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| **Declaration CFG** | |
| <dec> --> DT <dec\_choice>  <dec\_choice> --> [ ] ID <init\_arr><list\_arr> | ID <init><list>  <init> --> = <OE> | ~  <list> --> ; | , ID <init> <list>  <init\_arr> -- > = <init\_arr\_choice> | ~  <init\_arr\_choice> --> new DT[ <OE> ]<return\_choice> | { <PL>} | ID |~  <list\_arr> --> ; | , ID <init\_arr> <list\_arr> | |
| First(<dec>) 🡪 DT |  |
| First<dec\_choice>) 🡪 [ , ID |  |
| **First(<init>) 🡪 = , ~** | **Follow(<init>) 🡪 , , ;** |
| First(<list>) 🡪 ; , , |  |
| **First(<init\_arr>) 🡪 = , ~** | **Follow(<init\_arr>) 🡪 , , ;** |
| **First(<init\_arr\_choice>) 🡪 new, { , ID , ~** | **Follow(<init\_arr\_choice>) 🡪 , , ;** |
| First(<list\_arr>) 🡪 ; , , |  |

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| **Object Declaration** | |
| <obj\_dec> 🡪 ID <obj\_dec\_choice>  <obj\_dec\_choice> 🡪 [] ID <obj\_init\_arr><obj\_list\_arr> | ID <obj\_init><obj\_list>  <obj\_init> 🡪 = <obj\_init\_choice> | ~  <obj\_init\_choice> 🡪 new ID(<PL>) | <OE>  <obj\_list> --> ; | , ID <obj\_init> <obj\_list>  <obj\_init\_arr> 🡪 = <obj\_init\_arr\_choice> | ~  <obj\_init\_arr\_choice> 🡪 new ID [ <OE> ] <return\_obj\_choice> | { <PL\_dec>} | ID |~  <obj\_list\_arr> 🡪 ; | , ID <obj\_init\_arr> <obj\_list\_arr> | |
| First(<obj\_dec>) 🡪 DT |  |
| First(<obj\_dec\_choice>) 🡪 [ , ID |  |
| **First(<obj\_init>) 🡪 = , ~** | **Follow(<obj\_init>) 🡪 , , ;** |
| First(<init\_choice>) 🡪 new , int\_const, char\_const , string\_const, float\_const, true, false, ( , ! , this, ID , inc\_dec |  |
| First(<obj\_list>) 🡪 ; , , |  |
| **First(<obj\_init\_arr>) 🡪 = , ~** | **Follow(<obj\_init\_arr>) 🡪 , , ;** |
| **First(<obj\_init\_arr\_choice>) 🡪 new, { , ID , ~** | **Follow(<init\_arr\_choice>) 🡪 , , ;** |
| First(<obj\_list\_arr>) 🡪 ; , |  |

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| **SST ( Single Statement)** | |
| <SST> 🡪 <if\_else> | <while\_st> | <for\_st> | inc\_dec<this\_st> ID <X> ;| this . ID <XY\_SST> | ID<ZZZ> | <try\_st> | DT <dec\_choice> | continue; | break; | ;  <ZZZ> 🡪 ID <obj\_init><obj\_list> | [ <XY\_dec> | <XY1\_SST> | (<PL>)<XY2\_SST>  <XY\_dec> 🡪 <OE>] <XY1\_SST> | ] ID<obj\_init\_arr><obj\_list\_arr>  <XY\_SST> 🡪 ( <PL > ) <XY2\_SST> | . ID <XY\_SST> | inc\_dec; | = <OE> ; | [<OE>] <XY1\_SST> | ;  <XY1\_SST> 🡪. ID <XY\_SST> | inc\_dec ; | = <OE>;  <XY2\_SST> 🡪 . ID <XY\_SST> | [<OE>]<XY1\_SST>|;  <MST> 🡪 <SST><MST> | ~ | |
| First(<SST>) 🡪 if, while, for, try, this, inc\_dec, ID, DT, continue, break |  |
| First(<ZZZ>) 🡪 ID, ( , . , inc\_dec, = , [ |  |
| First(<XY\_dec>) 🡪 int\_const, char\_const , string\_const, float\_const, true, false, ( , ! , this, ID , inc\_dec, ] |  |
| First(<XY\_SST>) 🡪 ( , . , inc\_dec , = , ; , [ |  |
| First(<XY1\_SST>) 🡪 . , inc\_dec , = |  |
| First(<XY2\_SST>) 🡪 . , ; , [ |  |
| **First(<MST>) 🡪 if, while, for, try, this, inc\_dec, ID, DT, break, continue, ~** | **Follow(<MST>) 🡪 }** |

