

```

/**
 * Kotlin syntax grammar in ANTLR4 notation
 */

parser grammar KotlinParser;

options { tokenVocab = KotlinLexer; }

// SECTION: general

kotlinFile
    : shebangLine? NL* fileAnnotation* packageHeader importList
    topLevelObject* EOF
    ;

script
    : shebangLine? NL* fileAnnotation* packageHeader importList (statement
    semi)* EOF
    ;

shebangLine
    : ShebangLine NL+
    ;

fileAnnotation
    : (AT_NO_WS | AT_PRE_WS) FILE NL* COLON NL* (LSQUARE
    unescapedAnnotation+ RSQUARE | unescapedAnnotation) NL*
    ;

packageHeader
    : (PACKAGE identifier semi)?
    ;

importList
    : importHeader*
    ;

importHeader
    : IMPORT identifier (DOT MULT | importAlias)? semi?
    ;

importAlias
    : AS simpleIdentifier
    ;

topLevelObject
    : declaration semis?
    ;

typeAlias
    : modifiers? TYPE_ALIAS NL* simpleIdentifier (NL* typeParameters)? NL*

```

```
ASSIGNMENT NL* type
;
```

```
declaration
: classDeclaration
| objectDeclaration
| functionDeclaration
| propertyDeclaration
| typeAlias
;
```

// SECTION: classes

```
classDeclaration
: modifiers? (CLASS | (FUN NL*)? INTERFACE) NL* simpleIdentifier
(NL* typeParameters)? (NL* primaryConstructor)?
(NL* COLON NL* delegationSpecifiers)?
(NL* typeConstraints)?
(NL* classBody | NL* enumClassBody)?
;
```

```
primaryConstructor
: (modifiers? CONSTRUCTOR NL*)? classParameters
;
```

```
classBody
: LCURL NL* classMemberDeclarations NL* RCURL
;
```

```
classParameters
: LPAREN NL* (classParameter (NL* COMMA NL* classParameter)* (NL*
COMMA)?)? NL* RPAREN
;
```

```
classParameter
: modifiers? (VAL | VAR)? NL* simpleIdentifier COLON NL* type (NL*
ASSIGNMENT NL* expression)?
;
```

```
delegationSpecifiers
: annotatedDelegationSpecifier (NL* COMMA NL*
annotatedDelegationSpecifier)*
;
```

```
delegationSpecifier
: constructorInvocation
| explicitDelegation
| userType
| functionType
;
```

```

constructorInvocation
    : userType valueArguments
    ;

annotatedDelegationSpecifier
    : annotation* NL* delegationSpecifier
    ;

explicitDelegation
    : (userType | functionType) NL* BY NL* expression
    ;

typeParameters
    : LANGLE NL* typeParameter (NL* COMMA NL* typeParameter)* (NL* COMMA)?
    NL* RANGLE
    ;

typeParameter
    : typeParameterModifiers? NL* simpleIdentifier (NL* COLON NL* type)?
    ;

typeConstraints
    : WHERE NL* typeConstraint (NL* COMMA NL* typeConstraint)*
    ;

typeConstraint
    : annotation* simpleIdentifier NL* COLON NL* type
    ;

// SECTION: classMembers

classMemberDeclarations
    : (classMemberDeclaration semis?)*
    ;

classMemberDeclaration
    : declaration
    | companionObject
    | anonymousInitializer
    | secondaryConstructor
    ;

anonymousInitializer
    : INIT NL* block
    ;

companionObject
    : modifiers? COMPANION NL* OBJECT
    (NL* simpleIdentifier)?
    (NL* COLON NL* delegationSpecifiers)?
    (NL* classBody)?

```

```

;

functionValueParameters
: LPAREN NL* (functionValueParameter (NL* COMMA NL*
functionValueParameter)* (NL* COMMA)?)? NL* RPAREN
;

functionValueParameter
: parameterModifiers? parameter (NL* ASSIGNMENT NL* expression)?
;

functionDeclaration
: modifiers?
FUN (NL* typeParameters)? (NL* receiverType NL* DOT)? NL*
simpleIdentifier
NL* functionValueParameters
(NL* COLON NL* type)?
(NL* typeConstraints)?
(NL* functionBody)?
;

functionBody
: block
| ASSIGNMENT NL* expression
;

variableDeclaration
: annotation* NL* simpleIdentifier (NL* COLON NL* type)?
;

multiVariableDeclaration
: LPAREN NL* variableDeclaration (NL* COMMA NL* variableDeclaration)*
(NL* COMMA)? NL* RPAREN
;

propertyDeclaration
: modifiers? (VAL | VAR)
(NL* typeParameters)?
(NL* receiverType NL* DOT)?
(NL* (multiVariableDeclaration | variableDeclaration))
(NL* typeConstraints)?
(NL* (ASSIGNMENT NL* expression | propertyDelegate))?
(NL+ SEMICOLON)? NL* (getter? (NL* semi? setter)? | setter? (NL* semi?
getter)?)?
;

propertyDelegate
: BY NL* expression
;

getter

```

```

: modifiers? GET
| modifiers? GET NL* LPAREN NL* RPAREN (NL* COLON NL* type)? NL*
functionBody
;

