TypeScript

入門1

Getting Started

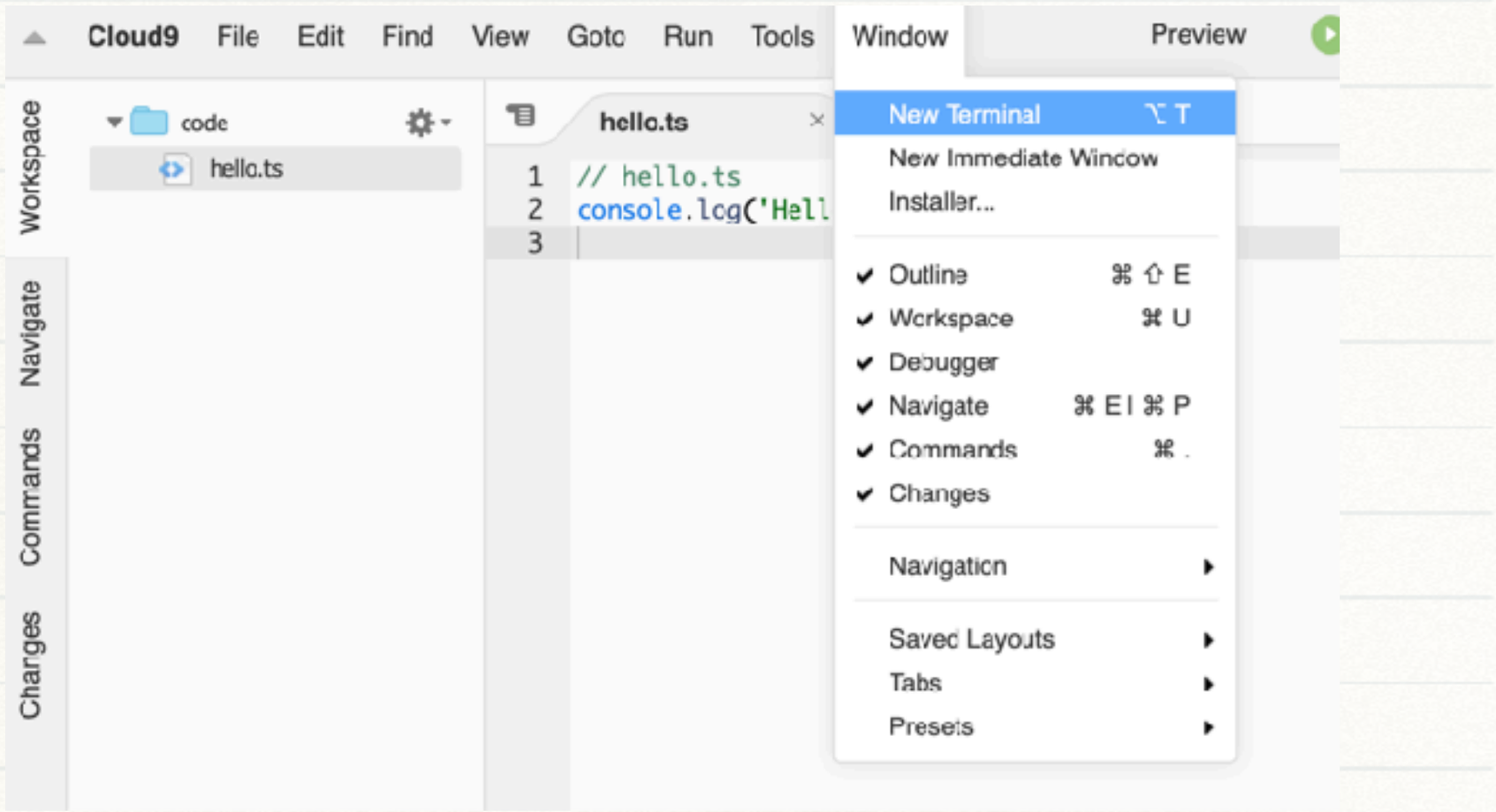
Hello, world!

