

# Almog String Manipulation

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<b>1 File Index</b>	<b>1</b>
1.1 File List . . . . .	1
<b>2 File Documentation</b>	<b>3</b>
2.1 Almog_String_Manipulation.h File Reference . . . . .	3
2.1.1 Detailed Description . . . . .	6
2.1.2 Macro Definition Documentation . . . . .	6
2.1.2.1 <code>asm_dprintCHAR</code> . . . . .	6
2.1.2.2 <code>asm_dprintDOUBLE</code> . . . . .	7
2.1.2.3 <code>asm_dprintERROR</code> . . . . .	7
2.1.2.4 <code>asm_dprintFLOAT</code> . . . . .	7
2.1.2.5 <code>asm_dprintINT</code> . . . . .	8
2.1.2.6 <code>asm_dprintSIZE_T</code> . . . . .	8
2.1.2.7 <code>asm_dprintSTRING</code> . . . . .	8
2.1.2.8 <code>ASM_MALLOC</code> . . . . .	9
2.1.2.9 <code>asm_max</code> . . . . .	9
2.1.2.10 <code>ASM_MAX_LEN</code> . . . . .	9
2.1.2.11 <code>asm_min</code> . . . . .	10
2.1.3 Function Documentation . . . . .	10
2.1.3.1 <code>asm_check_char_belong_to_base()</code> . . . . .	10
2.1.3.2 <code>asm_copy_array_by_indexes()</code> . . . . .	11
2.1.3.3 <code>asm_get_char_value_in_base()</code> . . . . .	11
2.1.3.4 <code>asm_get_line()</code> . . . . .	12
2.1.3.5 <code>asm_get_next_token_from_str()</code> . . . . .	13
2.1.3.6 <code>asm_get_token_and_cut()</code> . . . . .	14
2.1.3.7 <code>asm_isalnum()</code> . . . . .	14
2.1.3.8 <code>asm_isalpha()</code> . . . . .	15
2.1.3.9 <code>asm_isbdigit()</code> . . . . .	15
2.1.3.10 <code>asm_iscntrl()</code> . . . . .	16
2.1.3.11 <code>asm_isdigit()</code> . . . . .	16
2.1.3.12 <code>asm_isgraph()</code> . . . . .	17
2.1.3.13 <code>asm_islower()</code> . . . . .	17
2.1.3.14 <code>asm_isodigit()</code> . . . . .	17
2.1.3.15 <code>asm_isprint()</code> . . . . .	18
2.1.3.16 <code>asm_ispunct()</code> . . . . .	18
2.1.3.17 <code>asm_isspace()</code> . . . . .	19
2.1.3.18 <code>asm_isupper()</code> . . . . .	19
2.1.3.19 <code>asm_isxdigit()</code> . . . . .	20
2.1.3.20 <code>asm_isXdigit()</code> . . . . .	20
2.1.3.21 <code>asm_length()</code> . . . . .	21
2.1.3.22 <code>asm_memset()</code> . . . . .	21
2.1.3.23 <code>asm_pad_left()</code> . . . . .	22

2.1.3.24 <code>asm_print_many_times()</code>	22
2.1.3.25 <code>asm_remove_char_from_string()</code>	23
2.1.3.26 <code>asm_shift_left()</code>	23
2.1.3.27 <code>asm_str2double()</code>	24
2.1.3.28 <code>asm_str2float()</code>	25
2.1.3.29 <code>asm_str2int()</code>	26
2.1.3.30 <code>asm_str2size_t()</code>	26
2.1.3.31 <code>asm_str_in_str()</code>	27
2.1.3.32 <code>asm_str_is whitespace()</code>	27
2.1.3.33 <code>asm_strdup()</code>	28
2.1.3.34 <code>asm_strip whitespace()</code>	28
2.1.3.35 <code>asm_strncat()</code>	29
2.1.3.36 <code>asm_strncmp()</code>	30
2.1.3.37 <code>asm_strncpy()</code>	30
2.1.3.38 <code>asm_tolower()</code>	31
2.1.3.39 <code>asm_toupper()</code>	31
2.1.3.40 <code>asm_trim_left whitespace()</code>	32
2.2 <code>Almog_String_Manipulation.h</code>	32
2.3 <code>temp.c</code> File Reference	40
2.3.1 Macro Definition Documentation	41
2.3.1.1 <code>ALMOG_STRING_MANIPULATION_IMPLEMENTATION</code>	41
2.3.2 Function Documentation	41
2.3.2.1 <code>main()</code>	41
2.4 <code>temp.c</code>	41
2.5 <code>tests.c</code> File Reference	42
2.5.1 Macro Definition Documentation	43
2.5.1.1 <code>ALMOG_STRING_MANIPULATION_IMPLEMENTATION</code>	43
2.5.1.2 <code>NO_ERRORS</code>	43
2.5.1.3 <code>TEST_CASE</code>	44
2.5.1.4 <code>TEST_EQ_INT</code>	44
2.5.1.5 <code>TEST_EQ_SIZE</code>	44
2.5.1.6 <code>TEST_EQ_STR</code>	44
2.5.1.7 <code>TEST_NE_STR</code>	44
2.5.1.8 <code>TEST_WARN</code>	45
2.5.2 Function Documentation	45
2.5.2.1 <code>fill_sentinel()</code>	45
2.5.2.2 <code>is_nul_terminated_within()</code>	45
2.5.2.3 <code>main()</code>	46
2.5.2.4 <code>rand_ascii_printable()</code>	46
2.5.2.5 <code>test_ascii_classification_exhaustive_ranges()</code>	46
2.5.2.6 <code>test_ascii_classification_full_scan_0_127()</code>	46
2.5.2.7 <code>test_base_digit_helpers()</code>	47

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2.5.2.8 test_case_conversion_roundtrip()	47
2.5.2.9 test_copy_array_by_indexes_behavior_and_bounds()	47
2.5.2.10 test_get_line_tmpfile()	47
2.5.2.11 test_get_line_too_long()	48
2.5.2.12 test_get_next_word_from_line_current_behavior()	48
2.5.2.13 test_get_word_and_cut_edges()	48
2.5.2.14 test_left_pad_edges_and_sentinel()	48
2.5.2.15 test_left_shift_edges()	49
2.5.2.16 test_length_matches_strlen_small()	49
2.5.2.17 test_memset_basic_and_edges()	49
2.5.2.18 test_remove_char_form_string_edges()	49
2.5.2.19 test_str2double_exponent_basic()	50
2.5.2.20 test_str2double_exponent_edge_cases()	50
2.5.2.21 test_str2double_exponent_signed_mantissa()	50
2.5.2.22 test_str2float_double()	50
2.5.2.23 test_str2float_double_exponent_different_bases()	51
2.5.2.24 test_str2float_double_exponent_large_values()	51
2.5.2.25 test_str2float_double_exponent_whitespace()	51
2.5.2.26 test_str2float_exponent_basic()	51
2.5.2.27 test_str2float_exponent_edge_cases()	52
2.5.2.28 test_str2float_exponent_signed_mantissa()	52
2.5.2.29 test_str2float_exponent_with_trailing()	52
2.5.2.30 test_str2int()	52
2.5.2.31 test_str2size_t()	53
2.5.2.32 test_str_in_str_overlap_and_edges()	53
2.5.2.33 test_str_is_whitespace_edges()	53
2.5.2.34 test_strip_whitespace_properties()	53
2.5.2.35 test_strncat_current_behavior_and_sentinel()	54
2.5.2.36 test_strncmp_boolean_edges()	54
2.5.2.37 xorshift32()	54
2.5.3 Variable Documentation	54
2.5.3.1 g_tests_failed	54
2.5.3.2 g_tests_run	55
2.5.3.3 g_tests_warned	55
2.5.3.4 rng_state	55
2.6 tests.c	55
<b>Index</b>	<b>69</b>



# Chapter 1

## File Index

### 1.1 File List

Here is a list of all files with brief descriptions:

<a href="#">Almog_String_Manipulation.h</a>	Lightweight string and line manipulation helpers . . . . .	3
<a href="#">temp.c</a>		40
<a href="#">tests.c</a>		42



## Chapter 2

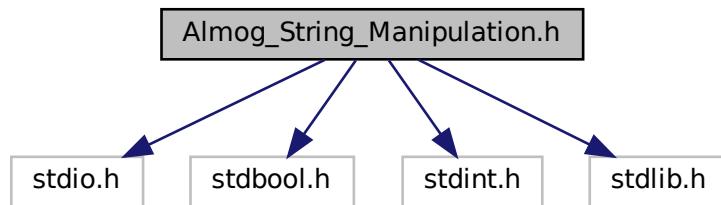
# File Documentation

## 2.1 Almog\_String\_Manipulation.h File Reference

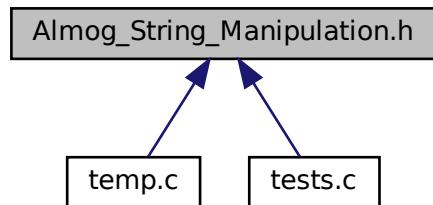
Lightweight string and line manipulation helpers.

```
#include <stdio.h>
#include <stdbool.h>
#include <stdint.h>
#include <stdlib.h>
```

Include dependency graph for Almog\_String\_Manipulation.h:



This graph shows which files directly or indirectly include this file:



## Macros

- `#define ASM_MALLOC malloc`
- `#define ASM_MAX_LEN (int)1e3`

*Maximum number of characters processed in some string operations.*
- `#define asm_dprintSTRING(expr) printf(#expr " = %s\n", expr)`

*Debug-print a C string expression as "expr = value\n".*
- `#define asm_dprintCHAR(expr) printf(#expr " = %c\n", expr)`

*Debug-print a character expression as "expr = c\n".*
- `#define asm_dprintINT(expr) printf(#expr " = %d\n", expr)`

*Debug-print an integer expression as "expr = n\n".*
- `#define asm_dprintFLOAT(expr) printf(#expr " = %#g\n", expr)`

*Debug-print a float expression as "expr = n\n".*
- `#define asm_dprintDOUBLE(expr) printf(#expr " = %#g\n", expr)`

*Debug-print a double expression as "expr = n\n".*
- `#define asm_dprintSIZE_T(expr) printf(#expr " = %zu\n", expr)`

*Debug-print a size\_t expression as "expr = n\n".*
- `#define asm_dprintERROR(fmt, ...)`
- `#define asm_min(a, b) ((a) < (b) ? (a) : (b))`

*Return the smaller of two values (macro).*
- `#define asm_max(a, b) ((a) > (b) ? (a) : (b))`

*Return the larger of two values (macro).*

## Functions

- `bool asm_check_char_belong_to_base (const char c, const size_t base)`

*Check if a character is a valid digit in a given base.*
- `void asm_copy_array_by_indexes (char *const target, const int start, const int end, const char *const src)`

*Copy a substring from src into target by indices and null-terminate.*
- `int asm_get_char_value_in_base (const char c, const size_t base)`

*Convert a digit character to its numeric value in base-N.*
- `int asm_get_line (FILE *fp, char *const dst)`

*Read a single line from a stream into a buffer.*
- `int asm_get_next_token_from_str (char *const dst, const char *const src, const char delimiter)`

*Copy characters from the start of a string into a token buffer.*
- `int asm_get_token_and_cut (char *const dst, char *src, const char delimiter, const bool leave_delimiter)`

*Extract the next token into dst and remove the corresponding prefix from src.*
- `bool asm_isalnum (char c)`

*Test for an alphanumeric character (ASCII).*
- `bool asm_isalpha (char c)`

*Test for an alphabetic character (ASCII).*
- `bool asm_isbdigit (const char c)`

*Test for a binary digit (ASCII).*
- `bool asm_iscntrl (char c)`

*Test for a control character (ASCII).*
- `bool asm_isdigit (char c)`

*Test for a decimal digit (ASCII).*
- `bool asm_isgraph (char c)`

*Test for any printable character except space (ASCII).*
- `bool asm_islower (char c)`

- `bool asm_isodigit (const char c)`  
*Test for a lowercase letter (ASCII).*
- `bool asm_isprint (char c)`  
*Test for an octal digit (ASCII).*
- `bool asm_ispunct (char c)`  
*Test for any printable character including space (ASCII).*
- `bool asm_isspace (char c)`  
*Test for a punctuation character (ASCII).*
- `bool asm_isupper (char c)`  
*Test for a whitespace character (ASCII).*
- `bool asm_isupper (char c)`  
*Test for an uppercase letter (ASCII).*
- `bool asm_isxdigit (char c)`  
*Test for a hexadecimal digit (lowercase or decimal).*
- `size_t asm_length (const char *const str)`  
*Compute the length of a null-terminated C string.*
- `void *asm_memset (void *const des, const unsigned char value, const size_t n)`  
*Set a block of memory to a repeated byte value.*
- `void asm_pad_left (char *const s, const size_t padding, const char pad)`  
*Left-pad a string in-place.*
- `void asm_print_many_times (const char *const str, const size_t n)`  
*Print a string *n* times, then print a newline.*
- `void asm_remove_char_from_string (char *const s, const size_t index)`  
*Remove a single character from a string by index.*
- `void asm_shift_left (char *const s, const size_t shift)`  
*Shift a string left in-place by *shift* characters.*
- `int asm_str_in_str (const char *const src, const char *const word_to_search)`  
*Count occurrences of a substring within a string.*
- `double asm_str2double (const char *const s, const char **const end, const size_t base)`  
*Convert a string to double in the given base with exponent support.*
- `float asm_str2float (const char *const s, const char **const end, const size_t base)`  
*Convert a string to float in the given base with exponent support.*
- `int asm_str2int (const char *const s, const char **const end, const size_t base)`  
*Convert a string to int in the given base.*
- `size_t asm_str2size_t (const char *const s, const char **const end, const size_t base)`  
*Convert a string to size\_t in the given base.*
- `void asm_strip_whitespace (char *const s)`  
*Remove all ASCII whitespace characters from a string in-place.*
- `bool asm_str_is_whitespace (const char *const s)`  
*Check whether a string contains only ASCII whitespace characters.*
- `char *asm_strdup (const char *const s, size_t length)`  
*Allocate and copy up to *length* characters from *s*.*
- `int asm_strncat (char *const s1, const char *const s2, const size_t N)`  
*Append up to *N* characters from *s2* to the end of *s1*.*
- `int asm_strncmp (const char *s1, const char *s2, const size_t N)`  
*Compare up to *N* characters for equality (boolean result).*
- `int asm_strncpy (char *const s1, const char *const s2, const size_t N)`  
*Copy up to *N* characters from *s2* into *s1* (non-standard).*
- `void asm_tolower (char *const s)`  
*Convert all ASCII letters in a string to lowercase in-place.*

- void `asm_toupper` (char \*const s)  
*Convert all ASCII letters in a string to uppercase in-place.*
- void `asm_trim_left_whitespace` (char \*const s)  
*Remove leading ASCII whitespace from a string in-place.*

## 2.1.1 Detailed Description

Lightweight string and line manipulation helpers.

This single-header module provides small utilities for working with C strings:

- Reading a single line from a FILE stream
- Measuring string length
- Extracting the next token from a string using a delimiter (does not skip whitespace)
- Cutting the extracted token (and leading whitespace) from the source buffer
- Copying a substring by indices
- Counting occurrences of a substring
- A boolean-style strncmp (returns 1 on equality, 0 otherwise)
- ASCII-only character classification helpers (isalnum, isalpha, ...)
- ASCII case conversion (toupper / tolower)
- In-place whitespace stripping and left padding
- Base-N string-to-number conversion for int, size\_t, float, and double

Usage

- In exactly one translation unit, define ALMOG\_STRING\_MANIPULATION\_IMPLEMENTATION before including this header to compile the implementation.
- In all other files, include the header without the macro to get declarations only.

Notes and limitations

- All destination buffers must be large enough; functions do not grow or allocate buffers.
- `asm_get_line` and `asm_length` enforce ASM\_MAX\_LEN characters (not counting the terminating '\0'). Longer lines cause an early return with an error message.
- `asm_strncmp` differs from the standard C `strncmp`: this version returns 1 if equal and 0 otherwise.
- Character classification and case-conversion helpers are ASCII-only and not locale aware.

Definition in file [Almog\\_String\\_Manipulation.h](#).

## 2.1.2 Macro Definition Documentation

### 2.1.2.1 `asm_dprintCHAR`

```
#define asm_dprintCHAR( expr ) printf(#expr " = %c\n", expr)
```

Debug-print a character expression as "expr = c\n".

**Parameters**

<i>expr</i>	An expression that yields a character (or an int promoted from a character). The expression is evaluated exactly once.
-------------	--

Definition at line 88 of file [Almog\\_String\\_Manipulation.h](#).

**2.1.2.2 asm\_dprintDOUBLE**

```
#define asm_dprintDOUBLE(
    expr ) printf(#expr " = %#g\n", expr)
```

Debug-print a double expression as "expr = n\n".

**Parameters**

<i>expr</i>	An expression that yields a double. The expression is evaluated exactly once.
-------------	---

Definition at line 115 of file [Almog\\_String\\_Manipulation.h](#).

**2.1.2.3 asm\_dprintERROR**

```
#define asm_dprintERROR(
    fmt,
    ...
)
```

**Value:**

```
fprintf(stderr, "\n%s:%d:\n[Error] in function '%s':\n      "
        " \
fmt "\n\n", __FILE__, __LINE__, __func__, __VA_ARGS__)
```

Definition at line 126 of file [Almog\\_String\\_Manipulation.h](#).

**2.1.2.4 asm\_dprintFLOAT**

```
#define asm_dprintFLOAT(
    expr ) printf(#expr " = %#g\n", expr)
```

Debug-print a float expression as "expr = n\n".

**Parameters**

<i>expr</i>	An expression that yields a float. The expression is evaluated exactly once.
-------------	--

Definition at line 106 of file [Almog\\_String\\_Manipulation.h](#).

### 2.1.2.5 `asm_dprintINT`

```
#define asm_dprintINT(  
    expr ) printf(#expr " = %d\n", expr)
```

Debug-print an integer expression as "expr = n\n".

#### Parameters

<code>expr</code>	An expression that yields an int. The expression is evaluated exactly once.
-------------------	---

Definition at line 97 of file [Almog\\_String\\_Manipulation.h](#).

### 2.1.2.6 `asm_dprintSIZE_T`

```
#define asm_dprintSIZE_T(  
    expr ) printf(#expr " = %zu\n", expr)
```

Debug-print a `size_t` expression as "expr = n\n".

#### Parameters

<code>expr</code>	An expression that yields a <code>size_t</code> . The expression is evaluated exactly once.
-------------------	---

Definition at line 124 of file [Almog\\_String\\_Manipulation.h](#).

### 2.1.2.7 `asm_dprintSTRING`

```
#define asm_dprintSTRING(  
    expr ) printf(#expr " = %s\n", expr)
```

Debug-print a C string expression as "expr = value\n".

#### Parameters

<code>expr</code>	An expression that yields a pointer to char (const or non-const). The expression is evaluated exactly once.
-------------------	---

Definition at line 79 of file [Almog\\_String\\_Manipulation.h](#).

### 2.1.2.8 ASM\_MALLOC

```
#define ASM_MALLOC malloc
```

Definition at line 50 of file [Almog\\_String\\_Manipulation.h](#).

### 2.1.2.9 asm\_max

```
#define asm_max(  
    a,  
    b ) ((a) > (b) ? (a) : (b))
```

Return the larger of two values (macro).

#### Parameters

a	First value.
b	Second value.

#### Returns

The larger of a and b.

#### Note

Each parameter may be evaluated more than once. Do not pass expressions with side effects (e.g., ++i, function calls with state).