```

```

setter
: modifiers? SET
| modifiers? SET NL* LPAREN NL* parameterWithOptionalType (NL* COMMA)?
NL* RPAREN (NL* COLON NL* type)? NL* functionBody
;

```

```

parametersWithOptionalType
: LPAREN NL* (parameterWithOptionalType (NL* COMMA NL*
parameterWithOptionalType)* (NL* COMMA)?)? NL* RPAREN
;

```

```

parameterWithOptionalType
: parameterModifiers? simpleIdentifier NL* (COLON NL* type)?
;

```

```

parameter
: simpleIdentifier NL* COLON NL* type
;

```

```

objectDeclaration
: modifiers? OBJECT
NL* simpleIdentifier
(NL* COLON NL* delegationSpecifiers)?
(NL* classBody)?
;

```

```

secondaryConstructor
: modifiers? CONSTRUCTOR NL* functionValueParameters (NL* COLON NL*
constructorDelegationCall)? NL* block?
;

```

```

constructorDelegationCall
: THIS NL* valueArguments
| SUPER NL* valueArguments
;

```

// SECTION: enumClasses

```

enumClassBody
: LCURL NL* enumEntries? (NL* SEMICOLON NL* classMemberDeclarations)?
NL* RCURL
;

```

```

enumEntries
: enumEntry (NL* COMMA NL* enumEntry)* NL* COMMA?
;

```

```
enumEntry
    : (modifiers NL*)? simpleIdentifier (NL* valueArguments)? (NL*
classBody)?
    ;
```

// SECTION: types

```
type
    : typeModifiers?
    ( parenthesizedType
    | nullableType
    | typeReference
    | functionType)
    ;
```

```
typeReference
    : userType
    | DYNAMIC
    ;
```

```
nullableType
    : (typeReference | parenthesizedType) NL* quest+
    ;
```

```
quest
    : QUEST_NO_WS
    | QUEST_WS
    ;
```

```
userType
    : simpleUserType (NL* DOT NL* simpleUserType)*
    ;
```

```
simpleUserType
    : simpleIdentifier (NL* typeArguments)?
    ;
```

```
typeProjection
    : typeProjectionModifiers? type | MULT
    ;
```

```
typeProjectionModifiers
    : typeProjectionModifier+
    ;
```

```
typeProjectionModifier
    : varianceModifier NL*
    | annotation
    ;
```

```

functionType
    : (receiverType NL* DOT NL*)? functionTypeParameters NL* ARROW NL*
    type
    ;

functionTypeParameters
    : LPAREN NL* (parameter | type)? (NL* COMMA NL* (parameter | type))*
    (NL* COMMA)? NL* RPAREN
    ;

parenthesizedType
    : LPAREN NL* type NL* RPAREN
    ;

receiverType
    : typeModifiers?
    (
        parenthesizedType
        | nullableType
        | typeReference
    )
    ;

parenthesizedUserType
    : LPAREN NL* userType NL* RPAREN
    | LPAREN NL* parenthesizedUserType NL* RPAREN
    ;

// SECTION: statements

statements
    : (statement (semis statement)*)? semis?
    ;

statement
    : (label | annotation)*
    (
        declaration
        | assignment
        | loopStatement
        | expression
    )
    ;

label
    : simpleIdentifier (AT_NO_WS | AT_POST_WS) NL*
    ;

controlStructureBody
    : block
    | statement
    ;

block
    : LCURL NL* statements NL* RCURL

```

```

;

loopStatement
: forStatement
| whileStatement
| doWhileStatement
;

forStatement
: FOR NL* LPAREN annotation* (variableDeclaration |
multiVariableDeclaration) IN expression RPAREN NL* controlStructureBody?
;

whileStatement
: WHILE NL* LPAREN expression RPAREN NL* controlStructureBody
| WHILE NL* LPAREN expression RPAREN NL* SEMICOLON
;

doWhileStatement
: DO NL* controlStructureBody? NL* WHILE NL* LPAREN expression RPAREN
;

assignment
: directlyAssignableExpression ASSIGNMENT NL* expression
| assignableExpression assignmentAndOperator NL* expression
;

semi
: (SEMICOLON | NL) NL*
| EOF;

semis
: (SEMICOLON | NL)+
| EOF
;

// SECTION: expressions

expression
: disjunction
;

disjunction
: conjunction (NL* DISJ NL* conjunction)*
;

conjunction
: equality (NL* CONJ NL* equality)*
;

equality

```



```

: comparison (equalityOperator NL* comparison)*
;

comparison
: infixOperation (comparisonOperator NL* infixOperation)?
;

infixOperation
: elvisExpression (inOperator NL* elvisExpression | isOperator NL*
type)*
;

elvisExpression
: infixFunctionCall (NL* elvis NL* infixFunctionCall)*
;

elvis
: QUEST_NO_WS COLON
;

infixFunctionCall
: rangeExpression (simpleIdentifier NL* rangeExpression)*
;

rangeExpression
: additiveExpression (RANGE NL* additiveExpression)*
;

additiveExpression
: multiplicativeExpression (additiveOperator NL*
multiplicativeExpression)*
;

multiplicativeExpression
: asExpression (multiplicativeOperator NL* asExpression)*
;

asExpression
: comparisonWithLiteralRightSide (NL* asOperator NL* type)?
;

comparisonWithLiteralRightSide
: prefixUnaryExpression (NL* LANGLE NL* literalConstant NL* RANGLE NL*
(expression | parenthesizedExpression))*
;

prefixUnaryExpression
: unaryPrefix* postfixUnaryExpression
;

unaryPrefix

