

# BNF for MIPS.jj

## NON-TERMINALS

```

Goal ::= StmtList <EOF>
StmtList ::= Stmt ( StmtList )?
Stmt ::= Stat ( ";" )?
Stat ::= Label Instruction
        | Label Data
        | Label
        | Instruction
        | Data
        | SymDef
        | Directive
Label ::= <IDENTIFIER_COLON>
        | <DECIMAL_COLON>
Instruction ::= OpCode ( Operand ( "," Operand ( "," Operand )? )? )?
Operand ::= Register
        | "(" Register ")"
        | FloatRegister
        | AddrImmed ( "(" Register ")" )?
        | <FLOAT>
Register ::= <DOLLAR_DECIMAL>
        | RegisterName
        | DollarRegisterName
FloatRegister ::= <DOLLAR_F_DECIMAL>
AddrImmed ::= LabelExpr ( ( "+" | "-" ) Expr )?
        | Expr
LabelExpr ::= LabelRef ( "-" LabelRef )?
LabelRef ::= <DECIMAL_B>
        | <DECIMAL_F>
        | <IDENTIFIER>
        | "."
Data ::= DataMode DataList
        | ".ascii" <STRING>
        | ".asciiz" <STRING>
        | ".space" Expr
DataMode ::= ".byte"
        | ".half"
        | ".word"
        | ".float"
        | ".double"
DataList ::= DataExpr ( "," DataList )*
DataExpr ::= Expr ( ":" Expr )?
        | <FLOAT> ( ":" <FLOAT> )?
SymDef ::= <IDENTIFIER_EQUAL> Expr

```

```

Directive ::= SetDir
           | SegmentDir
           | AlignDir
           | SymbolDir
           | BlockDir
           | CompilerDir
SetDir ::= ".set" SetDirArgs
SetDirArgs ::= "volatile"
             | "novolatile"
             | "reorder"
             | "noreorder"
             | "at"
             | "noat"
             | "macro"
             | "nomacro"
             | "bopt"
             | "nobopt"
             | "move"
             | "nomove"
SegmentDir ::= ".text"
            | ".data"
            | ".rdata"
            | ".sdata"
AlignDir ::= ".align" Expr
SymbolDir ::= ".globl" <IDENTIFIER>
            | ".extern" <IDENTIFIER> ", " Constant
            | ".comm" <IDENTIFIER> ", " Constant
            | ".lcomm" <IDENTIFIER> ", " Constant
BlockDir ::= ".ent" <IDENTIFIER> ( ", " Constant )?
            | ".aent" <IDENTIFIER> ", " Constant
            | ".mask" Expr ", " Expr
            | ".fmask" Expr ", " Expr
            | ".frame" Register ", " Expr ", " Register
            | ".end" ( <IDENTIFIER> )?
CompilerDir ::= ".alias" Register ", " Register
              | ".bgnb" Expr
              | ".endb" Expr
              | ".file" Constant <STRING>
              | ".galive"
              | ".gjaldef"
              | ".gjlive"
              | ".lab" <IDENTIFIER>
              | ".livereg" Expr ", " Expr
              | ".noalias" Register ", " Register
              | ".option" "flag"
              | ".verstamp" Constant Constant
              | ".vreg" Expr ", " Expr

```

```
Expr ::= Term Expr
Expr_ ::= ( BinaryOp Expr Expr ) *
Term ::= UnaryOp Term
      | Primary
Primary ::= Constant
          | "(" Expr ")"
BinaryOp ::= "*"
          | "/"
          | "%"
          | "+"
          | "-"
          | "<<"
          | ">>"
          | "&"
          | "^"
          | "|"
UnaryOp ::= "+"
          | "-"
          | "~"
          | "!"
Constant ::= <DECIMAL>
          | <HEXADECIMAL>
          | <OCTAL>
          | <CHARACTER>
          | <IDENTIFIER>
RegisterName ::= "zero"
              | "at"
              | "v0"
              | "v1"
              | "a0"
              | "a1"
              | "a2"
              | "a3"
              | "t0"
              | "t1"
              | "t2"
              | "t3"
              | "t4"
              | "t5"
              | "t6"
              | "t7"
              | "s0"
              | "s1"
              | "s2"
              | "s3"
              | "s4"
              | "s5"
```

