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№ 14

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: : -02-20 . .:№ 1032204593

2021 .

:

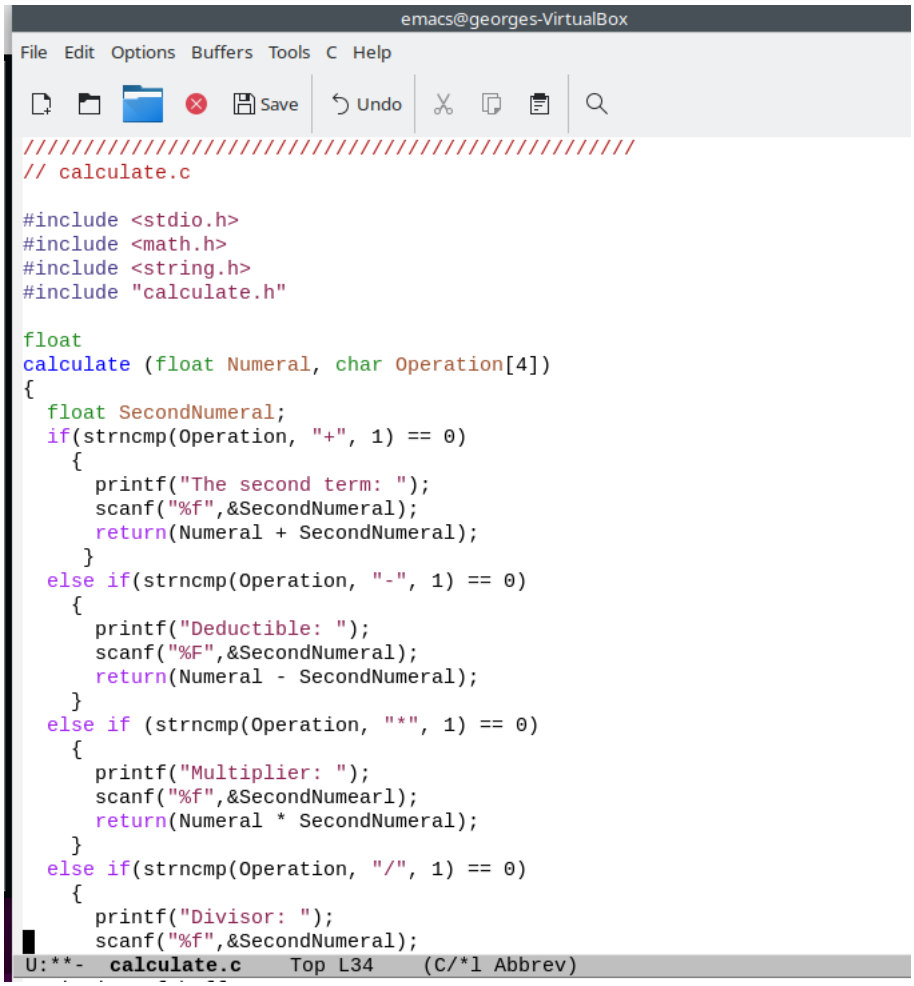
, , UNIX/Linux
. # : 1.
~/work/os/lab_prog «mkdir -p ~/work/os/lab_prog» (

```
georges@georges-VirtualBox:~$ mkdir -p ~/work/os/lab-prog
georges@georges-VirtualBox:~$
```

1).
(1) 1. 1. : calculate.h, calculate.c, main.c,
«cd ~/work/os/lab_prog» «touch calculate.h calculate.c main.c» (2)

```
georges@georges-VirtualBox:~$ cd ~/work/os/lab-prog
georges@georges-VirtualBox:~/work/os/lab-prog$ touch calculate.h calculate.c main.c
georges@georges-VirtualBox:~/work/os/lab-prog$ ls
calculate.c  calculate.h  main.c
georges@georges-VirtualBox:~/work/os/lab-prog$
```