Definition at line 154 of file [Almog\\_String\\_Manipulation.h](#).

### 2.1.2.10 ASM\_MAX\_LEN

```
#define ASM_MAX_LEN (int)1e3
```

Maximum number of characters processed in some string operations.

This constant limits:

- The number of characters read by `asm_get_line` from a stream (excluding the terminating null byte).
- The maximum number of characters inspected by `asm_length`.

If `asm_get_line` reads `ASM_MAX_LEN` characters without encountering '`'` or EOF, it prints an error to `stderr` and returns -1. In that error case, the buffer is truncated and null-terminated by overwriting the last stored character (so the resulting string length is `ASM_MAX_LEN` - 1).

Definition at line 69 of file [Almog\\_String\\_Manipulation.h](#).

### 2.1.2.11 `asm_min`

```
#define asm_min(
    a,
    b ) ((a) < (b) ? (a) : (b))
```

Return the smaller of two values (macro).

#### Parameters

<code>a</code>	First value.
<code>b</code>	Second value.

#### Returns

The smaller of `a` and `b`.

#### Note

Each parameter may be evaluated more than once. Do not pass expressions with side effects (e.g., `++i`, function calls with state).

Definition at line 141 of file [Almog\\_String\\_Manipulation.h](#).

## 2.1.3 Function Documentation

### 2.1.3.1 `asm_check_char_belong_to_base()`

```
bool asm_check_char_belong_to_base (
    const char c,
    const size_t base )
```

Check if a character is a valid digit in a given base.

#### Parameters

<code>c</code>	Character to test (e.g., '0'-'9', 'a'-'z', 'A'-'Z').
<code>base</code>	Numeric base in the range [2, 36].

#### Returns

true if `c` is a valid digit for `base`, false otherwise.

**Note**

If `base` is outside [2, 36], an error is printed to stderr and false is returned.

Definition at line 212 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_dprintERROR](#), and [asm\\_isdigit\(\)](#).

Referenced by [asm\\_get\\_char\\_value\\_in\\_base\(\)](#), [asm\\_str2double\(\)](#), [asm\\_str2float\(\)](#), [asm\\_str2int\(\)](#), [asm\\_str2size\\_t\(\)](#), and [test\\_base\\_digit\\_helpers\(\)](#).

### 2.1.3.2 `asm_copy_array_by_indexes()`

```
void asm_copy_array_by_indexes (
    char *const target,
    const int start,
    const int end,
    const char *const src )
```

Copy a substring from `src` into `target` by indices and null-terminate.

Copies characters with indices  $i = \text{start}, \text{start} + 1, \dots, \text{end}$  from `src` into `target` (note: `end` is inclusive in this implementation), then ensures `target` is null-terminated.

**Parameters**

<code>target</code>	Destination buffer. Must be large enough to hold $(\text{end} - \text{start} + 1)$ characters plus the null terminator.
<code>start</code>	Inclusive start index within <code>src</code> (0-based).
<code>end</code>	Inclusive end index within <code>src</code> (must satisfy <code>end &gt;= start</code> ).
<code>src</code>	Source string buffer.

**Warning**

No bounds checking is performed. The caller must ensure valid indices and sufficient target capacity.

Definition at line 247 of file [Almog\\_String\\_Manipulation.h](#).

Referenced by [test\\_copy\\_array\\_by\\_indexes\\_behavior\\_and\\_bounds\(\)](#).

### 2.1.3.3 `asm_get_char_value_in_base()`

```
int asm_get_char_value_in_base (
    const char c,
    const size_t base )
```

Convert a digit character to its numeric value in base-N.

**Parameters**

<i>c</i>	Digit character ('0'-'9', 'a'-'z', 'A'-'Z').
<i>base</i>	Numeric base in the range [2, 36] (used for validation).

**Returns**

The numeric value of *c* in the range [0, 35].

**Note**

Returns -1 if *c* is not valid for *base*.

Definition at line 269 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_check\\_char\\_belong\\_to\\_base\(\)](#), [asm\\_isdigit\(\)](#), and [asm\\_isupper\(\)](#).

Referenced by [asm\\_str2double\(\)](#), [asm\\_str2float\(\)](#), [asm\\_str2int\(\)](#), [asm\\_str2size\\_t\(\)](#), and [test\\_base\\_digit\\_helpers\(\)](#).

**2.1.3.4 asm\_get\_line()**

```
int asm_get_line (
    FILE * fp,
    char *const dst )
```

Read a single line from a stream into a buffer.

Reads characters from the FILE stream until a newline ('\n') or EOF is encountered. The newline, if present, is not copied. The result is always null-terminated on normal (non-error) completion.

**Parameters**

<i>fp</i>	Input stream (must be non-NULL).
<i>dst</i>	Destination buffer. Must have capacity of at least ASM_MAX_LEN bytes.

**Returns**

Number of characters stored in *dst* (excluding the terminating null byte).

**Return values**

-1	EOF was encountered before any character was read, or the line exceeded ASM_MAX_LEN characters (error).
----	---

**Note**

If the line reaches ASM\_MAX\_LEN characters before a newline or EOF is seen, the function prints an error message to stderr and returns -1. In that case, `dst` is truncated and null-terminated by overwriting the last stored character.

An empty line (just '`'`) returns 0 (not -1).

Definition at line 301 of file [Almog\\_String\\_Manipulation.h](#).

References `asm_dprintERROR`, and `ASM_MAX_LEN`.

Referenced by `test_get_line_tmpfile()`, and `test_get_line_too_long()`.

### 2.1.3.5 `asm_get_next_token_from_str()`

```
int asm_get_next_token_from_str (
    char *const dst,
    const char *const src,
    const char delimiter )
```

Copy characters from the start of a string into a token buffer.

Copies characters from `src` into `dst` until one of the following is encountered in `src`:

- the delimiter character,
- or the string terminator ('\0').

The delimiter (if present) is not copied into `dst`. The resulting token in `dst` is always null-terminated.

**Parameters**

<code>dst</code>	Destination buffer for the extracted token. Must be large enough to hold the token plus the null terminator.
<code>src</code>	Source C string to parse (not modified by this function).
<code>delimiter</code>	Delimiter character to stop at.

**Returns**

The number of characters copied into `dst` (excluding the null terminator). This is also the index in `src` of the delimiter or '\0' that stopped the copy.

**Note**

This function does not skip leading whitespace and does not treat newline ('\n') specially; newlines are copied like any other character.

If `src` starts with `delimiter` or '\0', an empty token is produced (`dst` becomes ""), and 0 is returned.

Definition at line 348 of file [Almog\\_String\\_Manipulation.h](#).

Referenced by `asm_get_token_and_cut()`, and `test_get_next_word_from_line_current_behavior()`.

### 2.1.3.6 `asm_get_token_and_cut()`

```
int asm_get_token_and_cut (
    char *const dst,
    char * src,
    const char delimiter,
    const bool leave_delimiter )
```

Extract the next token into `dst` and remove the corresponding prefix from `src`.

Calls `asm_get_next_token_from_str(dst, src, delimiter)` to extract a token from the beginning of `src` into `dst`. Then modifies `src` in-place by left-shifting it.

If `leave_delimiter` is true, `src` is left-shifted by the value returned from `asm_get_next_token_from_str()` (i.e., the delimiter—if present—remains as the first character in the updated `src`).

If `leave_delimiter` is false, `src` is left-shifted by that return value plus one (intended to also remove the delimiter).

#### Parameters

<code>dst</code>	Destination buffer for the extracted token (must be large enough for the token plus the null terminator).
<code>src</code>	Source buffer, modified in-place by this function.
<code>delimiter</code>	Delimiter character used to stop token extraction.
<code>leave_delimiter</code>	If true, do not remove the delimiter from <code>src</code> ; if false, remove one additional character after the token.

#### Returns

1 if `asm_get_next_token_from_str()` returned a non-zero value, otherwise 0.

#### Note

This function always calls `asm_shift_left()` even when the returned value from `asm_get_next_token_from_str()` is 0. In particular, when `leave_delimiter` is false and the returned value is 0, `src` will be left-shifted by 1.

Definition at line 391 of file [Almog\\_String\\_Manipulation.h](#).

References `asm_get_next_token_from_str()`, and `asm_shift_left()`.

Referenced by `test_get_word_and_cut_edges()`.

### 2.1.3.7 `asm_isalnum()`

```
bool asm_isalnum (
    char c )
```

Test for an alphanumeric character (ASCII).

**Parameters**

<code>c</code>	Character to test.
----------------	--------------------

**Returns**

true if `c` is '0'–'9', 'A'–'Z', or 'a'–'z'; false otherwise.

Definition at line 412 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_isalpha\(\)](#), and [asm\\_isdigit\(\)](#).

Referenced by [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#), and [test\\_ascii\\_classification\\_full\\_scan\\_0\\_127\(\)](#).

### 2.1.3.8 `asm_isalpha()`

```
bool asm_isalpha (
    char c )
```

Test for an alphabetic character (ASCII).

**Parameters**

<code>c</code>	Character to test.
----------------	--------------------

**Returns**

true if `c` is 'A'–'Z' or 'a'–'z'; false otherwise.

Definition at line 423 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_islower\(\)](#), and [asm\\_isupper\(\)](#).

Referenced by [asm\\_isalnum\(\)](#), [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#), and [test\\_ascii\\_classification\\_full\\_scan\\_0\\_127\(\)](#).

### 2.1.3.9 `asm_isbdigit()`

```
bool asm_isbdigit (
    const char c )
```

Test for a binary digit (ASCII).

**Parameters**

<code>c</code>	Character to test.
----------------	--------------------

**Returns**

true if `c` is '0' or '1'; false otherwise.

Definition at line 434 of file [Almog\\_String\\_Manipulation.h](#).

### 2.1.3.10 `asm_iscntrl()`

```
bool asm_iscntrl (
    char c )
```

Test for a control character (ASCII).

**Parameters**

<code>c</code>	Character to test.
----------------	--------------------

**Returns**

true if `c` is in the range [0, 31] or 127; false otherwise.

Definition at line 449 of file [Almog\\_String\\_Manipulation.h](#).

Referenced by [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#).

### 2.1.3.11 `asm_isdigit()`

```
bool asm_isdigit (
    char c )
```

Test for a decimal digit (ASCII).

**Parameters**

<code>c</code>	Character to test.
----------------	--------------------

**Returns**

true if `c` is '0'-'9'; false otherwise.

Definition at line 464 of file [Almog\\_String\\_Manipulation.h](#).

Referenced by [asm\\_check\\_char\\_belong\\_to\\_base\(\)](#), [asm\\_get\\_char\\_value\\_in\\_base\(\)](#), [asm\\_isalnum\(\)](#), [asm\\_isxdigit\(\)](#), [asm\\_isXdigit\(\)](#), [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#), and [test\\_ascii\\_classification\\_full\\_scan\\_0\\_127\(\)](#).

### 2.1.3.12 asm\_isgraph()

```
bool asm_isgraph (
    char c )
```

Test for any printable character except space (ASCII).

#### Parameters

<i>c</i>	Character to test.
----------	--------------------

#### Returns

true if *c* is in the range [33, 126]; false otherwise.

Definition at line 479 of file [Almog\\_String\\_Manipulation.h](#).

Referenced by [asm\\_isprint\(\)](#), [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#), and [test\\_ascii\\_classification\\_full\\_scan\\_0\\_127\(\)](#).

### 2.1.3.13 asm\_islower()

```
bool asm_islower (
    char c )
```

Test for a lowercase letter (ASCII).

#### Parameters

<i>c</i>	Character to test.
----------	--------------------

#### Returns

true if *c* is 'a'-'z'; false otherwise.

Definition at line 494 of file [Almog\\_String\\_Manipulation.h](#).

Referenced by [asm\\_isalpha\(\)](#), [asm\\_toupper\(\)](#), [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#), and [test\\_ascii\\_classification\\_full\\_scan\\_0\\_127\(\)](#).

### 2.1.3.14 asm\_isodigit()

```
bool asm_isodigit (
    const char c )
```

Test for an octal digit (ASCII).

**Parameters**

<code>c</code>	Character to test.
----------------	--------------------

**Returns**

true if `c` is '0'–'7'; false otherwise.

Definition at line 509 of file [Almog\\_String\\_Manipulation.h](#).

**2.1.3.15 `asm_isprint()`**

```
bool asm_isprint (
    char c )
```

Test for any printable character including space (ASCII).

**Parameters**

<code>c</code>	Character to test.
----------------	--------------------

**Returns**

true if `c` is space (' ') or `asm_isgraph(c)` is true; false otherwise.

Definition at line 525 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_isgraph\(\)](#).

Referenced by [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#), and [test\\_ascii\\_classification\\_full\\_scan\\_0\\_127\(\)](#).

**2.1.3.16 `asm_ispunct()`**

```
bool asm_ispunct (
    char c )
```

Test for a punctuation character (ASCII).

**Parameters**

<code>c</code>	Character to test.
----------------	--------------------

**Returns**

true if `c` is a printable, non-alphanumeric, non-space character; false otherwise.

Definition at line 537 of file [Almog\\_String\\_Manipulation.h](#).

Referenced by [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#).

### 2.1.3.17 `asm_isspace()`

```
bool asm_isspace (
    char c )
```

Test for a whitespace character (ASCII).

**Parameters**

<code>c</code>	Character to test.
----------------	--------------------

**Returns**

true if `c` is one of ' ', '  
'\t', '\v', '\f', or '\r'; false otherwise.

Definition at line 553 of file [Almog\\_String\\_Manipulation.h](#).

Referenced by [asm\\_str2double\(\)](#), [asm\\_str2float\(\)](#), [asm\\_str2int\(\)](#), [asm\\_str2size\\_t\(\)](#), [asm\\_str\\_is\\_whitespace\(\)](#), [asm\\_strip\\_whitespace\(\)](#), [asm\\_trim\\_left\\_whitespace\(\)](#), [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#), and [test\\_strip\\_whitespace\\_property\(\)](#).

### 2.1.3.18 `asm_isupper()`

```
bool asm_isupper (
    char c )
```

Test for an uppercase letter (ASCII).

**Parameters**

<code>c</code>	Character to test.
----------------	--------------------

**Returns**

true if `c` is 'A'-'Z'; false otherwise.

Definition at line 569 of file [Almog\\_String\\_Manipulation.h](#).

Referenced by [asm\\_get\\_char\\_value\\_in\\_base\(\)](#), [asm\\_isalpha\(\)](#), [asm\\_tolower\(\)](#), [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#), and [test\\_ascii\\_classification\\_full\\_scan\\_0\\_127\(\)](#).

### 2.1.3.19 `asm_isxdigit()`

```
bool asm_isxdigit (
    char c )
```

Test for a hexadecimal digit (lowercase or decimal).

#### Parameters

<code>c</code>	Character to test.
----------------	--------------------

#### Returns

true if `c` is '0'–'9' or 'a'–'f'; false otherwise.

Definition at line 584 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_isdigit\(\)](#).

Referenced by [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#).

### 2.1.3.20 `asm_isXdigit()`

```
bool asm_isXdigit (
    char c )
```

Test for a hexadecimal digit (uppercase or decimal).

#### Parameters

<code>c</code>	Character to test.
----------------	--------------------

#### Returns

true if `c` is '0'–'9' or 'A'–'F'; false otherwise.

Definition at line 599 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_isdigit\(\)](#).

Referenced by [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#).

### 2.1.3.21 asm\_length()

```
size_t asm_length (
    const char *const str )
```

Compute the length of a null-terminated C string.

#### Parameters

<i>str</i>	Null-terminated string (must be non-NULL).
------------	--

#### Returns

The number of characters before the terminating null byte.

#### Note

If more than ASM\_MAX\_LEN characters are scanned without encountering a null terminator, an error is printed to stderr and SIZE\_MAX is returned.

Definition at line 618 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_dprintERROR](#), and [ASM\\_MAX\\_LEN](#).

Referenced by [asm\\_pad\\_left\(\)](#), [asm\\_remove\\_char\\_from\\_string\(\)](#), [asm\\_shift\\_left\(\)](#), [asm\\_str\\_in\\_str\(\)](#), [asm\\_str\\_is\\_whitespace\(\)](#), [asm\\_strip\\_whitespace\(\)](#), [asm\\_strncat\(\)](#), [asm\\_tolower\(\)](#), [asm\\_toupper\(\)](#), [asm\\_trim\\_left whitespace\(\)](#), and [test\\_length\\_matches\\_strlen\\_small\(\)](#).

### 2.1.3.22 asm\_memset()

```
void * asm_memset (
    void *const des,
    const unsigned char value,
    const size_t n )
```

Set a block of memory to a repeated byte value.

Writes *value* into each of the first *n* bytes of the memory region pointed to by *des*. This function mirrors the behavior of the standard C `memset()`, but implements it using a simple byte-wise loop.

#### Parameters

<i>des</i>	Destination memory block to modify. Must point to a valid buffer of at least <i>n</i> bytes.
<i>value</i>	Unsigned byte value to store repeatedly.
<i>n</i>	Number of bytes to set.

**Returns**

The original pointer `des`.

**Note**

This implementation performs no optimizations (such as word-sized writes); the memory block is filled one byte at a time.

Behavior is undefined if `des` overlaps with invalid or non-writable memory.

Definition at line 653 of file [Almog\\_String\\_Manipulation.h](#).

Referenced by [test\\_memset\\_basic\\_and\\_edges\(\)](#).

**2.1.3.23 `asm_pad_left()`**

```
void asm_pad_left (
    char *const s,
    const size_t padding,
    const char pad )
```

Left-pad a string in-place.

Shifts the contents of `s` to the right by `padding` positions and fills the vacated leading positions with `pad`.

**Parameters**

<code>s</code>	String to pad. Modified in-place.
<code>padding</code>	Number of leading spaces to insert.
<code>pad</code>	The padding character to insert.

**Warning**

The buffer backing `s` must have enough capacity for the original string length plus padding and the terminating null byte. No bounds checking is performed.

Definition at line 676 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_length\(\)](#).

Referenced by [test\\_left\\_pad\\_edges\\_and\\_sentinel\(\)](#).

**2.1.3.24 `asm_print_many_times()`**

```
void asm_print_many_times (
    const char *const str,
    const size_t n )
```

Print a string `n` times, then print a newline.

**Parameters**

<i>str</i>	String to print (as-is with printf("%s", ...)).
<i>n</i>	Number of times to print <i>str</i> .

Definition at line 693 of file [Almog\\_String\\_Manipulation.h](#).

**2.1.3.25 asm\_remove\_char\_from\_string()**

```
void asm_remove_char_from_string (
    char *const s,
    const size_t index )
```

Remove a single character from a string by index.

Deletes the character at position *index* from *s* by shifting subsequent characters one position to the left.

**Parameters**

<i>s</i>	String to modify in-place. Must be null-terminated.
<i>index</i>	Zero-based index of the character to remove.

**Note**

If *index* is out of range, an error is printed to stderr and the string is left unchanged.

Definition at line 713 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_dprintERROR](#), and [asm\\_length\(\)](#).

Referenced by [asm\\_strip\\_whitespace\(\)](#), and [test\\_remove\\_char\\_form\\_string\\_edges\(\)](#).

**2.1.3.26 asm\_shift\_left()**

```
void asm_shift_left (
    char *const s,
    const size_t shift )
```

Shift a string left in-place by *shift* characters.

Removes the first *shift* characters from *s* by moving the remaining characters to the front. The resulting string is always null-terminated.

**Parameters**

<i>s</i>	String to modify in-place. Must be null-terminated.
<i>shift</i>	Number of characters to remove from the front.

