since it reads all of STDIN: <pre>foreach (<STDIN>) { last if ?__END__;/ ...; }</pre>	The while statement imposes a scalar context ; it takes one line at a time from <STDIN> and the following code works properly: <pre>while (<STDIN>) { last if /__END__;/ ...; }</pre>
	<ul style="list-style-type: none"><code>do block</code>		
Conditional statements			

Perl 5 Subroutines ⚠️

Perl subroutines			
subroutine &	<ul style="list-style-type: none">Why we teach the subroutine ampersandWhy should I use the & to call a Perl subroutine? @ StackOverflow		Another point of view: Subroutines and Ampersands
Subroutine Prototypes	An older Perl feature. Clashes with subroutine signatures as of Perl v5.20. In <i>Perl >= v5.20</i> put the :prototype attribute before subroutine prototype parenthesis.		
Subroutine signatures <ul style="list-style-type: none"><i>Perl >=5.36</i>: Stable<i>Perl >= 5.20</i>: Experimental See: Use v5.20 subroutine signatures	Exactly zero arguments	()	Zero or 1 argument, no default, unnamed: (\$=)
	Zero or 1 argument, no default, named	(\$val=)	Zero or 1 argument, named, with default (\$val=1)
	exactly 1 named argument:	(\$val)	Exactly 2 arguments (\$v1, \$v2)
	2, 3 or 4 arguments no defaults:	(\$v1, \$v2, \$=, \$=)	2,3 or 4 arguments, 1 default: (\$v1, \$v2, \$v3='a', \$=)
	Two or more, any number of arguments.	(\$v1, \$v2, @)	Two or more arguments, remainders into a named array: (\$v1, \$v2, @rest)
	Two or more arguments: an even number	(\$v1, \$v2, %)	Two or more arguments, remainders into a named hash: (\$v1, \$v2, %rest)
	Class method	(\$class, ...)	Object method (\$self, ...)
	Variables in subroutines	global by default	
	my	local, lexical scope, non persistent	
	state	Local, lexical scope, persistent <i>Perl >= v5.10</i>	Restriction: in <i>Perl < v5.28</i> : array and hashes state cannot be initialized in list context.
	our	creates a lexical scoped alias to a package variable	
	local	Localizes an existing package variable to the current scope. It's not a declaration. The variable previous value is restored when leaving the scope.	
Returned value	<ul style="list-style-type: none">The result of the last evaluated expression is implicitly returnedThe return operator can be used but it's not required unless used to change execution flow (return immediately from the subroutine).The subroutine can return a scalar in scalar context or a list if called in list context.<ul style="list-style-type: none">Inside the subroutine, use the wantarray function to determine the context of the subroutine call.		

Perl 5 Built-in Functions ⚠️

Perl Functions Perl syntax	<ul style="list-style-type: none">To get information about a Perl function from the command line use the <code>perldoc -f</code> command.To get information about print use: <code>perldoc -f print</code>		
⚠️ Cautionary notes			
<ul style="list-style-type: none">each keyword is brokenUse Var::Pairs instead.	Do NOT use the built-in each . It is broken, as described by Damian Conway in his Modern Perl Best Practice O'Reilly course , section control structure. <ul style="list-style-type: none">each is not re-entrant:<ul style="list-style-type: none">nested loops of each over the same hash does not work as expected and will create infinite loop since the nested loop each juts iterates from where the first loop each left it.Exiting the loop leaves the state of the each internal pointer at the current location.<ul style="list-style-type: none">If you use each on the same hash later it will resume from where it left, it will not start form the beginning.		