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| **SST1 ( Includes return keyword)** | |
| <SST1> 🡪 <if\_else> | <while\_st> | <for\_st> | inc\_dec<this\_st> ID <X> ;| this . ID <XY\_SST> | ID<ZZZ> | <try\_st> | DT <dec\_choice> | <return\_st> | ;  <MST1> 🡪 <SST1><MST1> | ~ | |
| First(<SST1>) 🡪 if, while, for, try, this, inc\_dec, ID, DT, return |  |
| First(<MST1>) 🡪if, while, for, try, this, inc\_dec, ID, DT, return, ~ | Follow(<MST1>) 🡪 } |

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| **For Statement** | |
| <for\_st> 🡪 for(<c1><c2>;<c3>) { <MST> }  <c1> 🡪 inc\_dec <this\_st>ID<X>; | DT <dec\_choice> | this . ID <X><c1\_choice2> | ID <for\_ZZZ> | ;  <c1\_choice2> 🡪 = <OE> ; | inc\_dec ;  <c2> 🡪 <OE> | ~  <c3> 🡪 <this\_st>ID<X> <c3\_choice><c3\_more\_choice> | inc\_dec <this\_st>ID<X><c3\_more\_choice> | new ID(<PL>)<c3\_more\_choice> | ~  <c3\_choice> 🡪 inc\_dec | = <OE>  <c3\_more\_choice> 🡪 , <c3\_must> <c3\_more\_choice> | ~  <c3\_must> 🡪 <this\_st>ID<X> <c3\_choice> | inc\_dec <this\_st>ID<X> | new ID(<PL>)  <for\_ZZZ> 🡪 ID <obj\_init><obj\_list> | [ <XY\_dec> | <for\_XY1\_SST> | (<PL>)<for\_XY2\_SST>  <for\_XY\_dec> 🡪 <OE>] <for\_XY1\_SST> | ] ID<obj\_init\_arr><obj\_list\_arr>  <for\_XY\_SST> 🡪 ( <PL > ) <for\_XY2\_SST> | . ID <for\_XY\_SST> | inc\_dec; | = <OE> ; | [<OE>] <for\_XY1\_SST> | ;  <for\_XY1\_SST> 🡪. ID <for\_XY\_SST> | inc\_dec ; | = <OE>;  <for\_XY2\_SST> 🡪 . ID <for\_XY\_SST> | [<OE>]<for\_XY1\_SST> | |
| First(<for>) 🡪 for |  |
| First(<c1>) 🡪 inc\_dec, DT,this, ID , ; |  |
| First(<c1\_choice2>) 🡪 = , inc\_dec |  |
| **First(<c2>) 🡪 int\_const, char\_const , string\_const, float\_const,** **true, false , ( , ! , this, ID , inc\_dec , ~** | **Follow(<c2>) 🡪 ;** |
| **First(<c3>) 🡪 this, ID , inc\_dec, new ,~** | **Follow(<c3>) 🡪 )** |
| First(<c3\_choice>) 🡪 inc\_dec, = |  |
| **First(<c3\_more\_choice>) 🡪 , , ~** | **Follow(c3\_more\_choice>) 🡪 )** |
| **First(<c3\_must>) 🡪 this, ID , inc\_dec , new** |  |
| First(<for\_ZZZ>) 🡪 ID, ( , . , inc\_dec, = , [ |  |
| First(<for\_XY\_dec>) 🡪 int\_const, char\_const , string\_const, float\_const, true, false, ( , ! , this, ID , inc\_dec, ] |  |
| First(<for\_XY\_SST>) 🡪 ( , . , inc\_dec , = , ; , [ |  |
| First(<for\_XY1\_SST>) 🡪 . , inc\_dec , = |  |
| First(<for\_XY2\_SST>) 🡪 . , [ |  |