**Note**

If `shift` is 0, `s` is unchanged.

If `shift` is greater than or equal to the string length, `s` becomes the empty string.

Definition at line 742 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_length\(\)](#).

Referenced by [asm\\_get\\_token\\_and\\_cut\(\)](#), [asm\\_trim\\_left\\_whitespace\(\)](#), and [test\\_left\\_shift\\_edges\(\)](#).

**2.1.3.27 `asm_str2double()`**

```
double asm_str2double (
    const char *const s,
    const char **const end,
    const size_t base )
```

Convert a string to double in the given base with exponent support.

Parses an optional sign, then a sequence of base-N digits, optionally a fractional part separated by a '.' character, and optionally an exponent part indicated by 'e' or 'E' followed by an optional sign and decimal digits.

**Parameters**

<code>s</code>	String to convert. Leading ASCII whitespace is skipped.
<code>end</code>	If non-NULL, <code>*end</code> is set to point to the first character not used in the conversion.
<code>base</code>	Numeric base in the range [2, 36].

**Returns**

The converted double value. Returns 0.0 on invalid base.

**Note**

Only digits '0'-'9', 'a'-'z', and 'A'-'Z' are recognized as base-N digits for the mantissa (the part before the exponent).

The exponent is always parsed in base 10 and represents the power of the specified base. For example, "1.5e2" in base 10 means  $1.5 \times 10^2 = 150$ , while "A.8e2" in base 16 means  $10.5 \times 16^2 = 2688$ .

The exponent can be positive or negative (e.g., "1e-3" = 0.001).

On invalid base, an error is printed to stderr, `*end` (if non-NULL) is set to `s`, and 0.0 is returned.

**Examples:**

```
asm_str2double("1.5e2", NULL, 10) // Returns 150.0
asm_str2double("-3.14e-1", NULL, 10) // Returns -0.314
asm_str2double("FF.0e1", NULL, 16) // Returns 4080.0 (255 × 16^1)
```

Definition at line 816 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_check\\_char\\_belong\\_to\\_base\(\)](#), [asm\\_dprintERROR](#), [asm\\_get\\_char\\_value\\_in\\_base\(\)](#), [asm\\_isspace\(\)](#), and [asm\\_str2int\(\)](#).

Referenced by [main\(\)](#), [test\\_str2double\\_exponent\\_basic\(\)](#), [test\\_str2double\\_exponent\\_edge\\_cases\(\)](#), [test\\_str2double\\_exponent\\_signed\\_mantissa\(\)](#), [test\\_str2float\\_double\(\)](#), [test\\_str2float\\_double\\_exponent\\_different\\_bases\(\)](#), [test\\_str2float\\_double\\_exponent\\_large\\_values\(\)](#), and [test\\_str2float\\_double\\_exponent\\_whitespace\(\)](#).

### 2.1.3.28 `asm_str2float()`

```
float asm_str2float (
    const char *const s,
    const char **const end,
    const size_t base )
```

Convert a string to float in the given base with exponent support.

Identical to `asm_str2double` semantically, but returns a float and uses float arithmetic for the fractional part.

#### Parameters

<i>s</i>	String to convert. Leading ASCII whitespace is skipped.
<i>end</i>	If non-NULL, <i>*end</i> is set to point to the first character not used in the conversion.
<i>base</i>	Numeric base in the range [2, 36].

#### Returns

The converted float value. Returns 0.0f on invalid base.

#### Note

Only digits '0'-'9', 'a'-'z', and 'A'-'Z' are recognized as base-N digits for the mantissa (the part before the exponent).

The exponent is always parsed in base 10 and represents the power of the specified base. For example, "1.5e2" in base 10 means  $1.5 \times 10^2 = 150$ , while "A.8e2" in base 16 means  $10.5 \times 16^2 = 2688$ .

The exponent can be positive or negative (e.g., "1e-3" = 0.001).

On invalid base, an error is printed to stderr, *\*end* (if non-NULL) is set to *s*, and 0.0f is returned.

#### Examples:

```
asm_str2float("1.5e2", NULL, 10)    // Returns 150.0f
asm_str2float("-3.14e-1", NULL, 10) // Returns -0.314f
asm_str2float("FF.0e1", NULL, 16)   // Returns 4080.0f (255 × 16^1)
```

Definition at line 903 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_check\\_char\\_belong\\_to\\_base\(\)](#), [asm\\_dprintERROR](#), [asm\\_get\\_char\\_value\\_in\\_base\(\)](#), [asm\\_isspace\(\)](#), and [asm\\_str2int\(\)](#).

Referenced by [main\(\)](#), [test\\_str2float\\_double\(\)](#), [test\\_str2float\\_double\\_exponent\\_different\\_bases\(\)](#), [test\\_str2float\\_double\\_exponent\\_large\\_values\(\)](#), [test\\_str2float\\_double\\_exponent\\_whitespace\(\)](#), [test\\_str2float\\_exponent\\_basic\(\)](#), [test\\_str2float\\_exponent\\_edge\\_cases\(\)](#), [test\\_str2float\\_exponent\\_signed\\_mantissa\(\)](#), and [test\\_str2float\\_exponent\\_with\\_trailing\(\)](#).

### 2.1.3.29 `asm_str2int()`

```
int asm_str2int (
    const char *const s,
    const char **const end,
    const size_t base )
```

Convert a string to int in the given base.

Parses an optional sign and then a sequence of base-N digits.

#### Parameters

<i>s</i>	String to convert. Leading ASCII whitespace is skipped.
<i>end</i>	If non-NULL, <i>*end</i> is set to point to the first character not used in the conversion.
<i>base</i>	Numeric base in the range [2, 36].

#### Returns

The converted int value. Returns 0 on invalid base.

#### Note

Only digits '0'-'9', 'a'-'z', and 'A'-'Z' are recognized as base-N digits.

On invalid base, an error is printed to stderr, *\*end* (if non-NULL) is set to *s*, and 0 is returned.

Definition at line 977 of file [Almog\\_String\\_Manipulation.h](#).

References `asm_check_char_belong_to_base()`, `asm_dprintERROR`, `asm_get_char_value_in_base()`, and `asm_isisspace()`.

Referenced by `asm_str2double()`, `asm_str2float()`, and `test_str2int()`.

### 2.1.3.30 `asm_str2size_t()`

```
size_t asm_str2size_t (
    const char *const s,
    const char **const end,
    const size_t base )
```

Convert a string to size\_t in the given base.

Parses an optional leading '+' sign, then a sequence of base-N digits. Negative numbers are rejected.

#### Parameters

<i>s</i>	String to convert. Leading ASCII whitespace is skipped.
<i>end</i>	If non-NULL, <i>*end</i> is set to point to the first character not used in the conversion.
<i>base</i>	Numeric base in the range [2, 36].

**Returns**

The converted size\_t value. Returns 0 on invalid base or if a negative sign is encountered.

**Note**

On invalid base or a negative sign, an error is printed to stderr, \*end (if non-NULL) is set to s, and 0 is returned.

Definition at line 1022 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_check\\_char\\_belong\\_to\\_base\(\)](#), [asm\\_dprintERROR](#), [asm\\_get\\_char\\_value\\_in\\_base\(\)](#), and [asm\\_isspace\(\)](#).

Referenced by [test\\_str2size\\_t\(\)](#).

**2.1.3.31 asm\_str\_in\_str()**

```
int asm_str_in_str (
    const char *const src,
    const char *const word_to_search )
```

Count occurrences of a substring within a string.

Counts how many times word\_to\_search appears in src. Occurrences may overlap.

**Parameters**

<i>src</i>	The string to search in (must be null-terminated).
<i>word_to_search</i>	The substring to find (must be null-terminated and non-empty).

**Returns**

The number of (possibly overlapping) occurrences found.

**Note**

If word\_to\_search is the empty string, the behavior is not well-defined and should be avoided.

Definition at line 773 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_length\(\)](#), and [asm\\_strncmp\(\)](#).

Referenced by [test\\_str\\_in\\_str\\_overlap\\_and\\_edges\(\)](#).

**2.1.3.32 asm\_str\_is\_whitespace()**

```
bool asm_str_is_whitespace (
    const char *const s )
```

Check whether a string contains only ASCII whitespace characters.

**Parameters**

<i>s</i>	Null-terminated string to test.
----------	---------------------------------

**Returns**

true if every character in *s* satisfies [asm\\_isspace\(\)](#), or if *s* is the empty string; false otherwise.

Definition at line 1090 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_isspace\(\)](#), and [asm\\_length\(\)](#).

Referenced by [test\\_str\\_is\\_whitespace\\_edges\(\)](#).

**2.1.3.33 asm\_strdup()**

```
char * asm_strdup (
    const char *const s,
    size_t length )
```

Allocate and copy up to *length* characters from *s*.

Allocates a new buffer of size (*length* + 1) bytes using [ASM\\_MALLOC](#), copies up to *length* characters from *s*, and always null-terminates the result.

**Parameters**

<i>s</i>	Source string (must be null-terminated).
<i>length</i>	Maximum number of characters to copy (excluding '\0').

**Returns**

Newly allocated string, or NULL if allocation fails.

**Note**

This is not the same as POSIX strdup(): it does not compute *length* by itself and may intentionally truncate.

Definition at line 1115 of file [Almog\\_String\\_Manipulation.h](#).

References [ASM\\_MALLOC](#), and [asm\\_strncpy\(\)](#).

**2.1.3.34 asm\_strip\_whitespace()**

```
void asm_strip_whitespace (
    char *const s )
```

Remove all ASCII whitespace characters from a string in-place.

Scans *s* and deletes all characters for which [asm\\_isspace\(\)](#) is true, compacting the string and preserving the original order of non-whitespace characters.

## Parameters

<i>s</i>	String to modify in-place. Must be null-terminated.
----------	---

Definition at line 1069 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_isspace\(\)](#), [asm\\_length\(\)](#), and [asm\\_remove\\_char\\_from\\_string\(\)](#).

Referenced by [test\\_strip\\_whitespace\\_properties\(\)](#).

### 2.1.3.35 asm\_strncat()

```
int asm_strncat (
    char *const s1,
    const char *const s2,
    const size_t N )
```

Append up to N characters from s2 to the end of s1.

Appends characters from s2 to the end of s1 until either:

- N characters were appended, or
- a '\0' is encountered in s2.

After appending, this implementation writes a terminating '\0' to s1.

## Parameters

<i>s1</i>	Destination string buffer (must be null-terminated).
<i>s2</i>	Source string buffer (must be null-terminated).
<i>N</i>	Maximum number of characters to append. If N == 0, the limit defaults to ASM_MAX_LEN.

## Returns

The number of characters appended to s1.

## Warning

This function uses ASM\_MAX\_LEN as an upper bound for the resulting length (excluding the terminating '\0'). The caller must ensure s1 has capacity of at least ASM\_MAX\_LEN bytes.

Definition at line 1143 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_dprintERROR](#), [asm\\_length\(\)](#), and [ASM\\_MAX\\_LEN](#).

Referenced by [test\\_strncat\\_current\\_behavior\\_and\\_sentinel\(\)](#).

### 2.1.3.36 `asm_strncmp()`

```
int asm_strncmp (
    const char * s1,
    const char * s2,
    const size_t N )
```

Compare up to N characters for equality (boolean result).

Returns 1 if the first N characters of s1 and s2 are all equal; otherwise returns 0. Unlike the standard C strncmp, which returns 0 on equality and a non-zero value on inequality/order, this function returns a boolean-like result (1 == equal, 0 == different).

#### Parameters

<i>s1</i>	First string (may be shorter than N).
<i>s2</i>	Second string (may be shorter than N).
<i>N</i>	Number of characters to compare.

#### Returns

1 if equal for the first N characters, 0 otherwise.

#### Note

If either string ends before N characters and the other does not, the strings are considered different.

Definition at line 1185 of file [Almog\\_String\\_Manipulation.h](#).

References [ASM\\_MAX\\_LEN](#).

Referenced by [asm\\_str\\_in\\_str\(\)](#), and [test\\_strcmp\\_boolean\\_edges\(\)](#).

### 2.1.3.37 `asm_strncpy()`

```
int asm_strncpy (
    char *const s1,
    const char *const s2,
    const size_t N )
```

Copy up to N characters from s2 into s1 (non-standard).

Copies N characters from s2 into s1 and then writes a terminating '\0'.

#### Parameters

<i>s1</i>	Destination string buffer (must be null-terminated).
<i>s2</i>	Source string buffer (must be null-terminated).
<i>N</i>	Maximum number of characters to copy from s2.

**Returns**

The number of characters copied (i.e., (n)).

Definition at line 1213 of file [Almog\\_String\\_Manipulation.h](#).

Referenced by [asm\\_strdup\(\)](#).

### 2.1.3.38 asm\_tolower()

```
void asm_tolower (
    char *const s )
```

Convert all ASCII letters in a string to lowercase in-place.

**Parameters**

s	String to modify in-place. Must be null-terminated.
---	---

Definition at line 1231 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_isupper\(\)](#), and [asm\\_length\(\)](#).

Referenced by [test\\_case\\_conversion\\_roundtrip\(\)](#).

### 2.1.3.39 asm\_toupper()

```
void asm_toupper (
    char *const s )
```

Convert all ASCII letters in a string to uppercase in-place.

**Parameters**

s	String to modify in-place. Must be null-terminated.
---	---

Definition at line 1246 of file [Almog\\_String\\_Manipulation.h](#).

References [asm\\_islower\(\)](#), and [asm\\_length\(\)](#).

Referenced by [test\\_case\\_conversion\\_roundtrip\(\)](#).

### 2.1.3.40 `asm_trim_left_whitespace()`

```
void asm_trim_left_whitespace (
    char *const s )
```

Remove leading ASCII whitespace from a string in-place.

Finds the first character in `s` for which `asm_isspace()` is false and left-shifts the string so that character becomes the first character.

#### Parameters

<code>s</code>	String to modify in-place. Must be null-terminated.
----------------	---

Definition at line 1264 of file [Almog\\_String\\_Manipulation.h](#).

References `asm_isspace()`, `asm_length()`, and `asm_shift_left()`.

## 2.2 Almog\_String\_Manipulation.h

```
00001
00041 #ifndef ALMOG_STRING_MANIPULATION_H_
00042 #define ALMOG_STRING_MANIPULATION_H_
00043
00044 #include <stdio.h>
00045 #include <stdbool.h>
00046 #include <stdint.h>
00047
00048 #ifndef ASM_MALLOC
00049 #include <stdlib.h>
00050 #define ASM_MALLOC malloc
00051 #endif
00052
00068 #ifndef ASM_MAX_LEN
00069 #define ASM_MAX_LEN (int)1e3
00070 #endif
00071
00079 #define asm_dprintSTRING(expr) printf(#expr " = %s\n", expr)
00080
00088 #define asm_dprintCHAR(expr) printf(#expr " = %c\n", expr)
00089
00097 #define asm_dprintINT(expr) printf(#expr " = %d\n", expr)
00098
00106 #define asm_dprintFLOAT(expr) printf(#expr " = %#g\n", expr)
00107
00115 #define asm_dprintDOUBLE(expr) printf(#expr " = %#g\n", expr)
00116
00124 #define asm_dprintSIZE_T(expr) printf(#expr " = %zu\n", expr)
00125
00126 #define asm_dprintERROR(fmt, ...) \
00127     fprintf(stderr, "\n%s:%d:\n[Error] in function '%s':\n" \
00128     fmt "\n\n", __FILE__, __LINE__, __func__, __VA_ARGS__)
00129
00141 #define asm_min(a, b) ((a) < (b) ? (a) : (b))
00142
00154 #define asm_max(a, b) ((a) > (b) ? (a) : (b))
00155
00156 bool    asm_check_char_belong_to_base(const char c, const size_t base);
00157 void    asm_copy_array_by_indexes(char * const target, const int start, const int end, const char *
    const src);
00158 int     asm_get_char_value_in_base(const char c, const size_t base);
00159 int     asm_get_line(FILE *fp, char * const dst);
00160 int     asm_get_next_token_from_str(char * const dst, const char * const src, const char delimiter);
00161 int     asm_get_token_and_cut(char * const dst, char *src, const char delimiter, const bool
    leave_delimiter);
00162 bool    asm_isalnum(const char c);
00163 bool    asm_isalpha(const char c);
00164 bool    asm_isbdigit(const char c);
00165 bool    asm_iscntrl(const char c);
00166 bool    asm_isdigit(const char c);
00167 bool    asm_isgraph(const char c);
00168 bool    asm_islower(const char c);
```

```

00169 bool      asm_isodigit(const char c);
00170 bool      asm_isprint(const char c);
00171 bool      asm_ispunct(const char c);
00172 bool      asm_isspace(const char c);
00173 bool      asm_isupper(const char c);
00174 bool      asm_isxdigit(const char c);
00175 bool      asm_isxdigit(const char c);
00176 size_t     asm_length(const char * const str);
00177 void *    asm_memset(void * const des, const unsigned char value, const size_t n);
00178 void      asm_pad_left(char * const s, const size_t padding, const char pad);
00179 void      asm_print_many_times(const char * const str, const size_t n);
00180 void      asm_remove_char_from_string(char * const s, const size_t index);
00181 void      asm_shift_left(char * const s, const size_t shift);
00182 int       asm_str_in_str(const char * const src, const char * const word_to_search);
00183 double    asm_str2double(const char * const s, const char ** const end, const size_t base);
00184 float     asm_str2float(const char * const s, const char ** const end, const size_t base);
00185 int       asm_str2int(const char * const s, const char ** const end, const size_t base);
00186 size_t    asm_str2size_t(const char * const s, const char ** const end, const size_t base);
00187 void      asm_strip_whitespace(char * const s);
00188 bool      asm_str_is whitespace(const char * const s);
00189 char *    asm_strdup(const char * const s, size_t length);
00190 int       asm_strncat(char * const s1, const char * const s2, const size_t N);
00191 int       asm_strncmp(const char * const s1, const char * const s2, const size_t N);
00192 int       asm_strncpy(char * const s1, const char * const s2, const size_t N);
00193 void      asm_tolower(char * const s);
00194 void      asm_toupper(char * const s);
00195 void      asm_trim_left whitespace(char *s);
00196
00197 #endif /*ALMOG_STRING_MANIPULATION_H*/
00198
00199 #ifdef ALMOG_STRING_MANIPULATION_IMPLEMENTATION
00200 #undef ALMOG_STRING_MANIPULATION_IMPLEMENTATION
00201
00212 bool asm_check_char_belong_to_base(const char c, const size_t base)
00213 {
00214     if (base > 36 || base < 2) {
00215         #ifndef ASM_NO_ERRORS
00216             asm_dprintERROR("Supported bases are [2...36]. Inputted: %zu", base);
00217         #endif
00218         return false;
00219     }
00220     if (base <= 10) {
00221         return c >= '0' && c <= '9'+(char)base-10;
00222     }
00223     if (base > 10) {
00224         return asm_isdigit(c) || (c >= 'A' && c <= ('A'+(char)base-11)) || (c >= 'a' && c <=
00225 ('a'+(char)base-11));
00226     }
00227     return false;
00228 }
00229
00247 void asm_copy_array_by_indexes(char * const target, const int start, const int end, const char * const
00248     src)
00249 {
00250     if (start > end) return;
00251     int j = 0;
00252     for (int i = start; i <= end; i++) {
00253         target[j] = src[i];
00254         j++;
00255     }
00256     if (target[j-1] != '\0') {
00257         target[j] = '\0';
00258     }
00259
00269 int asm_get_char_value_in_base(const char c, const size_t base)
00270 {
00271     if (!asm_check_char_belong_to_base(c, base)) return -1;
00272     if (asm_isdigit(c)) {
00273         return c - '0';
00274     } else if (asm_isupper(c)) {
00275         return c - 'A' + 10;
00276     } else {
00277         return c - 'a' + 10;
00278     }
00279 }
00280
00301 int asm_get_line(FILE *fp, char * const dst)
00302 {
00303     int i = 0;
00304     int c;
00305     while ((c = fgetc(fp)) != '\n' && c != EOF) {
00306         dst[i++] = c;
00307         if (i >= ASM_MAX_LEN) {
00308             #ifndef ASM_NO_ERRORS
00309                 asm_dprintERROR("%s", "index exceeds ASM_MAX_LEN. Line in file is too long.");
00310             break;
00311         }
00312     }
00313 }