```

```

: annotation
| label
| prefixUnaryOperator NL*
;

postfixUnaryExpression
: primaryExpression
| primaryExpression postfixUnarySuffix+
;

postfixUnarySuffix
: postfixUnaryOperator
| typeArguments
| callSuffix
| indexingSuffix
| navigationSuffix
;

directlyAssignableExpression
: postfixUnaryExpression assignableSuffix
| simpleIdentifier
| parenthesizedDirectlyAssignableExpression
;

parenthesizedDirectlyAssignableExpression
: LPAREN NL* directlyAssignableExpression NL* RPAREN
;

assignableExpression
: prefixUnaryExpression | parenthesizedAssignableExpression
;

parenthesizedAssignableExpression
: LPAREN NL* assignableExpression NL* RPAREN
;

assignableSuffix
: typeArguments
| indexingSuffix
| navigationSuffix
;

indexingSuffix
: LSQUARE NL* expression (NL* COMMA NL* expression)* (NL* COMMA)? NL*
RSQUARE
;

navigationSuffix
: NL* memberAccessOperator NL* (simpleIdentifier |
parenthesizedExpression | CLASS)
;

```

```

callSuffix
: typeArguments? valueArguments? annotatedLambda
| typeArguments? valueArguments
;

annotatedLambda
: annotation* label? NL* lambdaLiteral
;

typeArguments
: LANGLE NL* typeProjection (NL* COMMA NL* typeProjection)* (NL*
COMMA)? NL* RANGLE
;

valueArguments
: LPAREN NL* RPAREN
| LPAREN NL* valueArgument (NL* COMMA NL* valueArgument)* (NL* COMMA)?
NL* RPAREN
;

valueArgument
: annotation? NL* (simpleIdentifier NL* ASSIGNMENT NL*)? MULT? NL*
expression
;

primaryExpression
: parenthesizedExpression
| simpleIdentifier
| literalConstant
| stringLiteral
| callableReference
| functionLiteral
| objectLiteral
| collectionLiteral
| thisExpression
| superExpression
| ifExpression
| whenExpression
| tryExpression
| jumpExpression
;

parenthesizedExpression
: LPAREN NL* expression NL* RPAREN
;

collectionLiteral
: LSQUARE NL* expression (NL* COMMA NL* expression)* (NL* COMMA)? NL*
RSQUARE
| LSQUARE NL* RSQUARE

```

```

;

literalConstant
: BooleanLiteral
| IntegerLiteral
| HexLiteral
| BinLiteral
| CharacterLiteral
| RealLiteral
| NullLiteral
| LongLiteral
| UnsignedLiteral
;

stringLiteral
: lineStringLiteral
| multiLineStringLiteral
;

lineStringLiteral
: QUOTE_OPEN (lineStringContent | lineStringExpression)* QUOTE_CLOSE
;

multiLineStringLiteral
: TRIPLE_QUOTE_OPEN (multiLineStringContent |
multiLineStringExpression | MultiLineStringQuote)* TRIPLE_QUOTE_CLOSE
;

lineStringContent
: LineStrText
| LineStrEscapedChar
| LineStrRef
;

lineStringExpression
: LineStrExprStart expression RCURL
;

multiLineStringContent
: MultiLineStrText
| MultiLineStringQuote
| MultiLineStrRef
;

multiLineStringExpression
: MultiLineStrExprStart NL* expression NL* RCURL
;

lambdaLiteral
: LCURL NL* statements NL* RCURL
| LCURL NL* lambdaParameters? NL* ARROW NL* statements NL* RCURL

```

;

lambdaParameters

: lambdaParameter (NL\* COMMA NL\* lambdaParameter)\* (NL\* COMMA)?  
;

lambdaParameter

: variableDeclaration  
| multiVariableDeclaration (NL\* COLON NL\* type)?  
;

anonymousFunction

: FUN  
(NL\* type NL\* DOT)?  
NL\* parametersWithOptionalType  
(NL\* COLON NL\* type)?  
(NL\* typeConstraints)?  
(NL\* functionBody)?  
;

functionLiteral

: lambdaLiteral  
| anonymousFunction  
;

objectLiteral

: OBJECT NL\* COLON NL\* delegationSpecifiers NL\* classBody  
| OBJECT NL\* classBody  
;

thisExpression

: THIS  
| THIS\_AT  
;

superExpression

: SUPER (LANGLE NL\* type NL\* RANGLE)? (AT\_NO\_WS simpleIdentifier)?  
| SUPER\_AT  
;

ifExpression

: IF NL\* LPAREN NL\* expression NL\* RPAREN NL\* (controlStructureBody | SEMICOLON)  
| IF NL\* LPAREN NL\* expression NL\* RPAREN NL\* controlStructureBody?  
NL\* SEMICOLON? NL\* ELSE NL\* (controlStructureBody | SEMICOLON)  
;