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| **Return Statement** | |
| <return > 🡪 return <either\_return> ;  <either\_return> 🡪 <OE>| new <return1> | ~  <return1> 🡪 ID <return2> | DT [<OE>]<return\_choice>  <return2> 🡪 (<PL>) | [<OE>] <return\_obj\_choice>  <return\_obj\_choice> 🡪 { <PL\_dec> } | ~  <return\_choice> 🡪 { <PL> } | ~ | |
| First(<return>) 🡪 return |  |
| **First(<either\_return>) 🡪 int\_const, char\_const , string\_const, float\_const, true, false, ( , ! , this, ID , inc\_dec , new , ~** | **Follow(<either\_return>) 🡪 ;** |
| First(<return1>) 🡪 ID , DT |  |
| First(<return2>) 🡪 ( , [ |  |
| **First(<return\_obj\_choice>) 🡪 { , ~** | **Follow(<return\_obj\_choice>) 🡪 , , ;** |
| **First(return\_choice>) 🡪 { , ~** | **Follow(<return\_choice>) 🡪 , , ;** |

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| **PL\_dec ( Parameter List Declaration )** | |
| <PL\_dec> 🡪 new ID(<PL>)<PL1\_dec> | <OE> <PL1\_dec>  <PL1\_dec> 🡪 , <PL1\_choice><PL1\_dec> | ~  <PL1\_choice> 🡪 new ID(<PL>) | <OE> | |
| First(<PL\_dec>) -> new , int\_const, char\_const , string\_const, float\_const, true, false, ( , ! , this, ID , inc\_dec |  |
| **First(<PL1\_dec>) -> , , ~** | **Follow(<PL\_dec>) -> }** |
| First(<PL1\_choice>) -> new , int\_const, char\_const , string\_const, float\_const, true, false, ( , ! , this, ID , inc\_dec |  |

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| **PL ( Parameter List )** | |
| <PL> 🡪 <OE> <PL1> | ~  <PL1 > 🡪 , <OE> <PL1> | ~ | |
| First(<PL>) -> int\_const, char\_const , string\_const, float\_const, true, false, ( , ! , this, ID , inc\_dec |  |
| **First(<PL1>) -> , , ~** | **Follow(<PL>) -> ) , }** |

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| **Const (Constants)** | |
| <const> 🡪 string\_const | int\_const | char\_const | float\_const | true | false | |
| First(<const>) 🡪 string\_const, int\_const, char\_const, float\_const, true, false |  |

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| **Def ( Function Parameter list while defining )** | |
| <def> 🡪 <ret\_type> ID <more\_def> | ~  <more\_def> 🡪 , <ret\_type> ID <more\_def> | ~  <ret\_type> 🡪 DT <ret\_choice> | ID <ret\_choice>  <ret\_choice> 🡪 [ ] | ~ | |
| **First(<def>) 🡪DT , ID , ~** | **Follow(<def>) 🡪 )** |
| **First(<more\_def>) 🡪 , , ~** | **Follow(<more\_def>) 🡪)** |
| First(<ret\_type>) 🡪 DT , ID |  |
| **First(<ret\_choice>) 🡪 [ , ~** | **Follow(<ret\_choice>) 🡪 ) , , , ID** |

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| **X (Always end on variable)** | |
| <X> 🡪 [<OE>] <X1> | ( <PL> ) <X2> | . ID<X> | ~  <X1> 🡪 .ID<X> | ~  <X2> 🡪 .ID<X> | [<OE> ].ID<X> | |
| **First(<X>) 🡪 [ , ( , . ,~** | **Follow(<X>) 🡪 ; , pm , rop, mdm , && , || , ) , ] , , , } , =, inc\_dec** |
| **First(<X1>) 🡪 . , ~** | **Follow(<X1>) 🡪 ; , pm , rop, mdm , && , || , ) , ] , , , } , =, inc\_dec** |
| First(<X2>) 🡪 . , [ |  |

