NAME

perlreref - Perl Regular Expressions Reference

DESCRIPTION

This is a quick reference to Perl's regular expressions. For full information see perlre and perlop, as well as the "SEE ALSO" section in this document.

OPERATORS

"=~" determines to which variable the regex is applied. In its absence, $_ is used.

```
$var =~ /foo/;
```

"!~" determines to which variable the regex is applied, and negates the result of the match; it returns false if the match succeeds, and true if it fails.

```
$var !~ /foo/;
```

"m/pattern/msixpogcdualn" searches a string for a pattern match, applying the given options.

```
m  Multiline mode - ^ and $ match internal lines
s  match as a Single line - . matches \n
i  case-Insensitive
x  eXtended legibility - free whitespace and comments
p  Preserve a copy of the matched string -
   ${^PREMATCH}, ${^MATCH}, ${^POSTMATCH} will be defined.
o  compile pattern Once
g  Global - all occurrences
c  don't reset pos on failed matches when using /g
a  restrict \d, \s, \w and [:posix:] to match ASCII only
aa (two a's) also /i matches exclude ASCII/non-ASCII
l  match according to current locale
u  match according to Unicode rules
d  match according to native rules unless something indicates
   Unicode
n  Non-capture mode. Don't let () fill in $1, $2, etc...
```

If 'pattern' is an empty string, the last *successfully* matched regex is used. Delimiters other than '/' may be used for both this operator and the following ones. The leading "m" can be omitted if the delimiter is '/'.

"qr/pattern/msixpodualn" lets you store a regex in a variable, or pass one around. Modifiers as for "m//", and are stored within the regex.

"s/pattern/replacement/msixpogcedual" substitutes matches of ’pattern’ with ’replacement’. Modifiers as for "m//", with two additions:

e Evaluate ’replacement’ as an expression
r Return substitution and leave the original string untouched.

’e’ may be specified multiple times. ’replacement’ is interpreted as a double quoted string unless a single-quote ("’") is the delimiter.

"m?pattern?" is like "m/pattern/" but matches only once. No alternate delimiters can be used. Must be reset with **reset()**.

SYNTAX

\ Escapes the character immediately following it
. Matches any single character except a newline (unless /s is used)
^ Matches at the beginning of the string (or line, if /m is used)
$ Matches at the end of the string (or line, if /m is used)
* Matches the preceding element 0 or more times
+ Matches the preceding element 1 or more times
? Matches the preceding element 0 or 1 times
{...} Specifies a range of occurrences for the element preceding it
[...] Matches any one of the characters contained within the brackets
(...) Groups subexpressions for capturing to $1, $2...
(?:...) Groups subexpressions without capturing (cluster)
| Matches either the subexpression preceding or following it
\g1 or \g{1}, \g2 ... Matches the text from the Nth group
\1, \2, \3 ... Matches the text from the Nth group
\g-1 or \g{-1}, \g-2 ... Matches the text from the Nth previous group
\g{name} Named backreference
\k<name> Named backreference
\k’name’ Named backreference
(?P=name) Named backreference (python syntax)

ESCAPE SEQUENCES

These work as in normal strings.

\a Alarm (beep)
\e Escape
\f Formfeed
\n Newline
\r Carriage return
\t Tab
\037 Char whose ordinal is the 3 octal digits, max \777
\o{2307} Char whose ordinal is the octal number, unrestricted
\x7f Char whose ordinal is the 2 hex digits, max \xFF
\x{263a} Char whose ordinal is the hex number, unrestricted
\cx Control-x
\N{name} A named Unicode character or character sequence
\N{U+263D} A Unicode character by hex ordinal

\l Lowercase next character
\u Titlecase next character
\L Lowercase until \E
\U Uppercase until \E
\F Foldcase until \E
\Q Disable pattern metacharacters until \E
\E End modification

For Titlecase, see "Titlecase".

This one works differently from normal strings:

\b An assertion, not backspace, except in a character class

CHARACTER CLASSES

[amy] Match ’a’, ’m’ or ’y’
[f-j] Dash specifies "range"
[f-j-] Dash escaped or at start or end means ’dash’
[^f-j] Caret indicates "match any character _except_ these"

The following sequences (except "\N") work within or without a character class. The first six are locale aware, all are Unicode aware. See perllocale and perlunicode for details.

