**2.8 NA Values**

Sometimes, when working with sample data, a given value isn't available. But it's not a good idea to just throw those values out. R has a value that explicitly indicates a sample was not available: NA. Many functions that work with vectors treat this value specially. We'll create a vector for you with a missing sample, and store it in the a variable. Try to get the sum of its values, and see what the result is:

> a <- c(1, 3, NA, 7, 9)

> sum(a)

[1] NA

The sum is considered "not available" by default because one of the vector's values was NA. This is the responsible thing to do; R won't just blithely add up the numbers without warning you about the incomplete data. We can explicitly tell sum (and many other functions) to remove NA values before they do their calculations, however.

Bring up documentation for the sum function:

> help(sum)

sum package:base R Documentation

etc.

Usage:

sum(..., na.rm = FALSE)

As you see in the documentation, sum can take an optional named argument, na.rm. It's set to FALSE by default, but if you set it to TRUE, all NA arguments will be removed from the vector before the calculation is performed.

Try calling sum again, with na.rm set to TRUE:

> sum(a, na.rm = TRUE)

[1] 20

Voor meer informatie

> ?NA

starting httpd help server ... done

>

|  |  |
| --- | --- |
| NA {base} | R Documentation |

**‘Not Available’ / Missing Values**

**Description**

NA is a logical constant of length 1 which contains a missing value indicator. NA can be coerced to any other vector type except raw. There are also constants NA\_integer\_, NA\_real\_, NA\_complex\_ and NA\_character\_ of the other atomic vector types which support missing values: all of these are [reserved](http://127.0.0.1:30899/library/base/help/reserved) words in the **R** language.

The generic function is.na indicates which elements are missing.

The generic function is.na<- sets elements to NA.

**Usage**

NA

is.na(x)

## S3 method for class 'data.frame'

is.na(x)

> is.na(airquality$Ozone)

[1] FALSE FALSE FALSE FALSE TRUE FALSE FALSE FALSE FALSE TRUE FALSE FALSE

[13] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE

[25] TRUE TRUE TRUE FALSE FALSE FALSE FALSE TRUE TRUE TRUE TRUE TRUE

[37] TRUE FALSE TRUE FALSE FALSE TRUE TRUE FALSE TRUE TRUE FALSE FALSE

[49] FALSE FALSE FALSE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE

[61] TRUE FALSE FALSE FALSE TRUE FALSE FALSE FALSE FALSE FALSE FALSE TRUE

[73] FALSE FALSE TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE TRUE TRUE

[85] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE

[97] FALSE FALSE FALSE FALSE FALSE TRUE TRUE FALSE FALSE FALSE TRUE FALSE

[109] FALSE FALSE FALSE FALSE FALSE FALSE TRUE FALSE FALSE FALSE TRUE FALSE

[121] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE

[133] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE

[145] FALSE FALSE FALSE FALSE FALSE TRUE FALSE FALSE FALSE

>

> is.na(airquality)

Ozone Solar.R Wind Temp Month Day

[1,] FALSE FALSE FALSE FALSE FALSE FALSE

[2,] FALSE FALSE FALSE FALSE FALSE FALSE

[3,] FALSE FALSE FALSE FALSE FALSE FALSE

[4,] FALSE FALSE FALSE FALSE FALSE FALSE

[5,] TRUE TRUE FALSE FALSE FALSE FALSE

[6,] FALSE TRUE FALSE FALSE FALSE FALSE

[7,] FALSE FALSE FALSE FALSE FALSE FALSE

[8,] FALSE FALSE FALSE FALSE FALSE FALSE

[9,] FALSE FALSE FALSE FALSE FALSE FALSE

[10,] TRUE FALSE FALSE FALSE FALSE FALSE

[11,] FALSE TRUE FALSE FALSE FALSE FALSE

[12,] FALSE FALSE FALSE FALSE FALSE FALSE

etc.

is.na(x) <- value

**Arguments**

|  |  |
| --- | --- |
| x | an **R** object to be tested: the default method handles atomic vectors, lists and pairlists. |
| value | a suitable index vector for use with x. |

**Details**

The NA of character type is distinct from the string "NA". Programmers who need to specify an explicit string NA should use NA\_character\_ rather than "NA", or set elements to NA using is.na<-.

is.na(x) works elementwise when x is a [list](http://127.0.0.1:30899/library/base/help/list). It is generic: you can write methods to handle specific classes of objects, see [InternalMethods](http://127.0.0.1:30899/library/base/help/InternalMethods). A complex value is regarded as NA if either its real or imaginary part is NA or NaN.