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| **OE (Expression)** | |
| <OE> 🡪 <AE> <OE'>  <OE'> 🡪 || <AE><OE'> | ~  <AE> 🡪 <RE> <AE'>  <AE'> 🡪 &&<RE><AE'> | ~  <RE> 🡪 <PE><RE'>  <RE'> 🡪 rop <PE><RE'>|~  <PE> 🡪 <ME><PE'>  <PE'> 🡪 pm <ME><PE'>|~  <ME> 🡪 <F><ME'>  <ME'> 🡪 mdm <F><ME'>|~  <F> 🡪 <const> | (<OE>) | ! <F> | <this\_st> ID <XY> | inc\_dec <this\_st> ID <X>  <XY> 🡪 [<OE>] <XY1> | (<PL> ) <XY2> | .ID <XY> | inc\_dec | ~  <XY1> 🡪 .ID<XY> | inc\_dec | ~  <XY2> 🡪 .ID <XY> | [<OE>] <XY1> | ~ | |
| First(<OE>) 🡪 int\_const, char\_const , string\_const, float\_const, true, false, bool, var, ( , ! , this, ID , inc\_dec |  |
| **First(<OE’>) 🡪 || , ~** | **Follow(<OE’>) 🡪 ) , } , ] , , , ;** |
| First(<AE>) 🡪 int\_const, char\_const , string\_const, float\_const, true, false, bool, var, ( , ! , this, ID , inc\_dec |  |
| **First(<AE’>) 🡪 && , ~** | **Follow(<AE’>) 🡪 || , ) , } , ] , , , ;** |
| First(<RE>) 🡪 int\_const, char\_const , string\_const, float\_const, true, false, bool, var, ( , ! , this, ID , inc\_dec |  |
| **First(<RE’>) 🡪 rop , ~** | **Follow(<RE’>) 🡪 && , || , ) , } , ] , , , ;** |
| First(<PE>) 🡪 int\_const, char\_const , string\_const, float\_const, true, false, bool, var, ( , ! , this, ID , inc\_dec |  |
| **First(<PE’>) 🡪 pm , ~** | **Follow(<PE’>) 🡪 rop , && , || , ) , } , ] , , , ;** |
| First(<ME>) 🡪 int\_const, char\_const , string\_const, float\_const, true, false, bool, var, ( , ! , this, ID , inc\_dec |  |
| **First(<ME’>) 🡪 mdm, ~** | **Follow(<ME’>) 🡪 pm , rop , && , || , ) , } , ] , , , ;** |
| First(<F>) 🡪 int\_const, char\_const , string\_const, float\_const, true, false, bool, var, ( , ! , this, ID , inc\_dec | Follow(<F>) 🡪 mdm, pm , rop , && , || , ) , } , ] , , , ; |
| **First(<XY>) 🡪 [ , ( , . , inc\_dec , ~** | **Follow(<XY>) 🡪 mdm, pm , rop , && , || , ) , } , ] , , , ;** |
| **First(<XY1>)🡪 . , inc\_dec, ~** | **Follow(<XY1>) 🡪 mdm, pm , rop , && , || , ) , } , ] , , , ;** |
| **First(<XY2>) 🡪 . , [ , ~** | **Follow(<XY2>) 🡪 mdm, pm , rop , && , || , ) , } , ] , , , ;** |