(2) 1. 2. , , , ,
, , sin, cos, tan.
, , . . Emacs,
. calculate. (3, 4)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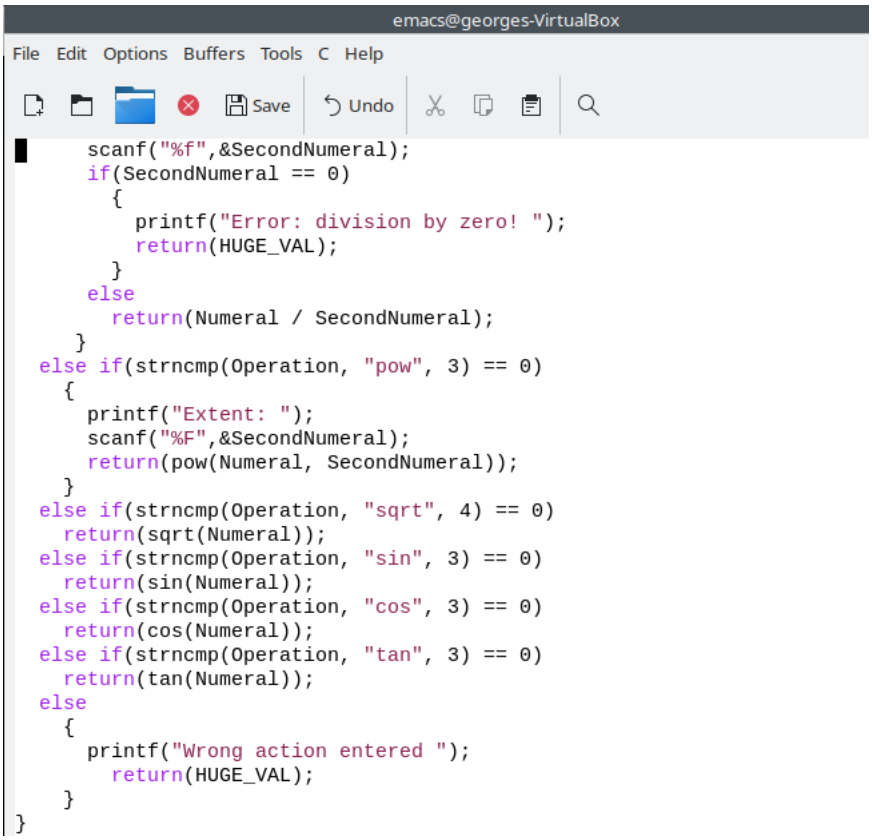
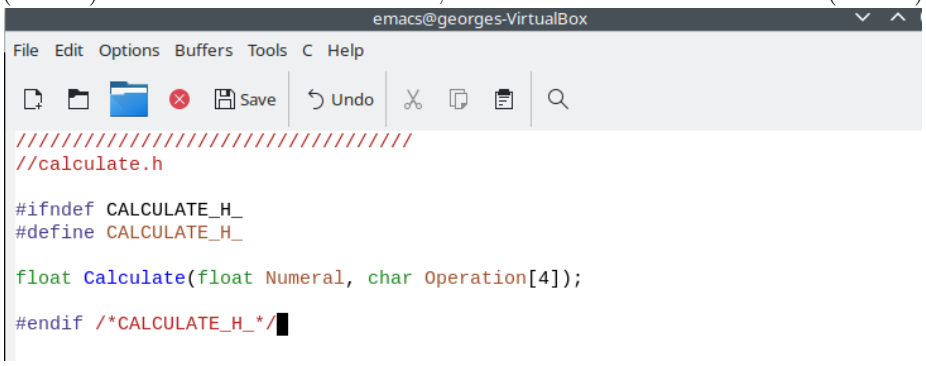
File Edit Options Buffers Tools C Help
Save
Undo
//
// calculate.c
#include <stdio.h>
#include <math.h>
#include <string.h>
#include "calculate.h"
float
calculate (float Numeral, char Operation[4])
{
float SecondNumeral;
if(strncmp(Operation, "+", 1) == 0)
{
printf("The second term: ");
scanf("%f",&SecondNumeral);
return(Numeral + SecondNumeral);
}
else if(strncmp(Operation, "-", 1) == 0)
{
printf("Deductible: ");
scanf("%F",&SecondNumeral);
return(Numeral - SecondNumeral);
}
else if (strncmp(Operation, "*", 1) == 0)
{
printf("Multiplier: ");
scanf("%f",&SecondNumearl);
return(Numeral * SecondNumeral);
}
else if(strncmp(Operation, "/", 1) == 0)
{
printf("Divisor: ");
scanf("%f",&SecondNumeral);
U:**- calculate.c Top L34 (C/*l Abbrev)



(3)

(4) 1. 3. calculate.h, (5)



(5) 1. 4. main.c, (6)

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```
////////////////////////////////
//main.c

#include <stdio.h>
#include "calculate.h"

int
main (void)
{
  float Numeral;
  char Operation[4];
  float Result;
  printf("Number: ");
  scanf("%f",&Numeral);
  printf("Operation (+,-,*,/,pow,sqrt,sin,cos,tan): ");
  scanf("%f",&Operation);
  Result = Calculate(Numeral, Operation);
  printf("%6,2f\n",Result);
  return 0;
}
```

(6) 2. gcc (: 8.3.0-19), «gcc -c calculate.c», «gcc-c main.c» «gcc calculate.o main.o -o calcul -lm» (7)