- | "s6"
- | "s7"
- | "t8"
- | "t9"
- | "k0"
- | "k1"
- | "gp"
- | "sp"
- | "s8"
- | "fp"
- | "ra"

DollarRegisterName ::= "\$zero"

- | "\$at"
- | "\$v0"
- | "\$v1"
- | "\$a0"
- | "\$a1"
- | "\$a2"
- | "\$a3"
- | "\$t0"
- | "\$t1"
- | "\$t2"
- | "\$t3"
- | "\$t4"
- | "\$t5"
- | "\$t6"
- | "\$t7"
- | "\$s0"
- | "\$s1"
- | "\$s2"
- | "\$s3"
- | "\$s4"
- | "\$s5"
- | "\$s6"
- | "\$s7"
- | "\$t8"
- | "\$t9"
- | "\$k0"
- | "\$k1"
- | "\$gp"
- | "\$sp"
- | "\$s8"
- | "\$fp"
- | "\$ra"

OpCode ::= "abs"

- | "add"
- | "addciu"

| "addu"  
| "and"  
| "b"  
| "bal"  
| "bc0f"  
| "bc0fl"  
| "bc0t"  
| "bc0tlbc1f"  
| "bc1fl"  
| "bc1t"  
| "bc1tl"  
| "bc2f"  
| "bc2fl"  
| "bc2t"  
| "bc2tl"  
| "beq"  
| "beql"  
| "beqz"  
| "beqzl"  
| "bge"  
| "bgei"  
| "bgeu"  
| "bgeul"  
| "bgez"  
| "bgezal"  
| "bgezall"  
| "bgezl"  
| "bgt"  
| "bgtl"  
| "bgtu"  
| "bgtul"  
| "bgtz"  
| "bgtzl"  
| "ble"  
| "blel"  
| "bleu"  
| "bleul"  
| "blez"  
| "blezl"  
| "blt"  
| "bltl"  
| "bltu"  
| "bltul"  
| "bltz"  
| "bltzal"  
| "bltzall"  
| "bltzl"

| "bne"  
| "bnel"  
| "bnez"  
| "bnezl"  
| "break"  
| "cache"  
| "cfc0"  
| "cfc1"  
| "cfc2"  
| "ctc0"  
| "ctc1"  
| "ctc2"  
| "dabs"  
| "dadd"  
| "daddi"  
| "daddiu"  
| "daddu"  
| "ddiv"  
| "ddivd"  
| "ddivdu"  
| "ddivu"  
| "div"  
| "divd"  
| "divdu"  
| "divo"  
| "divou"  
| "divu"  
| "dla"  
| "dli"  
| "dmadd16"  
| "dmfc0"  
| "dmfc1"  
| "dmfc2"  
| "dmtc0"  
| "dmtc1"  
| "dmtc2"  
| "dmul"  
| "dmulo"  
| "dmulou"  
| "dmult"  
| "dmultu"  
| "dneg"  
| "dnegu"  
| "drem"  
| "dremu"  
| "dret"  
| "drol"

| "dror"  
| "dsll"  
| "dsllv"  
| "dsll32"  
| "dsra"  
| "dsra32"  
| "dsrl"  
| "dsrlv"  
| "dsrl32"  
| "dsub"  
| "dsubu"  
| "eret"  
| "ffc"  
| "ffs"  
| "flushd"  
| "j"  
| "jr"  
| "jal"  
| "jalr"  
| "la"  
| "lb"  
| "lbu"  
| "ld"  
| "ldl"  
| "ldr"  
| "ldxc1"  
| "lh"  
| "lhu"  
| "li"  
| "ll"  
| "lld"  
| "lui"  
| "lw"  
| "lwc1"  
| "lwl"  
| "lwr"  
| "lwu"  
| "lwx1"  
| "madd"  
| "maddu"  
| "mad"  
| "madu"  
| "madd16"  
| "max"  
| "mfc0"  
| "mfc1"  
| "mfc2"