whenSubject

: LPAREN (annotation\* NL\* VAL NL\* variableDeclaration NL\* ASSIGNMENT NL\*)?  
expression RPAREN  
;

```
whenExpression
: WHEN NL* whenSubject? NL* LCURL NL* (whenEntry NL*)* NL* RCURL
;
```

```
whenEntry
: whenCondition (NL* COMMA NL* whenCondition)* (NL* COMMA)? NL* ARROW
NL* controlStructureBody semi?
| ELSE NL* ARROW NL* controlStructureBody semi?
;
```

```
whenCondition
: expression
| rangeTest
| typeTest
;
```

```
rangeTest
: inOperator NL* expression
;
```

```
typeTest
: isOperator NL* type
;
```

```
tryExpression
: TRY NL* block ((NL* catchBlock)+ (NL* finallyBlock)? | NL*
finallyBlock)
;
```

```
catchBlock
: CATCH NL* LPAREN annotation* simpleIdentifier COLON type (NL*
COMMA)? RPAREN NL* block
;
```

```
finallyBlock
: FINALLY NL* block
;
```

```
jumpExpression
: THROW NL* expression
| (RETURN | RETURN_AT) expression?
| CONTINUE | CONTINUE_AT
| BREAK | BREAK_AT
;
```

```
callableReference
: (receiverType? NL* COLONCOLON NL* (simpleIdentifier | CLASS))
;
```

```
assignmentAndOperator
```

```
: ADD_ASSIGNMENT
| SUB_ASSIGNMENT
| MULT_ASSIGNMENT
| DIV_ASSIGNMENT
| MOD_ASSIGNMENT
;
```

equalityOperator

```
: EXCL_EQ
| EXCL_EQEQ
| EQEQ
| EQEQEQ
;
```

comparisonOperator

```
: LANGLE
| RANGLE
| LE
| GE
;
```

inOperator

```
: IN | NOT_IN
;
```

isOperator

```
: IS | NOT_IS
;
```

additiveOperator

```
: ADD | SUB
;
```

multiplicativeOperator

```
: MULT
| DIV
| MOD
;
```

asOperator

```
: AS
| AS_SAFE
;
```

prefixUnaryOperator

```
: INCR
| DECR
| SUB
| ADD
| excl
;
```

postfixUnaryOperator

```
: INCR  
| DECR  
| EXCL_NO_WS excl  
;
```

excl

```
: EXCL_NO_WS  
| EXCL_WS  
;
```

memberAccessOperator

```
: DOT | safeNav | COLONCOLON  
;
```

safeNav

```
: QUEST_NO_WS DOT  
;
```

// SECTION: modifiers

modifiers

```
: (annotation | modifier)+  
;
```

parameterModifiers

```
: (annotation | parameterModifier)+  
;
```

modifier

```
: (classModifier  
| memberModifier  
| visibilityModifier  
| functionModifier  
| propertyModifier  
| inheritanceModifier  
| parameterModifier  
| platformModifier) NL*  
;
```

typeModifiers

```
: typeModifier+  
;
```

typeModifier

```
: annotation | SUSPEND NL*  
;
```

classModifier

```
: ENUM
```



```
| SEALED  
| ANNOTATION  
| DATA  
| INNER  
;
```

```
memberModifier  
: OVERRIDE  
| LATEINIT  
;
```

```
visibilityModifier  
: PUBLIC  
| PRIVATE  
| INTERNAL  
| PROTECTED  
;
```

```
varianceModifier  
: IN  
| OUT  
;
```

```
typeParameterModifiers  
: typeParameterModifier+  
;
```

```
typeParameterModifier  
: reificationModifier NL*  
| varianceModifier NL*  
| annotation  
;
```

```
functionModifier  
: TAILREC  
| OPERATOR  
| INFIX  
| INLINE  
| EXTERNAL  
| SUSPEND  
;
```

```
propertyModifier  
: CONST  
;
```

```
inheritanceModifier  
: ABSTRACT  
| FINAL  
| OPEN  
;
```

```
parameterModifier
: VARARG
| NOINLINE
| CROSSINLINE
;
```

```
reificationModifier
: REIFIED
;
```

```
platformModifier
: EXPECT
| ACTUAL
;
```

// SECTION: annotations

```
annotation
: (singleAnnotation | multiAnnotation) NL*
;
```

```
singleAnnotation
: annotationUseSiteTarget NL* unescapedAnnotation
| (AT_NO_WS | AT_PRE_WS) unescapedAnnotation
;
```

```
multiAnnotation
: annotationUseSiteTarget NL* LSQUARE unescapedAnnotation+ RSQUARE
| (AT_NO_WS | AT_PRE_WS) LSQUARE unescapedAnnotation+ RSQUARE
;
```

```
annotationUseSiteTarget
: (AT_NO_WS | AT_PRE_WS) (FIELD | PROPERTY | GET | SET | RECEIVER |
PARAM | SETPARAM | DELEGATE) NL* COLON
;
```

```
unescapedAnnotation
: constructorInvocation
| userType
;
```

