

本日の内容



例題 1. プログラム実行の体験



- プログラミングを行えるオンラインのサービス

<https://www.onlinegdb.com>

- ウェブブラウザを使う

- たくさんの言語を扱うことができる

Pascal, Python3, Java, C/C++, C#, JavaScript,
R, アセンブリ言語, SQL など

- オンラインなので、「秘密にしたいプログラム」
を扱うには十分な注意が必要

Online GDB で Pascal を動かす手順



① ウェブブラウザを起動する

② 次の URL を開く

<https://www.onlinegdb.com>

A screenshot of a web browser's address bar. The address bar is a light gray rectangle with a thin border. On the left side, there is a magnifying glass icon. To the right of the icon, the text "https://www.onlinegdb.com" is displayed in a dark gray font. Below the address bar, there is a thin horizontal line, and below that, a larger, light gray rectangular area representing the browser's content area.



③ 「Language」 のところで、「Pascal」 を選ぶ

The screenshot shows the GDB Online interface. At the top, there is a navigation bar with buttons for Run, Debug, Stop, Share, Save, Beautify, and a download icon. A 'Language' dropdown menu is open, showing a list of programming languages. The 'Pascal' option is highlighted with a red box. The main area displays a C program with a 'Hello World' message.

```
1 - /*****  
2  
3 Welcome to GDB Online.  
4 GDB online is an online compiler and debugger tool for C, C++, Python  
5 C#, VB, Perl, Swift, Prolog, Javascript, Pascal, HTML, CSS, JS  
6 Code, Compile, Run and Debug online from anywhere in world.  
7  
8 *****/  
9 #include <stdio.h>  
10  
11 int main()  
12 {  
13     printf("Hello World");  
14  
15     return 0;  
16 }  
17
```



実行ボタン

```
main.pas
1 {
2
3 Welcome to GDB Online.
4 GDB online is an online compiler and debugger tool for C, C++, Python, Java,
5 C#, VB, Swift, Pascal, Fortran, Haskell, Objective-C, Assembly, HTML, CSS,
6 Code, Compile, Run and Debug online from anywhere in world.
7
8 }
9 program Hello;
10 begin
11     writeln ('Hello World')
12 end.
13
```

Copyright (c) 1993-2017 by Florian Klaempfl and others
Target OS: Linux for x86-64
Compiling main.pas
Linking a.out
/usr/bin/ld.bfd: warning: link.res contains output sections; did you forget -T?
12 lines compiled, 0.1 sec
Hello World
...Program finished with exit code 0
Press ENTER to exit console.

エディタ画面

プログラムを
書き換えること
ができる

例題 1. プログラム実行の体験



- コンピュータを役に立つ道具として実感するために、次ページの**プログラム**を使って、**sin 関数の繰り返し計算**を行ってみる



```
program sum;  
var start_x, step_x, x, y:real;  
var i:integer;  
begin
```

```
write('Please Enter start_x:');  
readln(start_x);  
write('Please Enter step_x:');  
readln(step_x);
```

```
for i:=1 to 20 do  
begin  
  x := start_x + ( i * step_x );  
  y := sin(x);  
writeln('sin(', x:8:3, ') =', y:8:3);  
end;  
readln
```

```
end.
```

キーボードからの
データの読み込みを
行っている部分

計算の繰り返しを
行っている部分

画面へのデータの
書き出しを行ってい
る部分

例題 1 のプログラム実行結果



```
main.pas
1 program sum;
2 var start_x, step_x, x, y:real;
3 var i:integer;
4 begin
5   write('Please Enter start_x:');
6   readln(start_x);
7   write('Please Enter step_x:');
8   readln(step_x);
9   for i:=1 to 20 do
10    begin
11      x := start_x + ( i * step_x );
12      y := sin(x);
13      writeln('sin(', x:8:3, ') = ', y:8:3);
14    end;
15   readln
16 end.
```