```
georges@georges-VirtualBox:~/work/os/lab-prog$ gcc -c calculate.c
georges@georges-VirtualBox:~/work/os/lab-prog$ gcc -c main.c
georges@georges-VirtualBox:~/work/os/lab-prog$ gcc calculate.o main.o -o calcul -lm
```

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File Edit Options Buffers Tools Makefile Help

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```
CC = gcc
CFLAGS =
LIBS = -lm

calcul: calcuate.o main.o
	gcc -c calculate.o main.o -o calcul $(LIBS)

calculate.o: calculate.c  calculate.h
	gcc -c calculate.c $(CFLAGS)

main.o: main.c calculate.h
	gcc -c main.c $(CFLAGS)

clean:
	-rm calcul *.o *~
```

(7) 3. Makefile (8)

(8) 3. 1. Makefile (9).

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File Edit Options Buffers Tools Makefile Help

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```
#
# Makefile
#

CC = gcc
CFLAGS = -g
LIBS = -lm

calcul: calcuate.o main.o
	$(CC) -c calculate.o main.o -o calcul $(LIBS)

calculate.o: calculate.c  calculate.h
	$(CC) -c calculate.c $(CFLAGS)

main.o: main.c calculate.h
	$(CC) -c main.c $(CFLAGS)

clean:
	-rm calcul *.o*~

#End Makefile
```

(9) 3. 2. Makefile :

```
georges@georges-VirtualBox:~/work/os/lab-prog$ touch makefile
georges@georges-VirtualBox:~/work/os/lab-prog$ ls
calculate.c   calculate.h   calculate.o  main.c~  makefile
calculate.c~  calculate.h~  main.c       main.o
georges@georges-VirtualBox:~/work/os/lab-prog$
```

(10) 4. gdb calcul.
GDB : «gdb ./calcul» (11)

```
georges@georges-VirtualBox:~/work/os/lab-prog$ touch makefile
georges@georges-VirtualBox:~/work/os/lab-prog$ vi makefile
georges@georges-VirtualBox:~/work/os/lab-prog$ gdb calcul
GNU gdb (Ubuntu 9.2-0ubuntu1~20.04) 9.2
Copyright (C) 2020 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.
Type "show copying" and "show warranty" for details.
This GDB was configured as "x86_64-linux-gnu".
Type "show configuration" for configuration details.
For bug reporting instructions, please see:
<http://www.gnu.org/software/gdb/bugs/>.
Find the GDB manual and other documentation resources online at:
    <http://www.gnu.org/software/gdb/documentation/>.

For help, type "help".
Type "apropos word" to search for commands related to "word"...
calcul: No such file or directory.
(gdb) 7
Undefined command: "7".  Try "help".
(gdb) run
Starting program:
No executable file specified.
Use the "file" or "exec-file" command.
(gdb)
```

(11) 5. example.c, (12).

```
georges@georges-VirtualBox:~/work/os/lab-prog$ touch example.c
georges@georges-VirtualBox:~/work/os/lab-prog$ emacs
bc
(emacs:6616): GLib-GObject-WARNING**: The property GtkButton:use-stock is deprecated and sho
uldn't be used anymore. It will be removed in a future version.

(emacs:6616): GLib-GObject-WARNING **: The property GtkSettings:gtk-button-images is depreca
ted and shouldn't be used anymore. It will be removed in a future version
georges@georges-VirtualBox:~/work/os/lab-prog$ bc
bc 1.07.1
Copyright 1991-1994, 1997, 1998, 2000, 2004, 2006, 2008, 2012-2017 Free Software Foundation,
 Inc.
```

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Save Undo

```
float
sum (float x,floaty){
  return x+y;
}
int main (){
  int x, y;
  float z;
  x= 10
  y= 12
  z= x+y+sum(x, y);
  return z;
}
```

(12)

(12) splint calculate.c main.c. «sudo apt update» «sudo apt install splint» (

```
georges@georges-VirtualBox:~/work/os/lab-prog$ sudo apt install splint
[sudo] password for georges:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  distro-info
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  splint-data
Suggested packages:
  splint-doc-html
The following NEW packages will be installed:
  splint splint-data
0 upgraded, 2 newly installed, 0 to remove and 64 not upgraded.
Need to get 740 kB of archives.
After this operation, 2 883 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ru.archive.ubuntu.com/ubuntu focal/universe amd64 splint-data all 1:3.1.2+dfsg-
1build1 [57,5 kB]
```

13)

(13) 7. splint calculate.c main.c. (14)