// SECTION: identifiers

```
simpleIdentifier: Identifier
| ABSTRACT
| ANNOTATION
| BY
| CATCH
| COMPANION
| CONSTRUCTOR
```

```
CROSSINLINE  
DATA  
DYNAMIC  
ENUM  
EXTERNAL  
FINAL  
FINALLY  
GET  
IMPORT  
INFIX  
INIT  
INLINE  
INNER  
INTERNAL  
LATEINIT  
NOINLINE  
OPEN  
OPERATOR  
OUT  
OVERRIDE  
PRIVATE  
PROTECTED  
PUBLIC  
REIFIED  
SEALED  
TAILREC  
SET  
VARARG  
WHERE  
FIELD  
PROPERTY  
RECEIVER  
PARAM  
SETPARAM  
DELEGATE  
FILE  
EXPECT  
ACTUAL  
CONST  
SUSPEND  
;
```

```
identifier  
: simpleIdentifier (NL* DOT simpleIdentifier)*  
;
```

```
/**  
 * Kotlin lexical grammar in ANTLR4 notation  
 */
```

```
lexer grammar KotlinLexer;
```

```
import UnicodeClasses;
```

```
// SECTION: lexicalGeneral
```

```
ShebangLine
```

```
: '#!' ~[\r\n]*  
;
```

```
DelimitedComment
```

```
: '/*' ( DelimitedComment | . ) *? '*/'  
-> channel(HIDDEN)  
;
```

```
LineComment
```

```
: '//' ~[\r\n]*  
-> channel(HIDDEN)  
;
```

```
WS
```

```
: [\u0020\u0009\u000C]  
-> channel(HIDDEN)  
;
```

```
NL: '\n' | '\r' '\n'?
```

```
fragment Hidden: DelimitedComment | LineComment | WS;
```

```
// SECTION: separatorsAndOperations
```

```
RESERVED: '...';
```

```
DOT: '.';
```

```
COMMA: ',';
```

```
LPAREN: '(' -> pushMode(Inside);
```

```
RPAREN: ')';
```

```
LSQUARE: '[' -> pushMode(Inside);
```

```
RSQUARE: ']';
```

```
LCURL: '{' -> pushMode(DEFAULT_MODE);
```

```
/*
```

```
 * When using another programming language (not Java) to generate a  
parser,
```

```
 * please replace this code with the corresponding code of a programming  
language you are using.
```

```
*/
```

```
RCURL: '}' { if (!_modeStack.isEmpty()) { popMode(); } };
```

```
MULT: '*';
```

```
MOD: '%';
```

```
DIV: '/';
```

```
ADD: '+';
```

```
SUB: '-';
```

```
INCR: '++';
```

```

DECR: '--';
CONJ: '&&';
DISJ: '||';
EXCL_WS: '!' Hidden;
EXCL_NO_WS: '!';
COLON: ':';
SEMICOLON: ';';
ASSIGNMENT: '=';
ADD_ASSIGNMENT: '+=';
SUB_ASSIGNMENT: '-=';
MULT_ASSIGNMENT: '*=';
DIV_ASSIGNMENT: '/=';
MOD_ASSIGNMENT: '%=';
ARROW: '->';
DOUBLE_ARROW: '=>';
RANGE: '..';
COLONCOLON: '::';
DOUBLE_SEMICOLON: ';;';
HASH: '#';
AT_NO_WS: '@';
AT_POST_WS: '@' (Hidden | NL);
AT_PRE_WS: (Hidden | NL) '@';
AT_BOTH_WS: (Hidden | NL) '@' (Hidden | NL);
QUEST_WS: '?' Hidden;
QUEST_NO_WS: '?';
LANGLE: '<';
RANGLE: '>';
LE: '<=';
GE: '>=';
EXCL_EQ: '!=';
EXCL_EQEQ: '!==';
AS_SAFE: 'as?';
EQEQ: '==';
EQEQEQ: '===';
SINGLE_QUOTE: '\'';

```

**// SECTION: keywords**

```

RETURN_AT: 'return@' Identifier;
CONTINUE_AT: 'continue@' Identifier;
BREAK_AT: 'break@' Identifier;

```

```

THIS_AT: 'this@' Identifier;
SUPER_AT: 'super@' Identifier;

```

```

FILE: 'file';
FIELD: 'field';
PROPERTY: 'property';
GET: 'get';
SET: 'set';
RECEIVER: 'receiver';

```

```
PARAM: 'param';
SETPARAM: 'setparam';
DELEGATE: 'delegate';

PACKAGE: 'package';
IMPORT: 'import';
CLASS: 'class';
INTERFACE: 'interface';
FUN: 'fun';
OBJECT: 'object';
VAL: 'val';
VAR: 'var';
TYPE_ALIAS: 'typealias';
CONSTRUCTOR: 'constructor';
BY: 'by';
COMPANION: 'companion';
INIT: 'init';
THIS: 'this';
SUPER: 'super';
typeof: 'typeof';
WHERE: 'where';
IF: 'if';
ELSE: 'else';
WHEN: 'when';
TRY: 'try';
CATCH: 'catch';
FINALLY: 'finally';
FOR: 'for';
DO: 'do';
WHILE: 'while';
THROW: 'throw';
RETURN: 'return';
CONTINUE: 'continue';
BREAK: 'break';
AS: 'as';
IS: 'is';
IN: 'in';
NOT_IS: '!is' (Hidden | NL);
NOT_IN: '!in' (Hidden | NL);
OUT: 'out';
DYNAMIC: 'dynamic';
```

