

# ISO/IEC 26300-2:2015-07 (E)

## Information technology - Open Document Format for Office Applications (OpenDocument) v1.2 - Part 2: Recalculated Formula (OpenFormula) Format

---

### Table of Contents

- 1 Introduction..... 20
  - 1.1 Introduction..... 20
  - 1.2 Terminology..... 20
  - 1.3 Purpose..... 20
  - 1.4 Normative References..... 20
  - 1.5 Non-Normative References..... 21
- 2 Expressions and Evaluators..... 22
  - 2.1 Introduction..... 22
  - 2.2 OpenDocument Formula Expression..... 22
  - 2.3 Evaluators..... 22
    - 2.3.1 OpenDocument Formula Evaluator..... 22
    - 2.3.2 OpenDocument Formula Small Group Evaluator..... 22
    - 2.3.3 OpenDocument Formula Medium Group Evaluator..... 23
    - 2.3.4 OpenDocument Formula Large Group Evaluator..... 24
  - 2.4 Variances (Implementation-defined, Unspecified, and Behavioral Changes)..... 25
- 3 Formula Processing Model..... 26
  - 3.1 General..... 26
  - 3.2 Expression Evaluation..... 26
    - 3.2.1 General..... 26
    - 3.2.2 Expression Calculation ..... 26
    - 3.2.3 Operator and Function Evaluation..... 26
  - 3.3 Non-Scalar Evaluation (aka 'Array expressions')..... 27
  - 3.4 Host-Defined Behaviors..... 29
  - 3.5 When recalculation occurs..... 30
  - 3.6 Numerical Models..... 30
  - 3.7 Basic Limits..... 30
- 4 Types..... 32
  - 4.1 General..... 32
  - 4.2 Text (String)..... 32
  - 4.3 Number..... 32
    - 4.3.1 General..... 32
    - 4.3.2 Time..... 33
    - 4.3.3 Date..... 33
    - 4.3.4 DateTime..... 33

4.3.5 Percentage.....	33
4.3.6 Currency.....	33
4.3.7 Logical (Number).....	33
4.4 Complex Number.....	34
4.5 Logical (Boolean).....	34
4.6 Error.....	34
4.7 Empty Cell.....	35
4.8 Reference.....	35
4.9 ReferenceList.....	35
4.10 Array.....	35
4.11 Pseudotypes.....	36
4.11.1 General.....	36
4.11.2 Scalar.....	36
4.11.3 DateParam.....	36
4.11.4 TimeParam.....	36
4.11.5 Integer.....	36
4.11.6 TextOrNumber.....	36
4.11.7 Basis.....	36
4.11.8 Criterion.....	38
4.11.9 Database.....	39
4.11.10 Field.....	39
4.11.11 Criteria.....	39
4.11.12 Sequences (NumberSequence, NumberSequenceList, DateSequence, LogicalSequence, and ComplexSequence).....	40
4.11.13 Any.....	40
5 Expression Syntax.....	41
5.1 General.....	41
5.2 Basic Expressions.....	41
5.3 Constant Numbers.....	42
5.4 Constant Strings.....	42
5.5 Operators.....	42
5.6 Functions and Function Parameters.....	43
5.7 Nonstandard Function Names.....	44
5.8 References.....	44
5.9 Reference List.....	45
5.10 Quoted Label.....	45
5.10.1 General.....	45
5.10.2 Lookup of Defined Labels.....	46

5.10.3 Automatic Lookup of Labels.....	46
5.10.4 Implicit Intersection.....	47
5.10.5 Automatic Range.....	47
5.10.6 Automatic Intersection.....	48
5.11 Named Expressions.....	48
5.12 Constant Errors.....	49
5.13 Inline Arrays.....	50
5.14 Whitespace.....	50
6 Standard Operators and Functions.....	51
6.1 General.....	51
6.2 Common Template for Functions and Operators.....	51
6.3 Implicit Conversion Operators.....	52
6.3.1 General.....	52
6.3.2 Conversion to Scalar.....	52
6.3.3 Implied intersection.....	52
6.3.4 Force to array context (ForceArray).....	52
6.3.5 Conversion to Number.....	53
6.3.6 Conversion to Integer.....	53
6.3.7 Conversion to NumberSequence.....	53
6.3.8 Conversion to NumberSequenceList.....	54
6.3.9 Conversion to DateSequence.....	54
6.3.10 Conversion to Complex Number.....	54
6.3.11 Conversion to ComplexSequence.....	54
6.3.12 Conversion to Logical.....	55
6.3.13 Conversion to LogicalSequence.....	55
6.3.14 Conversion to Text.....	55
6.3.15 Conversion to DateParam.....	55
6.3.16 Conversion to TimeParam.....	55
6.4 Standard Operators.....	56
6.4.1 General.....	56
6.4.2 Infix Operator "+".....	56
6.4.3 Infix Operator "-".....	56
6.4.4 Infix Operator "*".....	56
6.4.5 Infix Operator "/".....	57
6.4.6 Infix Operator "^".....	57
6.4.7 Infix Operator "=".....	57
6.4.8 Infix Operator "<>".....	57
6.4.9 Infix Operator Ordered Comparison ("<", "<=", ">", ">=").....	58