Function is.na<- may provide a safer way to set missingness. It behaves differently for factors, for example.

Computations using NA will normally result in NA: a possible exception is where [NaN](http://127.0.0.1:30899/library/base/help/NaN) is also involved, in which case either might result.

**Value**

The default method for is.na applied to an atomic vector returns a logical vector of the same length as its argument x, containing TRUE for those elements marked NA or, for numeric or complex vectors, [NaN](http://127.0.0.1:30899/library/base/help/NaN) (!) and FALSE otherwise. dim, dimnames and names attributes are preserved.

The default methods also works for lists and pairlists:  
For is.na, elementwise the result is false unless that element is a length-one atomic vector and the single element of that vector is regarded as NA or NaN (note that any is.na methods for the class of the atomic vector is ignored).

The data frame method for is.na returns a logical matrix with the same dimensions as the data frame, and with dimnames taken from the row and column names of the data frame.

**References**

Becker, R. A., Chambers, J. M. and Wilks, A. R. (1988) *The New S Language*. Wadsworth & Brooks/Cole.

Chambers, J. M. (1998) *Programming with Data. A Guide to the S Language*. Springer.

**See Also**

[NaN](http://127.0.0.1:30899/library/base/help/NaN), [is.nan](http://127.0.0.1:30899/library/base/help/is.nan), etc., and the utility function [complete.cases](http://127.0.0.1:30899/library/base/help/complete.cases).

[na.action](http://127.0.0.1:30899/library/base/help/na.action), [na.omit](http://127.0.0.1:30899/library/base/help/na.omit), [na.fail](http://127.0.0.1:30899/library/base/help/na.fail) on how methods can be tuned to deal with missing values.

**Examples**

is.na(c(1, NA)) #> FALSE TRUE

is.na(paste(c(1, NA))) #> FALSE FALSE

(xx <- c(0:4))

is.na(xx) <- c(2, 4)

xx #> 0 NA 2 NA 4

|  |  |
| --- | --- |
| na.action {stats} | R Documentation |

## NA Action

### Description

Extract information on the NA action used to create an object.

### Usage

na.action(object, ...)

### Arguments

|  |  |
| --- | --- |
| object | any object whose [NA](http://127.0.0.1:30899/library/stats/help/NA) action is given. |
| ... | further arguments special methods could require. |

### Details

na.action is a generic function, and na.action.default its default method. The latter extracts the "na.action" component of a list if present, otherwise the "na.action" attribute.

When [model.frame](http://127.0.0.1:30899/library/stats/help/model.frame) is called, it records any information on NA handling in a "na.action" attribute. Most model-fitting functions return this as a component of their result.

### Value

Information from the action which was applied to object if NAs were handled specially, or NULL.

### References

Chambers, J. M. and Hastie, T. J. (1992) Statistical Models in S. Wadsworth & Brooks/Cole.

### See Also

[options](http://127.0.0.1:30899/library/stats/help/options)("na.action"), [na.omit](http://127.0.0.1:30899/library/stats/help/na.omit), [na.fail](http://127.0.0.1:30899/library/stats/help/na.fail), also for na.exclude, na.pass.

### Examples

na.action(na.omit(c(1, NA)))

|  |  |
| --- | --- |
| na.fail {stats} | R Documentation |

## Handle Missing Values in Objects

### Description

These generic functions are useful for dealing with [NA](http://127.0.0.1:30899/library/stats/help/NA)s in e.g., data frames. na.fail returns the object if it does not contain any missing values, and signals an error otherwise. na.omit returns the object with incomplete cases removed. na.pass returns the object unchanged.