```

```

00310         #endif
00311         dst[i-1] = '\0';
00312         return -1;
00313     }
00314 }
00315 dst[i] = '\0';
00316 if (c == EOF && i == 0) {
00317     return -1;
00318 }
00319 return i;
00320 }
00321
00348 int asm_get_next_token_from_str(char * const dst, const char * const src, const char delimiter)
00349 {
00350     int i = 0, j = 0;
00351     char c;
00352     while ((c = src[i]) != delimiter && c != '\0') {
00353         dst[j++] = src[i++];
00354     }
00355
00356     dst[j] = '\0';
00357
00358     return j;
00359 }
00360
00391 int asm_get_token_and_cut(char * const dst, char *src, const char delimiter, const bool
    leave_delimiter)
00392 {
00393     int new_src_start_index = asm_get_next_token_from_str(dst, src, delimiter);
00394     bool delimiter_at_start = src[new_src_start_index] == delimiter;
00395
00396     if (leave_delimiter) {
00397         asm_shift_left(src, new_src_start_index);
00398     } else if (delimiter_at_start) {
00399         asm_shift_left(src, new_src_start_index + 1);
00400     } else {
00401         src[0] = '\0';
00402     }
00403     return new_src_start_index ? 1 : 0;
00404 }
00405
00412 bool asm_isalnum(char c)
00413 {
00414     return asm_isalpha(c) || asm_isdigit(c);
00415 }
00416
00423 bool asm_isalpha(char c)
00424 {
00425     return asm_isupper(c) || asm_islower(c);
00426 }
00427
00434 bool asm_isbdigit(const char c)
00435 {
00436     if (c == '0' || c == '1') {
00437         return true;
00438     } else {
00439         return false;
00440     }
00441 }
00442
00449 bool asm_iscntrl(char c)
00450 {
00451     if ((c >= 0 && c <= 31) || c == 127) {
00452         return true;
00453     } else {
00454         return false;
00455     }
00456 }
00457
00464 bool asm_isdigit(char c)
00465 {
00466     if (c >= '0' && c <= '9') {
00467         return true;
00468     } else {
00469         return false;
00470     }
00471 }
00472
00479 bool asm_isgraph(char c)
00480 {
00481     if (c >= 33 && c <= 126) {
00482         return true;
00483     } else {
00484         return false;
00485     }
00486 }
00487

```

```

00494 bool asm_islower(char c)
00495 {
00496     if (c >= 'a' && c <= 'z') {
00497         return true;
00498     } else {
00499         return false;
00500     }
00501 }
00502
00509 bool asm_isodigit(const char c)
00510 {
00511     if ((c >= '0' && c <= '7')) {
00512         return true;
00513     } else {
00514         return false;
00515     }
00516 }
00517
00525 bool asm_isprint(char c)
00526 {
00527     return asm_isgraph(c) || c == ' ';
00528 }
00529
00537 bool asm_ispunct(char c)
00538 {
00539     if ((c >= 33 && c <= 47) || (c >= 58 && c <= 64) || (c >= 91 && c <= 96) || (c >= 123 && c <=
126)) {
00540         return true;
00541     } else {
00542         return false;
00543     }
00544 }
00545
00553 bool asm_isspace(char c)
00554 {
00555     if (c == ' ' || c == '\n' || c == '\t' ||
00556     c == '\v' || c == '\f' || c == '\r') {
00557         return true;
00558     } else {
00559         return false;
00560     }
00561 }
00562
00569 bool asm_isupper(char c)
00570 {
00571     if (c >= 'A' && c <= 'Z') {
00572         return true;
00573     } else {
00574         return false;
00575     }
00576 }
00577
00584 bool asm_isxdigit(char c)
00585 {
00586     if ((c >= 'a' && c <= 'f') || asm_isdigit(c)) {
00587         return true;
00588     } else {
00589         return false;
00590     }
00591 }
00592
00599 bool asm_isXdigit(char c)
00600 {
00601     if ((c >= 'A' && c <= 'F') || asm_isdigit(c)) {
00602         return true;
00603     } else {
00604         return false;
00605     }
00606 }
00607
00618 size_t asm_length(const char * const str)
00619 {
00620     char c;
00621     size_t i = 0;
00622
00623     while ((c = str[i++]) != '\0') {
00624         if (i > ASM_MAX_LEN) {
00625             #ifndef ASM_NO_ERRORS
00626             asm_dprintERROR("%s", "index exceeds ASM_MAX_LEN. Probably no NULL termination.");
00627             #endif
00628             return SIZE_MAX;
00629         }
00630     }
00631     return --i;
00632 }
00633
00653 void * asm_memset(void * const des, const unsigned char value, const size_t n)

```

```

00654 {
00655     unsigned char *ptr = (unsigned char *)des;
00656     for (size_t i = n; i-- > 0;) {
00657         *ptr++ = value;
00658     }
00659     return des;
00660 }
00661
00676 void asm_pad_left(char * const s, const size_t padding, const char pad)
00677 {
00678     int len = (int)asm_length(s);
00679     for (int i = len; i >= 0; i--) {
00680         s[i+(int)padding] = s[i];
00681     }
00682     for (int i = 0; i < (int)padding; i++) {
00683         s[i] = pad;
00684     }
00685 }
00686
00693 void asm_print_many_times(const char * const str, const size_t n)
00694 {
00695     for (size_t i = 0; i < n; i++) {
00696         printf("%s", str);
00697     }
00698     printf("\n");
00699 }
00700
00713 void asm_remove_char_from_string(char * const s, const size_t index)
00714 {
00715     size_t len = asm_length(s);
00716     if (len == 0) return;
00717     if (index >= len) {
00718         #ifndef ASM_NO_ERRORS
00719         asm_dprintERROR("%s", "index exceeds array length.");
00720         #endif
00721         return;
00722     }
00723
00724     for (size_t i = index; i < len; i++) {
00725         s[i] = s[i+1];
00726     }
00727 }
00728
00742 void asm_shift_left(char * const s, const size_t shift)
00743 {
00744     size_t len = asm_length(s);
00745
00746     if (shift == 0) return;
00747     if (len <= shift) {
00748         s[0] = '\0';
00749         return;
00750     }
00751
00752     size_t i;
00753     for (i = shift; i < len; i++) {
00754         s[i-shift] = s[i];
00755     }
00756     s[i-shift] = '\0';
00757 }
00758
00773 int asm_str_in_str(const char * const src, const char * const word_to_search)
00774 {
00775     int i = 0, num_of_accur = 0;
00776     while (src[i] != '\0') {
00777         if (asm_strncmp(src+i, word_to_search, asm_length(word_to_search))) {
00778             num_of_accur++;
00779         }
00780         i++;
00781     }
00782     return num_of_accur;
00783 }
00784
00816 double asm_str2double(const char * const s, const char ** const end, const size_t base)
00817 {
00818     if (base < 2 || base > 36) {
00819         #ifndef ASM_NO_ERRORS
00820         asm_dprintERROR("Supported bases are [2...36]. Input: %zu", base);
00821         #endif
00822         if (end) *end = s;
00823         return 0.0;
00824     }
00825     int num_of_whitespace = 0;
00826     while (asm_isspace(s[num_of_whitespace])) {
00827         num_of_whitespace++;
00828     }
00829     int i = 0;

```

```

00831     if (s[0+num_of_whitespace] == '-' || s[0+num_of_whitespace] == '+') {
00832         i++;
00833     }
00834     int sign = s[0+num_of_whitespace] == '-' ? -1 : 1;
00835
00836     size_t left = 0;
00837     double right = 0.0;
00838     int expo = 0;
00839     for (; asm_check_char_belong_to_base(s[i+num_of_whitespace], base); i++) {
00840         left = base * left + asm_get_char_value_in_base(s[i+num_of_whitespace], base);
00841     }
00842
00843     if (s[i+num_of_whitespace] == '.') {
00844         i++; /* skip the point */
00845
00846         size_t divider = base;
00847         for (; asm_check_char_belong_to_base(s[i+num_of_whitespace], base); i++) {
00848             right = right + asm_get_char_value_in_base(s[i+num_of_whitespace], base) /
00849             (double)divider;
00850             divider *= base;
00851         }
00852
00853     if ((s[i+num_of_whitespace] == 'e') || (s[i+num_of_whitespace] == 'E')) {
00854         expo = asm_str2int(&(s[i+num_of_whitespace+1]), end, 10);
00855     } else {
00856         if (end) *end = s + i + num_of_whitespace;
00857     }
00858
00859     double res = sign * (left + right);
00860
00861     if (expo > 0) {
00862         for (int index = 0; index < expo; index++) {
00863             res *= (double)base;
00864         }
00865     } else {
00866         for (int index = 0; index > expo; index--) {
00867             res /= (double)base;
00868         }
00869     }
00870
00871     return res;
00872 }
00873
00903 float asm_str2float(const char * const s, const char ** const end, const size_t base)
00904 {
00905     if (base < 2 || base > 36) {
00906         #ifndef ASM_NO_ERRORS
00907             asm_dprintERROR("Supported bases are [2...36]. Input: %zu", base);
00908         #endif
00909         if (end) *end = s;
00910         return 0.0f;
00911     }
00912     int num_of_whitespace = 0;
00913     while (asm_isspace(s[num_of_whitespace])) {
00914         num_of_whitespace++;
00915     }
00916
00917     int i = 0;
00918     if (s[0+num_of_whitespace] == '-' || s[0+num_of_whitespace] == '+') {
00919         i++;
00920     }
00921     int sign = s[0+num_of_whitespace] == '-' ? -1 : 1;
00922
00923     int left = 0;
00924     float right = 0.0f;
00925     int expo = 0;
00926     for (; asm_check_char_belong_to_base(s[i+num_of_whitespace], base); i++) {
00927         left = base * left + asm_get_char_value_in_base(s[i+num_of_whitespace], base);
00928     }
00929
00930     if (s[i+num_of_whitespace] == '.') {
00931         i++; /* skip the point */
00932
00933         size_t divider = base;
00934         for (; asm_check_char_belong_to_base(s[i+num_of_whitespace], base); i++) {
00935             right = right + asm_get_char_value_in_base(s[i+num_of_whitespace], base) / (float)divider;
00936             divider *= base;
00937         }
00938     }
00939
00940     if ((s[i+num_of_whitespace] == 'e') || (s[i+num_of_whitespace] == 'E')) {
00941         expo = asm_str2int(&(s[i+num_of_whitespace+1]), end, 10);
00942     } else {
00943         if (end) *end = s + i + num_of_whitespace;
00944     }
00945

```

```

00946     float res = sign * (left + right);
00947
00948     if (expo > 0) {
00949         for (int index = 0; index < expo; index++) {
00950             res *= (float)base;
00951         }
00952     } else {
00953         for (int index = 0; index > expo; index--) {
00954             res /= (float)base;
00955         }
00956     }
00957
00958     return res;
00959 }
00960
00977 int asm_str2int(const char * const s, const char ** const end, const size_t base)
00978 {
00979     if (base < 2 || base > 36) {
00980         #ifndef ASM_NO_ERRORS
00981             asm_dprintERROR("Supported bases are [2...36]. Input: %zu", base);
00982         #endif
00983         if (*end) *end = s;
00984         return 0;
00985     }
00986     int num_of_whitespace = 0;
00987     while (asm_isspace(s[num_of_whitespace])) {
00988         num_of_whitespace++;
00989     }
00990
00991     int n = 0, i = 0;
00992     if (s[0+num_of_whitespace] == '-' || s[0+num_of_whitespace] == '+') {
00993         i++;
00994     }
00995     int sign = s[0+num_of_whitespace] == '-' ? -1 : 1;
00996
00997     for (; asm_check_char_belong_to_base(s[i+num_of_whitespace], base); i++) {
00998         n = base * n + asm_get_char_value_in_base(s[i+num_of_whitespace], base);
00999     }
01000
01001     if (*end) *end = s + i+num_of_whitespace;
01002
01003     return n * sign;
01004 }
01005
01022 size_t asm_str2size_t(const char * const s, const char ** const end, const size_t base)
01023 {
01024     if (*end) *end = s;
01025
01026     int num_of_whitespace = 0;
01027     while (asm_isspace(s[num_of_whitespace])) {
01028         num_of_whitespace++;
01029     }
01030
01031     if (s[0+num_of_whitespace] == '-') {
01032         #ifndef ASM_NO_ERRORS
01033             asm_dprintERROR("%s", "Unable to convert a negative number to size_t.");
01034         #endif
01035         return 0;
01036     }
01037
01038     if (base < 2 || base > 36) {
01039         #ifndef ASM_NO_ERRORS
01040             asm_dprintERROR("Supported bases are [2...36]. Input: %zu", base);
01041         #endif
01042         if (*end) *end = s+num_of_whitespace;
01043         return 0;
01044     }
01045
01046     size_t n = 0, i = 0;
01047     if (s[0+num_of_whitespace] == '+') {
01048         i++;
01049     }
01050
01051     for (; asm_check_char_belong_to_base(s[i+num_of_whitespace], base); i++) {
01052         n = base * n + asm_get_char_value_in_base(s[i+num_of_whitespace], base);
01053     }
01054
01055     if (*end) *end = s + i+num_of_whitespace;
01056
01057     return n;
01058 }
01059
01069 void asm_strip whitespace(char * const s)
01070 {
01071     size_t len = asm_length(s);
01072     size_t i;
01073     for (i = 0; i < len; i++) {

```

```

01074     if (asm_isspace(s[i])) {
01075         asm_remove_char_from_string(s, i);
01076         len--;
01077         i--;
01078     }
01079 }
01080 s[i] = '\0';
01081 }
01082
01090 bool asm_str_is whitespace(const char * const s)
01091 {
01092     size_t len = asm_length(s);
01093     for (size_t i = 0; i < len; i++) {
01094         if (!asm_isspace(s[i])) {
01095             return false;
01096         }
01097     }
01098
01099     return true;
01100 }
01101
01115 char * asm_strdup(const char * const s, size_t length)
01116 {
01117     char * res = (char *)ASM_MALLOC(sizeof(char) * length+1);
01118     asm_strncpy((char * const)res, s, length);
01119
01120     return res;
01121 }
01122
01143 int asm_strncat(char * const s1, const char * const s2, const size_t N)
01144 {
01145     size_t len_s1 = asm_length(s1);
01146
01147     int limit = N;
01148     if (limit == 0) {
01149         limit = ASM_MAX_LEN;
01150     }
01151
01152     int i = 0;
01153     while (i < limit && s2[i] != '\0') {
01154         if (len_s1 + (size_t)i >= ASM_MAX_LEN-1) {
01155             #ifndef ASM_NO_ERRORS
01156             asm_dprintERROR("s2 or the first N=%zu digit of s2 does not fit into s1.", N);
01157             #endif
01158             return i;
01159         }
01160
01161         s1[len_s1+(size_t)i] = s2[i];
01162         i++;
01163     }
01164     s1[len_s1+(size_t)i] = '\0';
01165
01166     return i;
01167 }
01168
01185 int asm_strncmp(const char *s1, const char *s2, const size_t N)
01186 {
01187     size_t n = N == 0 ? ASM_MAX_LEN : N;
01188     size_t i = 0;
01189     while (i < n) {
01190         if (s1[i] == '\0' && s2[i] == '\0') {
01191             break;
01192         }
01193         if (s1[i] != s2[i] || (s1[i] == '\0' || (s2[i] == '\0'))) {
01194             return 0;
01195         }
01196         i++;
01197     }
01198     return 1;
01199 }
01200
01213 int asm_strncpy(char * const s1, const char * const s2, const size_t N)
01214 {
01215     size_t n = N;
01216
01217     size_t i;
01218     for (i = 0; i < n && s2[i] != '\0'; i++) {
01219         s1[i] = s2[i];
01220     }
01221     s1[i] = '\0';
01222
01223     return i;
01224 }
01225
01231 void asm_tolower(char * const s)
01232 {
01233     size_t len = asm_length(s);

```

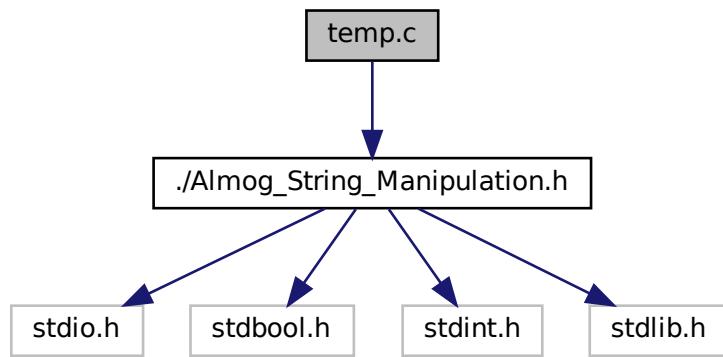
```

01234     for (size_t i = 0; i < len; i++) {
01235         if (asm_isupper(s[i])) {
01236             s[i] += 'a' - 'A';
01237         }
01238     }
01239 }
01240
01246 void asm_toupper(char * const s)
01247 {
01248     size_t len = asm_length(s);
01249     for (size_t i = 0; i < len; i++) {
01250         if (asm_islower(s[i])) {
01251             s[i] += 'A' - 'a';
01252         }
01253     }
01254 }
01255
01264 void asm_trim_left_whitespace(char * const s)
01265 {
01266     size_t len = asm_length(s);
01267
01268     if (len == 0) return;
01269     size_t i;
01270     for (i = 0; i < len; i++) {
01271         if (!asm_isspace(s[i])) {
01272             break;
01273         }
01274     }
01275     asm_shift_left(s, i);
01276 }
01277
01278 #ifdef ASM_NO_ERRORS
01279 #undef ASM_NO_ERRORS
01280 #endif
01281
01282 #endif /*ALMOG_STRING_MANIPULATION_IMPLEMENTATION*/
01283

```

## 2.3 temp.c File Reference

#include "./Almog\_String\_Manipulation.h"  
 Include dependency graph for temp.c:



### Macros

- #define ALMOG\_STRING\_MANIPULATION\_IMPLEMENTATION

## Functions

- int [main](#) (void)

### 2.3.1 Macro Definition Documentation

#### 2.3.1.1 ALMOG\_STRING\_MANIPULATION\_IMPLEMENTATION

```
#define ALMOG_STRING_MANIPULATION_IMPLEMENTATION
```

Definition at line [1](#) of file [temp.c](#).

### 2.3.2 Function Documentation

#### 2.3.2.1 main()

```
int main (
    void )
```

Definition at line [4](#) of file [temp.c](#).