6.4.10 Infix Operator "&"	58
6.4.11 Infix Operator Reference Range (":")	58
6.4.12 Infix Operator Reference Intersection ("!")	59
6.4.13 Infix Operator Reference Concatenation ("~") (aka Union)	59
6.4.14 Postfix Operator "%"	60
6.4.15 Prefix Operator "+"	60
6.4.16 Prefix Operator "-"	60
6.5 Matrix Functions	61
6.5.1 General	61
6.5.2 MDETERM	61
6.5.3 MINVERSE	61
6.5.4 MMULT	62
6.5.5 MUNIT	62
6.5.6 TRANSPOSE	62
6.6 Bit operation functions	63
6.6.1 General	63
6.6.2 BITAND	63
6.6.3 BITLSHIFT	63
6.6.4 BITOR	63
6.6.5 BITRSHIFT	64
6.6.6 BITXOR	64
6.7 Byte-position text functions	64
6.7.1 General	64
6.7.2 FINDB	64
6.7.3 LEFTB	65
6.7.4 LENB	65
6.7.5 MIDB	65
6.7.6 REPLACEB	65
6.7.7 RIGHTB	66
6.7.8 SEARCHB	66
6.8 Complex Number Functions	66
6.8.1 General	66
6.8.2 COMPLEX	66
6.8.3 IMABS	66
6.8.4 IMAGINARY	67
6.8.5 IMARGUMENT	67
6.8.6 IMCONJUGATE	67
6.8.7 IMCOS	67

6.8.8 IMCOSH .....	68
6.8.9 IMCOT.....	68
6.8.10 IMCSC.....	68
6.8.11 IMCSCH.....	68
6.8.12 IMDIV.....	69
6.8.13 IMEXP.....	69
6.8.14 IMLN.....	69
6.8.15 IMLOG10.....	69
6.8.16 IMLOG2.....	70
6.8.17 IMPOWER.....	70
6.8.18 IMPRODUCT.....	70
6.8.19 IMREAL.....	70
6.8.20 IMSIN.....	71
6.8.21 IMSINH.....	71
6.8.22 IMSEC.....	71
6.8.23 IMSECH.....	71
6.8.24 IMSQRT.....	72
6.8.25 IMSUB.....	72
6.8.26 IMSUM.....	72
6.8.27 IMTAN.....	72
6.9 Database Functions.....	73
6.9.1 General.....	73
6.9.2 DAVERAGE.....	73
6.9.3 DCOUNT.....	73
6.9.4 DCOUNTA.....	73
6.9.5 DGET.....	74
6.9.6 DMAX.....	74
6.9.7 DMIN.....	74
6.9.8 DPRODUCT.....	74
6.9.9 DSTDEV.....	75
6.9.10 DSTDEVP.....	75
6.9.11 DSUM.....	75
6.9.12 DVAR.....	75
6.9.13 DVARP.....	76
6.10 Date and Time Functions.....	76
6.10.1 General.....	76
6.10.2 DATE.....	76
6.10.3 DATEDIF.....	76

6.10.4 DATEVALUE.....	77
6.10.5 DAY.....	77
6.10.6 DAYS.....	77
6.10.7 DAYS360.....	78
6.10.8 EDATE.....	78
6.10.9 EOMONTH.....	79
6.10.10 HOUR.....	79
6.10.11 ISOWEEKNUM.....	79
6.10.12 MINUTE.....	80
6.10.13 MONTH.....	80
6.10.14 NETWORKDAYS.....	80
6.10.15 NOW.....	81
6.10.16 SECOND.....	81
6.10.17 TIME.....	81
6.10.18 TIMEVALUE.....	82
6.10.19 TODAY.....	82
6.10.20 WEEKDAY.....	82
6.10.21 WEEKNUM.....	83
6.10.22 WORKDAY.....	83
6.10.23 YEAR.....	84
6.10.24 YEARFRAC.....	84
6.11 External Access Functions.....	85
6.11.1 General.....	85
6.11.2 DDE.....	85
6.11.3 HYPERLINK.....	85
6.12 Financial Functions.....	86
6.12.1 General.....	86
6.12.2 ACCRINT.....	86
6.12.3 ACCRINTM.....	87
6.12.4 AMORLINC.....	87
6.12.5 COUPDAYBS.....	88
6.12.6 COUPDAYS.....	88
6.12.7 COUPDAYSNC.....	89
6.12.8 COUPNCD.....	89
6.12.9 COUPNUM.....	90
6.12.10 COUPPCD.....	91
6.12.11 CUMIPMT.....	91
6.12.12 CUMPRINC.....	92