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| **Class Statement** | |
| <class\_st> 🡪 <class\_choice> <class\_def>  <class\_def> 🡪 class ID <inhrt> { <CB> }  <class\_choice> 🡪 static | abstract | final | ~  <inhrt> 🡪 extends ID <inhrt\_choice> | ~  <inhrt\_choice> 🡪 , ID <inhrt choice> | ~  <CB> 🡪 static <CB\_Class>| <access\_modifiers> <static\_choice> <CB1> | <CB1> | abstract <class\_def><CB> | final <class\_def> <CB>| <class\_def> <CB>| ~  <CB\_Class> 🡪 <acc\_choice> <CB1> | <class\_def><CB>  <acc\_choice> 🡪 <access\_modifiers> | ~  <static\_choice> 🡪 static | ~  <CB1> 🡪 DT<fn1><CB> | void <func><CB> | ID <fn2><CB>  <fn1> 🡪 ID <fn\_simple> | [ ] ID <fn\_arr>  <fn\_simple> 🡪 (<def>) {<MST1>} | <init><list>  <fn\_arr> 🡪 (<def>){<MST>} | <init\_arr><list\_arr>  <fn2> 🡪 ID<fn2\_simple> | [ ] ID <fn2\_arr> | (<def>){<MST1>}  <fn2\_simple> 🡪 (<def>){<MST1>} | <obj\_init><obj\_list>  <fn2\_arr> 🡪 (<def>){<MST>} | <obj\_init\_arr><obj\_list\_arr> | |
| First(<class\_st>)🡪 static, abstract, final, class | Follow(<class\_st>) 🡪 static, abstract, final , class , } |
| First(<class\_def>) 🡪class |  |
| **First(<class\_choice>) 🡪 static, abstract, final, ~** | **Follow(<class\_choice>) 🡪 class** |
| **First(<inhrt>) -- > extends,~** | **Follow(<inhrt>) 🡪 {** |
| **First(<inhrt\_choice>) 🡪 , , ~** | **Follow(<inhrt\_choice>) 🡪 {** |
| **First(<CB>) 🡪 static, public , protected, private, DT , void , ID , abstract, final, class~** | **Follow(<CB>) 🡪 }** |
| **First(<acc\_choice>) 🡪 public, protected, private, ~** | **Follow(<acc\_choice>) 🡪 DT ,ID, void** |
| **First(<static\_choice>) 🡪 static, ~** | **Follow(<static\_choice>) 🡪 DT ,ID, void** |
| First(<CB1>) 🡪 DT, void , ID |  |
| First(<fn1>) 🡪 ID, [ |  |
| First(<fn\_simple>) 🡪 ( , = , , , ; |  |
| First(<fn\_arr>) 🡪 (, = , ; , , |  |
| First(<fn2>) 🡪 ID, [ , ( |  |
| First(<fn2\_simple>) 🡪 ( , = , , , ; |  |
| First(<fn2\_arr>) 🡪 (, = , , , ; |  |

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| **This\_st ( This Statement)** | |
| <this\_st> 🡪 this . | ~ | |
| **First(<this\_st>) 🡪 this , ~** | **Follow(<this\_st>) 🡪 ID** |

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| **Try\_st (Try Catch Finally Statement)** | |
| <try\_st> 🡪 try { <MST> } <catch\_st><finally\_st>  <catch\_st> 🡪 catch(ID ID) { <MST> } <catch\_st1>  <catch\_st1> 🡪 <catch\_st><catch\_st1> | ~  <finally\_st> 🡪finally {<MST>} | ~ | |
| First(<try>) 🡪 try |  |
| First(<catch\_st>) 🡪 catch | Follow(<MST1>) 🡪 } |
| **First(<catch\_st1>) 🡪 catch, ~** | **Follow(<catch\_st1>) 🡪 if, while, for , try, this, inc\_dec, ID ,DT , continue, break, return, } , finally** |
| **First(<finally\_st>) 🡪 finally , ~** | **Follow(<catch\_st1>) 🡪 if, while, for , try, this, inc\_dec, ID ,DT , continue, break, return, }** |

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| **Access Modifiers** | |
| <access\_modifiers > 🡪 public | private | protected | |
| First(<access\_modifiers>) 🡪 public , private , protected |  |

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| **Func ( Function )** | |
| <func> 🡪 ID(<def>) { <MST1> } | |
| First(<func>) 🡪 ID |  |

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| **Class Repeatition** | |
| <class\_rep> 🡪 <class\_st> <class\_rep>| ~ | |
| **First(<class\_rep>) 🡪 static, abstract, final , class , ~** | **Follow(<class\_rep>) 🡪 }** |

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| **Starting** | |
| <S> 🡪 namespace ID { <class\_rep> } | |
| First(<S>) 🡪 namespace | Follow(<S>) 🡪 $ |

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| **While\_st (While Loop)** | |
| <while\_st> 🡪 while( <OE> ) {<MST>} | |
| First(<while\_st>) 🡪 while |  |

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| **If\_else (If Else)** | |
| <if\_else> 🡪 if ( <OE> ) { <MST> } <o\_else>  <o\_else> 🡪 else <if\_choice> | ~  <if\_choice> 🡪 <if\_else> | { <MST>} | |
| First(<if\_else>) 🡪 if |  |
| First(<o\_else>) 🡪 else , ~ | **Follow(<o\_else>) 🡪 if, while , for , try, this, inc\_dec , ID ,DT, continue, break , return , }** |
| First(<if\_choice>) 🡪 if , { |  |