Hello, world!

hello.ts
拡張子は .ts

```
// hello.ts
console.log('Hello, world!');
```

Window → New Terminal
実行してください



deno

10 Things I Regret About Node.js - Ryan Dahl

```
deno run filename.ts
    --help
    --reload
```

```
$ deno run hello.ts
Hello, world!
```

拡張子 .js も試しましょう

```
$ deno run hello.js
Hello, world!
```

```
ls
pwd
cd

mkdir
rmdir
cp
rm
```

```
$ ls
$ pwd
$ cd
$ pwd

$ cd /code
```

```
zip -r file.zip dir
```

コメント

```
// コメント

console.log('Hello, world!');      // 行の途中からコメント


/*
   複数行のコメント

*/


/**
 * document comment
 */
```

TYPEDOC

https://typedoc.org/

https://typedoc.org/guides/doccomments/

Lesson1

リテラル、変数、型

リテラル 数値、文字列

数値（number）

浮動小数点、整数はない

```
1
10.1
1.23e-4

0b1111
0o10
0x12

12345678901234567890      // -> 12345678901234567000

12345678901234567890n     // bigint
123456789012345678901234567890123456789012345678901234567890n
```

bigint

文字列（string）

```
'string'
"string"
'"'
"'"

'\''
"\""

'\\'
'\n'
```

環境によっては \ ではなく ¥ を使用

MacOSでは、キーボードの設定を U.S. にして \ を使用してください

リテラル 真偽値、Object、配列

真偽値

```
true
false
```

Object {}

```
{ x: 1.1, y: 3, z: 4.4 }

{
    name: 'yamada',
    age: 28
}
```

配列Array []

```
[ 1.1, 3, 4.4 ]

[
    [ 1, 2, 3 ],
    [ 4, 5, 6 ],
    [ 7, 8, 9 ]
]

[
    { name: 'yamada', age: 28 },
    { name: 'tanaka', age: 34 }
]
```

変数 const, let, var

なるべく、const を使用

let は値を変更できる

なるべく、var は使用しないこと

```
// ex1.ts
const a = 1;
a = 2;

let b = 1;
b = 2;
b = 'abc';
```

```
$ deno run ex1.ts
error: Uncaught TypeError: Assignment to constant variable.
a = 2;
 ^
    at file:///Users/shingo1551/Documents/github/course/ts1/lesson1/ex1.ts:3:2
```

拡張子 .js も試しましょう

```
$ deno check ex1.ts
Check file:///Users/shingo1551/Documents/github/course/ts1/lesson1/ex1.ts
error: TS2588 [ERROR]: Cannot assign to 'a' because it is a constant.
a = 2;
^
    at file:///Users/shingo1551/Documents/github/course/ts1/lesson1/ex1.ts:3:1

TS2322 [ERROR]: Type 'string' is not assignable to type 'number'.
b = 'abc';
^
    at file:///Users/shingo1551/Documents/github/course/ts1/lesson1/ex1.ts:7:1
Found 2 errors.
```

型 typeof

さまざまな、型

```
number
string
boolean
object

function
undefined

bigint
symbol
```

型 typeof number, bigint

```ts
// ex2.ts
const log = console.log;

// number
log(typeof 1, 1);
log(typeof 10.1, 10.1);
log(typeof 1.23e-4, 1.23e-4);

log(typeof 0b1111, 0b1111);
log(typeof 0o10, 0o10);
log(typeof 0x12, 0x12);

log(typeof 12345678901234567890, 12345678901234567890);

// big int
log(typeof 12345678901234567890n, 12345678901234567890n);
log(
  typeof 123456789012345678901234567890123456789012345678901234567890n,
  123456789012345678901234567890123456789012345678901234567890n
);
```

型 typeof（実行結果）

```
$ deno run ex2.ts
number 1
number 10.1
number 0.000123
number 15
number 8
number 18
number 12345678901234567000
bigint 12345678901234567890n
bigint 123456789012345678901234567890123456789012345678901234567890n
```