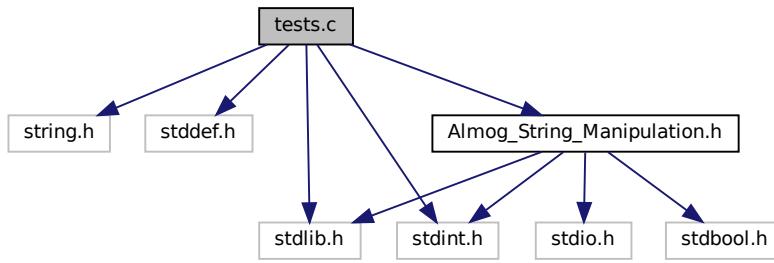
References [asm\\_dprintDOUBLE](#), [asm\\_dprintFLOAT](#), [asm\\_str2double\(\)](#), and [asm\\_str2float\(\)](#).

## 2.4 temp.c

```
00001 #define ALMOG_STRING_MANIPULATION_IMPLEMENTATION
00002 #include "./Almog_String_Manipulation.h"
00003
00004 int main(void)
00005 {
00006     char str[] = "-1.1e-1";
00007
00008     asm_dprintFLOAT(asn_str2float(str, NULL, 10));
00009     asm_dprintDOUBLE(asn_str2double(str, NULL, 10));
00010
00011
00012
00013     return 0;
00014 }
```

## 2.5 tests.c File Reference

```
#include <string.h>
#include <stddef.h>
#include <stdlib.h>
#include <stdint.h>
#include "Almog_String_Manipulation.h"
Include dependency graph for tests.c:
```



### Macros

- #define ALMOG\_STRING\_MANIPULATION\_IMPLEMENTATION
- #define NO\_ERRORS
- #define TEST\_CASE(expr)
- #define TEST\_WARN(expr, msg)
- #define TEST\_EQ\_INT(a, b) TEST\_CASE((a) == (b))
- #define TEST\_EQ\_SIZE(a, b) TEST\_CASE((a) == (b))
- #define TEST\_EQ\_STR(a, b) TEST\_CASE(strcmp((a), (b)) == 0)
- #define TEST\_NE\_STR(a, b) TEST\_CASE(strcmp((a), (b)) != 0)

### Functions

- static void `fill_sentinel` (unsigned char \*buf, size\_t n, unsigned char v)
- static bool `is_nul_terminated_within` (const char \*s, size\_t cap)
- static uint32\_t `xorshift32` (void)
- static char `rand_ascii_printable` (void)
- static void `test_ascii_classification_exhaustive_ranges` (void)
- static void `test_ascii_classification_full_scan_0_127` (void)
- static void `test_case_conversion_roundtrip` (void)
- static void `test_length_matches_strlen_small` (void)
- static void `test_memset_basic_and_edges` (void)
- static void `test_copy_array_by_indexes_behavior_and_bounds` (void)
- static void `test_left_shift_edges` (void)
- static void `test_left_pad_edges_and_sentinel` (void)
- static void `test_remove_char_form_string_edges` (void)
- static void `test_strip_whitespace_properties` (void)
- static void `test_str_is_whitespace_edges` (void)
- static void `test_strncmp_boolean_edges` (void)

- static void `test_str_in_str_overlap_and_edges` (void)
- static void `test_base_digit_helpers` (void)
- static void `test_str2int` (void)
- static void `test_str2size_t` (void)
- static void `test_str2float_double` (void)
- static void `test_get_next_word_from_line_current_behavior` (void)
- static void `test_get_word_and_cut_edges` (void)
- static void `test_get_line_tmpfile` (void)
- static void `test_get_line_too_long` (void)
- static void `test_strncat_current_behavior_and_sentinel` (void)
- static void `test_str2float_exponent_basic` (void)
- static void `test_str2float_exponent_signed_mantissa` (void)
- static void `test_str2float_exponent_edge_cases` (void)
- static void `test_str2float_exponent_with_trailing` (void)
- static void `test_str2double_exponent_basic` (void)
- static void `test_str2double_exponent_signed_mantissa` (void)
- static void `test_str2double_exponent_edge_cases` (void)
- static void `test_str2float_double_exponent_different_bases` (void)
- static void `test_str2float_double_exponent_whitespace` (void)
- static void `test_str2float_double_exponent_large_values` (void)
- int `main` (void)

## Variables

- static int `g_tests_run` = 0
- static int `g_tests_failed` = 0
- static int `g_tests_warned` = 0
- static uint32\_t `rng_state` = 0xC0FFEE01u

### 2.5.1 Macro Definition Documentation

#### 2.5.1.1 ALMOG\_STRING\_MANIPULATION\_IMPLEMENTATION

```
#define ALMOG_STRING_MANIPULATION_IMPLEMENTATION
```

Definition at line 9 of file [tests.c](#).

#### 2.5.1.2 NO\_ERRORS

```
#define NO_ERRORS
```

Definition at line 10 of file [tests.c](#).

### 2.5.1.3 TEST\_CASE

```
#define TEST_CASE(
    expr )
```

**Value:**

```
do {
    g_tests_run++;
    if (!expr) {
        g_tests_failed++;
        fprintf(stderr, "[FAIL] %s:%d: %s\n", __FILE__, __LINE__, #expr);
    }
} while (0)
```

Definition at line 19 of file [tests.c](#).

### 2.5.1.4 TEST\_EQ\_INT

```
#define TEST_EQ_INT(
    a,
    b ) TEST_CASE((a) == (b))
```

Definition at line 38 of file [tests.c](#).

### 2.5.1.5 TEST\_EQ\_SIZE

```
#define TEST_EQ_SIZE(
    a,
    b ) TEST_CASE((a) == (b))
```

Definition at line 39 of file [tests.c](#).

### 2.5.1.6 TEST\_EQ\_STR

```
#define TEST_EQ_STR(
    a,
    b ) TEST_CASE(strcmp((a), (b)) == 0)
```

Definition at line 40 of file [tests.c](#).

### 2.5.1.7 TEST\_NE\_STR

```
#define TEST_NE_STR(
    a,
    b ) TEST_CASE(strcmp((a), (b)) != 0)
```

Definition at line 41 of file [tests.c](#).

### 2.5.1.8 TEST\_WARN

```
#define TEST_WARN( expr, msg )
```

**Value:**

```
do {  
    g_tests_run++;  
    if (!expr) {  
        g_tests_warned++;  
        fprintf(stderr, "[WARN] %s:%d: %s | %s\n", __FILE__, __LINE__,  
                #expr, msg);  
    }  
} while (0)
```

Definition at line 28 of file [tests.c](#).

## 2.5.2 Function Documentation

### 2.5.2.1 fill\_sentinel()

```
static void fill_sentinel (  
    unsigned char * buf,  
    size_t n,  
    unsigned char v ) [static]
```

Definition at line 43 of file [tests.c](#).

Referenced by [test\\_copy\\_array\\_by\\_indexes\\_behavior\\_and\\_bounds\(\)](#), [test\\_get\\_line\\_too\\_long\(\)](#), [test\\_left\\_pad\\_edges\\_and\\_sentinel\(\)](#), [test\\_memset\\_basic\\_and\\_edges\(\)](#), and [test\\_strncat\\_current\\_behavior\\_and\\_sentinel\(\)](#).

### 2.5.2.2 is\_nul\_terminated\_within()

```
static bool is_nul_terminated_within (  
    const char * s,  
    size_t cap ) [static]
```

Definition at line 48 of file [tests.c](#).

Referenced by [test\\_case\\_conversion\\_roundtrip\(\)](#), and [test\\_get\\_line\\_tmpfile\(\)](#).

### 2.5.2.3 main()

```
int main (
    void )
```

Definition at line 1076 of file [tests.c](#).

References [g\\_tests\\_failed](#), [g\\_tests\\_run](#), [g\\_tests\\_warned](#), [test\\_ascii\\_classification\\_exhaustive\\_ranges\(\)](#), [test\\_ascii\\_classification\\_full\\_test\\_base\\_digit\\_helpers\(\)](#), [test\\_case\\_conversion\\_roundtrip\(\)](#), [test\\_copy\\_array\\_by\\_indexes\\_behavior\\_and\\_bounds\(\)](#), [test\\_get\\_line\\_tmpfile\(\)](#), [test\\_get\\_line\\_too\\_long\(\)](#), [test\\_get\\_next\\_word\\_from\\_line\\_current\\_behavior\(\)](#), [test\\_get\\_word\\_and\\_cut\\_edges\(\)](#), [test\\_left\\_pad\\_edges\\_and\\_sentinel\(\)](#), [test\\_left\\_shift\\_edges\(\)](#), [test\\_length\\_matches\\_strlen\\_small\(\)](#), [test\\_memset\\_basic\\_and\\_edges\(\)](#), [test\\_remove\\_char\\_form\\_string\\_edges\(\)](#), [test\\_str2double\\_exponent\\_basic\(\)](#), [test\\_str2double\\_exponent\\_edge\\_cases\(\)](#), [test\\_str2double\\_exponent\\_signed\\_mantissa\(\)](#), [test\\_str2float\\_double\(\)](#), [test\\_str2float\\_double\\_exponent\\_different\\_bases\(\)](#), [test\\_str2float\\_double\\_exponent\\_large\\_values\(\)](#), [test\\_str2float\\_double\\_exponent\\_whitespace\(\)](#), [test\\_str2float\\_exponent\\_basic\(\)](#), [test\\_str2float\\_exponent\\_edge\\_cases\(\)](#), [test\\_str2float\\_exponent\\_signed\\_mantissa\(\)](#), [test\\_str2float\\_exponent\\_with\\_trailing\(\)](#), [test\\_str2int\(\)](#), [test\\_str2size\\_t\(\)](#), [test\\_str\\_in\\_str\\_overlap\\_and\\_edges\(\)](#), [test\\_str\\_is whitespace\\_edges\(\)](#), [test\\_strip\\_whitespace\\_properties\(\)](#), [test\\_strncat\\_current\\_behavior\\_and\\_sentinel\(\)](#), and [test\\_strncmp\\_boolean\\_edges\(\)](#).

### 2.5.2.4 rand\_ascii\_printable()

```
static char rand_ascii_printable (
    void ) [static]
```

Definition at line 68 of file [tests.c](#).

References [xorshift32\(\)](#).

Referenced by [test\\_case\\_conversion\\_roundtrip\(\)](#), [test\\_length\\_matches\\_strlen\\_small\(\)](#), and [test\\_strip\\_whitespace\\_properties\(\)](#).

### 2.5.2.5 test\_ascii\_classification\_exhaustive\_ranges()

```
static void test_ascii_classification_exhaustive_ranges (
    void ) [static]
```

Definition at line 82 of file [tests.c](#).

References [asm\\_isalnum\(\)](#), [asm\\_isalpha\(\)](#), [asm\\_iscntrl\(\)](#), [asm\\_isdigit\(\)](#), [asm\\_isgraph\(\)](#), [asm\\_islower\(\)](#), [asm\\_isprint\(\)](#), [asm\\_ispunct\(\)](#), [asm\\_isspace\(\)](#), [asm\\_isupper\(\)](#), [asm\\_isxdigit\(\)](#), [asm\\_isXdigit\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.6 test\_ascii\_classification\_full\_scan\_0\_127()

```
static void test_ascii_classification_full_scan_0_127 (
    void ) [static]
```

Definition at line 153 of file [tests.c](#).

References [asm\\_isalnum\(\)](#), [asm\\_isalpha\(\)](#), [asm\\_isdigit\(\)](#), [asm\\_isgraph\(\)](#), [asm\\_islower\(\)](#), [asm\\_isprint\(\)](#), [asm\\_isupper\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.7 test\_base\_digit\_helpers()

```
static void test_base_digit_helpers (
    void ) [static]
```

Definition at line 460 of file [tests.c](#).

References [asm\\_check\\_char\\_belong\\_to\\_base\(\)](#), [asm\\_get\\_char\\_value\\_in\\_base\(\)](#), [TEST\\_CASE](#), and [TEST\\_EQ\\_INT](#).

Referenced by [main\(\)](#).

### 2.5.2.8 test\_case\_conversion\_roundtrip()

```
static void test_case_conversion_roundtrip (
    void ) [static]
```

Definition at line 181 of file [tests.c](#).

References [asm\\_tolower\(\)](#), [asm\\_toupper\(\)](#), [is\\_nul\\_terminated\\_within\(\)](#), [rand\\_ascii\\_printable\(\)](#), [TEST\\_CASE](#), [TEST\\_EQ\\_STR](#), and [xorshift32\(\)](#).

Referenced by [main\(\)](#).

### 2.5.2.9 test\_copy\_array\_by\_indexes\_behavior\_and\_bounds()

```
static void test_copy_array_by_indexes_behavior_and_bounds (
    void ) [static]
```

Definition at line 257 of file [tests.c](#).

References [asm\\_copy\\_array\\_by\\_indexes\(\)](#), [fill\\_sentinel\(\)](#), [TEST\\_CASE](#), and [TEST\\_EQ\\_STR](#).

Referenced by [main\(\)](#).

### 2.5.2.10 test\_get\_line\_tmpfile()

```
static void test_get_line_tmpfile (
    void ) [static]
```

Definition at line 689 of file [tests.c](#).

References [asm\\_get\\_line\(\)](#), [ASM\\_MAX\\_LEN](#), [g\\_tests\\_warned](#), [is\\_nul\\_terminated\\_within\(\)](#), [TEST\\_CASE](#), [TEST\\_EQ\\_INT](#), and [TEST\\_EQ\\_STR](#).

Referenced by [main\(\)](#).

### 2.5.2.11 test\_get\_line\_too\_long()

```
static void test_get_line_too_long (
    void ) [static]
```

Definition at line 733 of file [tests.c](#).

References [asm\\_get\\_line\(\)](#), [ASM\\_MAX\\_LEN](#), [fill\\_sentinel\(\)](#), [g\\_tests\\_warned](#), and [TEST\\_EQ\\_INT](#).

Referenced by [main\(\)](#).

### 2.5.2.12 test\_get\_next\_word\_from\_line\_current\_behavior()

```
static void test_get_next_word_from_line_current_behavior (
    void ) [static]
```

Definition at line 606 of file [tests.c](#).

References [asm\\_get\\_next\\_token\\_from\\_str\(\)](#), [TEST\\_CASE](#), [TEST\\_EQ\\_INT](#), and [TEST\\_EQ\\_STR](#).

Referenced by [main\(\)](#).

### 2.5.2.13 test\_get\_word\_and\_cut\_edges()

```
static void test_get_word_and_cut_edges (
    void ) [static]
```

Definition at line 651 of file [tests.c](#).

References [asm\\_get\\_token\\_and\\_cut\(\)](#), [TEST\\_CASE](#), and [TEST\\_EQ\\_STR](#).

Referenced by [main\(\)](#).

### 2.5.2.14 test\_left\_pad\_edges\_and\_sentinel()

```
static void test_left_pad_edges_and_sentinel (
    void ) [static]
```

Definition at line 319 of file [tests.c](#).

References [asm\\_pad\\_left\(\)](#), [fill\\_sentinel\(\)](#), [TEST\\_CASE](#), and [TEST\\_EQ\\_STR](#).

Referenced by [main\(\)](#).

### 2.5.2.15 test\_left\_shift\_edges()

```
static void test_left_shift_edges (
    void ) [static]
```

Definition at line 294 of file [tests.c](#).

References [asm\\_shift\\_left\(\)](#), and [TEST\\_EQ\\_STR](#).

Referenced by [main\(\)](#).

### 2.5.2.16 test\_length\_matches\_strlen\_small()

```
static void test_length_matches_strlen_small (
    void ) [static]
```

Definition at line 227 of file [tests.c](#).

References [asm\\_length\(\)](#), [rand\\_ascii\\_printable\(\)](#), [TEST\\_EQ\\_SIZE](#), and [xorshift32\(\)](#).

Referenced by [main\(\)](#).

### 2.5.2.17 test\_memset\_basic\_and\_edges()

```
static void test_memset_basic_and_edges (
    void ) [static]
```

Definition at line 241 of file [tests.c](#).

References [asm\\_memset\(\)](#), [fill\\_sentinel\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.18 test\_remove\_char\_form\_string\_edges()

```
static void test_remove_char_form_string_edges (
    void ) [static]
```

Definition at line 358 of file [tests.c](#).

References [asm\\_remove\\_char\\_from\\_string\(\)](#), and [TEST\\_EQ\\_STR](#).

Referenced by [main\(\)](#).

### 2.5.2.19 test\_str2double\_exponent\_basic()

```
static void test_str2double_exponent_basic (
    void ) [static]
```

Definition at line 931 of file [tests.c](#).

References [asm\\_str2double\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.20 test\_str2double\_exponent\_edge\_cases()

```
static void test_str2double_exponent_edge_cases (
    void ) [static]
```

Definition at line 980 of file [tests.c](#).

References [asm\\_str2double\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.21 test\_str2double\_exponent\_signed\_mantissa()

```
static void test_str2double_exponent_signed_mantissa (
    void ) [static]
```

Definition at line 960 of file [tests.c](#).

References [asm\\_str2double\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.22 test\_str2float\_double()

```
static void test_str2float_double (
    void ) [static]
```

Definition at line 562 of file [tests.c](#).

References [asm\\_str2double\(\)](#), [asm\\_str2float\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.23 test\_str2float\_double\_exponent\_different\_bases()

```
static void test_str2float_double_exponent_different_bases (
    void ) [static]
```

Definition at line 1006 of file [tests.c](#).

References [asm\\_str2double\(\)](#), [asm\\_str2float\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.24 test\_str2float\_double\_exponent\_large\_values()

```
static void test_str2float_double_exponent_large_values (
    void ) [static]
```

Definition at line 1049 of file [tests.c](#).

References [asm\\_str2double\(\)](#), [asm\\_str2float\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.25 test\_str2float\_double\_exponent\_whitespace()

```
static void test_str2float_double_exponent_whitespace (
    void ) [static]
```

Definition at line 1033 of file [tests.c](#).

References [asm\\_str2double\(\)](#), [asm\\_str2float\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.26 test\_str2float\_exponent\_basic()

```
static void test_str2float_exponent_basic (
    void ) [static]
```

Definition at line 791 of file [tests.c](#).

References [asm\\_str2float\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.27 test\_str2float\_exponent\_edge\_cases()

```
static void test_str2float_exponent_edge_cases (
    void ) [static]
```

Definition at line 865 of file [tests.c](#).

References [asm\\_str2float\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.28 test\_str2float\_exponent\_signed\_mantissa()

```
static void test_str2float_exponent_signed_mantissa (
    void ) [static]
```

Definition at line 832 of file [tests.c](#).

References [asm\\_str2float\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.29 test\_str2float\_exponent\_with\_trailing()

```
static void test_str2float_exponent_with_trailing (
    void ) [static]
```

Definition at line 912 of file [tests.c](#).

References [asm\\_str2float\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.30 test\_str2int()

```
static void test_str2int (
    void ) [static]
```

Definition at line 495 of file [tests.c](#).

References [asm\\_str2int\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.31 test\_str2size\_t()

```
static void test_str2size_t (
    void ) [static]
```

Definition at line 531 of file [tests.c](#).

References [asm\\_str2size\\_t\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.32 test\_str\_in\_str\_overlap\_and\_edges()

```
static void test_str_in_str_overlap_and_edges (
    void ) [static]
```

Definition at line 448 of file [tests.c](#).

References [asm\\_str\\_in\\_str\(\)](#), and [TEST\\_EQ\\_INT](#).

Referenced by [main\(\)](#).

### 2.5.2.33 test\_str\_is\_whitespace\_edges()

```
static void test_str_is_whitespace_edges (
    void ) [static]
```

Definition at line 423 of file [tests.c](#).

References [asm\\_str\\_is\\_whitespace\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.34 test\_strip\_whitespace\_properties()

```
static void test_strip_whitespace_properties (
    void ) [static]
```

Definition at line 387 of file [tests.c](#).

