Informatik - Exercise Session
Characters and Recursion[1]

[1] Recursion, see [1]

Characters - Useful to know

All ASCII characters (`char`) can be treated as 8-bit integers (for our purposes).

To append a single element to the end of a vector, use:

```
auto vec = std::vector<char>();
char c = ?;
vec.push_back(c);
```

ASCII

Excerpt of an ASCII table (the rest are unprintable control sequences or special characters):

int	char	int	char	int	char	int	char	int	char	int	char
32	␣	48	0	64	@	80	P	96	‘	112	p
33	!	49	1	65	A	81	Q	97	a	113	q
34	”	50	2	66	B	82	R	98	b	114	r
35	#	51	3	67	C	83	S	99	c	115	s
36	$	52	4	68	D	84	T	100	d	116	t
37	%	53	5	69	E	85	U	101	e	117	u
38	&	54	6	70	F	86	V	102	f	118	v
39	’	55	7	71	G	87	W	103	g	119	w
40	(	56	8	72	H	88	X	104	h	120	x
41	)	57	9	73	I	89	Y	105	i	121	y
42	*	58	:	74	J	90	Z	106	j	122	z
43	+	59	;	75	K	91	[	107	k	123	{
44	,	60	<	76	L	92	\	108	l	124	|
45	-	61	=	77	M	93	]	109	m	125	}
46	.	62	>	78	N	94	^	110	n	126	~
47	/	63	?	79	O	95	_	111	o	127	DEL

How To Recursion

1. Never forget the base case(s)!
2. If there already is a recursive formula: just implement it.
3. If you need to find the formula:
   3.1 Find the base case(s).
   3.2 Assume case for `n-1` or `n/2` or similar is given, then find out how to get case `n`.
   3.3 Implement.
4. Never forget the base case(s)!

Power Function

Consider the following function:

```
int f(const int x, const int n) {
    if (n == 0) {
        return 1;
    } else if (n == 1) {
        return x;
    }
    return x * f(x, n-1);
}
```

It computes x^n recursively.

How many (recursive) calls to `f()` are made to calculate x^7?

`f(x, 7)` $\rightarrow$ `f(x, 6)` $\rightarrow$ `f(x, 5)` $\rightarrow$ `f(x, 4)` $\rightarrow$ `f(x, 3)` $\rightarrow$ `f(x, 2)` $\rightarrow$ `f(x, 1)`.