6.12.13 DB.....	92
6.12.14 DDB.....	93
6.12.15 DISC.....	95
6.12.16 DOLLARDE.....	95
6.12.17 DOLLARFR.....	95
6.12.18 DURATION.....	96
6.12.19 EFFECT.....	96
6.12.20 FV.....	97
6.12.21 FVSCHEDULE.....	97
6.12.22 INTRATE.....	97
6.12.23 IPMT.....	98
6.12.24 IRR.....	98
6.12.25 ISPMT.....	99
6.12.26 MDURATION.....	99
6.12.27 MIRR.....	100
6.12.28 NOMINAL.....	100
6.12.29 NPER.....	101
6.12.30 NPV.....	101
6.12.31 ODDFPRICE.....	102
6.12.32 ODDFYIELD.....	102
6.12.33 ODDLPRICE.....	103
6.12.34 ODDLYIELD.....	103
6.12.35 PDURATION.....	104
6.12.36 PMT.....	104
6.12.37 PPMT.....	105
6.12.38 PRICE.....	105
6.12.39 PRICEDISC.....	106
6.12.40 PRICEMAT.....	106
6.12.41 PV.....	107
6.12.42 RATE.....	107
6.12.43 RECEIVED.....	108
6.12.44 RRI.....	109
6.12.45 SLN.....	109
6.12.46 SYD.....	109
6.12.47 TBILLEQ.....	110
6.12.48 TBILLPRICE.....	110
6.12.49 TBILLYIELD.....	111
6.12.50 VDB.....	111

6.12.51 XIRR.....	112
6.12.52 XNPV.....	112
6.12.53 YIELD.....	113
6.12.54 YIELDDISC.....	113
6.12.55 YIELDMAT.....	114
6.13 Information Functions.....	114
6.13.1 General.....	114
6.13.2 AREAS.....	114
6.13.3 CELL.....	115
6.13.4 COLUMN.....	116
6.13.5 COLUMNS.....	117
6.13.6 COUNT.....	117
6.13.7 COUNTA.....	117
6.13.8 COUNTBLANK.....	118
6.13.9 COUNTIF.....	118
6.13.10 COUNTIFS.....	118
6.13.11 ERROR.TYPE.....	119
6.13.12 FORMULA.....	119
6.13.13 INFO.....	119
6.13.14 ISBLANK.....	120
6.13.15 ISERR.....	121
6.13.16 ISERROR.....	121
6.13.17 ISEVEN.....	121
6.13.18 ISFORMULA.....	121
6.13.19 ISLOGICAL.....	122
6.13.20 ISNA.....	122
6.13.21 ISNONTEXT.....	122
6.13.22 ISNUMBER.....	123
6.13.23 ISODD.....	123
6.13.24 ISREF.....	123
6.13.25 ISTEXT.....	123
6.13.26 N.....	124
6.13.27 NA.....	124
6.13.28 NUMBERVALUE.....	124
6.13.29 ROW.....	125
6.13.30 ROWS.....	125
6.13.31 SHEET.....	125
6.13.32 SHEETS.....	126

6.13.33 TYPE.....	126
6.13.34 VALUE.....	127
6.14 Lookup Functions.....	128
6.14.1 General.....	128
6.14.2 ADDRESS.....	128
6.14.3 CHOOSE.....	129
6.14.4 GETPIVOTDATA.....	129
6.14.5 HLOOKUP.....	130
6.14.6 INDEX.....	131
6.14.7 INDIRECT.....	131
6.14.8 LOOKUP.....	132
6.14.9 MATCH.....	133
6.14.10 MULTIPLE.OPERATIONS.....	134
6.14.11 OFFSET.....	135
6.14.12 VLOOKUP.....	136
6.15 Logical Functions.....	136
6.15.1 General.....	136
6.15.2 AND.....	137
6.15.3 FALSE.....	137
6.15.4 IF.....	137
6.15.5 IFERROR.....	137
6.15.6 IFNA.....	138
6.15.7 NOT.....	138
6.15.8 OR.....	138
6.15.9 TRUE.....	139
6.15.10 XOR.....	139
6.16 Mathematical Functions.....	139
6.16.1 General.....	139
6.16.2 ABS.....	139
6.16.3 ACOS.....	140
6.16.4 ACOSH.....	140
6.16.5 ACOT.....	140
6.16.6 ACOTH.....	140
6.16.7 ASIN.....	141
6.16.8 ASINH.....	141
6.16.9 ATAN.....	141
6.16.10 ATAN2.....	142
6.16.11 ATANH.....	142