**// SECTION: lexicalModifiers**

```
PUBLIC: 'public';
PRIVATE: 'private';
PROTECTED: 'protected';
INTERNAL: 'internal';
ENUM: 'enum';
SEALED: 'sealed';
ANNOTATION: 'annotation';
```

```
DATA: 'data';
INNER: 'inner';
TAILREC: 'tailrec';
OPERATOR: 'operator';
INLINE: 'inline';
INFIX: 'infix';
EXTERNAL: 'external';
SUSPEND: 'suspend';
OVERRIDE: 'override';
ABSTRACT: 'abstract';
FINAL: 'final';
OPEN: 'open';
CONST: 'const';
LATEINIT: 'lateinit';
VARARG: 'vararg';
NOINLINE: 'noinline';
CROSSINLINE: 'crossinline';
REIFIED: 'reified';
EXPECT: 'expect';
ACTUAL: 'actual';
```

## // SECTION: literals

```
fragment DecDigit: '0'..'9';
fragment DecDigitNoZero: '1'..'9';
fragment DecDigitOrSeparator: DecDigit | '_';
```

```
fragment DecDigits
    : DecDigit DecDigitOrSeparator* DecDigit
    | DecDigit
    ;
```

```
fragment DoubleExponent: [eE] [+~]? DecDigits;
```

```
RealLiteral
    : FloatLiteral
    | DoubleLiteral
    ;
```

```
FloatLiteral
    : DoubleLiteral [fF]
    | DecDigits [fF]
    ;
```

```
DoubleLiteral
    : DecDigits? '.' DecDigits DoubleExponent?
    | DecDigits DoubleExponent
    ;
```

```
IntegerLiteral
    : DecDigitNoZero DecDigitOrSeparator* DecDigit
```

```
| DecDigit  
;
```

```
fragment HexDigit: [0-9a-fA-F];  
fragment HexDigitOrSeparator: HexDigit | '_';
```

### HexLiteral

```
: '0' [xX] HexDigit HexDigitOrSeparator* HexDigit  
| '0' [xX] HexDigit  
;
```

```
fragment BinDigit: [01];  
fragment BinDigitOrSeparator: BinDigit | '_';
```

### BinLiteral

```
: '0' [bB] BinDigit BinDigitOrSeparator* BinDigit  
| '0' [bB] BinDigit  
;
```

### UnsignedLiteral

```
: (IntegerLiteral | HexLiteral | BinLiteral) [uU] 'L'?  
;
```

### LongLiteral

```
: (IntegerLiteral | HexLiteral | BinLiteral) 'L'  
;
```

```
BooleanLiteral: 'true' | 'false';
```

```
NullLiteral: 'null';
```

### CharacterLiteral

```
: '\\' (EscapeSeq | ~[\n\r'\\""]) '\\'  
;
```

## // SECTION: lexicalIdentifiers

```
fragment UnicodeDigit: UNICODE_CLASS_ND;
```

### Identifier

```
: (Letter | '_' ) (Letter | '_' | UnicodeDigit)*  
| '\\' ~([\r\n] | '\\')+ '\\'  
;
```

### IdentifierOrSoftKey

```
: Identifier  
/* Soft keywords */  
| ABSTRACT  
| ANNOTATION  
| BY  
| CATCH
```



```
COMPANION
CONSTRUCTOR
CROSSINLINE
DATA
DYNAMIC
ENUM
EXTERNAL
FINAL
FINALLY
IMPORT
INFIX
INIT
INLINE
INNER
INTERNAL
LATEINIT
NOINLINE
OPEN
OPERATOR
OUT
OVERRIDE
PRIVATE
PROTECTED
PUBLIC
REIFIED
SEALED
TAILREC
VARARG
WHERE
GET
SET
FIELD
PROPERTY
RECEIVER
PARAM
SETPARAM
DELEGATE
FILE
EXPECT
ACTUAL
CONST
SUSPEND
;
```

```
FieldIdentifier
: '$' IdentifierOrSoftKey
;
```

```
fragment UniCharacterLiteral
: '\\' 'u' HexDigit HexDigit HexDigit HexDigit
;
```

```
fragment EscapedIdentifier
: '\\\ ('t' | 'b' | 'r' | 'n' | '\\\ ' | '\'\ ' | '$')
;
```

```
fragment EscapeSeq
: UniCharacterLiteral
| EscapedIdentifier
;
```

**// SECTION: characters**

```
fragment Letter
: UNICODE_CLASS_LL
| UNICODE_CLASS_LM
| UNICODE_CLASS_LO
| UNICODE_CLASS_LT
| UNICODE_CLASS_LU
| UNICODE_CLASS_NL
;
```