### Usage

na.fail(object, ...)

na.omit(object, ...)

na.exclude(object, ...)

na.pass(object, ...)

### Arguments

|  |  |
| --- | --- |
| object | an **R** object, typically a data frame |
| ... | further arguments special methods could require. |

### Details

At present these will handle vectors, matrices and data frames comprising vectors and matrices (only).

If na.omit removes cases, the row numbers of the cases form the "na.action" attribute of the result, of class "omit".

na.exclude differs from na.omit only in the class of the "na.action" attribute of the result, which is "exclude". This gives different behaviour in functions making use of [naresid](http://127.0.0.1:30899/library/stats/help/naresid) and [napredict](http://127.0.0.1:30899/library/stats/help/napredict): when na.exclude is used the residuals and predictions are padded to the correct length by inserting NAs for cases omitted by na.exclude.

### References

Chambers, J. M. and Hastie, T. J. (1992) Statistical Models in S. Wadsworth & Brooks/Cole.

### See Also

[na.action](http://127.0.0.1:30899/library/stats/help/na.action); [options](http://127.0.0.1:30899/library/stats/help/options) with argument na.action for setting NA actions; and [lm](http://127.0.0.1:30899/library/stats/help/lm) and [glm](http://127.0.0.1:30899/library/stats/help/glm) for functions using these. [na.contiguous](http://127.0.0.1:30899/library/stats/help/na.contiguous) as alternative for time series.

### Examples

DF <- data.frame(x = c(1, 2, 3), y = c(0, 10, NA))

na.omit(DF)

m <- as.matrix(DF)

na.omit(m)

stopifnot(all(na.omit(1:3) == 1:3)) # does not affect objects with no NA's

try(na.fail(DF)) #> Error: missing values in ...

options("na.action")