キーボードから、データ「0.4」と「0.1」を読み込んでいる

```
Copyright (c) 1993-2017 by Florian Klaempfl and others
Target OS: Linux for x86-64
Compiling main.pas
Linking a.out
/usr/bin/ld.bfd: warning: link.res contains output sect
17 lines compiled, 0.1 sec
Please Enter start_x:0.4
Please Enter step_x:0.1
sin( 0.500) = 0.479
sin( 0.600) = 0.565
sin( 0.700) = 0.644
sin( 0.800) = 0.717
sin( 0.900) = 0.783
sin( 1.000) = 0.841
sin( 1.100) = 0.891
sin( 1.200) = 0.932
sin( 1.300) = 0.964
sin( 1.400) = 0.985
sin( 1.500) = 0.997
sin( 1.600) = 1.000
sin( 1.700) = 0.992
sin( 1.800) = 0.974
sin( 1.900) = 0.946
sin( 2.000) = 0.909
sin( 2.100) = 0.863
sin( 2.200) = 0.808
sin( 2.300) = 0.746
sin( 2.400) = 0.675
```

計算を 20 回繰り返して、計算結果を表示している

プログラムの機能



プログラムでは、計算等の実行手順を記述

- 計算の繰り返し

計算は自動で**繰り返し**

- キーボードからの読み込み

- 画面への表示

など

例題 1 のプログラムの機能



1. キーボードからのデータの読み込み

次の2つの値を読み込む

start_x, step_x

2. 計算の繰り返し

$\sin(x)$ の計算を20回繰り返す

x = start_x + step_x,
start_x + 2 × step_x,
...
start_x + 20 × step_x

} 20回分

3. 画面へのデータの書き出し

計算した $\sin(x)$ の値を書き出す

実行(1/4)



```
main.pas
1 program sum;
2 var start_x, step_x, x, y:real;
3 var i:integer;
4 begin
5     write('Please Enter start_x:');
6     readln(start_x);
7     write('Please Enter step_x:');
8     readln(step_x);
9     for i:=1 to 20 do
10    begin
11        x := start_x + ( i * step_x );
12        y := sin(x);
13        writeln('sin(', x:8:3, ') =', y:8:3);
14    end;
15    readln
```

「Run」をクリック

input

Command line arguments:

Standard Input: Interactive Console Text

実行(2/4)



```
main.pas
1 program sum;
2 var start_x, step_x, x, y:real;
3 var i:integer;
4 begin
5     write('Please Enter start_x:');
6     readln(start_x);
7     write('Please Enter step_x:');
8     readln(step_x);
9     for i:=1 to 20 do
10    begin
11        x := start_x + ( i * step_x );
12        y := sin(x);
13        writeln('sin(', x:8:3, ') =', y:8:3);
14    end;
15    readln
16 end.
17
```

実行画面が現れる

input

```
Copyright (c) 1993-2017 by Florian Klaempfl and others
Target OS: Linux for x86-64
Compiling main.pas
Linking a.out
/usr/bin/ld.bfd: warning: link.res contains output sections; did you
16 lines compiled, 0.1 sec
Please Enter start_x: █
```

実行(3/4)



```
main.pas
1 program sum;
2 var start_x, step_x, x, y:real;
3 var i:integer;
4 begin
5   write('Please Enter start_x:');
6   readln(start_x);
7   write('Please Enter step_x:');
8   readln(step_x);
9   for i:=1 to 20
10  begin
11    x := start_x;
12    y := sin(x);
13    writeln('i: ', i, ' x: ', x, ' y: ', y);
14  end;
15  readln;
16 end.
17
```

Copyright (c) 1993-2017 by Florian Klaempfl and others
Target OS: Linux for x86-64
Compiling main.pas
Linking a.out
/usr/bin/ld.bfd: warning: link.res contains output sections; did not strip
16 lines compiled, 0.1 sec
Please Enter start_x: 0.4

