

Usage of ECMAScript 5.1 Object Internal Methods

| Spec. | Internal Method | implemented by | Calls [[methods]] | Called by [[methods]] | Used By abstract operations & semantic productions | called by built-in functions |
|-------------------------------|--------------------|---|---|--|---|---|
| 8.12.1, 10.6, 15.5.5.2 | [[GetOwnProperty]] | Object, argumentsObj, string instances | none | [[GetOwnProperty], [[CanPut]], [[Put]], [[Delete]], [[DefineOwnProperty]], argObj.[[GetOwnProperty]] ² , argObj.[[GetOwnProperty]], argObj.[[Get]], argObj.[[DefineOwnProperty]], Array.[[DefineOwnProperty]], String.[[GetOwnProperty]], [[Get]], [[CanPut]], [[Put]], [[HasProperty]], primref.[[Get]], primref.[[Put]] | declaration instantiation ¹ , <i>PropertyAssignment</i> | Object.getOwnPropertyDescriptor, Object.seal, Object.freeze, Object.isSealed, Object.isFrozen, Object.prototype.hasOwnProperty, Object.prototype.propertyIsEnumerable, Array <i>sparse</i> |
| 8.12.2 | [[GetProperty]] | Object | [[GetOwnProperty]], [[GetProperty]] ³ | String.[[GetOwnProperty]], [[Get]], [[CanPut]], [[Put]], [[HasProperty]], primref.[[Get]], primref.[[Put]] | none | none |
| 8.12.3, 8.7.1, 10.6, 15.3.5.4 | [[Get]] | Object, Reference with primitive base, argumentsObj, function instances | [[GetProperty], [[Call]], [[DefaultValue]] | primref.[[Get]], func.[[HasInstance]], func.[[Get]] ² , func.[[Call]], argObj.[[Get]] ² , argObj.[[Get]] | GetValue, ToPropertyDescriptor, objEnvRec.GetBindingValue, <i>ArrayLiteral</i> , <i>ElementList</i> | Object.defineProperties, Object.prototype.toLocaleString, Function.prototype.apply, Array <i>sparse</i> , Array.prototype.toString, Array.prototype.toLocaleString, Array.prototype.concat, Array.prototype.join, Array.prototype.pop, Array.prototype.push, Array.prototype.reverse, Array.prototype.shift, Array.prototype.slice, Array.prototype.sort, Array.prototype.splice, Array.prototype.unshift, Array.prototype.indexOf, Array.prototype.lastIndexOf, Array.prototype.every, Array.prototype.some, Array.prototype.forEach, Array.prototype.map, Array.prototype.filter, Array.prototype.reduce, Array.prototype.reduceRight, String.prototype.match, Data.prototype.toJSON, RegExp.prototype.exec, Error.prototype.toString, JSON.parse, JSON.stringify, <i>RegExp</i> <i>prototype</i> <i>toString</i> ⁴ , <i>String</i> <i>prototype</i> <i>replace</i> ⁴ |
| 8.12.4 | [[CanPut]] | Object | [[GetOwnProperty]], [[GetProperty]] | [[Put]], primref.[[Put]] | none | none |
| 8.12.5, 8.7.2, 10.6 | [[Put]] | Object, Reference with primitive base, argumentsObj | [[CanPut]], [[GetOwnProperty]], [[Call]], [[DefineOwnProperty]] | argObj.[[DefineOwnProperty]] | PutValue, objEnvRec.SetMutableBinding, <i>ArrayLiteral</i> | Array.prototype.pop, Array.prototype.push, Array.prototype.reverse, Array.prototype.shift, Array.prototype.sort, Array.prototype.splice, Array.prototype.unshift, String.prototype.match, |
| 8.12.6 | [[HasProperty]] | Object | [[GetProperty]] | | ToPropertyDescriptor, objEnvRec.HasBinding, objEnvRec.CreateMutableBinding, objEnvRec.GetBindingValue, <i>in operator</i> | <i>RegExp</i> <i>prototype</i> <i>exec</i> , <i>String</i> <i>prototype</i> <i>replace</i> ⁴ , Array.prototype.concat, Array.prototype.reverse, Array.prototype.shift, Array.prototype.slice, Array.prototype.sort, Array.prototype.splice, Array.prototype.unshift, Array.prototype.indexOf, Array.prototype.lastIndexOf, Array.prototype.every, Array.prototype.some, Array.prototype.forEach, Array.prototype.map, Array.prototype.filter, Array.prototype.reduce, Array.prototype.reduceRight, Array.prototype.reduceRight |
| 8.12.7, 10.6 | [[Delete]] | Object, argumentsObject | [[GetOwnProperty]] | argObj.[[DefineOwnProperty]], argObj.[[Delete]], Array.[[DefineOwnProperty]] | objEnvRec.DeleteBinding, <i>delete operator</i> | Array.prototype.pop, Array.prototype.reverse, Array.prototype.shift, Array.prototype.sort, Array.prototype.splice, Array.prototype.unshift |
| 8.12.8 | [[DefaultValue]] | Object | [[Get]], [[Call]] | | ToPrimitive | |

| | | | | | | |
|------------------------------|-----------------------|--|--------------------|---|---|--|
| 8.12.9, 10.6, 15.4.5.1 | [[DefineOwnProperty]] | Object, argumentsObject, array instances | [[GetOwnProperty]] | [[Put]], argObj. [[DefineOwnProperty]] ² , Array. [[DefineOwnProperty]] ² | FromPropertyDescriptor, objEnvRec.CreateMutableBinding, declaration instantiation, CreateArgumentsObject, <i>ElementList</i> , <i>PropertyNameandValueList</i> , Create Function Obj, create ThrowTypeError function (13.2.3) | Object.getOwnPropertyNames, Object.defineProperty, Object.defineProperties, Object.seal, Object.freeze, Object.keys, Function.prototype.bind, Array.prototype.concat, Array.prototype.slice, Array.prototype.splice, Array.prototype.map, Array.prototype.filter, String.prototype.match, String.prototype.split, RegExp.prototype.exec, JSON.parse, JSON.stringify |
|------------------------------|-----------------------|--|--------------------|---|---|--|

