

COMP 1010- Summer 2015 (A01)

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Example: Calendar

Setup globals

CAL_TOP (50)

CAL_LEFT (50)

CAL_DAYS (31)

CAL_SPACE (60)

TEXT_SIZE (30)

Draw header row.

S	M	T	W	R	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Draw calendar numbers

Single for loop through days

Day -> row, column mapping?

Integer arithmetic

S	M	T	W	R	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Highlight selected cell

If a cell is clicked on, it gets selected and stays selected

But how to keep track?

Highlight selected cell

Global variable – selected!

Default day?

set to impossible

When drawing days, test if selected is the day

if so, highlight

How to select with mouse?

At each calendar spot, calculate left, right, top, bottom

Check if the mouse is within that, AND, the button is clicked

At home:

Let the user deselect the cell by clicking, but not a day

Debug!!! Header disappears if you click last day

```
• final int CANVAS_SIZE = 500;
• final int CAL_TOP = 50;
• final int CAL_LEFT = 50;
• final int CAL_DAYS = 31;
• final int CAL_SPACE = 60;
• final int TEXT_SIZE = 30;
• int selected = 10;

• void setup()
• {
•   size(CANVAS_SIZE, CANVAS_SIZE);
•   textSize(TEXT_SIZE);
• }

• void draw()
• {
•   background(0);

•   int x = CAL_LEFT;
•   int y = CAL_TOP;
•   String s = "S";
•   text(s, x, y);

•   x += CAL_SPACE;
•   s = "M";
•   text(s, x, y);

•   x += CAL_SPACE;
•   s = "T";
•   text(s, x, y);

•   x += CAL_SPACE;
•   s = "W";
•   text(s, x, y);

•   x += CAL_SPACE;
•   s = "R";
•   text(s, x, y);
```

```
•   x += CAL_SPACE;
•   s = "F";
•   text(s, x, y);

•   x += CAL_SPACE;
•   s = "S";
•   text(s, x, y);

•   // draw the numbers
•   for (int i = 1; i <= CAL_DAYS; i++)
•   {
•     int row = i/7+1;
•     int col = i%7;
•     x = col*CAL_SPACE+CAL_LEFT; // left
•     y = row*CAL_SPACE+CAL_TOP; // bottom
•     int top = y-CAL_SPACE;
•     int right = x+CAL_SPACE;

•     if (mouseX>x && mouseX < right &&
•         mouseY>top && mouseY < y && mousePressed)
•     {
•       selected = i;
•     }

•     if (selected == i) // current day is sel
•     {
•       fill(255);
•       rect(x, y-CAL_SPACE, CAL_SPACE, CAL_SPACE);
•       fill(0);
•     } else { // not selected
•       fill(255);
•     }
•     text(i, x, y);
•   }
• }
```


Calendar Exercises:

Exercise: set which day of the week the calendar starts on

Exercise: fix the highlighting to be better centered around the number

Exercise: highlight Sundays and Wednesdays on the calendar

Example: count number of digits

If we draw a number on screen, then knowing the number of digits is useful

larger numbers can be made smaller to fit

But how to count the number of digits?

First, program setup

Number variable, increase by mouseX each time
(grows nicely)

Draw the text at 0,height-1 (bottom left).

Text size is $1.5 * \text{width} / \text{digits}$ (scales with digits)

Count digits?

Trick:

```
number = 1234;
```

```
number /= 10; // integer division, now 123
```

```
number /= 10; // now 12.
```

Dividing by 10 strips a digit

What happens at the end?

```
number /= 10; // now 1
```

```
number /= 10; // now 0
```

```
number /= 10; // still 0
```

Loop setup:

While number isn't 0, divide by 10, and count the digits we have stripped

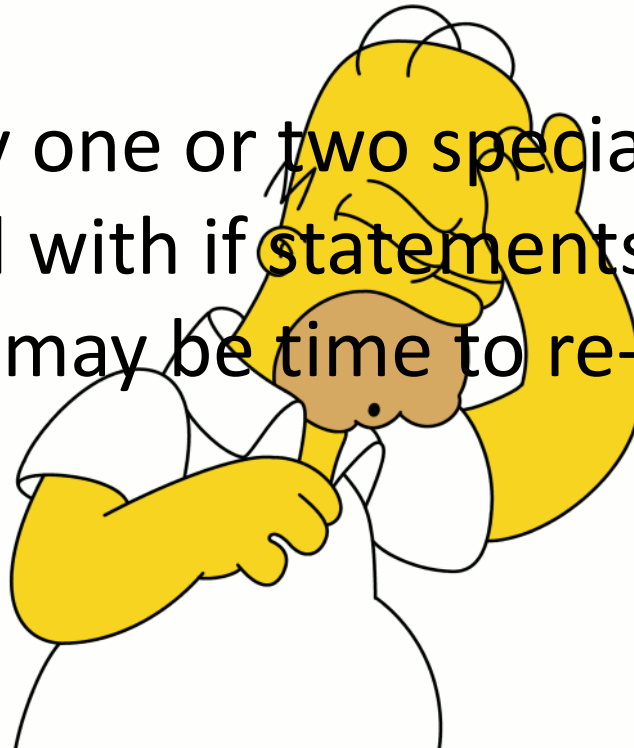
but wait! a special case! what happens if
the number is 0?

How many digits?

!!! special case !!!

note: in computer programming you will often find **special cases** that break your algorithm. D'oh!
Either you fix your algorithm to remove the special cases, or, you handle the special cases separately.

if there is only one or two special cases they are often handled with if statements. if you have many special cases, may be time to re-think your algorithm.



Example: interactive temperature scale

Globals!

S_TOP

S_LEFT

S_WIDTH

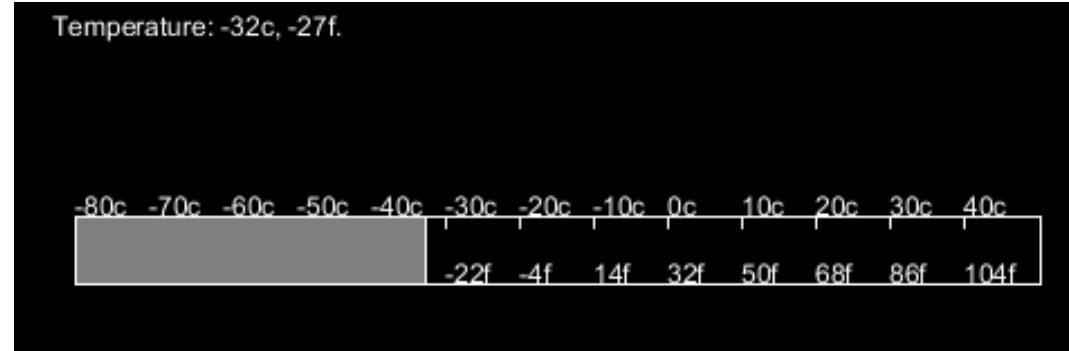
S_HEIGHT

HOT

COLD

TEMP_RANGE

Draw outside rectangle



Example: interactive temperature scale

Tick mark calculations

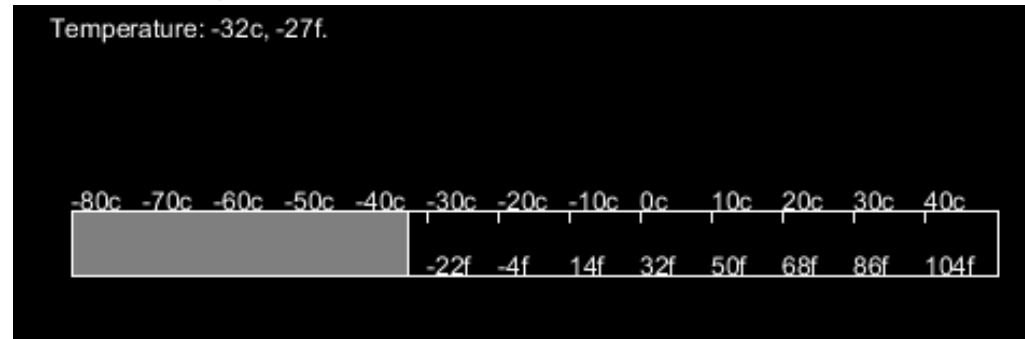
DEG_PER_TICK

TICKS

TICK_SPACING

TICK_HEIGHT

Draw ticks (for loop!!)



labels

Calculate and output celcius label at each tick

Calculate Fahrenheit:

$$f = 9/5c + 32$$

Output at each tick at bottom of scale

Mouse interactive..