Perl 5 Modules ⚠️

Perl Modules		
Perl core modules	<ul style="list-style-type: none">How to detect where a module is installed : <code>perldoc -l Module</code>How to check if a module is part of Perl core : <code>corelist</code> Module (Perl >= v5.9.2)	
Modules @perltutorial Modules Using simple modules ⚠️	<u>do</u>	Looks for the module file by searching the <u>@INC</u> path. Performed at run time (and therefore can be done conditionally). <ul style="list-style-type: none">If Perl finds the file, it places the code inside the calling program and executes it. Otherwise, Perl will skip the do statement silently. 👉 The "included" code does not have access to the lexical variables from the main program.Skip the <u>@INC</u> path lookup if given a file path starting with <code>./</code>, <code>../</code>, or <code>/</code>
The normal way to access Perl modules ➡️	<u>require</u>	Loads the module file once, also searching the <u>@INC</u> path. Performed at run time (and therefore can be done conditionally). <ul style="list-style-type: none">If the <u>require</u> for the same file appears twice, Perl ignores it. Perl will issue an error message if it cannot find the file (as opposed to <u>do</u>).Skip the <u>@INC</u> path lookup if given a file path starting with <code>./</code>, <code>../</code>, or <code>/</code>
	<u>use</u>	Similar to <u>require</u> except that Perl applies it before the program starts: it's done at compile time . Modify it dynamically in a <u>BEGIN</u> block. See <u>IntP⚠️</u> . <ul style="list-style-type: none">Therefore the <u>use</u> statement cannot be invoked inside conditional statements such as if-else. Used often to include a module in a program. That imports the defaults as defined by the module's code. Select what to import with one of the two equivalent forms: (See <u>IntP⚠️</u>): <ul style="list-style-type: none"><u>use</u> Module::Name ('function_a', 'function_b');<u>use</u> Module::Name <u>qw</u>(function_a function_b);<u>use</u> Module::Name (); # import nothing. All accesses to the module must be done with Module::Name::something
Error handling for: <u>Can't locate in @INC</u> • <u>How to fix that</u>	For the above statements to work Perl must be able to identify the location of the requested module(s). <ul style="list-style-type: none">Perl looks for a module code inside the directories identified by the <u>@INC</u> array. if you have. <u>use</u> The::Module; inside your code, Perl looks for a sub-directory named 'The' containing a file named 'Module.pm' inside each <u>@INC</u> directory. If Perl does not find it, there are <u>multiple ways to solve the problem</u> : <ul style="list-style-type: none">Add the required directory to the list of directories identified in the ':' separated list in the PERL5LIB environment variable. (<u>use</u> ';' as separators in Windows).Add a <u>use lib</u> 'path/to/the/directory'; statement inside your Perl file to add the required directory when executing a specific piece of Perl code, at compile time.Run Perl with the <u>-I (capital i) option</u> to run the code with the extra directory added to <u>@INC</u> array. To List the directories used by Perl from one of the following equivalent command lines: <ul style="list-style-type: none"><code>perl -e 'print join("\n", @INC), "\n";'</code><code>perl -le 'print for INC;'</code>	
See Also: <u>IntP⚠️</u>		
• See: <u>show-perl-inc @ USRHOME</u>	You can also get more information with <code>perl -v</code>	

Topic: Directory Operations 🚧

Directory Operations	In Books: LPo		
Opening Files	All file open operations are relative to the <i>current working directory</i> (for relative file names)		<code>open my \$filehandle, '<:utf8', 'a_relative/path.txt'</code>
Creating temporary files	File::Temp (Perl >= v5.6.1). Using File::Temp <ul style="list-style-type: none">Also see IO::File		
Built-in Functions	Related Functions/Packages / Descriptions		Notes
Getting file names by: <ul style="list-style-type: none">Globbering :<ul style="list-style-type: none">with globwith the glob operator <code><></code>	File::Glob (Perl >= v5.6.0) - provides more control.	Example:	<code>my @all_files = glob '*';</code> <code>my @perl_files = glob '*.pm *.pl'; # 2 globs, space-separated</code>
	The <> operator is identifying: <ul style="list-style-type: none">a filehandle, when: the item inside <> is a Perl identifier or an indirect file handle read scalar,a glob expression otherwise.	Glob examples:	<code>my @all_files = <'*>;</code> <code>my @all_files = <*>; # 1 glob: no space, no need for string</code> <code>my @perl_files = <'*.pm *.pl'>; # 2 globs, space-separated</code> <code>my \$etc_dir = '/etc';</code> <code>my @etc_dir_files = <\$etc_dir/* \$etc_dir/.*>;</code> <code>my @files = <LARRY/*>; # a glob</code>
	See: readline	Filehandle examples:	<code>my @his_lines = <LARRY>; # a filehandle read</code> <code>my \$name = 'LARRY';</code> <code>my @his_lines = <\$name>; # indirect filehandle read of LARRY handle</code> <code>my @same_lines = readline LARRY; # another way to write above</code> <code>my @same_lines = readline \$name;</code>
	<ul style="list-style-type: none">with a directory handle LPo	Example: iterate explicitly over a list of file names extracted from the directory using these 3 functions.	<code>my \$dir = '/usr/bin';</code> <code>opendir my \$dh, \$dir or die "Failed opening \$dir: \$!";</code> <code>foreach \$file (readdir \$dh) {</code> <code> print "File \$file is inside \$dir\n"; # ⚠️ no path in name!</code> <code>}</code> <code>closedir \$dh;</code>
Creating directory	<ul style="list-style-type: none">mkdir	Example:	<code>mkdir \$dir_name, oct(\$permissions); # octal for permissions</code> <code>mkdir \$dir_name, 0700; # do not use "0700", it's 700 decimal!</code>
Removing directory	<ul style="list-style-type: none">rmdir Removes an empty directory.File::Path remove_tree, rmtree remove dir & files (Perl >= v5.0.1)		
Removing files	<ul style="list-style-type: none">unlink a list or <code>\$_</code>		<code>unlink 'file1.txt', 'file2.txt';</code> <code>unlink qw(file1.txt file2.txt);</code> <code>unlink glob 'file?.txt'</code>
Renaming files	<ul style="list-style-type: none">rename an old file name to a new one.<ul style="list-style-type: none">The fat comma operator is sometimes used to highlight what is the old and the new name.	As in here:	<code>rename 'old_name' , 'new_name';</code> <code>rename old_name => new_name; # using fat comma (which quotes)</code>
Changing permissions	<ul style="list-style-type: none">chmod changes file permissions		
Changing ownership	<ul style="list-style-type: none">chown changes file ownership		
Creating Hard link	<ul style="list-style-type: none">link to create a hard link		
Creating symbolic link	<ul style="list-style-type: none">symlink to create a symbolic link		
chdir Change current working directory	<ul style="list-style-type: none">File::chdirFile::HomeDir	<ul style="list-style-type: none">Change the current working directory.chdir without argument attempt to change to user home directory using the <code>\$ENV{HOME}</code> and <code>\$ENV{LOGDIR}</code> environment values if ⚠️ they are set. The File::HomeDir module helps in setting them.The built-in chdir is global ⚠️ for the entire program. Use File::chdir facilities for localized operations.	
Modules	Functions Legend: Exported by default , exported on request, <i>Win32 specific</i>		Extra Information
Cwd	<ul style="list-style-type: none">getcwd, cwd, fastcwd, fastgetcwd, <i>getdcwd</i>abs_path, realpath, fast_abs_path		<code>use Cwd;</code> <code>my \$curdir = getcwd;</code> <code>print "cwd is \$curdir\n";</code>
File::Basename	<ul style="list-style-type: none">fileparse, basename, dirname.		
File::SPec File::Spec::Functions	<ul style="list-style-type: none">functional interface to methods: canonpath, catdir, catfile, curdir, rootdir, updir, no_upwards, file_name_is_absolute, path. <code>devnul</code>, <code>tmpdir</code>, <code>case_tolerant</code>, <code>splitpath</code>, <code>splitdir</code>, <code>catpath</code>, <code>abs2rel</code>, <code>rel2abs</code>. All can be imported by using the <code>:ALL</code> tag.		