\d A digit
\D A nondigit
\w A word character

\W A non-word character
\s A whitespace character
\S A non-whitespace character
\h A horizontal whitespace
\H A non horizontal whitespace
\N A non newline (when not followed by '{NAME}';;
not valid in a character class; equivalent to [^\n]; it's
like '.' without /s modifier)
\v A vertical whitespace
\V A non vertical whitespace
\R A generic newline (?>\v|\x0D\x0A)

\pP Match P-named (Unicode) property
\p{...} Match Unicode property with name longer than 1 character
\PP Match non-P
\P{...} Match lack of Unicode property with name longer than 1 char
\X Match Unicode extended grapheme cluster

POSIX character classes and their Unicode and Perl equivalents:

POSIX [[:...:]]	ASCII-range \p{...}	Full-range \p{...}	backslash sequence	Description
alnum	PosixAlnum	XPosixAlnum		'alpha' plus 'digit'
alpha	PosixAlpha	XPosixAlpha		Alphabetic characters
ascii	ASCII			Any ASCII character
blank	PosixBlank	XPosixBlank	\h	Horizontal whitespace; full-range also written as \p{HorizSpace} (GNU extension)
cntrl	PosixCntrl	XPosixCntrl		Control characters
digit	PosixDigit	XPosixDigit	\d	Decimal digits
graph	PosixGraph	XPosixGraph		'alnum' plus 'punct'
lower	PosixLower	XPosixLower		Lowercase characters
print	PosixPrint	XPosixPrint		'graph' plus 'space', but not any Controls
punct	PosixPunct	XPosixPunct		Punctuation and Symbols

				in ASCII-range; just punct outside it
space	PosixSpace	XPosixSpace	\s	Whitespace
upper	PosixUpper	XPosixUpper		Uppercase characters
word	PosixWord	XPosixWord	\w	'alnum' + Unicode marks + connectors, like '_' (Perl extension)
xdigit	ASCII_Hex_Digit	XPosixDigit		Hexadecimal digit, ASCII-range is [0-9A-Fa-f]

Also, various synonyms like "\p{Alpha}" for "\p{XPosixAlpha}"; all listed in "Properties accessible through \p{} and \P{}" in perluniprops

Within a character class:

POSIX	traditional	Unicode
[:digit:]	\d	\p{Digit}
[:^digit:]	\D	\P{Digit}

ANCHORS

All are zero-width assertions.

^ Match string start (or line, if /m is used)
$ Match string end (or line, if /m is used) or before newline
\b{} Match boundary of type specified within the braces
\B{} Match wherever \b{} doesn't match
\b Match word boundary (between \w and \W)
\B Match except at word boundary (between \w and \w or \W and \W)
\A Match string start (regardless of /m)
\Z Match string end (before optional newline)
\z Match absolute string end
\G Match where previous m//g left off
\K Keep the stuff left of the \K, don't include it in $&

QUANTIFIERS

Quantifiers are greedy by default and match the **longest** leftmost.

Maximal	Minimal	Possessive	Allowed range

{n,m}	{n,m}?	{n,m}+	Must occur at least n times but no more than m times
{n,}	{n,}?	{n,}+	Must occur at least n times
{,n}	{,n}?	{,n}+	Must occur at most n times
{n}	{n}?	{n}+	Must occur exactly n times
*	*?	*+	0 or more times (same as {0,})
+	+?	++	1 or more times (same as {1,})
?	??	?+	0 or 1 time (same as {0,1})

The possessive forms (new in Perl 5.10) prevent backtracking: what gets matched by a pattern with a possessive quantifier will not be backtracked into, even if that causes the whole match to fail.

EXTENDED CONSTRUCTS

(?#text) A comment
(?:...) Groups subexpressions without capturing (cluster)
(?pimsx-imsx:...) Enable/disable option (as per m// modifiers)
(?=...) Zero-width positive lookahead assertion
(*pla:...) Same, starting in 5.32; experimentally in 5.28
(*positive_lookahead:...) Same, same versions as *pla
(?!...) Zero-width negative lookahead assertion
(*nla:...) Same, starting in 5.32; experimentally in 5.28
(*negative_lookahead:...) Same, same versions as *nla
(?<=...) Zero-width positive lookbehind assertion
(*plb:...) Same, starting in 5.32; experimentally in 5.28
(*positive_lookbehind:...) Same, same versions as *plb
(?<!...) Zero-width negative lookbehind assertion
(*nlb:...) Same, starting in 5.32; experimentally in 5.28
(*negative_lookbehind:...) Same, same versions as *plb
(?>...) Grab what we can, prohibit backtracking
(*atomic:...) Same, starting in 5.32; experimentally in 5.28
(?|...) Branch reset
(?<name>...) Named capture
(?'name'...) Named capture
(?P<name>...) Named capture (python syntax)
(?[...]) Extended bracketed character class
(?{ code }) Embedded code, return value becomes $^R
(??{ code }) Dynamic regex, return value used as regex
(?N) Recurse into subpattern number N
(?-N), (?+N) Recurse into Nth previous/next subpattern
(?R), (?0) Recurse at the beginning of the whole pattern

