

```

/**
 * 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
    ;
```

```
LineStrRef
    : FieldIdentifier
    ;
```

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

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

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

```
mode MultiLineStyle;
```

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

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

```
MultiLineStrRef
: 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: .;
```