Topic: List Operations 🚧

List Operators			
Sorting lists	<u>sort</u>	Sort a list	<code>my @sorted = sort @unsorted_list;</code> in place: <code>my @data = <u>sort</u> @data;</code>
	<u>reverse</u>	Sort a list in reverse order	<code>my @rsorted = <u>reverse</u> @unsorted_list;</code> in place: <code>my @data = <u>reverse</u> @data;</code>
Filtering list with grep	<code>my @adult_ages = grep \$_ > 18, @ages;</code>	<code>my @lucky_ages = grep /7\$/, @ages; # all that end with 7</code>	<code>my @read_ages = grep { \$_ >= 7 && \$_ <= 77 } @ages;</code>
Counting matches	<code>my \$count = grep \$_ > 18, @ages;</code>	<div>An expression, subroutine or block with trailing boolean can be used as the grep criteria. Each item in the list is identified inside grep by <u>\$</u><ul style="list-style-type: none">The block is an anonymous subroutine. 🙌 Return a boolean from the subroutine, but fall-off, do not return, from a block!</div>	
Transform a list with map			

Topic: Process control 🚧

Process Control	In Books: LPo		Important security information: perldoc perlsec
Environment Variables	Inside the %ENV hash.	Perl %Config hash: Perl configuration information. For example, whether it support threads, what are path separators, etc... <ul style="list-style-type: none">To use it: <code>use Config;</code>	
Built-in Functions	Example	Description/ Notes	
system (2 functions) <ul style="list-style-type: none">using the shell<ul style="list-style-type: none">security risk?avoiding the shell<ul style="list-style-type: none">other syntax	system 'ls -l \$HOME';	Run child process asynchronously using parent's stdin, stdout and stderr, using the OS native command shell.	
	system "cd \$project; make &;"	Use the Unix shell to execute a long running build asynchronously. 🙌 However: avoid using the shell like this . <ul style="list-style-type: none">Using the shell to build commands from unvalidated user input data may lead to security issues.	
	system 'tar', 'cvf', \$tarfile, @directories;	No shell invoked when more than 1 argument is passed to system. No shell interpretation, piping, re-direction done.	
	system ('tar', @arguments);	0 means success: <code>unless (system 'tar', arguments) { print "tar command success\n"; }</code>	
	system ({ \$prog }, \$arg0, @args);		