(?&name) Recurse into a named subpattern
(?P>name) Recurse into a named subpattern (python syntax)
(?(cond)yes|no)
(?(cond)yes) Conditional expression, where "(cond)" can be:
(?=pat) lookahead; also (*pla:pat)
(*positive_lookahead:pat)
(?!pat) negative lookahead; also (*nla:pat)
(*negative_lookahead:pat)
(?<=pat) lookbehind; also (*plb:pat)
(*lookbehind:pat)
(?<!pat) negative lookbehind; also (*nlb:pat)
(*negative_lookbehind:pat)
(N) subpattern N has matched something
(<name>) named subpattern has matched something
('name') named subpattern has matched something
(?{code}) code condition
(R) true if recursing
(RN) true if recursing into Nth subpattern
(R&name) true if recursing into named subpattern
(DEFINE) always false, no no-pattern allowed

VARIABLES

$_ Default variable for operators to use

$‘ Everything prior to matched string
$& Entire matched string
$’ Everything after to matched string

${^PREMATCH} Everything prior to matched string
${^MATCH} Entire matched string
${^POSTMATCH} Everything after to matched string

Note to those still using Perl 5.18 or earlier: The use of "$‘", $& or "$’" will slow down **all** regex use within your program. Consult perlvar for "@-" to see equivalent expressions that won't cause slow down. See also Devel::SawAmpersand. Starting with Perl 5.10, you can also use the equivalent variables "${^PREMATCH}", "${^MATCH}" and "${^POSTMATCH}", but for them to be defined, you have to specify the "/p" (preserve) modifier on your regular expression. In Perl 5.20, the use of "$‘", $& and "$’" makes no speed difference.

$1, $2 ... hold the Xth captured expr

$+ Last parenthesized pattern match
$^N Holds the most recently closed capture
$^R Holds the result of the last (?{...}) expr
@- Offsets of starts of groups. $-[0] holds start of whole match
@+ Offsets of ends of groups. $+[0] holds end of whole match
%+ Named capture groups
%- Named capture groups, as array refs

Captured groups are numbered according to their *opening* paren.

FUNCTIONS

lc Lowercase a string
lcfirst Lowercase first char of a string
uc Uppercase a string
ucfirst Titlecase first char of a string
fc Foldcase a string

pos Return or set current match position
quotemeta Quote metacharacters
reset Reset m?pattern? status
study Analyze string for optimizing matching

split Use a regex to split a string into parts

The first five of these are like the escape sequences "\L", "\l", "\U", "\u", and "\F". For Titlecase, see "Titlecase"; For Foldcase, see "Foldcase".

TERMINOLOGY

Titlecase

Unicode concept which most often is equal to uppercase, but for certain characters like the German "sharp s" there is a difference.

Foldcase

Unicode form that is useful when comparing strings regardless of case, as certain characters have complex one-to-many case mappings. Primarily a variant of lowercase.

AUTHOR

Iain Truskett. Updated by the Perl 5 Porters.

SEE ALSO

- perlretut for a tutorial on regular expressions.
- perlrequick for a rapid tutorial.
- perlre for more details.
- perlvar for details on the variables.
- perlop for details on the operators.
- perlfunc for details on the functions.
- perlfaq6 for FAQs on regular expressions.
- perlrebackslash for a reference on backslash sequences.
- perlrecharclass for a reference on character classes.
- The re module to alter behaviour and aid debugging.
- "Debugging Regular Expressions" in perldebug
- perluniintro, perlunicode, charnames and perllocale for details on regexes and internationalisation.
- *Mastering Regular Expressions* by Jeffrey Friedl (<http://oreilly.com/catalog/9780596528126/>) for a thorough grounding and reference on the topic.

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