数値を入れる
(プログラムに数値
データを与える)



実行(4/4)



```
main.pas
1 program sum;
2 var start_x, step_x, x, y:real;
3 var i:integer;
4 begin
5   write('Please Enter start_x:');
6   readln(start_x);
7   write('Please Enter step_x:');
8   readln(step_x);
9   for i:=1 to 20
10    begin
11      x := start_x + i * step_x;
12      y := sin(x);
13      writeln('sin( ', x, ') = ', y);
14    end;
15   readln;
16 end.
17
```

さらに数値を入れると、
計算結果が表示される

```
Copyright (c) 1993-2017 by Florian Klaempfl and others
Target OS: Linux for x86-64
Compiling main.pas
Linking a.out
/usr/bin/ld.bfd: warning: link.res contains output sections; did you
16 lines compiled, 0.1 sec
Please Enter start_x:0.4
Please Enter step_x:0.1
sin( 0.500) = 0.479
sin( 0.600) = 0.565
sin( 0.700) = 0.644
sin( 0.800) = 0.717
sin( 0.900) = 0.783
sin( 1.000) = 0.841
sin( 1.100) = 0.891
sin( 1.200) = 0.932
sin( 1.300) = 0.964
sin( 1.400) = 0.985
sin( 1.500) = 0.997
sin( 1.600) = 1.000
sin( 1.700) = 0.992
sin( 1.800) = 0.974
sin( 1.900) = 0.946
sin( 2.000) = 0.909
sin( 2.100) = 0.863
sin( 2.200) = 0.808
sin( 2.300) = 0.746
sin( 2.400) = 0.675
```

実行の終了



The screenshot shows a code editor with a toolbar at the top containing buttons for Run, Debug, Stop, Share, Save, and Beautify. The 'Stop' button is highlighted with a blue box and an arrow pointing to it. A large blue box with white text is overlaid on the code, reading 「Stop」をクリック. Below the code editor, a terminal window shows the following output:

```
input
Compilation failed due to following error(s).
Copyright (c) 1993-2017 by Florian Klaempfl and others
Target OS: Linux for x86-64
Compiling main.pas
main.pas(12,14) Error: Identifier not found "son"
main.pas(17) Fatal: There were 1 errors compiling module, stopping
Fatal: Compilation aborted
Error: /usr/bin/ppcx64 returned an error exitcode
```


演習 1



例題 1 のプログラムを実行して、 $\sin(0.4)$ の値を確認しなさい

そのために `start_x`, `step_x` の値を適切に与えること

```
sin( 0.400) = 0.389
```

演習 2



例題 1 のプログラムの「sin」の部分を、**わざと間違えて**（「son」のように）、コンピュータによるプログラムの**構文チェックの機能**が有効に働いていることを確認しなさい

```
main.pas
1 program sum;
2 var start_x, step_x, x, y:real;
3 var i:integer;
4 begin
5   write('Please Enter start_x:');
6   readln(start_x);
7   write('Please Enter step_x:');
8   readln(step_x);
9   for i:=1 to 20 do
10  begin
11    x := start_x + ( i * step_x );
12    y := son(x);
13    writeln('sin(', x:8:3, ') = ', y:8:3);
14  end;
15  readln
16 end.
17
```

input

Compilation failed due to following error(s).

```
Copyright (c) 1993-2017 by Florian Klaempfl and others
Target OS: Linux for x86-64
Compiling main.pas
main.pas(12,14) Error: Identifier not found "son"
main.pas(17) Fatal: There were 1 errors compiling module, stopping
Fatal: Compilation aborted
Error: /usr/bin/ppcx64 returned an error exitcode
```

演習 3



例題 1 のプログラムを **cos の値を計算**できるように書き換えて, 実行をなさい. そして, $\cos(0.4)$ の値を確認しなさい.

$y := \cos(x);$

```
cos ( 0.400 ) = 0.921
```