**// SECTION: strings**

```
QUOTE_OPEN: '\"' -> pushMode(LineStyle);
```

```
TRIPLE_QUOTE_OPEN: '\"\"' -> pushMode(MultiLineStyle);
```

```
mode LineString;
```

```
QUOTE_CLOSE
: '\"' -> popMode
;
```

```
LineStringRef
: FieldIdentifier
;
```

```
LineStrText
: ~('\\" | '\" | '$')+ | '$'
;
```

```
LineStrEscapedChar
: EscapedIdentifier
| UniCharacterLiteral
;
```

```
LineStrExprStart
: '${' -> pushMode(DEFAULT_MODE)
;
```

```
mode MultiLineStyle;
```

```
TRIPLE_QUOTE_CLOSE
: MultiLineStringQuote? '""' -> popMode
;
```

```
MultiLineStringQuote
: '""'+
;
```

```
MultiLineStringRef
: FieldIdentifier
;
```

```
MultiLineStrText
: ~('"' | '$')+ | '$'
;
```

```
MultiLineStrExprStart
: '${' -> pushMode(DEFAULT_MODE)
;
```

// SECTION: inside

mode Inside;

```
Inside_RPAREN: RPAREN -> popMode, type(RPAREN);
Inside_RSQUARE: RSQUARE -> popMode, type(RSQUARE);
Inside_LPAREN: LPAREN -> pushMode(Inside), type(LPAREN);
Inside_LSQUARE: LSQUARE -> pushMode(Inside), type(LSQUARE);
Inside_LCURL: LCURL -> pushMode(DEFAULT_MODE), type(LCURL);
Inside_RCURL: RCURL -> popMode, type(RCURL);
```

```
Inside_DOT: DOT -> type(DOT);
Inside_COMMA: COMMA -> type(COMMA);
Inside_MULT: MULT -> type(MULT);
Inside_MOD: MOD -> type(MOD);
Inside_DIV: DIV -> type(DIV);
Inside_ADD: ADD -> type(ADD);
Inside_SUB: SUB -> type(SUB);
Inside_INCR: INCR -> type(INCR);
Inside_DECR: DECR -> type(DECR);
Inside_CONJ: CONJ -> type(CONJ);
Inside_DISJ: DISJ -> type(DISJ);
Inside_EXCL_WS: '!' (Hidden|NL) -> type(EXCL_WS);
Inside_EXCL_NO_WS: EXCL_NO_WS -> type(EXCL_NO_WS);
Inside_COLON: COLON -> type(COLON);
Inside_SEMICOLON: SEMICOLON -> type(SEMICOLON);
Inside_ASSIGNMENT: ASSIGNMENT -> type(ASSIGNMENT);
Inside_ADD_ASSIGNMENT: ADD_ASSIGNMENT -> type(ADD_ASSIGNMENT);
Inside_SUB_ASSIGNMENT: SUB_ASSIGNMENT -> type(SUB_ASSIGNMENT);
Inside_MULT_ASSIGNMENT: MULT_ASSIGNMENT -> type(MULT_ASSIGNMENT);
```

```
Inside_DIV_ASSIGNMENT: DIV_ASSIGNMENT -> type(DIV_ASSIGNMENT);
Inside_MOD_ASSIGNMENT: MOD_ASSIGNMENT -> type(MOD_ASSIGNMENT);
Inside_ARROW: ARROW -> type(ARROW);
Inside_DOUBLE_ARROW: DOUBLE_ARROW -> type(DOUBLE_ARROW);
Inside_RANGE: RANGE -> type(RANGE);
Inside_RESERVED: RESERVED -> type(RESERVED);
Inside_COLONCOLON: COLONCOLON -> type(COLONCOLON);
Inside_DOUBLE_SEMICOLON: DOUBLE_SEMICOLON -> type(DOUBLE_SEMICOLON);
Inside_HASH: HASH -> type(HASH);
Inside_AT_NO_WS: AT_NO_WS -> type(AT_NO_WS);
Inside_AT_POST_WS: AT_POST_WS -> type(AT_POST_WS);
Inside_AT_PRE_WS: AT_PRE_WS -> type(AT_PRE_WS);
Inside_AT_BOTH_WS: AT_BOTH_WS -> type(AT_BOTH_WS);
Inside_QUEST_WS: '?' (Hidden | NL) -> type(QUEST_WS);
Inside_QUEST_NO_WS: QUEST_NO_WS -> type(QUEST_NO_WS);
Inside_LANGLE: LANGLE -> type(LANGLE);
Inside_RANGLE: RANGLE -> type(RANGLE);
Inside_LE: LE -> type(LE);
Inside_GE: GE -> type(GE);
Inside_EXCL_EQ: EXCL_EQ -> type(EXCL_EQ);
Inside_EXCL_EQEQ: EXCL_EQEQ -> type(EXCL_EQEQ);
Inside_IS: IS -> type(IS);
Inside_NOT_IS: NOT_IS -> type(NOT_IS);
Inside_NOT_IN: NOT_IN -> type(NOT_IN);
Inside_AS: AS -> type(AS);
Inside_AS_SAFE: AS_SAFE -> type(AS_SAFE);
Inside_EQEQ: EQEQ -> type(EQEQ);
Inside_EQEQEQ: EQEQEQ -> type(EQEQEQ);
Inside_SINGLE_QUOTE: SINGLE_QUOTE -> type(SINGLE_QUOTE);
Inside_QUOTE_OPEN: QUOTE_OPEN -> pushMode(LineString), type(QUOTE_OPEN);