	👉 Note that if the string contain no shell metacharacters it is executed directly (not through a shell).		
system return value: <ul style="list-style-type: none">A value of 0 usually means all was OK.	2 bytes:	MSByte: child program exit code. LSByte: system-specific information bits: <ul style="list-style-type: none">0x80 : set on core dump.0x7f : signal number	<pre>my \$retval = system(...); my \$childp_exitcode = \$retval >> 8; my \$had_core_dump = (\$retval & 0x80) == 0x80? 1 : 0; my \$signal_number = \$retval & 0x7f;</pre> <div>↩ shift most significant byte ↩ use least significant byte</div>
exec	Unlike system, exec does not return to the parent Perl process. Use: exec 'the_program' or die 'Could not run: \$!'; #or warn or exit		
backquotes ``	Use backquotes to capture the stdout of a program. That's the main point of using it. <ul style="list-style-type: none">The trailing newline is not filtered out; it can be filter by chomp.		chomp (my \$current_date = `date`);
	<ul style="list-style-type: none">The value inside the backquotes is treated like the single double quote string argument of system: it will invoke the shell if there are any shell meta-characters and supports interpolation.<ul style="list-style-type: none">The following example builds a dictionary (hash) of topics with the text extracted from perldoc.Note that `...` is also written as qx/ ... /backquote operation in scalar context returns 1 string. In list context it returns a list of strings (1 per line).		<pre>my @topics = qw(die warn exit); my %info; foreach (@topics) { \$info{\$_} = `perldoc -t -f \$_`; }</pre>
Modules			
Capture streams	<ul style="list-style-type: none">Capture::Tiny	Can be used to capture the stdout and stderr streams for various ways if executing other programs	
Inter-process support	<ul style="list-style-type: none">IPC::System::Simple	Can also be used to capture streams and provide more inter-process support. <ul style="list-style-type: none">It provides systemx which never uses the shell, along with other useful functions.	
Processes as filehandles	In Books: LPα		
Perl ↩ program	Launching a process that pipes into the Perl process	open DATE, 'date ' or die "Cannot pipe from date: \$!";	Use a bare word to define the DATE file handle.
		open my \$date_fh, ' -', 'date' or die "Cannot pipe from date: \$!";	This one and the others define a local file handle variable. The file handle variable can later be used to read, as the above one, but is not global.
		open my \$ps_fh, ' -', 'ps', 'aux' or die "Cannot pipe from ps: \$!";	
		open my \$find_fh, ' -', 'find', qw(. -name '*.p[m]' -print) or die "Cannot pipe from find: \$!";	
Perl ➡ program	Launching a process that the Perl process pipes into.	open my \$dispatcher_fh, ' -', 'dispatcher', qw('—to-perl-groups' 'Help!') or die "Cannot pipe to the dispatcher: \$!";	
Forking	In Books: LPα . See also: Linux fork(2) system call, QA: Why do we need fort to create new processes? Why fork woks the way it does?		
fork with exec and waitpid See also: <ul style="list-style-type: none">Other IPC functionsPerl IPC	<ul style="list-style-type: none">fork the process into parent and child.in the child process start the program with execIn the parent process wait for the program termination with waitpid	<pre>defined(my \$process_id = fork) or die "Fork failed: \$!"; unless (\$process_id) { # Inside the child process (created by fork) exec 'long_running_process' or die "Failed starting long_running_process: \$!"; } # Inside the parent process, wait for completion of long_running_process. waitpid(\$process_id, 0);</pre>	
Signals	In Books: LPα		
kill	Sends a signal to a list of processes. <ul style="list-style-type: none">The signal may be identified by number or name (string), which is more portable.The %Config{sign_name} provides the supported signal names.		kill 'INT', \$pid or die "Can't signal \$pid with SIGINT: \$!";
	<ul style="list-style-type: none">Note that the <i>fat comma</i> operator (=>) can be used to automatically quote signal name:		kill INT => \$pid or die "Can't signal \$pid with SIGINT: \$!";
	<ul style="list-style-type: none">If the signal is 0 or "ZERO" no signal is sent to the process; instead Perl checks if it's possible to send a signal to the process: ie: if the process exists.		<pre>unless (kill 0, \$process_id) { warn "Process \$process_id is no longer running!"; }</pre>
	<ul style="list-style-type: none">If the signal is a negative number or a string that starts with '-' the signal is sent to the process group identified by the process scalar argument.		<ul style="list-style-type: none">kill '-KILL', \$process_groupkill -9, \$process_group
	Signal handlers <ul style="list-style-type: none">Set the signal handler by setting %SIG for the signal name (with no 'SIG' prefix) to a string holding the name of the subroutine.		\$SIG {'INT'} = 'dispatcher_int_handler';

PerlTidy formatting control 🚧🚧

perltidy option	Option	Impact
indentation style	<ul style="list-style-type: none"> -bl, --opening-brace-on-new-line --brace-left 	<ul style="list-style-type: none"> Without this option (the default) the code indentation style selected is K&R style. With this option, the indentation style is Allman/BSD style.