> airquality

nr Ozone Solar.R Wind Temp Month Day

1 41 190 7.4 67 5 1

2 36 118 8.0 72 5 2

3 12 149 12.6 74 5 3

4 18 313 11.5 62 5 4

7 23 299 8.6 65 5 7

8 19 99 13.8 59 5 8

9 8 19 20.1 61 5 9

10 NA 194 8.6 69 5 10

11 7 NA 6.9 74 5 11

12 16 256 9.7 69 5 12

13 11 290 9.2 66 5 13

14 14 274 10.9 68 5 14

15 18 65 13.2 58 5 15

16 14 334 11.5 64 5 16

17 34 307 12.0 66 5 17

18 6 78 18.4 57 5 18

19 30 322 11.5 68 5 19

20 11 44 9.7 62 5 20

21 1 8 9.7 59 5 21

22 11 320 16.6 73 5 22

23 4 25 9.7 61 5 23

24 32 92 12.0 61 5 24

25 NA 66 16.6 57 5 25

26 NA 266 14.9 58 5 26

27 NA NA 8.0 57 5 27

28 23 13 12.0 67 5 28

29 45 252 14.9 81 5 29

30 115 223 5.7 79 5 30

31 37 279 7.4 76 5 31

32 NA 286 8.6 78 6 1

33 NA 287 9.7 74 6 2

34 NA 242 16.1 67 6 3

35 NA 186 9.2 84 6 4

36 NA 220 8.6 85 6 5

37 NA 264 14.3 79 6 6

38 29 127 9.7 82 6 7

39 NA 273 6.9 87 6 8

40 71 291 13.8 90 6 9

41 39 323 11.5 87 6 10

42 NA 259 10.9 93 6 11

43 NA 250 9.2 92 6 12

44 23 148 8.0 82 6 13

45 NA 332 13.8 80 6 14

46 NA 322 11.5 79 6 15

47 21 191 14.9 77 6 16

48 37 284 20.7 72 6 17

49 20 37 9.2 65 6 18

50 12 120 11.5 73 6 19

51 13 137 10.3 76 6 20

52 NA 150 6.3 77 6 21

53 NA 59 1.7 76 6 22

54 NA 91 4.6 76 6 23

55 NA 250 6.3 76 6 24

56 NA 135 8.0 75 6 25

57 NA 127 8.0 78 6 26

58 NA 47 10.3 73 6 27

59 NA 98 11.5 80 6 28

60 NA 31 14.9 77 6 29

61 NA 138 8.0 83 6 30

62 135 269 4.1 84 7 1

63 49 248 9.2 85 7 2

64 32 236 9.2 81 7 3

65 NA 101 10.9 84 7 4

66 64 175 4.6 83 7 5

67 40 314 10.9 83 7 6

68 77 276 5.1 88 7 7

69 97 267 6.3 92 7 8

70 97 272 5.7 92 7 9

71 85 175 7.4 89 7 10

72 NA 139 8.6 82 7 11

73 10 264 14.3 73 7 12

74 27 175 14.9 81 7 13

75 NA 291 14.9 91 7 14

76 7 48 14.3 80 7 15

77 48 260 6.9 81 7 16

78 35 274 10.3 82 7 17

79 61 285 6.3 84 7 18

80 79 187 5.1 87 7 19

81 63 220 11.5 85 7 20

82 16 7 6.9 74 7 21

83 NA 258 9.7 81 7 22

84 NA 295 11.5 82 7 23

85 80 294 8.6 86 7 24

86 108 223 8.0 85 7 25

87 20 81 8.6 82 7 26

88 52 82 12.0 86 7 27

89 82 213 7.4 88 7 28

90 50 275 7.4 86 7 29

91 64 253 7.4 83 7 30

92 59 254 9.2 81 7 31

93 39 83 6.9 81 8 1

94 9 24 13.8 81 8 2

95 16 77 7.4 82 8 3

96 78 NA 6.9 86 8 4

97 35 NA 7.4 85 8 5

98 66 NA 4.6 87 8 6

99 122 255 4.0 89 8 7

100 89 229 10.3 90 8 8

101 110 207 8.0 90 8 9

102 NA 222 8.6 92 8 10

103 NA 137 11.5 86 8 11

104 44 192 11.5 86 8 12

105 28 273 11.5 82 8 13

106 65 157 9.7 80 8 14

107 NA 64 11.5 79 8 15

108 22 71 10.3 77 8 16

109 59 51 6.3 79 8 17

110 23 115 7.4 76 8 18

111 31 244 10.9 78 8 19

112 44 190 10.3 78 8 20

113 21 259 15.5 77 8 21

114 9 36 14.3 72 8 22

115 NA 255 12.6 75 8 23

116 45 212 9.7 79 8 24

117 168 238 3.4 81 8 25

118 73 215 8.0 86 8 26

119 NA 153 5.7 88 8 27

120 76 203 9.7 97 8 28

121 118 225 2.3 94 8 29

122 84 237 6.3 96 8 30

123 85 188 6.3 94 8 31

124 96 167 6.9 91 9 1

125 78 197 5.1 92 9 2

126 73 183 2.8 93 9 3

127 91 189 4.6 93 9 4

128 47 95 7.4 87 9 5

129 32 92 15.5 84 9 6

130 20 252 10.9 80 9 7

131 23 220 10.3 78 9 8

132 21 230 10.9 75 9 9

133 24 259 9.7 73 9 10

134 44 236 14.9 81 9 11

135 21 259 15.5 76 9 12

136 28 238 6.3 77 9 13

137 9 24 10.9 71 9 14

138 13 112 11.5 71 9 15

139 46 237 6.9 78 9 16

140 18 224 13.8 67 9 17

141 13 27 10.3 76 9 18

142 24 238 10.3 68 9 19

143 16 201 8.0 82 9 20

144 13 238 12.6 64 9 21

145 23 14 9.2 71 9 22

146 36 139 10.3 81 9 23

147 7 49 10.3 69 9 24

148 14 20 16.6 63 9 25

149 30 193 6.9 70 9 26

150 NA 145 13.2 77 9 27

151 14 191 14.3 75 9 28

152 18 131 8.0 76 9 29

153 20 223 11.5 68 9 30