6.16.12 BESSELI.....	142
6.16.13 BESSELJ.....	143
6.16.14 BESSELK.....	143
6.16.15 BESSELY.....	143
6.16.16 COMBIN.....	143
6.16.17 COMBINA.....	144
6.16.18 CONVERT.....	144
6.16.19 COS.....	152
6.16.20 COSH.....	152
6.16.21 COT.....	153
6.16.22 COTH.....	153
6.16.23 CSC.....	153
6.16.24 CSCH.....	154
6.16.25 DEGREES.....	154
6.16.26 DELTA.....	154
6.16.27 ERF.....	154
6.16.28 ERFC.....	155
6.16.29 EUROCONVERT.....	155
6.16.30 EVEN.....	156
6.16.31 EXP.....	157
6.16.32 FACT.....	157
6.16.33 FACTDOUBLE.....	157
6.16.34 GAMMA.....	157
6.16.35 GAMMALN.....	158
6.16.36 GCD.....	158
6.16.37 GESTEP.....	158
6.16.38 LCM.....	159
6.16.39 LN.....	159
6.16.40 LOG.....	159
6.16.41 LOG10.....	159
6.16.42 MOD.....	160
6.16.43 MULTINOMIAL.....	160
6.16.44 ODD.....	160
6.16.45 PI.....	160
6.16.46 POWER.....	161
6.16.47 PRODUCT.....	161
6.16.48 QUOTIENT.....	161
6.16.49 RADIANS.....	161

6.16.50 RAND.....	162
6.16.51 RANDBETWEEN.....	162
6.16.52 SEC.....	162
6.16.53 SERIESSUM.....	162
6.16.54 SIGN.....	163
6.16.55 SIN.....	163
6.16.56 SINH.....	164
6.16.57 SECH.....	164
6.16.58 SQRT.....	164
6.16.59 SQRTPI.....	164
6.16.60 SUBTOTAL.....	165
6.16.61 SUM.....	165
6.16.62 SUMIF.....	166
6.16.63 SUMIFS.....	166
6.16.64 SUMPRODUCT.....	167
6.16.65 SUMSQ.....	167
6.16.66 SUMX2MY2.....	167
6.16.67 SUMX2PY2.....	167
6.16.68 SUMXMY2.....	168
6.16.69 TAN.....	168
6.16.70 TANH.....	168
6.17 Rounding Functions.....	169
6.17.1 CEILING.....	169
6.17.2 INT.....	169
6.17.3 FLOOR.....	169
6.17.4 MROUND.....	170
6.17.5 ROUND.....	170
6.17.6 ROUNDDOWN.....	170
6.17.7 ROUNDUP.....	171
6.17.8 TRUNC.....	171
6.18 Statistical Functions.....	171
6.18.1 General.....	171
6.18.2 AVEDEV.....	171
6.18.3 AVERAGE.....	172
6.18.4 AVERAGEA.....	172
6.18.5 AVERAGEIF.....	172
6.18.6 AVERAGEIFS.....	173
6.18.7 BETADIST.....	173

6.18.8 BETAINV.....	174
6.18.9 BINOM.DIST.RANGE.....	174
6.18.10 BINOMDIST.....	175
6.18.11 LEGACY.CHIDIST.....	175
6.18.12 CHISQDIST.....	175
6.18.13 LEGACY.CHIINV.....	176
6.18.14 CHISQINV.....	176
6.18.15 LEGACY.CHITEST.....	176
6.18.16 CONFIDENCE.....	177
6.18.17 CORREL.....	177
6.18.18 COVAR.....	178
6.18.19 CRITBINOM.....	178
6.18.20 DEVSQ.....	178
6.18.21 EXPONDIST.....	179
6.18.22 FDIST.....	179
6.18.23 LEGACY.FDIST.....	180
6.18.24 FINV.....	180
6.18.25 LEGACY.FINV.....	180
6.18.26 FISHER.....	181
6.18.27 FISHERINV.....	181
6.18.28 FORECAST.....	181
6.18.29 FREQUENCY.....	182
6.18.30 FTEST.....	182
6.18.31 GAMMADIST.....	182
6.18.32 GAMMAINV.....	183
6.18.33 GAUSS.....	183
6.18.34 GEOMEAN.....	183
6.18.35 GROWTH.....	184
6.18.36 HARMEAN.....	185
6.18.37 HYPGEOMDIST.....	185
6.18.38 INTERCEPT.....	186
6.18.39 KURT.....	186
6.18.40 LARGE.....	186
6.18.41 LINEST.....	187
6.18.42 LOGEST.....	189
6.18.43 LOGINV.....	191
6.18.44 LOGNORMDIST.....	191
6.18.45 MAX.....	192