References [asm\\_isspace\(\)](#), [asm\\_strip\\_whitespace\(\)](#), [rand\\_ascii\\_printable\(\)](#), [TEST\\_CASE](#), [TEST\\_EQ\\_STR](#), and [xorshift32\(\)](#).

Referenced by [main\(\)](#).

### 2.5.2.35 test\_strncat\_current\_behavior\_and\_sentinel()

```
static void test_strncat_current_behavior_and_sentinel (
    void ) [static]
```

Definition at line 761 of file [tests.c](#).

References [asm\\_strncat\(\)](#), [fill\\_sentinel\(\)](#), [TEST\\_CASE](#), [TEST\\_EQ\\_INT](#), and [TEST\\_EQ\\_STR](#).

Referenced by [main\(\)](#).

### 2.5.2.36 test\_strncmp\_boolean\_edges()

```
static void test_strncmp_boolean_edges (
    void ) [static]
```

Definition at line 432 of file [tests.c](#).

References [asm\\_strncmp\(\)](#), and [TEST\\_CASE](#).

Referenced by [main\(\)](#).

### 2.5.2.37 xorshift32()

```
static uint32_t xorshift32 (
    void ) [static]
```

Definition at line 58 of file [tests.c](#).

References [rng\\_state](#).

Referenced by [rand\\_ascii\\_printable\(\)](#), [test\\_case\\_conversion\\_roundtrip\(\)](#), [test\\_length\\_matches\\_strlen\\_small\(\)](#), and [test\\_strip\\_whitespace\\_properties\(\)](#).

## 2.5.3 Variable Documentation

### 2.5.3.1 g\_tests\_failed

```
int g_tests_failed = 0 [static]
```

Definition at line 16 of file [tests.c](#).

Referenced by [main\(\)](#).

### 2.5.3.2 g\_tests\_run

```
int g_tests_run = 0 [static]
```

Definition at line 15 of file [tests.c](#).

Referenced by [main\(\)](#).

### 2.5.3.3 g\_tests\_warned

```
int g_tests_warned = 0 [static]
```

Definition at line 17 of file [tests.c](#).

Referenced by [main\(\)](#), [test\\_get\\_line\\_tmpfile\(\)](#), and [test\\_get\\_line\\_too\\_long\(\)](#).

### 2.5.3.4 rng\_state

```
uint32_t rng_state = 0xC0FFEE01u [static]
```

Definition at line 57 of file [tests.c](#).

Referenced by [xorshift32\(\)](#).

## 2.6 tests.c

```
00001 /* written by AI */
00002 /* test_almog_string_manipulation.c */
00003
00004 #include <string.h>
00005 #include <stddef.h>
00006 #include <stdlib.h>
00007 #include <stdint.h>
00008
00009 #define ALMOG_STRING_MANIPULATION_IMPLEMENTATION
00010 #define NO_ERRORS
00011 #include "Almog_String_Manipulation.h"
00012
00013 /* ----- Test harness ----- */
00014
00015 static int g_tests_run = 0;
00016 static int g_tests_failed = 0;
00017 static int g_tests_warned = 0;
00018
00019 #define TEST_CASE(expr)
00020     do {
00021         g_tests_run++;
00022         if (!(expr)) {
00023             g_tests_failed++;
00024             fprintf(stderr, "[FAIL] %s:%d: %s\n", __FILE__, __LINE__, #expr);
00025         }
00026     } while (0)
00027
00028 #define TEST_WARN(expr, msg)
00029     do {
00030         g_tests_run++;
00031         if (!(expr)) {
00032             g_tests_warned++;
00033             fprintf(stderr, "[WARN] %s:%d: %s | %s\n", __FILE__, __LINE__,
00034                     #expr, msg);
00035     }
```

```

00036     } while (0)
00037
00038 #define TEST_EQ_INT(a, b) TEST_CASE((a) == (b))
00039 #define TEST_EQ_SIZE(a, b) TEST_CASE((a) == (b))
00040 #define TEST_EQ_STR(a, b) TEST_CASE(strcmp((a), (b)) == 0)
00041 #define TEST_NE_STR(a, b) TEST_CASE(strcmp((a), (b)) != 0)
00042
00043 static void fill_sentinel(unsigned char *buf, size_t n, unsigned char v)
00044 {
00045     for (size_t i = 0; i < n; i++) buf[i] = v;
00046 }
00047
00048 static bool is_nul_terminated_within(const char *s, size_t cap)
00049 {
00050     for (size_t i = 0; i < cap; i++) {
00051         if (s[i] == '\0') return true;
00052     }
00053     return false;
00054 }
00055
00056 /* Simple deterministic RNG for fuzz-ish tests */
00057 static uint32_t rng_state = 0xC0FEE01u;
00058 static uint32_t xorshift32(void)
00059 {
00060     uint32_t x = rng_state;
00061     x ^= x << 13;
00062     x ^= x >> 17;
00063     x ^= x << 5;
00064     rng_state = x;
00065     return x;
00066 }
00067
00068 static char rand_ascii_printable(void)
00069 {
00070     /* printable ASCII range 32..126 */
00071     return (char)(32 + (xorshift32() % 95));
00072 }
00073
00074 /* ----- Coverage checks -----*/
00075 * We can't reliably "assert all symbols exist" at runtime, but we can at least
00076 * ensure we have tests for every IMPLEMENTED function by calling it at least
00077 * once in this file.
00078 */
00079
00080 /* ----- Tests: ASCII classification ----- */
00081
00082 static void test_ascii_classification_exhaustive_ranges(void)
00083 {
00084     /* Check key boundaries and a few midpoints for each function. */
00085     TEST_CASE(asn_isdigit('0'));
00086     TEST_CASE(asn_isdigit('9'));
00087     TEST_CASE(!asn_isdigit('/'));
00088     TEST_CASE(!asn_isdigit(':'));
00089
00090     TEST_CASE(asn_isupper('A'));
00091     TEST_CASE(asn_isupper('Z'));
00092     TEST_CASE(!asn_isupper('@'));
00093     TEST_CASE(!asn_isupper(['']));
00094
00095     TEST_CASE(asn_islower('a'));
00096     TEST_CASE(asn_islower('z'));
00097     TEST_CASE(!asn_islower('`'));
00098     TEST_CASE(!asn_islower('`'));
00099
00100    TEST_CASE(asn_isalpha('A'));
00101    TEST_CASE(asn_isalpha('z'));
00102    TEST_CASE(!asn_isalpha('0'));
00103
00104    TEST_CASE(asn_isalnum('A'));
00105    TEST_CASE(asn_isalnum('9'));
00106    TEST_CASE(!asn_isalnum('_'));
00107    TEST_CASE(!asn_isalnum(' '));
00108
00109    TEST_CASE(asn_isspace(' '));
00110    TEST_CASE(asn_isspace('\n'));
00111    TEST_CASE(asn_isspace('\t'));
00112    TEST_CASE(asn_isspace('\r'));
00113    TEST_CASE(asn_isspace('\v'));
00114    TEST_CASE(asn_isspace('\f'));
00115    TEST_CASE(!asn_isspace('X'));
00116
00117    TEST_CASE(asn_isgraph('!'));
00118    TEST_CASE(asn_isgraph('~'));
00119    TEST_CASE(!asn_isgraph(' '));
00120
00121    TEST_CASE(asn_isprint(' '));
00122    TEST_CASE(asn_isprint('!'));

```

```

00123     TEST_CASE(!asm_isprint('\n'));
00124
00125     TEST_CASE(asm_ispunct('!'));
00126     TEST_CASE(asm_ispunct('/'));
00127     TEST_CASE(asm_ispunct(':'));
00128     TEST_CASE(!asm_ispunct('A'));
00129     TEST_CASE(!asm_ispunct('0'));
00130     TEST_CASE(!asm_ispunct(' '));
00131
00132     TEST_CASE(asm_iscntrl('\0'));
00133     TEST_CASE(asm_iscntrl('\n'));
00134     TEST_CASE(asm_iscntrl(127));
00135     TEST_CASE(!asm_iscntrl('A'));
00136
00137     /* Hex digit helpers (your impl splits by case) */
00138     TEST_CASE(asm_isxdigit('0'));
00139     TEST_CASE(asm_isxdigit('9'));
00140     TEST_CASE(asm_isxdigit('a'));
00141     TEST_CASE(asm_isxdigit('f'));
00142     TEST_CASE(!asm_isxdigit('g'));
00143     TEST_CASE(!asm_isxdigit('A'));
00144
00145     TEST_CASE(asm_isXdigit('0'));
00146     TEST_CASE(asm_isXdigit('9'));
00147     TEST_CASE(asm_isXdigit('A'));
00148     TEST_CASE(asm_isXdigit('F'));
00149     TEST_CASE(!asm_isXdigit('G'));
00150     TEST_CASE(!asm_isXdigit('a'));
00151 }
00152
00153 static void test_ascii_classification_full_scan_0_127(void)
00154 {
00155     /* Property checks over ASCII 0..127. */
00156     for (int c = 0; c <= 127; c++) {
00157         char ch = (char)c;
00158
00159         /* isalnum == isalpha || isdigit */
00160         TEST_CASE(asm_isalnum(ch) == (asm_isalpha(ch) || asm_isdigit(ch)));
00161
00162         /* isprint == isgraph || ' ' */
00163         TEST_CASE(asm_isprint(ch) == (asm_isgraph(ch) || ch == ' '));
00164
00165         /* isalpha implies not digit */
00166         if (asm_isalpha(ch)) {
00167             TEST_CASE(!asm_isdigit(ch));
00168         }
00169
00170         /* upper and lower are disjoint */
00171         if (asm_isupper(ch)) TEST_CASE(!asm_islower(ch));
00172         if (asm_islower(ch)) TEST_CASE(!asm_isupper(ch));
00173
00174         /* graph implies print */
00175         if (asm_isgraph(ch)) TEST_CASE(asm_isprint(ch));
00176     }
00177 }
00178
00179 /* ----- Tests: case conversion ----- */
00180
00181 static void test_case_conversion_roundtrip(void)
00182 {
00183     for (int i = 0; i < 200; i++) {
00184         char s[128];
00185         char a[128];
00186         char b[128];
00187
00188         /* random printable string length 0..40 */
00189         size_t n = (size_t)(xorshift32() % 41);
00190         for (size_t j = 0; j < n; j++) s[j] = rand_ascii_printable();
00191         s[n] = '\0';
00192
00193         strcpy(a, s);
00194         strcpy(b, s);
00195
00196         asm_tolower(a);
00197         asm_toupper(a);
00198         asm_toupper(b);
00199         asm_tolower(b);
00200
00201         /* Not equal generally, but must still be valid strings and stable */
00202         TEST_CASE(is_nul_terminated_within(a, sizeof(a)));
00203         TEST_CASE(is_nul_terminated_within(b, sizeof(b)));
00204
00205         /* toupper(toupper(x)) == toupper(x) */
00206         char u1[128], u2[128];
00207         strcpy(u1, s);
00208         strcpy(u2, s);
00209         asm_toupper(u1);

```

```

00210     asm_toupper(u2);
00211     asm_toupper(u2);
00212     TEST_EQ_STR(u1, u2);
00213
00214     /* tolower(tolower(x)) == tolower(x) */
00215     char l1[128], l2[128];
00216     strcpy(l1, s);
00217     strcpy(l2, s);
00218     asm_tolower(l1);
00219     asm_tolower(l2);
00220     asm_tolower(l2);
00221     TEST_EQ_STR(l1, l2);
00222 }
00223 }
00224
00225 /* ----- Tests: asm_length ----- */
00226
00227 static void test_length_matches_strlen_small(void)
00228 {
00229     for (int i = 0; i < 200; i++) {
00230         char s[256];
00231         size_t n = (size_t)(xorshift32() % 200);
00232         for (size_t j = 0; j < n; j++) s[j] = rand_ascii_printable();
00233         s[n] = '\0';
00234
00235         TEST_EQ_SIZE(asym_length(s), strlen(s));
00236     }
00237 }
00238
00239 /* ----- Tests: asym_memset ----- */
00240
00241 static void test_memset_basic_and_edges(void)
00242 {
00243     unsigned char buf[32];
00244     fill_sentinel(buf, sizeof(buf), 0xCC);
00245
00246     void *ret = asym_memset(buf, 0xAB, sizeof(buf));
00247     TEST_CASE(ret == buf);
00248     for (size_t i = 0; i < sizeof(buf); i++) TEST_CASE(buf[i] == 0xAB);
00249
00250     fill_sentinel(buf, sizeof(buf), 0xCC);
00251     asym_memset(buf, 0xAB, 0);
00252     for (size_t i = 0; i < sizeof(buf); i++) TEST_CASE(buf[i] == 0xCC);
00253 }
00254
00255 /* ----- Tests: asym_copy_array_by_indexes ----- */
00256
00257 static void test_copy_array_by_indexes_behavior_and_bounds(void)
00258 {
00259     const char *src = "abcdef";
00260     char out[16];
00261
00262     asym_copy_array_by_indexes(out, 1, 3, src); /* inclusive end in impl */
00263     TEST_EQ_STR(out, "bcd");
00264
00265     asym_copy_array_by_indexes(out, 0, 0, src);
00266     TEST_EQ_STR(out, "a");
00267
00268     asym_copy_array_by_indexes(out, 5, 5, src);
00269     TEST_EQ_STR(out, "f");
00270
00271     asym_copy_array_by_indexes(out, 0, 6, src); /* copies '\0' too */
00272     TEST_EQ_STR(out, "abcdef");
00273
00274     /* Sentinel around output buffer to detect overwrite beyond out[16] */
00275     struct {
00276         unsigned char pre[8];
00277         char out2[8];
00278         unsigned char post[8];
00279     } box;
00280
00281     fill_sentinel(box.pre, sizeof(box.pre), 0xA5);
00282     fill_sentinel((unsigned char *)box.out2, sizeof(box.out2), 0xCC);
00283     fill_sentinel(box.post, sizeof(box.post), 0x5A);
00284
00285     /* copy "ab" plus '\0' => should fit exactly */
00286     asym_copy_array_by_indexes(box.out2, 0, 1, "ab");
00287     TEST_EQ_STR(box.out2, "ab");
00288     for (size_t i = 0; i < sizeof(box.pre); i++) TEST_CASE(box.pre[i] == 0xA5);
00289     for (size_t i = 0; i < sizeof(box.post); i++) TEST_CASE(box.post[i] == 0x5A);
00290 }
00291
00292 /* ----- Tests: shifting/padding ----- */
00293
00294 static void test_left_shift_edges(void)
00295 {
00296     char s[64];

```

```
00297
00298     strcpy(s, "abcdef");
00299     asm_shift_left(s, 0);
00300     TEST_EQ_STR(s, "abcdef");
00301
00302     strcpy(s, "abcdef");
00303     asm_shift_left(s, 1);
00304     TEST_EQ_STR(s, "bcdef");
00305
00306     strcpy(s, "abcdef");
00307     asm_shift_left(s, 5);
00308     TEST_EQ_STR(s, "f");
00309
00310     strcpy(s, "abcdef");
00311     asm_shift_left(s, 6);
00312     TEST_EQ_STR(s, "");
00313
00314     strcpy(s, "abcdef");
00315     asm_shift_left(s, 1000);
00316     TEST_EQ_STR(s, "");
00317 }
00318
00319 static void test_left_pad_edges_and_sentinel(void)
00320 {
00321     {
00322         char s[64] = "abc";
00323         asm_pad_left(s, 0, ' ');
00324         TEST_EQ_STR(s, "abc");
00325     }
00326     {
00327         char s[64] = "abc";
00328         asm_pad_left(s, 4, ' ');
00329         TEST_EQ_STR(s, "    abc");
00330     }
00331     {
00332         char s[64] = "";
00333         asm_pad_left(s, 3, '_');
00334         TEST_EQ_STR(s, "__");
00335     }
00336
00337 /* Sentinel structure: ensure we don't write before start */
00338 struct {
00339     unsigned char pre[8];
00340     char s[32];
00341     unsigned char post[8];
00342 } box;
00343
00344 fill_sentinel(box.pre, sizeof(box.pre), 0x11);
00345 fill_sentinel((unsigned char *)box.s, sizeof(box.s), 0xCC);
00346 fill_sentinel(box.post, sizeof(box.post), 0x22);
00347
00348 strcpy(box.s, "x");
00349 asm_pad_left(box.s, 5, '0');
00350 TEST_EQ_STR(box.s, "00000x");
00351
00352 for (size_t i = 0; i < sizeof(box.pre); i++) TEST_CASE(box.pre[i] == 0x11);
00353 for (size_t i = 0; i < sizeof(box.post); i++) TEST_CASE(box.post[i] == 0x22);
00354 }
00355
00356 /* ----- Tests: remove/strip/whitespace ----- */
00357
00358 static void test_remove_char_from_string_edges(void)
00359 {
00360     char s[64];
00361
00362     strcpy(s, "abcd");
00363     asm_remove_char_from_string(s, 1);
00364     TEST_EQ_STR(s, "acd");
00365
00366     strcpy(s, "abcd");
00367     asm_remove_char_from_string(s, 0);
00368     TEST_EQ_STR(s, "bcd");
00369
00370     strcpy(s, "abcd");
00371     asm_remove_char_from_string(s, 3);
00372     TEST_EQ_STR(s, "abc");
00373
00374     strcpy(s, "a");
00375     asm_remove_char_from_string(s, 0);
00376     TEST_EQ_STR(s, "");
00377
00378     strcpy(s, "");
00379     asm_remove_char_from_string(s, 0);
00380     TEST_EQ_STR(s, "");
00381
00382     strcpy(s, "abcd");
00383     asm_remove_char_from_string(s, 999);
```

```

00384     TEST_EQ_STR(s, "abcd");
00385 }
00386
00387 static void test_strip_whitespace_properties(void)
00388 {
00389     char s[128];
00390
00391     strcpy(s, " a \t b\n c ");
00392     asm_strip_whitespace(s);
00393     TEST_EQ_STR(s, "abc");
00394
00395     strcpy(s, "no_spaces");
00396     asm_strip_whitespace(s);
00397     TEST_EQ_STR(s, "no_spaces");
00398
00399     strcpy(s, "\t\r\n");
00400     asm_strip_whitespace(s);
00401     TEST_EQ_STR(s, "");
00402
00403 /* Property: result has no whitespace chars */
00404 for (int i = 0; i < 100; i++) {
00405     size_t n = (size_t)(xorshift32() % 60);
00406     for (size_t j = 0; j < n; j++) {
00407         /* mix whitespace and printable */
00408         uint32_t r = xorshift32() % 10;
00409         if (r == 0) s[j] = ' ';
00410         else if (r == 1) s[j] = '\n';
00411         else if (r == 2) s[j] = '\t';
00412         else s[j] = rand_ascii_printable();
00413     }
00414     s[n] = '\0';
00415
00416     asm_strip_whitespace(s);
00417     for (size_t k = 0; s[k] != '\0'; k++) {
00418         TEST_CASE(!asm_isspace(s[k]));
00419     }
00420 }
00421 }
00422
00423 static void test_str_is_whitespace_edges(void)
00424 {
00425     TEST_CASE(asm_str_is_whitespace("\t\r\n") == true);
00426     TEST_CASE(asm_str_is_whitespace("") == true); /* current behavior */
00427     TEST_CASE(asm_str_is_whitespace("x ") == false);
00428 }
00429
00430 /* ----- Tests: asm_strncmp (boolean) ----- */
00431
00432 static void test_strncmp_boolean_edges(void)
00433 {
00434     TEST_CASE(asm_strncmp("abc", "abc", 3) == 1);
00435     TEST_CASE(asm_strncmp("abc", "abd", 3) == 0);
00436     TEST_CASE(asm_strncmp("ab", "abc", 3) == 0);
00437     TEST_CASE(asm_strncmp("abc", "ab", 3) == 0);
00438
00439     TEST_CASE(asm_strncmp("abc", "XYZ", 0) == 1);
00440
00441     TEST_CASE(asm_strncmp("", "", 5) == 1);
00442     TEST_CASE(asm_strncmp("", "a", 1) == 0);
00443     TEST_CASE(asm_strncmp("a", "", 1) == 0);
00444 }
00445
00446 /* ----- Tests: asm_str_in_str ----- */
00447
00448 static void test_str_in_str_overlap_and_edges(void)
00449 {
00450     TEST_EQ_INT(asm_str_in_str("aaaa", "aa"), 3);
00451     TEST_EQ_INT(asm_str_in_str("hello world", "lo"), 1);
00452     TEST_EQ_INT(asm_str_in_str("abc", "abcd"), 0);
00453     TEST_EQ_INT(asm_str_in_str("abababa", "aba"), 3);
00454
00455     /* Do not pass empty needle: undefined-ish for your implementation. */
00456 }
00457
00458 /* ----- Tests: base digit helpers ----- */
00459
00460 static void test_base_digit_helpers(void)
00461 {
00462     TEST_CASE(asm_check_char_belong_to_base('0', 2) == true);
00463     TEST_CASE(asm_check_char_belong_to_base('1', 2) == true);
00464     TEST_CASE(asm_check_char_belong_to_base('2', 2) == false);
00465
00466     TEST_CASE(asm_check_char_belong_to_base('9', 10) == true);
00467     TEST_CASE(asm_check_char_belong_to_base('a', 10) == false);
00468
00469     TEST_CASE(asm_check_char_belong_to_base('a', 16) == true);
00470     TEST_CASE(asm_check_char_belong_to_base('f', 16) == true);