型 typeof function, string, boolean, object

```
// ex3.ts
const log = console.log;

// function
log(typeof log);

// string
log(typeof 'string', 'string');
log(typeof 'string', 'string');

// boolean
log(typeof false, false);
log(typeof true, true);

// object
const o = { x: 1.1, y: 3, z: 4.4 };
log(typeof o, o);

const a = [1.1, 3, 4.4];
log(typeof a, a);
```

型 typeof（実行結果）

```
$ deno run ex3.ts
function
string string
string string
boolean false
boolean true
object { x: 1.1, y: 3, z: 4.4 }
object [ 1.1, 3, 4.4 ]
```

型推論

明示的に型を記述しなくていい

javaと同じ <型> も使用できる

```
// ex4.ts
const log = console.log;

//
let a = 1;

let b: number;

let c = 3 as number;
let d = <number>4;

b = 2;

log(typeof a, a);
log(typeof b, b);
log(typeof c, c);
log(typeof d, d);
log(typeof log, log);
```

```
$ deno run ex4.ts
number 1
number 2
number 3
number 4
```

JSX

jsxでは <tag> を使用できる

```
ReactDOM.render(
  <h1>Hello, world!</h1>,
  document.getElementById('root')
);
```

Lesson2

演算子

演算子

算術演算子	+	/	%	
	-	*	**	
等価演算子	==	!=	===	!==
関係演算子	in	<	<=	
	instanceof	>	>=	
単項演算子	delete	typeof	+	~
	void		-	!
インクリメント & デクリメント	i++	i--	++i	--i
ビット演算子	&	|	^	
論理演算子	&&	||		
代入演算子	=	%=	<<=	&=
	*=	+=	>>=	^=
	/=	-=	>>>=	|=

演算子 2

代入演算子 2

```
const list = [1, 2, 3];
let [a, b, c, d] = list;

const o = { x: 1, y: 2, z: 3 };
let { x, z } = o;
```

条件(三項)演算子

```
    condition ? ifTrue : ifFalse
```

スプレッド**構文**

```
    ...obj
```

演算子 例1

```ts
// ex1.ts
const log = console.log;

//
log(1 == '1');
log(1 === '1');

log(0 == false);
log(0 === false);

//
log(null == undefined);
log(null === undefined);
```

```
$ deno run ex1.ts
true
false
true
false
true
false
```

演算子 例1（続き）

拡張子 `.js` も試しましょう

```
$ deno check ex1.ts
Check file:///Users/shingo1551/Documents/github/course/ts1/lesson2/ex1.ts
error: TS2367 [ERROR]: This condition will always return 'false' since the types 'number' and 'string' have no overlap.
log(1 == '1');
    ~~~~~~~~
    at file:///Users/shingo1551/Documents/github/course/ts1/lesson2/ex1.ts:5:5

TS2367 [ERROR]: This condition will always return 'false' since the types 'number' and 'string' have no overlap.
log(1 === '1');
    ~~~~~~~~~
    at file:///Users/shingo1551/Documents/github/course/ts1/lesson2/ex1.ts:6:5

TS2367 [ERROR]: This condition will always return 'false' since the types 'number' and 'boolean' have no overlap.
log(0 == false);
    ~~~~~~~~~~
    at file:///Users/shingo1551/Documents/github/course/ts1/lesson2/ex1.ts:8:5

TS2367 [ERROR]: This condition will always return 'false' since the types 'number' and 'boolean' have no overlap.
log(0 === false);
    ~~~~~~~~~~~
    at file:///Users/shingo1551/Documents/github/course/ts1/lesson2/ex1.ts:9:5

Found 4 errors.
```