- Calculate how far along the scale the mouse is. Take the mouse position and subtract the left end of the scale
- Make sure we're not off either end of the scale!!
- Draw the filling using that width

Mouse reading

Convert the mouse position to percentage,

Then convert to temperature

Put a string out with the reading

char type

holds a single character

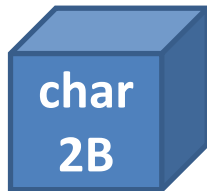
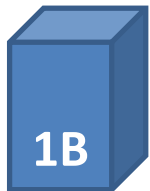
```
char variablename = 'x';
```

you specify a single character by using single quotes: 'x'

note: a String is " " and a char is ' '

traditionally, 1 byte

in Processing, its 2 bytes (don't memorize)



what is a single character??

a letter, e.g., 'f'

a number, e.g., '8'

a symbol, e.g., '+'

a space, ' '

etc...

Is there an empty character?

no

How Computers stores characters

in the old days, computers only had a small number of characters they could display:

ASCII standard:

this is a table of characters, and each character has a number.

standard ASCII table:

ASCII value	Character	Control character	ASCII value	Character	ASCII value	Character	ASCII value	Character
000	(null)	NUL	032	(space)	064	@	096	
001	☺	SOH	033	!	065	A	097	a
002	☹	STX	034	"	066	B	098	b
003	♥	ETX	035	#	067	C	099	c
004	♦	EOT	036	\$	068	D	100	d
005	♣	ENQ	037	%	069	E	101	e
006	♠	ACK	038	&	070	F	102	f
007	(beep)	BEL	039	'	071	G	103	g
008	■	BS	040	(	072	H	104	h
009	(tab)	HT	041	)	073	I	105	i
010	(line feed)	LF	042	*	074	J	106	j
011	(home)	VT	043	+	075	K	107	k
012	(form feed)	FF	044	,	076	L	108	l
013	(carriage return)	CR	045	-	077	M	109	m
014	♪	SO	046	.	078	N	110	n
015	☼	SI	047	/	079	O	111	o
016	▲	DLE	048	0	080	P	112	p
017	▼	DC1	049	1	081	Q	113	q
018	↕	DC2	050	2	082	R	114	r
019	!!	DC3	051	3	083	S	115	s
020	π	DC4	052	4	084	T	116	t
021	§	NAK	053	5	085	U	117	u
022	▬	SYN	054	6	086	V	118	v
023	↕	ETB	055	7	087	W	119	w
024	↑	CAN	056	8	088	X	120	x
025	↓	EM	057	9	089	Y	121	y
026	→	SUB	058	:	090	Z	122	z
027	←	ESC	059	;	091	[	123	{
028	(cursor right)	FS	060	<	092	\	124	|
029	(cursor left)	GS	061	=	093	]	125	}
030	(cursor up)	RS	062	>	094	^	126	~
031	(cursor down)	US	063	?	095	_	127	␣

why do we number the characters?

ASCII value	Character
----------------	-----------

064	@
065	A
066	B
067	C
068	D
069	E
070	F
071	G
072	H
073	I
074	J
075	K
076	L
077	M
078	N
079	O

everything in a computer is stored as numbers.

even your music and photos!!!

some clever people decided on a standard numbering, so that, e.g., the number 65 is A, 78 is N, etc.

How to check the ascii number of a character?

Force the data into an integer

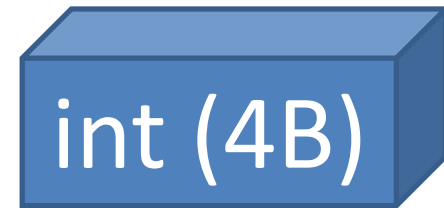
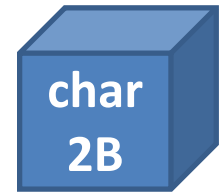
(advanced, gimmicky, don't study)

Char and casting

Since the character is simply an integer number underneath, you can convert back and forth to an integer.

char -> int is a widening cast because the int has more memory (implicit cast)

int->char is a narrowing cast because the char is less capable: requires an explicit cast



ASCII is limited!!!