```

```

00471     TEST_CASE(asn_check_char_belong_to_base('g', 16) == false);
00472     TEST_CASE(asn_check_char_belong_to_base('A', 16) == true);
00473     TEST_CASE(asn_check_char_belong_to_base('F', 16) == true);
00474     TEST_CASE(asn_check_char_belong_to_base('G', 16) == false);
00475
00476     TEST_CASE(asn_check_char_belong_to_base('z', 36) == true);
00477     TEST_CASE(asn_check_char_belong_to_base('Z', 36) == true);
00478
00479     TEST_EQ_INT(asn_get_char_value_in_base('0', 10), 0);
00480     TEST_EQ_INT(asn_get_char_value_in_base('9', 10), 9);
00481     TEST_EQ_INT(asn_get_char_value_in_base('A', 16), 10);
00482     TEST_EQ_INT(asn_get_char_value_in_base('f', 16), 15);
00483     TEST_EQ_INT(asn_get_char_value_in_base('z', 36), 35);
00484
00485     TEST_EQ_INT(asn_get_char_value_in_base('g', 16), -1);
00486
00487     /* base validity errors should return false / -1 */
00488     TEST_CASE(asn_check_char_belong_to_base('0', 1) == false);
00489     TEST_CASE(asn_check_char_belong_to_base('0', 37) == false);
00490     TEST_EQ_INT(asn_get_char_value_in_base('0', 1), -1);
00491 }
00492
00493 /* ----- Tests: str2int/size_t/float/double ----- */
00494
00495 static void test_str2int(void)
00496 {
00497     const char *end = NULL;
00498
00499     {
00500         char s[] = " -1011zzz";
00501         int v = asn_str2int(s, &end, 2);
00502         TEST_CASE(v == -11);
00503         TEST_CASE(*end == 'z');
00504     }
00505     {
00506         char s[] = "+7fff!";
00507         int v = asn_str2int(s, &end, 16);
00508         TEST_CASE(v == 0x7fff);
00509         TEST_CASE(*end == '!');
00510     }
00511     {
00512         char s[] = " +0";
00513         int v = asn_str2int(s, &end, 10);
00514         TEST_CASE(v == 0);
00515         TEST_CASE(*end == '\0');
00516     }
00517     {
00518         char s[] = "xyz";
00519         int v = asn_str2int(s, &end, 10);
00520         TEST_CASE(v == 0);
00521         TEST_CASE(*end == 'x');
00522     }
00523     {
00524         char s[] = "123";
00525         int v = asn_str2int(s, &end, 1);
00526         TEST_CASE(v == 0);
00527         TEST_CASE(end == s);
00528     }
00529 }
00530
00531 static void test_str2size_t(void)
00532 {
00533     const char *end = NULL;
00534
00535     {
00536         char s[] = " +1f!";
00537         size_t v = asn_str2size_t(s, &end, 16);
00538         TEST_CASE(v == 3lu);
00539         TEST_CASE(*end == '!');
00540     }
00541     {
00542         char s[] = " -1";
00543         size_t v = asn_str2size_t(s, &end, 10);
00544         TEST_CASE(v == 0);
00545         TEST_CASE(end == s);
00546     }
00547     {
00548         char s[] = " +0009x";
00549         size_t v = asn_str2size_t(s, &end, 10);
00550         TEST_CASE(v == 9u);
00551         TEST_CASE(*end == 'x');
00552     }
00553     {
00554         char s[] = " 123";
00555         size_t v = asn_str2size_t(s, &end, 37);
00556         TEST_CASE(v == 0);
00557         /* current implementation sets *end = s+num_of_whitespace on invalid base */

```

```

00558     TEST_CASE(end == s + 2);
00559 }
00560 }
00561
00562 static void test_str2float_double(void)
00563 {
00564     const char *end = NULL;
00565
00566 {
00567     char s[] = " 10.5x";
00568     float v = asm_str2float(s, &end, 10);
00569     TEST_CASE(v > 10.49f && v < 10.51f);
00570     TEST_CASE(*end == 'x');
00571 }
00572 {
00573     char s[] = "-a.bQ";
00574     double v = asm_str2double(s, &end, 16);
00575     TEST_CASE(v < -10.68 && v > -10.70);
00576     TEST_CASE(*end == 'Q');
00577 }
00578 {
00579     char s[] = " 123.";
00580     double v = asm_str2double(s, &end, 10);
00581     TEST_CASE(v > 122.99 && v < 123.01);
00582     TEST_CASE(*end == '\0');
00583 }
00584 {
00585     char s[] = ".5";
00586     double v = asm_str2double(s, &end, 10);
00587     TEST_CASE(v > 0.49 && v < 0.51);
00588     TEST_CASE(*end == '\0');
00589 }
00590 {
00591     char s[] = "-.";
00592     double v = asm_str2double(s, &end, 10);
00593     TEST_CASE(v == 0.0);
00594     TEST_CASE(*end == '\0');
00595 }
00596 {
00597     char s[] = "12.3";
00598     double v = asm_str2double(s, &end, 37);
00599     TEST_CASE(v == 0.0);
00600     TEST_CASE(end == s);
00601 }
00602 }
00603
00604 /* ----- Tests: tokenization helpers ----- */
00605
00606 static void test_get_next_word_from_line_current_behavior(void)
00607 {
00608     /* Your implementation:
00609      * - does NOT skip whitespace
00610      * - stops only on delimiter or '\0'
00611      * - returns length (j), not consumed index
00612     */
00613 {
00614     char src[] = "abc,def";
00615     char w[64] = {0};
00616     int r = asm_get_next_token_from_str(w, src, ',');
00617     TEST_EQ_INT(r, 3);
00618     TEST_EQ_STR(w, "abc");
00619 }
00620 {
00621     char src[] = ",def";
00622     char w[64] = {0};
00623     int r = asm_get_next_token_from_str(w, src, ',');
00624     TEST_EQ_INT(r, 0);
00625     TEST_EQ_STR(w, "");
00626 }
00627 {
00628     char src[] = " abc,def";
00629     char w[64] = {0};
00630     int r = asm_get_next_token_from_str(w, src, ',');
00631     TEST_EQ_INT(r, 5);
00632     TEST_EQ_STR(w, " abc");
00633 }
00634 {
00635     char src[] = "abc\ndef";
00636     char w[64] = {0};
00637     int r = asm_get_next_token_from_str(w, src, '\n');
00638     TEST_EQ_INT(r, (int)strlen(src));
00639     TEST_EQ_STR(w, "abc\ndef");
00640 }
00641
00642     /* Doc mismatch detection (warn, not fail) */
00643 {
00644     char src[] = " abc,def";

```

```
00645     char w[64] = {0};
00646     asm_get_next_token_from_str(w, src, ',');
00647     TEST_CASE(strcmp(w, "abc") == 0);
00648 }
00649 }
00650
00651 static void test_get_word_and_cut_edges(void)
00652 {
00653 {
00654     char src[64] = "abc,def";
00655     char w[64] = {0};
00656     int ok = asm_get_token_and_cut(w, src, ',', true);
00657     TEST_CASE(ok == 1);
00658     TEST_EQ_STR(w, "abc");
00659     TEST_EQ_STR(src, ",def");
00660 }
00661 {
00662     char src[64] = "abc,def";
00663     char w[64] = {0};
00664     int ok = asm_get_token_and_cut(w, src, ',', false);
00665     TEST_CASE(ok == 1);
00666     TEST_EQ_STR(w, "abc");
00667     TEST_EQ_STR(src, "def");
00668 }
00669 {
00670     char src[64] = ",def";
00671     char w[64] = {0};
00672     int ok = asm_get_token_and_cut(w, src, ',', true);
00673     TEST_CASE(ok == 0);
00674     TEST_EQ_STR(w, "");
00675     TEST_EQ_STR(src, ",def");
00676 }
00677 {
00678     char src[64] = "nodelem";
00679     char w[64] = {0};
00680     int ok = asm_get_token_and_cut(w, src, ',', false);
00681     TEST_CASE(ok == 1);
00682     TEST_EQ_STR(w, "nodelem");
00683     TEST_EQ_STR(src, "");
00684 }
00685 }
00686
00687 /* ----- Tests: asm_get_line ----- */
00688
00689 static void test_get_line_tmpfile(void)
00690 {
00691     FILE *fp = tmpfile();
00692     if (!fp) {
00693         fprintf(stderr,
00694                 "[WARN] tmpfile() unavailable; skipping asm_get_line tests\n");
00695         g_tests_warned++;
00696         return;
00697     }
00698
00699     fputs("hello\n", fp);
00700     fputs("\n", fp);
00701     fputs("world", fp);
00702     rewind(fp);
00703
00704 {
00705     char line[ASM_MAX_LEN + 1];
00706     int n = asm_get_line(fp, line);
00707     TEST_EQ_INT(n, 5);
00708     TEST_EQ_STR(line, "hello");
00709     TEST_CASE(is_nul_terminated_within(line, sizeof(line)));
00710 }
00711 {
00712     char line[ASM_MAX_LEN + 1];
00713     int n = asm_get_line(fp, line);
00714     TEST_EQ_INT(n, 0);
00715     TEST_EQ_STR(line, "");
00716 }
00717 {
00718     char line[ASM_MAX_LEN + 1];
00719     int n = asm_get_line(fp, line);
00720     TEST_EQ_INT(n, 5);
00721     TEST_EQ_STR(line, "world");
00722 }
00723 {
00724     char line[ASM_MAX_LEN + 1];
00725     int n = asm_get_line(fp, line);
00726     TEST_EQ_INT(n, -1);
00727 }
00728
00729 fclose(fp);
00730 }
```

```

00732 /* Optional: test overflow condition using ASM_MAX_LEN+1 chars before '\n' */
00733 static void test_get_line_too_long(void)
00734 {
00735     FILE *fp = tmpfile();
00736     if (!fp) {
00737         fprintf(stderr,
00738             "[WARN] tmpfile() unavailable; skipping long-line test\n");
00739         g_tests_warned++;
00740         return;
00741     }
00742
00743     for (int i = 0; i < ASM_MAX_LEN + 5; i++) fputc('a', fp);
00744     fputc('\n', fp);
00745     rewind(fp);
00746
00747     char line[ASM_MAX_LEN + 1];
00748     fill_sentinel((unsigned char *)line, sizeof(line), 0xCC);
00749
00750     int n = asm_get_line(fp, line);
00751     TEST_EQ_INT(n, -1);
00752
00753     /* On error, your docs say not guaranteed NUL terminated. We only ensure
00754      we didn't write past buffer size (can't directly prove; but at least
00755      array exists). */
00756     fclose(fp);
00757 }
00758
00759 /* ----- Tests: asm_strncat ----- */
00760
00761 static void test_strncat_current_behavior_and_sentinel(void)
00762 {
00763     /* Current impl does NOT append '\0' (bug-like).
00764      We test both:
00765      - it copies correct bytes
00766      - it does not clobber past allowed region
00767     */
00768     struct {
00769         unsigned char pre[8];
00770         char s1[16];
00771         unsigned char post[8];
00772     } box;
00773
00774     fill_sentinel(box.pre, sizeof(box.pre), 0xAA);
00775     fill_sentinel((unsigned char *)box.s1, sizeof(box.s1), 0xCC);
00776     fill_sentinel(box.post, sizeof(box.post), 0xBB);
00777
00778     strcpy(box.s1, "abc");
00779
00780     int n = asm_strncat(box.s1, "DEF", 3);
00781     TEST_EQ_INT(n, 3);
00782
00783     TEST_EQ_STR(box.s1, "abcDEF");
00784
00785     for (size_t i = 0; i < sizeof(box.pre); i++) TEST_CASE(box.pre[i] == 0xAA);
00786     for (size_t i = 0; i < sizeof(box.post); i++) TEST_CASE(box.post[i] == 0xBB);
00787 }
00788
00789 /* ----- Tests: str2float/double with exponent notation ----- */
00790
00791 static void test_str2float_exponent_basic(void)
00792 {
00793     const char *end = NULL;
00794     float v;
00795
00796     /* Basic positive exponents */
00797     v = asm_str2float("1e2", &end, 10);
00798     TEST_CASE(v > 99.9f && v < 100.1f);
00799     TEST_CASE(*end == '\0');
00800
00801     v = asm_str2float("1.5e3", &end, 10);
00802     TEST_CASE(v > 1499.9f && v < 1500.1f);
00803     TEST_CASE(*end == '\0');
00804
00805     v = asm_str2float("5e2", &end, 10);
00806     TEST_CASE(v > 499.9f && v < 500.1f);
00807     TEST_CASE(*end == '\0');
00808
00809     /* Basic negative exponents */
00810     v = asm_str2float("1e-2", &end, 10);
00811     TEST_CASE(v > 0.0099f && v < 0.0101f);
00812     TEST_CASE(*end == '\0');
00813
00814     v = asm_str2float("5e-1", &end, 10);
00815     TEST_CASE(v > 0.49f && v < 0.51f);
00816     TEST_CASE(*end == '\0');
00817
00818     v = asm_str2float("2.5e-3", &end, 10);

```

```
00819     TEST_CASE(v > 0.00249f && v < 0.00251f);
00820     TEST_CASE(*end == '\0');
00821
00822     /* Exponent with explicit positive sign */
00823     v = asm_str2float("1e+2", &end, 10);
00824     TEST_CASE(v > 99.9f && v < 100.1f);
00825     TEST_CASE(*end == '\0');
00826
00827     v = asm_str2float("3.5e+1", &end, 10);
00828     TEST_CASE(v > 34.9f && v < 35.1f);
00829     TEST_CASE(*end == '\0');
00830 }
00831
00832 static void test_str2float_exponent_signed_mantissa(void)
00833 {
00834     const char *end = NULL;
00835     float v;
00836
00837     /* Negative mantissa with positive exponent */
00838     v = asm_str2float("-1e2", &end, 10);
00839     TEST_CASE(v > -100.1f && v < -99.9f);
00840     TEST_CASE(*end == '\0');
00841
00842     v = asm_str2float("-2.5e3", &end, 10);
00843     TEST_CASE(v > -2500.1f && v < -2499.9f);
00844     TEST_CASE(*end == '\0');
00845
00846     /* Negative mantissa with negative exponent */
00847     v = asm_str2float("-1.0e-2", &end, 10);
00848     TEST_CASE(v > -0.0101f && v < -0.0099f);
00849     TEST_CASE(*end == '\0');
00850
00851     v = asm_str2float("-5e-1", &end, 10);
00852     TEST_CASE(v > -0.51f && v < -0.49f);
00853     TEST_CASE(*end == '\0');
00854
00855     /* Positive sign with exponent */
00856     v = asm_str2float("+1.5e2", &end, 10);
00857     TEST_CASE(v > 149.9f && v < 150.1f);
00858     TEST_CASE(*end == '\0');
00859
00860     v = asm_str2float("+3e-2", &end, 10);
00861     TEST_CASE(v > 0.0299f && v < 0.0301f);
00862     TEST_CASE(*end == '\0');
00863 }
00864
00865 static void test_str2float_exponent_edge_cases(void)
00866 {
00867     const char *end = NULL;
00868     float v;
00869
00870     /* Zero exponent */
00871     v = asm_str2float("5e0", &end, 10);
00872     TEST_CASE(v > 4.99f && v < 5.01f);
00873     TEST_CASE(*end == '\0');
00874
00875     v = asm_str2float("3.14e0", &end, 10);
00876     TEST_CASE(v > 3.13f && v < 3.15f);
00877     TEST_CASE(*end == '\0');
00878
00879     /* Zero mantissa */
00880     v = asm_str2float("0e5", &end, 10);
00881     TEST_CASE(v > -0.01f && v < 0.01f);
00882     TEST_CASE(*end == '\0');
00883
00884     v = asm_str2float("0.0e-3", &end, 10);
00885     TEST_CASE(v > -0.01f && v < 0.01f);
00886     TEST_CASE(*end == '\0');
00887
00888     /* No integer part */
00889     v = asm_str2float(".5e2", &end, 10);
00890     TEST_CASE(v > 49.9f && v < 50.1f);
00891     TEST_CASE(*end == '\0');
00892
00893     v = asm_str2float(".25e-1", &end, 10);
00894     TEST_CASE(v > 0.0249f && v < 0.0251f);
00895     TEST_CASE(*end == '\0');
00896
00897     /* No fractional part */
00898     v = asm_str2float("10.e2", &end, 10);
00899     TEST_CASE(v > 999.9f && v < 1000.1f);
00900     TEST_CASE(*end == '\0');
00901
00902     /* Uppercase E */
00903     v = asm_str2float("1E2", &end, 10);
00904     TEST_CASE(v > 99.9f && v < 100.1f);
00905     TEST_CASE(*end == '\0');
```

```

00906
00907     v = asm_str2float("5E-3", &end, 10);
00908     TEST_CASE(v > 0.00499f && v < 0.00501f);
00909     TEST_CASE(*end == '\0');
00910 }
00911
00912 static void test_str2float_exponent_with_trailing(void)
00913 {
00914     const char *end = NULL;
00915     float v;
00916
00917     /* Exponent with trailing characters */
00918     v = asm_str2float("1.5e2xyz", &end, 10);
00919     TEST_CASE(v > 149.9f && v < 150.1f);
00920     TEST_CASE(*end == 'x');
00921
00922     v = asm_str2float("3e-1!", &end, 10);
00923     TEST_CASE(v > 0.29f && v < 0.31f);
00924     TEST_CASE(*end == '!');
00925
00926     v = asm_str2float(" -2.5e3 ", &end, 10);
00927     TEST_CASE(v > -2500.1f && v < -2499.9f);
00928     TEST_CASE(*end == ' ');
00929 }
00930
00931 static void test_str2double_exponent_basic(void)
00932 {
00933     const char *end = NULL;
00934     double v;
00935
00936     /* Basic positive exponents */
00937     v = asm_str2double("1e2", &end, 10);
00938     TEST_CASE(v > 99.99 && v < 100.01);
00939     TEST_CASE(*end == '\0');
00940
00941     v = asm_str2double("1.5e3", &end, 10);
00942     TEST_CASE(v > 1499.99 && v < 1500.01);
00943     TEST_CASE(*end == '\0');
00944
00945     /* Basic negative exponents */
00946     v = asm_str2double("1e-2", &end, 10);
00947     TEST_CASE(v > 0.0099 && v < 0.0101);
00948     TEST_CASE(*end == '\0');
00949
00950     v = asm_str2double("-1.0e-2", &end, 10);
00951     TEST_CASE(v > -0.0101 && v < -0.0099);
00952     TEST_CASE(*end == '\0');
00953
00954     /* Higher precision than float */
00955     v = asm_str2double("3.141592653589793e0", &end, 10);
00956     TEST_CASE(v > 3.141592653 && v < 3.141592654);
00957     TEST_CASE(*end == '\0');
00958 }
00959
00960 static void test_str2double_exponent_signed_mantissa(void)
00961 {
00962     const char *end = NULL;
00963     double v;
00964
00965     /* Negative mantissa with exponents */
00966     v = asm_str2double("-2.5e3", &end, 10);
00967     TEST_CASE(v > -2500.01 && v < -2499.99);
00968     TEST_CASE(*end == '\0');
00969
00970     v = asm_str2double("-5e-1", &end, 10);
00971     TEST_CASE(v > -0.51 && v < -0.49);
00972     TEST_CASE(*end == '\0');
00973
00974     /* Positive sign */
00975     v = asm_str2double("+1.5e2", &end, 10);
00976     TEST_CASE(v > 149.99 && v < 150.01);
00977     TEST_CASE(*end == '\0');
00978 }
00979
00980 static void test_str2double_exponent_edge_cases(void)
00981 {
00982     const char *end = NULL;
00983     double v;
00984
00985     /* Zero exponent */
00986     v = asm_str2double("5e0", &end, 10);
00987     TEST_CASE(v > 4.99 && v < 5.01);
00988     TEST_CASE(*end == '\0');
00989
00990     /* Zero mantissa */
00991     v = asm_str2double("0e5", &end, 10);
00992     TEST_CASE(v > -0.01 && v < 0.01);