6.18.46 MAXA.....	192
6.18.47 MEDIAN.....	192
6.18.48 MIN.....	193
6.18.49 MINA.....	193
6.18.50 MODE.....	194
6.18.51 NEGBINOMDIST.....	194
6.18.52 NORMDIST.....	194
6.18.53 NORMINV.....	195
6.18.54 LEGACY.NORMSDIST.....	195
6.18.55 LEGACY.NORMSINV.....	195
6.18.56 PEARSON.....	196
6.18.57 PERCENTILE.....	196
6.18.58 PERCENTRANK.....	197
6.18.59 PERMUT.....	198
6.18.60 PERMUTATIONA.....	198
6.18.61 PHI.....	199
6.18.62 POISSON.....	199
6.18.63 PROB.....	199
6.18.64 QUARTILE.....	200
6.18.65 RANK.....	200
6.18.66 RSQ.....	201
6.18.67 SKEW.....	202
6.18.68 SKEWP.....	202
6.18.69 SLOPE.....	203
6.18.70 SMALL.....	203
6.18.71 STANDARDIZE.....	204
6.18.72 STDEV.....	204
6.18.73 STDEVA.....	204
6.18.74 STDEVP.....	205
6.18.75 STDEVPA.....	205
6.18.76 STEYX.....	206
6.18.77 LEGACY.TDIST.....	206
6.18.78 TINV.....	207
6.18.79 TREND.....	207
6.18.80 TRIMMEAN.....	208
6.18.81 TTEST.....	208
6.18.82 VAR.....	210
6.18.83 VARA.....	210

6.18.84 VARP.....	211
6.18.85 VARPA.....	211
6.18.86 WEIBULL.....	212
6.18.87 ZTEST.....	212
6.19 Number Representation Conversion Functions.....	213
6.19.1 General.....	213
6.19.2 ARABIC.....	213
6.19.3 BASE.....	214
6.19.4 BIN2DEC.....	214
6.19.5 BIN2HEX.....	214
6.19.6 BIN2OCT.....	215
6.19.7 DEC2BIN.....	215
6.19.8 DEC2HEX.....	216
6.19.9 DEC2OCT.....	216
6.19.10 DECIMAL.....	217
6.19.11 HEX2BIN.....	217
6.19.12 HEX2DEC.....	217
6.19.13 HEX2OCT.....	218
6.19.14 OCT2BIN.....	218
6.19.15 OCT2DEC.....	219
6.19.16 OCT2HEX.....	219
6.19.17 ROMAN.....	219
6.20 Text Functions.....	221
6.20.1 General.....	221
6.20.2 ASC.....	221
6.20.3 CHAR.....	223
6.20.4 CLEAN.....	223
6.20.5 CODE.....	224
6.20.6 CONCATENATE.....	224
6.20.7 DOLLAR.....	224
6.20.8 EXACT.....	224
6.20.9 FIND.....	225
6.20.10 FIXED.....	225
6.20.11 JIS.....	225
6.20.12 LEFT.....	227
6.20.13 LEN.....	228
6.20.14 LOWER.....	228
6.20.15 MID.....	228

6.20.16	PROPER.....	229
6.20.17	REPLACE.....	229
6.20.18	REPT.....	229
6.20.19	RIGHT.....	230
6.20.20	SEARCH.....	230
6.20.21	SUBSTITUTE.....	230
6.20.22	T.....	231
6.20.23	TEXT.....	231
6.20.24	TRIM.....	231
6.20.25	UNICHAR.....	232
6.20.26	UNICODE.....	232
6.20.27	UPPER.....	232
7	Other Capabilities.....	233
7.1	General.....	233
7.2	Inline constant arrays.....	233
7.3	Inline non-constant arrays.....	233
7.4	Year 1583.....	233
8	Non-portable Features.....	234
8.1	General.....	234
8.2	Distinct Logical.....	234