演算子 例2

いくつか試してみましょう

```
// ex2.ts
const log = console.log;

//
const list = [1, 2, 3];
let [a, b, c, d] = list;
log(a, b, c, d);

[a, b] = [4, 5, 6, 7];
log(a, b);

//
const o = { x: 1, y: 2, z: 3 };
let { x, z } = o;
log(x, z);
```

```
$ deno run ex2.ts
1 2 3 undefined
4 5
1 3
```

演算子 例3

いくつか試してみましょう

```
// ex3.ts
const log = console.log;

//
const m = [1, 2];
const n = [7, 8, 9];
const l = [...m, ...n];
log(l);

//
const o = { a: 1, b: 2 };
const p = { x: 1, y: 2, z: 3 };
const q = { ...o, ...p };
log(q);

//
const a = [...'abcxyz'];
log(a);
```

```
$ deno run ex3.ts
[ 1, 2, 7, 8, 9 ]
{ a: 1, b: 2, x: 1, y: 2, z: 3 }
[ "a", "b", "c", "x", "y", "z" ]
```

Lesson3

予約語、識別子

予約語

Reserved Words	break	else	in	try
	case	enum	instanceof	typeof
	catch	export	new	var
	class	extends	null	void
	const	false	return	while
	continue	finally	super	with
	debugger	for	switch	
	default	function	this	
	delete	if	throw	
	do	import	true	

Strict Mode Reserved Words	as	private	
	implements	protected	
	interface	public	
	let	static	
	package	yield	

Contextual Keywords	any	module	symbol
	boolean	require	type
	constructor	number	from
	declare	set	of
	get	string	

その他、定義済	NaN	
	Infinity	

識別子　変数名、関数名など...

大文字と小文字は区別

演算子、予約語など、使用できない

特殊文字で、_ $ は使用可

0-9 数字で始まるものは不可

```
// ex1.ts
const _a = '_a';
const $a = '$a';

const あいうえお = 'あいうえお';
```

Lesson4

分岐

if...else

if...else

else はなくてもよい

```
// ex1.ts
const a = 10;

if (a > 0)
    console.log('positive');
else
    console.log('NOT positive');
```

```
$ deno run ex1.ts
positive
```

{}で、複数行の処理を書ける

elseの後にifを書くことができる

```
if (x > 50) {
    ...
    ...
} else if (x > 5) {
    ...
    ...
} else {
    ...
}
```

if...else（続き）

条件、はtrue/false以外の値でもよい

true -> truthy
false -> falsy

```
// ex2.ts
const a = 10;

if (a)
    console.log('NOT zero');
else
    console.log('zero');
```

```
$ deno run ex2.ts
NOT zero
```

truthy, falsy

falsy	false 0 -0 0n '' null undefined NaN
truthy (falsy以外)	true 10 -2 1n "a" 'b' {} [] Infinity

falsy

!!

```
// ex3.ts
const log = console.log;

//
log(false, !!false);
log(0, !!0);
log(-0, !!-0);
log(0n, !!0n);
log('', !!'');
log(null, !!null);
log(undefined, !!undefined);
log(NaN, !!NaN);
```

```
$ deno run ex3.ts
false false
0 false
-0 false
0n false
 false
null false
undefined false
NaN false
```

truthy

```
// ex4.ts
const log = console.log;

//
log(true, !!true);
log(10, !!10);
log(-2, !!-2);
log(1n, !!1n);
log('a', !!'a');
log({}, !!{});
log([], !![]);
log(Infinity, !!Infinity);
```

```
$ deno run ex4.ts
true true
10 true
-2 true
1n true
a true
{} true
[] true
Infinity true
```

switch, case, break

数値や文字列で分岐

default（どのcaseにも一致しない）

breakで途中から抜ける

```
// ex5.ts
const expr = 'Papayas' as string;

switch (expr) {
    case 'Oranges':
        console.log('Oranges are $0.59 a pound.');
        break;

    case 'Mangoes':
    case 'Papayas':
        console.log('Mangoes and papayas are $2.79 a pound.');
        break;

    default:
        console.log('Sorry, we are out of' + expr + '.');
}
```

```
$ deno run ex5.ts
Mangoes and papayas are $2.79 a pound.
```