Inside_TRIPLE_QUOTE_OPEN: TRIPLE_QUOTE_OPEN -> pushMode(MultiLineString),
type(TRIPLE_QUOTE_OPEN);
```

```
Inside_VAL: VAL -> type(VAL);
Inside_VAR: VAR -> type(VAR);
Inside_FUN: FUN -> type(FUN);
Inside_OBJECT: OBJECT -> type(OBJECT);
Inside_SUPER: SUPER -> type(SUPER);
Inside_IN: IN -> type(IN);
Inside_OUT: OUT -> type(OUT);
Inside_FIELD: FIELD -> type(FIELD);
Inside_FILE: FILE -> type(FILE);
Inside_PROPERTY: PROPERTY -> type(PROPERTY);
Inside_GET: GET -> type(GET);
Inside_SET: SET -> type(SET);
Inside_RECEIVER: RECEIVER -> type(RECEIVER);
Inside_PARAM: PARAM -> type(PARAM);
Inside_SETPARAM: SETPARAM -> type(SETPARAM);
Inside_DELEGATE: DELEGATE -> type(DELEGATE);
Inside_THROW: THROW -> type(THROW);
Inside_RETURN: RETURN -> type(RETURN);
```

```
Inside_CONTINUE: CONTINUE -> type(CONTINUE);
Inside_BREAK: BREAK -> type(BREAK);
Inside_RETURN_AT: RETURN_AT -> type(RETURN_AT);
Inside_CONTINUE_AT: CONTINUE_AT -> type(CONTINUE_AT);
Inside_BREAK_AT: BREAK_AT -> type(BREAK_AT);
Inside_IF: IF -> type(IF);
Inside_ELSE: ELSE -> type(ELSE);
Inside_WHEN: WHEN -> type(WHEN);
Inside_TRY: TRY -> type(TRY);
Inside_CATCH: CATCH -> type(CATCH);
Inside_FINALLY: FINALLY -> type(FINALLY);
Inside_FOR: FOR -> type(FOR);
Inside_DO: DO -> type(DO);
Inside_WHILE: WHILE -> type(WHILE);
```

```
Inside_PUBLIC: PUBLIC -> type(PUBLIC);
Inside_PRIVATE: PRIVATE -> type(PRIVATE);
Inside_PROTECTED: PROTECTED -> type(PROTECTED);
Inside_INTERNAL: INTERNAL -> type(INTERNAL);
Inside_ENUM: ENUM -> type(ENUM);
Inside_SEALED: SEALED -> type(SEALED);
Inside_ANNOTATION: ANNOTATION -> type(ANNOTATION);
Inside_DATA: DATA -> type(DATA);
Inside_INNER: INNER -> type(INNER);
Inside_TAILREC: TAILREC -> type(TAILREC);
Inside_OPERATOR: OPERATOR -> type(OPERATOR);
Inside_INLINE: INLINE -> type(INLINE);
Inside_INFIX: INFIX -> type(INFIX);
Inside_EXTERNAL: EXTERNAL -> type(EXTERNAL);
Inside_SUSPEND: SUSPEND -> type(SUSPEND);
Inside_OVERRIDE: OVERRIDE -> type(OVERRIDE);
Inside_ABSTRACT: ABSTRACT -> type(ABSTRACT);
Inside_FINAL: FINAL -> type(FINAL);
Inside_OPEN: OPEN -> type(OPEN);
Inside_CONST: CONST -> type(CONST);
Inside_LATEINIT: LATEINIT -> type(LATEINIT);
Inside_VARARG: VARARG -> type(VARARG);
Inside_NOINLINE: NOINLINE -> type(NOINLINE);
Inside_CROSSINLINE: CROSSINLINE -> type(CROSSINLINE);
Inside_REIFIED: REIFIED -> type(REIFIED);
Inside_EXPECT: EXPECT -> type(EXPECT);
Inside_ACTUAL: ACTUAL -> type(ACTUAL);
```

```
Inside_BooleanLiteral: BooleanLiteral -> type(BooleanLiteral);
Inside_IntegerLiteral: IntegerLiteral -> type(IntegerLiteral);
Inside_HexLiteral: HexLiteral -> type(HexLiteral);
Inside_BinLiteral: BinLiteral -> type(BinLiteral);
Inside_CharacterLiteral: CharacterLiteral -> type(CharacterLiteral);
Inside_RealLiteral: RealLiteral -> type(RealLiteral);
Inside_NullLiteral: NullLiteral -> type(NullLiteral);
Inside_LongLiteral: LongLiteral -> type(LongLiteral);
```

```
Inside_UnsignedLiteral: UnsignedLiteral -> type(UnsignedLiteral);  
Inside_Identifier: Identifier -> type(Identifier);  
Inside_Comment: (LineComment | DelimitedComment) -> channel(HIDDEN);  
Inside_WS: WS -> channel(HIDDEN);  
Inside_NL: NL -> channel(HIDDEN);  
  
mode DEFAULT_MODE;  
  
ErrorCharacter: .;
```