```
georges@georges-VirtualBox:~/work/os/lab-prog$ splint calculate.c
Splint 3.1.2 --- 20 Feb 2018

calculate.h:7:37: Function parameter Operation declared as manifest array (size
                    constant is meaningless)
  A formal parameter is declared as an array with size.  The size of the array
  is ignored in this context, since the array formal parameter is treated as a
  pointer. (Use -fixedformalarray to inhibit warning)
calculate.c:10:32: Function parameter Operation declared as manifest array
                     (size constant is meaningless)
calculate.c: (in function calculate)
calculate.c:16:7: Return value (type int) ignored: scanf("%f", &Sec...
  Result returned by function call is not used. If this is intended, can cast
  result to (void) to eliminate message. (Use -retvalint to inhibit warning)
calculate.c:22:15: Unrecognized format code: %F
  Format code in a format string is not valid. (Use -formatcode to inhibit
  warning)
calculate.c:22:7: Return value (type int) ignored: scanf("%F", &Sec...
calculate.c:28:7: Return value (type int) ignored: scanf("%f", &Sec...
calculate.c:34:7: Return value (type int) ignored: scanf("%f", &Sec...
calculate.c:35:10: Dangerous equality comparison involving float types:
                     SecondNumeral == 0
  Two real (float, double, or long double) values are compared directly using
  == or != primitive. This may produce unexpected results since floating point
  representations are inexact. Instead, compare the difference to FLT_EPSILON
  or DBL_EPSILON. (Use -realcompare to inhibit warning)
calculate.c:38:10: Return value type double does not match declared type float:
                     (HUGE_VAL)
```

```
georges@georges-VirtualBox:~/work/os/lab-prog$ splint main.c
Splint 3.1.2 --- 20 Feb 2018

calculate.h:7:37: Function parameter Operation declared as manifest array (size
                    constant is meaningless)
  A formal parameter is declared as an array with size.  The size of the array
  is ignored in this context, since the array formal parameter is treated as a
  pointer. (Use -fixedformalarray to inhibit warning)
main.c: (in function main)
main.c:14:3: Return value (type int) ignored: scanf("%f", &Num...
  Result returned by function call is not used. If this is intended, can cast
  result to (void) to eliminate message. (Use -retvalint to inhibit warning)
main.c:16:3: Return value (type int) ignored: scanf("%s", &Ope...
main.c:17:31: Passed storage Operation not completely defined (*Operation is
                undefined): Calculate (..., Operation)
  Storage derivable from a parameter, return value or global is not defined.
  Use /*@out@*/ to denote passed or returned storage which need not be defined.
  (Use -compdef to inhibit warning)

Finished checking --- 4 code warnings
georges@georges-VirtualBox:~/work/os/lab-prog$
```

(14)

(15) # : ,
, UNIX/Linux
. ### : 1)
gcc, make, gdb . man -help (-h)
. 2) : ,
; ,
, ;
: o – ( );
– ; o , ; o ,
; .
: vi, vim, mceditor, emacs, geany .
( ),
. 3) .

. ( ) .c gcc , .cc .C – C++, c .o . , «gcc -c main.c»: gcc ( ) .c – .o. (, hello), -o : «gcc -o hello main.c». 4) UNIX / . 5) make. , . 6) make makefile Makefile, . Makefile : … : … < 1> … , , . . . Makefile - . ( ) . - . – , . Makefile : target1 [target2…]:[:] [dependment1…] [(tab)commands] [#commentary] [(tab)commands] [#commentary] # (# . , . (). , . Makefile: # # Makefile for abcd.c # CC = gcc CFLAGS = # Compile abcd.c normaly abcd: abcd.c $(CC) -o abcd $(CFLAGS) abcd.c clean: -rm abcd *.o ~ # End Makefile for abcd.c : CC CFLAGS. , . . clean , . . 7) . . GNU UNIX GDB (GNU Debugger). GDB , . -g gcc: gcc -c file.c -g gdb , : gdb file.o 8) gdb: backtrace – (–) break – ( ) clear – continue – delete – display – , finish – info breakpoints – info watchpoints – list – ( ) next – , print – run – set – step – watch – , gdb quit (q) Ctrl-d. gdb gdb -h man gdb. 9) C 6 . 10)

, main.c ,
(, - 8.3.0-19): scanf(“%s”, &Operation);
&, . 11)
UNIX , . : cscope
– , , lint – , .
12) splint ,
, . C
splint ,
, , , ,
, .