```

```

0093     TEST_CASE(*end == '\0');

0094
0095     /* No integer part */
0096     v = asm_str2double(".5e2", &end, 10);
0097     TEST_CASE(v > 49.99 && v < 50.01);
0098     TEST_CASE(*end == '\0');

0099
0100    /* Uppercase E */
0101    v = asm_str2double("1E2", &end, 10);
0102    TEST_CASE(v > 99.99 && v < 100.01);
0103    TEST_CASE(*end == '\0');

0104 }
0105
0106 static void test_str2float_double_exponent_different_bases(void)
0107 {
0108     const char *end = NULL;
0109     float vf;
0110     double vd;
0111
0112     /* Binary with exponent (base 2)
0113      * 1.le3 in base 2 = 1.5 * 2^3 = 1.5 * 8 = 12 */
0114     vf = asm_str2float("1.1e3", &end, 2);
0115     TEST_CASE(vf > 11.9f && vf < 12.1f);
0116     TEST_CASE(*end == '\0');

0117
0118     vd = asm_str2double("1.1e3", &end, 2);
0119     TEST_CASE(vd > 11.99 && vd < 12.01);
0120     TEST_CASE(*end == '\0');

0121
0122     /* Octal with exponent (base 8)
0123      * 7.4e2 in base 8 = (7 + 4/8) * 8^2 = 7.5 * 64 = 480 */
0124     vf = asm_str2float("7.4e2", &end, 8);
0125     TEST_CASE(vf > 479.9f && vf < 480.1f);
0126     TEST_CASE(*end == '\0');

0127
0128     vd = asm_str2double("7.4e2", &end, 8);
0129     TEST_CASE(vd > 479.99 && vd < 480.01);
0130     TEST_CASE(*end == '\0');

0131 }
0132
0133 static void test_str2float_double_exponent_whitespace(void)
0134 {
0135     const char *end = NULL;
0136     float vf;
0137     double vd;
0138
0139     /* Leading whitespace */
0140     vf = asm_str2float("\t\n1.5e2", &end, 10);
0141     TEST_CASE(vf > 149.9f && vf < 150.1f);
0142     TEST_CASE(*end == '\0');

0143
0144     vd = asm_str2double("\t\n-2.5e-3", &end, 10);
0145     TEST_CASE(vd > -0.00251 && vd < -0.00249);
0146     TEST_CASE(*end == '\0');

0147 }
0148
0149 static void test_str2float_double_exponent_large_values(void)
0150 {
0151     const char *end = NULL;
0152     float vf;
0153     double vd;
0154
0155     /* Larger exponents */
0156     vf = asm_str2float("1e5", &end, 10);
0157     TEST_CASE(vf > 99999.0f && vf < 100001.0f);
0158     TEST_CASE(*end == '\0');

0159
0160     vd = asm_str2double("1e10", &end, 10);
0161     TEST_CASE(vd > 9999999999.0 && vd < 10000000001.0);
0162     TEST_CASE(*end == '\0');

0163
0164     /* Very small exponents */
0165     vf = asm_str2float("1e-5", &end, 10);
0166     TEST_CASE(vf > 0.000009f && vf < 0.000011f);
0167     TEST_CASE(*end == '\0');

0168
0169     vd = asm_str2double("1e-10", &end, 10);
0170     TEST_CASE(vd > 0.0000000009 && vd < 0.0000000011);
0171     TEST_CASE(*end == '\0');

0172 }
0173
0174 /* ----- Main ----- */
0175
0176 int main(void)
0177 {
0178     test_ascii_classification_exhaustive_ranges();
0179     test_ascii_classification_full_scan_0_127();

```

```
01080
01081     test_case_conversion_roundtrip();
01082
01083     test_length_matches_strlen_small();
01084
01085     test_memset_basic_and_edges();
01086
01087     test_copy_array_by_indexes_behavior_and_bounds();
01088
01089     test_left_shift_edges();
01090     test_left_pad_edges_and_sentinel();
01091
01092     test_remove_char_form_string_edges();
01093     test_strip_whitespace_properties();
01094     test_str_is_whitespace_edges();
01095
01096     test_strncmp_boolean_edges();
01097     test_str_in_str_overlap_and_edges();
01098
01099     test_base_digit_helpers();
01100     test_str2int();
01101     test_str2size_t();
01102     test_str2float_double();
01103
01104     test_str2float_exponent_basic();
01105     test_str2float_exponent_signed_mantissa();
01106     test_str2float_exponent_edge_cases();
01107     test_str2float_exponent_with_trailing();
01108     test_str2double_exponent_basic();
01109     test_str2double_exponent_signed_mantissa();
01110     test_str2double_exponent_edge_cases();
01111     test_str2float_double_exponent_different_bases();
01112     test_str2float_double_exponent_whitespace();
01113     test_str2float_double_exponent_large_values();
01114
01115     test_get_next_word_from_line_current_behavior();
01116     test_get_word_and_cut_edges();
01117
01118     test_get_line_tmpfile();
01119     test_get_line_too_long();
01120
01121     test_strncat_current_behavior_and_sentinel();
01122
01123 if (g_tests_failed == 0) {
01124     if (g_tests_warned == 0) {
01125         printf("[OK] %d tests passed\n", g_tests_run);
01126     } else {
01127         printf("[OK] %d tests passed, %d warnings\n", g_tests_run,
01128               g_tests_warned);
01129     }
01130     return 0;
01131 }
01132
01133 fprintf(stderr, "[FAIL] %d/%d tests failed (%d warnings)\n",
01134         g_tests_run, g_tests_warned);
01135 return 1;
01136 }
```

# Index

Almog\_String\_Manipulation.h, 3  
asm\_check\_char\_belong\_to\_base, 10  
asm\_copy\_array\_by\_indexes, 11  
asm\_dprintCHAR, 6  
asm\_dprintDOUBLE, 7  
asm\_dprintERROR, 7  
asm\_dprintFLOAT, 7  
asm\_dprintINT, 8  
asm\_dprintSIZE\_T, 8  
asm\_dprintSTRING, 8  
asm\_get\_char\_value\_in\_base, 11  
asm\_get\_line, 12  
asm\_get\_next\_token\_from\_str, 13  
asm\_get\_token\_and\_cut, 13  
asm\_isalnum, 14  
asm\_isalpha, 15  
asm\_isbdigit, 15  
asm\_iscntrl, 16  
asm\_isdigit, 16  
asm\_isgraph, 16  
asm\_islower, 17  
asm\_isodigit, 17  
asm\_isprint, 18  
asm\_ispunct, 18  
asm\_isspace, 19  
asm\_isupper, 19  
asm\_isXdigit, 20  
asm\_isxdigit, 20  
asm\_length, 20  
ASM\_MALLOC, 8  
asm\_max, 9  
ASM\_MAX\_LEN, 9  
asm\_memset, 21  
asm\_min, 9  
asm\_pad\_left, 22  
asm\_print\_many\_times, 22  
asm\_remove\_char\_from\_string, 23  
asm\_shift\_left, 23  
asm\_str2double, 24  
asm\_str2float, 25  
asm\_str2int, 25  
asm\_str2size\_t, 26  
asm\_str\_in\_str, 27  
asm\_str\_is\_whitespace, 27  
asm\_strdup, 28  
asm\_strip\_whitespace, 28  
asm\_strncat, 29  
asm\_strncmp, 29  
asm\_strncpy, 30  
asm\_tolower, 31  
asm\_toupper, 31  
asm\_trim\_left whitespace, 31  
ALMOG\_STRING\_MANIPULATION\_IMPLEMENTATION  
temp.c, 41  
tests.c, 43  
asm\_check\_char\_belong\_to\_base  
    Almog\_String\_Manipulation.h, 10  
asm\_copy\_array\_by\_indexes  
    Almog\_String\_Manipulation.h, 11  
asm\_dprintCHAR  
    Almog\_String\_Manipulation.h, 6  
asm\_dprintDOUBLE  
    Almog\_String\_Manipulation.h, 7  
asm\_dprintERROR  
    Almog\_String\_Manipulation.h, 7  
asm\_dprintFLOAT  
    Almog\_String\_Manipulation.h, 7  
asm\_dprintINT  
    Almog\_String\_Manipulation.h, 8  
asm\_dprintSIZE\_T  
    Almog\_String\_Manipulation.h, 8  
asm\_dprintSTRING  
    Almog\_String\_Manipulation.h, 8  
asm\_get\_char\_value\_in\_base  
    Almog\_String\_Manipulation.h, 11  
asm\_get\_line  
    Almog\_String\_Manipulation.h, 12  
asm\_get\_next\_token\_from\_str  
    Almog\_String\_Manipulation.h, 13  
asm\_get\_token\_and\_cut  
    Almog\_String\_Manipulation.h, 13  
asm\_isalnum  
    Almog\_String\_Manipulation.h, 14  
asm\_isalpha  
    Almog\_String\_Manipulation.h, 15  
asm\_isbdigit  
    Almog\_String\_Manipulation.h, 15  
asm\_iscntrl  
    Almog\_String\_Manipulation.h, 16  
asm\_isdigit  
    Almog\_String\_Manipulation.h, 16  
asm\_isgraph  
    Almog\_String\_Manipulation.h, 16  
asm\_islower  
    Almog\_String\_Manipulation.h, 17  
asm\_isodigit  
    Almog\_String\_Manipulation.h, 17  
asm\_isprint

Almog\_String\_Manipulation.h, 18  
 asm\_ispunct  
     Almog\_String\_Manipulation.h, 18  
 asm\_isspace  
     Almog\_String\_Manipulation.h, 19  
 asm\_isupper  
     Almog\_String\_Manipulation.h, 19  
 asm\_isXdigit  
     Almog\_String\_Manipulation.h, 20  
 asm\_isxdigit  
     Almog\_String\_Manipulation.h, 20  
 asm\_length  
     Almog\_String\_Manipulation.h, 20  
 ASM\_MALLOC  
     Almog\_String\_Manipulation.h, 8  
 asm\_max  
     Almog\_String\_Manipulation.h, 9  
 ASM\_MAX\_LEN  
     Almog\_String\_Manipulation.h, 9  
 asm\_memset  
     Almog\_String\_Manipulation.h, 21  
 asm\_min  
     Almog\_String\_Manipulation.h, 9  
 asm\_pad\_left  
     Almog\_String\_Manipulation.h, 22  
 asm\_print\_many\_times  
     Almog\_String\_Manipulation.h, 22  
 asm\_remove\_char\_from\_string  
     Almog\_String\_Manipulation.h, 23  
 asm\_shift\_left  
     Almog\_String\_Manipulation.h, 23  
 asm\_str2double  
     Almog\_String\_Manipulation.h, 24  
 asm\_str2float  
     Almog\_String\_Manipulation.h, 25  
 asm\_str2int  
     Almog\_String\_Manipulation.h, 25  
 asm\_str2size\_t  
     Almog\_String\_Manipulation.h, 26  
 asm\_str\_in\_str  
     Almog\_String\_Manipulation.h, 27  
 asm\_str\_is whitespace  
     Almog\_String\_Manipulation.h, 27  
 asm\_strdup  
     Almog\_String\_Manipulation.h, 28  
 asm\_strip whitespace  
     Almog\_String\_Manipulation.h, 28  
 asm\_strncat  
     Almog\_String\_Manipulation.h, 29  
 asm\_strncmp  
     Almog\_String\_Manipulation.h, 29  
 asm\_strncpy  
     Almog\_String\_Manipulation.h, 30  
 asm\_tolower  
     Almog\_String\_Manipulation.h, 31  
 asm\_toupper  
     Almog\_String\_Manipulation.h, 31  
 asm\_trim\_left whitespace

Almog\_String\_Manipulation.h, 31  
 fill\_sentinel  
     tests.c, 45  
 g\_tests\_failed  
     tests.c, 54  
 g\_tests\_run  
     tests.c, 54  
 g\_tests\_warned  
     tests.c, 55  
 is\_nul\_terminated\_within  
     tests.c, 45  
 main  
     temp.c, 41  
     tests.c, 45  
 NO\_ERRORS  
     tests.c, 43  
 rand\_ascii\_printable  
     tests.c, 46  
 rng\_state  
     tests.c, 55  
 temp.c, 40  
     ALMOG\_STRING\_MANIPULATION\_IMPLEMENTATION,  
         41  
     main, 41  
 test\_ascii\_classification\_exhaustive\_ranges  
     tests.c, 46  
 test\_ascii\_classification\_full\_scan\_0\_127  
     tests.c, 46  
 test\_base\_digit\_helpers  
     tests.c, 46  
 TEST\_CASE  
     tests.c, 43  
 test\_case\_conversion\_roundtrip  
     tests.c, 47  
 test\_copy\_array\_by\_indexes\_behavior\_and\_bounds  
     tests.c, 47  
 TEST\_EQ\_INT  
     tests.c, 44  
 TEST\_EQ\_SIZE  
     tests.c, 44  
 TEST\_EQ\_STR  
     tests.c, 44  
 test\_get\_line\_tmpfile  
     tests.c, 47  
 test\_get\_line\_too\_long  
     tests.c, 47  
 test\_get\_next\_word\_from\_line\_current\_behavior  
     tests.c, 48  
 test\_get\_word\_and\_cut\_edges  
     tests.c, 48  
 test\_left\_pad\_edges\_and\_sentinel  
     tests.c, 48  
 test\_left\_shift\_edges

tests.c, 48  
test\_length\_matches\_strlen\_small  
tests.c, 49  
test\_memset\_basic\_and\_edges  
tests.c, 49  
TEST\_NE\_STR  
tests.c, 44  
test\_remove\_char\_form\_string\_edges  
tests.c, 49  
test\_str2double\_exponent\_basic  
tests.c, 49  
test\_str2double\_exponent\_edge\_cases  
tests.c, 50  
test\_str2double\_exponent\_signed\_mantissa  
tests.c, 50  
test\_str2float\_double  
tests.c, 50  
test\_str2float\_double\_exponent\_different\_bases  
tests.c, 50  
test\_str2float\_double\_exponent\_large\_values  
tests.c, 51  
test\_str2float\_double\_exponent\_whitespace  
tests.c, 51  
test\_str2float\_exponent\_basic  
tests.c, 51  
test\_str2float\_exponent\_edge\_cases  
tests.c, 51  
test\_str2float\_exponent\_signed\_mantissa  
tests.c, 52  
test\_str2float\_exponent\_with\_trailing  
tests.c, 52  
test\_str2int  
tests.c, 52  
test\_str2size\_t  
tests.c, 52  
test\_str\_in\_str\_overlap\_and\_edges  
tests.c, 53  
test\_str\_is\_whitespace\_edges  
tests.c, 53  
test\_strip\_whitespace\_properties  
tests.c, 53  
test\_strncat\_current\_behavior\_and\_sentinel  
tests.c, 53  
test\_strncmp\_boolean\_edges  
tests.c, 54  
TEST\_WARN  
tests.c, 44  
tests.c, 42  
ALMOG\_STRING\_MANIPULATION\_IMPLEMENTATION,  
43  
fill\_sentinel, 45  
g\_tests\_failed, 54  
g\_tests\_run, 54  
g\_tests\_warned, 55  
is\_nul\_terminated\_within, 45  
main, 45  
NO\_ERRORS, 43  
rand\_ascii\_printable, 46  
rng\_state, 55  
test\_ascii\_classification\_exhaustive\_ranges, 46  
test\_ascii\_classification\_full\_scan\_0\_127, 46  
test\_base\_digit\_helpers, 46  
TEST\_CASE, 43  
test\_case\_conversion\_roundtrip, 47  
test\_copy\_array\_by\_indexes\_behavior\_and\_bounds,  
47  
TEST\_EQ\_INT, 44  
TEST\_EQ\_SIZE, 44  
TEST\_EQ\_STR, 44  
test\_get\_line\_tmpfile, 47  
test\_get\_line\_too\_long, 47  
test\_get\_next\_word\_from\_line\_current\_behavior,  
48  
test\_get\_word\_and\_cut\_edges, 48  
test\_left\_pad\_edges\_and\_sentinel, 48  
test\_left\_shift\_edges, 48  
test\_length\_matches\_strlen\_small, 49  
test\_memset\_basic\_and\_edges, 49  
TEST\_NE\_STR, 44  
test\_remove\_char\_form\_string\_edges, 49  
test\_str2double\_exponent\_basic, 49  
test\_str2double\_exponent\_edge\_cases, 50  
test\_str2double\_exponent\_signed\_mantissa, 50  
test\_str2float\_double, 50  
test\_str2float\_double\_exponent\_different\_bases,  
50  
test\_str2float\_double\_exponent\_large\_values, 51  
test\_str2float\_double\_exponent\_whitespace, 51  
test\_str2float\_exponent\_basic, 51  
test\_str2float\_exponent\_edge\_cases, 51  
test\_str2float\_exponent\_signed\_mantissa, 52  
test\_str2float\_exponent\_with\_trailing, 52  
test\_str2int, 52  
test\_str2size\_t, 52  
test\_str\_in\_str\_overlap\_and\_edges, 53  
test\_str\_is\_whitespace\_edges, 53  
test\_strip\_whitespace\_properties, 53  
test\_strncat\_current\_behavior\_and\_sentinel, 53  
test\_strncmp\_boolean\_edges, 54  
TEST\_WARN, 44  
xorshift32, 54  
xorshift32  
tests.c, 54