NOTES

- 1 The actual algorithms in both ES5 and ES5.1 use [[GetProperty]]. This is an error as reported in <https://mail.mozilla.org/pipermail/es5-discuss/2011-January/003882.html>
- 2 This is a non-polymorphic calls to the default object implementation
- 3 This is a recursive polymorphic call
- 4 The call is implicit in a non-algorithm specification

Abstract Operations that call Object internal methods

| Spec. | Abstract Operation | part of by | Calls [[methods]] | Called by [[methods]] | Used By abstract operations & semantic productions | called by built-in functions |
|--------|--------------------------|-------------------------|--------------------------|------------------------------|---|---|
| 8.7.1 | GetValue() | Reference | [[Get]] | none | many semantic productions | none |
| 8.7.2 | PutValue() | Reference | [[Put]] | none | <i>postfix increment, postfix decrement, prefix increment, prefix decrement, simple assignment, compound assignment, variable statement, for-in statement</i> | none |
| 8.10.4 | FromPropertyDescriptor() | [[Property Descriptor]] | [[DefineOwnProperty]] | none | | Object.getOwnPropertyDescriptor |
| 8.10.5 | ToPropertyDescriptor() | [[Property Descriptor]] | [[HasProperty]], [[Get]] | none | | Object.defineProperty, Object.defineProperties |
| 9.1 | ToPrimitive | | [[DefaultValue]] | none | ToNumber, ToString, addition operator, abstraction relational comparison algorithm, abstract equality comparison algorithm | Date constructor, Date.prototype.toISOString |
| | ToNumber | | | Array. [[DefineOwnProperty]] | ToInteger, ToInt32, ToUInt32, ToUInt16, most arithmetic operators, abstraction relational comparison algorithm, abstract equality comparison algorithm | isNaN, isFinite, String.prototype.lastIndexOf, Number constructor, all Math functions, Date constructor, Date.UTC, all Date.prototype methods with arguments, JSON.stringify |
| | ToInteger | | | String. [[GetOwnProperty]] | | Array.prototype.slice, Array.prototype.splice, Array.prototype.indexOf, Array.prototype.lastIndexOf, String.prototype.charAt, String.prototype.charCodeAt, String.prototype.indexOf, String.prototype.lastIndexOf, String.prototype.slice, String.prototype.substring, Number.prototype.toString, Number.prototype.toFixed, Number.prototype.toExponential, Number.prototype.toPrecision, Date MakeTime, Date TimeClip, Date constructor, Date.UTC, RegExp.prototype.exe, JSON.stringify, String.prototype.substr, Date.prototype.setYear |
| | ToInt32 | | | | Bitwise not operator, left shift operator, signed right shift operator, binary bitwise operators | parseInt |

ToUnit32

Array.[[DefineOwnProperty]]

ArrayLiteral, ElementList, left shift operator, signed right shift operator, unsigned right shift operator, binary bitwise operators

Function.proto.apply, array sparse algorithm, Array constructor, Array.proto.toLocaleString, Array.proto.join, Array.proto.pop, Array.proto.push, Array.proto.reverse, Array.proto.shift, Array.proto.slice, Array.proto.splice, Array.proto.unshift, Array.proto.indexOf, Array.proto.lastIndexOf, Array.proto.every, Array.proto.some, Array.proto.forEach, Array.proto.map, Array.proto.filter, Array.proto.reduce, Array.proto.reduceRight, String.proto.split, String.fromCharCode

ToUint16
ToString

Array.[[DefineOwnProperty]],
String.[[GetOwnProperty]]

ToString, CreateArgumentsObject. *ArrayLiteral, ElementList,PropertyName, MemberExpression, addition operator, in operator,*

parseInt, parseFloat, decodeURI, decodeURIComponent, encodeURI, encodeURIComponent, Object.getOwnPropertyDescriptor, Object.getOwnPropertyNames, Object.defineProperty, Object.keys, Object.proto.hasOwnProperty, Object.proto.propertyIsEnumerable, Function constructor, Function.proto.apply, Array sparse, Array.proto.concat, Array.proto.join, Array.proto.pop, Array.proto.push, Array.proto.reverse, Array.proto.shift, Array.proto.slice, Array.proto.sort, Array.proto.splice, Array.proto.unshift, Array.proto.indexOf, Array.proto.lastIndexOf, Array.proto.every, Array.proto.some, Array.proto.forEach, Array.proto.map, Array.proto.filter, Array.proto.reduce, Array.proto.reduceRight, String constructor, String.proto.charAt, String.proto.charCodeAt, String.proto.concat, String.proto.indexOf, String.proto.lastIndexOf, String.proto.localeCompare, String.proto.match, String.proto.replace, String.proto.search, String.proto.slice, String.proto.split, String.proto.substring, String.proto.toLowerCase, String.proto.trim, Number.proto.toString,