| "mfhi"  
| "mflo"  
| "min"  
| "move"  
| "movf"  
| "movn"  
| "movt"  
| "movz"  
| "msub"  
| "msubu"  
| "mtc0"  
| "mtc1"  
| "mtc2"  
| "mthi"  
| "mtlo"  
| "mul"  
| "mulu"  
| "mulo"  
| "mulou"  
| "mult"  
| "multu"  
| "neg"  
| "negu"  
| "nop"  
| "nor"  
| "not"  
| "or"  
| "ori"  
| "pref"  
| "prefx"  
| "r2u"  
| "radd"  
| "rem"  
| "remu"  
| "rfe"  
| "rmul"  
| "rol"  
| "ror"  
| "rsub"  
| "sb"  
| "sc"  
| "scd"  
| "sd"  
| "sdbbp"  
| "sdc1"  
| "sdl"  
| "sdr"



| "sdxcl"  
| "selsl"  
| "selsr"  
| "seq"  
| "sge"  
| "sgeu"  
| "sgt"  
| "sgtu"  
| "sh"  
| "sle"  
| "sleu"  
| "sll"  
| "sllv"  
| "slt"  
| "slti"  
| "sltiu"  
| "sltu"  
| "sne"  
| "sra"  
| "sraV"  
| "srl"  
| "srlv"  
| "standby"  
| "sub"  
| "subu"  
| "suspend"  
| "sw"  
| "swc1"  
| "swl"  
| "swr"  
| "swxc1"  
| "sync"  
| "syscall"  
| "teq"  
| "teqi"  
| "tge"  
| "tgei"  
| "tgeiu"  
| "tgeu"  
| "tlbp"  
| "tlbr"  
| "tlbwi"  
| "tlbwr"  
| "tlt"  
| "lti"  
| "ltiu"  
| "ltu"

| "tne"  
| "tnei"  
| "u2r"  
| "uld"  
| "ulh"  
| "ulhu"  
| "ulw"  
| "usd"  
| "ushusw"  
| "waiti"  
| "wb"  
| "xor"  
| "xori"  
| "abs.s"  
| "add.s"  
| "c.eq.s"  
| "c.f.s"  
| "c.le.s"  
| "c.lt.s"  
| "c.nge.s"  
| "c.ngl.s"  
| "c.ngt.s"  
| "c.ole.s"  
| "c.olt.s"  
| "c.seq.s"  
| "c.sf.s"  
| "c.ueq.s"  
| "c.ule.s"  
| "c.ult.s"  
| "c.un.s"  
| "ceil.l.d"  
| "ceil.l.s"  
| "ceil.w.d"  
| "ceil.w.s"  
| "cvt.d.l"  
| "cvt.d.s"  
| "cvt.d.w"  
| "cvt.l.d"  
| "cvt.l.s"  
| "cvt.s.d"  
| "cvt.s.l"  
| "cvt.s.w"  
| "cvt.w.d"  
| "cvt.w.s"  
| "div.s"  
| "floor.l.d"  
| "floor.l.s"

- | "floor.w.d"
- | "floor.w.s"
- | "l.d"
- | "l.s"
- | "ldc1"
- | "madd.s"
- | "mov.s"
- | "movf.s"
- | "movn.s"
- | "movt.s"
- | "movz.s"
- | "msub.s"
- | "mul.s"
- | "neg.s"
- | "nmadd.s"
- | "nmsub.s"
- | "recip.s"
- | "round.l.d"
- | "round.l.s"
- | "round.w.d"
- | "round.w.s"
- | "rsqrt.s"
- | "s.d"
- | "s.s"
- | "sqrt.s"
- | "sub.s"
- | "trunc.l.d"
- | "trunc.l.s"