Lesson5

繰り返し

while, do...while

```
while (条件) {

}
```

```
// ex1.ts
let n = 0;

while (n < 3) {
    n++;
}

console.log(n);
```

```
$ deno run ex1.ts
3
```

```
do {

} while (条件);
```

```
// ex2.ts
let result = '';
let i = 0;

do {
    i = i + 1;
    result = result + i;
} while (i < 5);

console.log(result);
```

```
$ deno run ex2.ts
12345
```

Tips

```
'' + i
i.toString()

 +s
 Number.parseFloat(s)
 Number.parseInt(s)

 Boolean(i)

 Boolean(s)
```

```
// ex3.ts
const log = console.log;

const i = 999;
log(typeof '' + i);
log(typeof i.toString());

const s = '12345.67';
log(typeof +s);
log(typeof Number.parseFloat(s));
log(typeof Number.parseInt(s));

const b1 = Boolean(i);
log(typeof b1, b1, !!i);

const b2 = Boolean(s);
log(typeof b2, b2, !!s);
```

```
$ deno run ex3.ts
string999
string
number
number
number
boolean true true
boolean true true
```

for

```
for (初期化式; 条件式; 加算式) {
    文
}
```

```
// ex4.ts
const array = ['a', 'b', 'c'];

for (let i = 0; i < array.length; i++)
    console.log(array[i]);

for (let i = 0; i < 5; i++)
    console.log(array[i]);
```

```
 deno run ex4.ts
a
b
c
a
b
c
undefined
undefined
```

for...in, for...of

```
for (variable in object) {
    文
}
```

```
// ex5.ts
const obj = { a: 1, b: 2, c: 3 };
for (const key in obj)
    console.log(key);
```

```
$ deno run ex5.ts
a
b
c
```

```
for (variable of iterable) {
    文
}
```

```
// ex6.ts
const array = ['a', 'b', 'c'];

for (const element of array)
  console.log(element);

for (const element in array)
    console.log(element);
```

```
$ deno run ex6.ts
a
b
c
0
1
2
```

break, continue

breakの例

forでも使用できる

```
// ex7.ts
let i = 0;
while (i < 6) {
    if (i === 3)
        break;
    i = i + 1;
}
console.log(i);
```

```
$ deno run ex7.ts
3
```

continueの例

whileでも使用できる

```
// ex8.ts
let text = '';
for (let i = 0; i < 10; i++) {
    if (i === 3)
        continue;
    text = text + i;
}
console.log(text);
```

```
deno run ex8.ts
012456789
```

label

labelの例

continueでも使用できる

```
// ex9.ts
loop:
for (let i = 0; i < 3; i++) {
    for (let j = 0; j < 3; j++) {
        if (i === 1 && j === 1)
            break loop;
        console.log('i = ' + i + ', j = ' + j);
    }
}
```

```
$ deno run ex9.ts
i = 0, j = 0
i = 0, j = 1
i = 0, j = 2
i = 1, j = 0
```

Question

実行結果になるようにコードを追加してください

```
const colors = ['red', 'green', 'blue'];

ここにコードを追加する
```

実行結果

注意、blueの後に ： はありません

```
$ deno run colors.ts
red:green:blue
```

Answer

Answer 1

```
// ans1.ts
const colors = ['red', 'green', 'blue'];

let s = '';
for (let i = 0; i < colors.length; i++) {
    s += colors[i];
    if (i !==2 )
        s += ':';
}
console.log(s);
```

Answer 2

Array.prototype.join()

```
// ans2.ts
const colors = ['red', 'green', 'blue'];

console.log(colors.join(':'));
```

TypeScript入門2 で便利な関数を紹介します

Appendix

Link

TypeScript	https://www.typescriptlang.org
deno	https://deno.land
10 Things I Regret About Node.js	https://youtu.be/M3BM9TB-8yA
Visual Studio Code (VScode)	https://code.visualstudio.com