ASCII value	Character	Control character	ASCII value	Character	ASCII value	Character	ASCII value	Character
000	(null)	NUL	032	(space)	064	@	096	
001	☺	SOH	033	!	065	A	097	a
002	☹	STX	034	"	066	B	098	b
003	♥	ETX	035	#	067	C	099	c
004	♦	EOT	036	\$	068	D	100	d
005	♣	ENQ	037	%	069	E	101	e
006	♠	ACK	038	&	070	F	102	f
007	(beep)	BEL	039	'	071	G	103	g
008	▣	BS	040	(	072	H	104	h
009	(tab)	HT	041	)	073	I	105	i
010	(line feed)	LF	042	*	074	J	106	j
011	(home)	VT	043	+	075	K	107	k
012	(form feed)	FF	044	,	076	L	108	l
013	(carriage return)	CR	045	-	077	M	109	m
014	☐	SO	046	.	078	N	110	n

only one language at a time:

language-specific, accented letters, etc.

does not handle complex writing systems!

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remember those garbled websites?

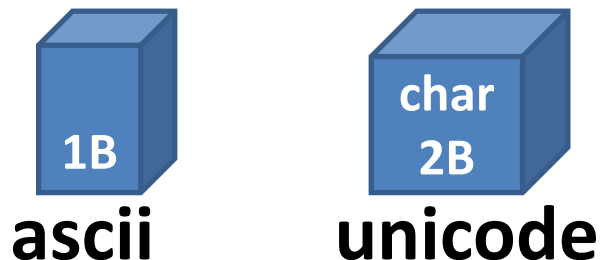
Unicode:

ONE standard for all languages
is the reason I can put many languages at once:

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double the memory of ASCII –

note: each character takes 2 bytes of memory.



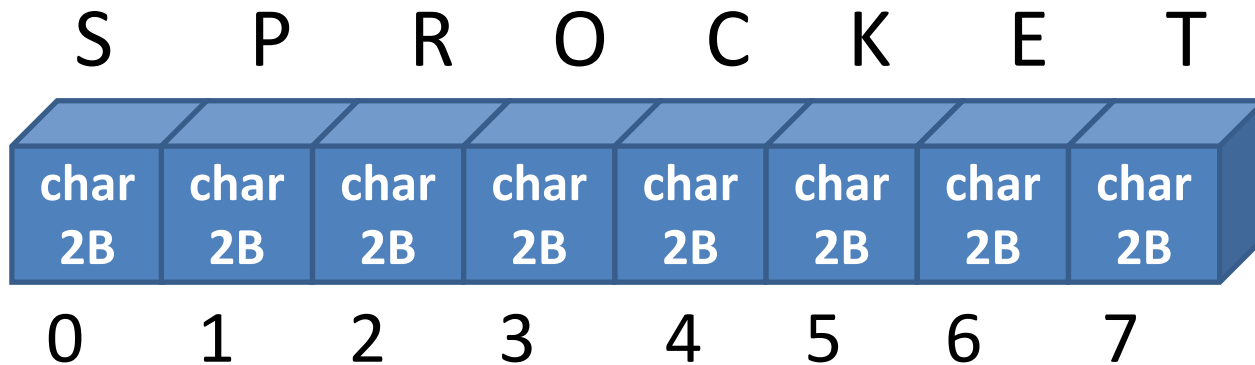
String indices

each box has a designated number

the 1st box is box 0

2nd is box 1..... and so forth

Note: OFF BY ONE ERROR!



String methods!! (Object)

Your string variable type has several built-in **methods** (commands) that you can use.

```
variableName.method(parameters);
```

```
String dogName;
```

```
dogName = "sprocket";
```

```
// dogName.method(parameters);
```

```
dogName.length(); // takes no parameters
```

```
...
```


String Length:

```
int variableName.length()
```

What is the length of this string?

note: the index of the last character is
`string.length() - 1`

off by one error

