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Группа: М8О-206Б-20
Номер по списку:21

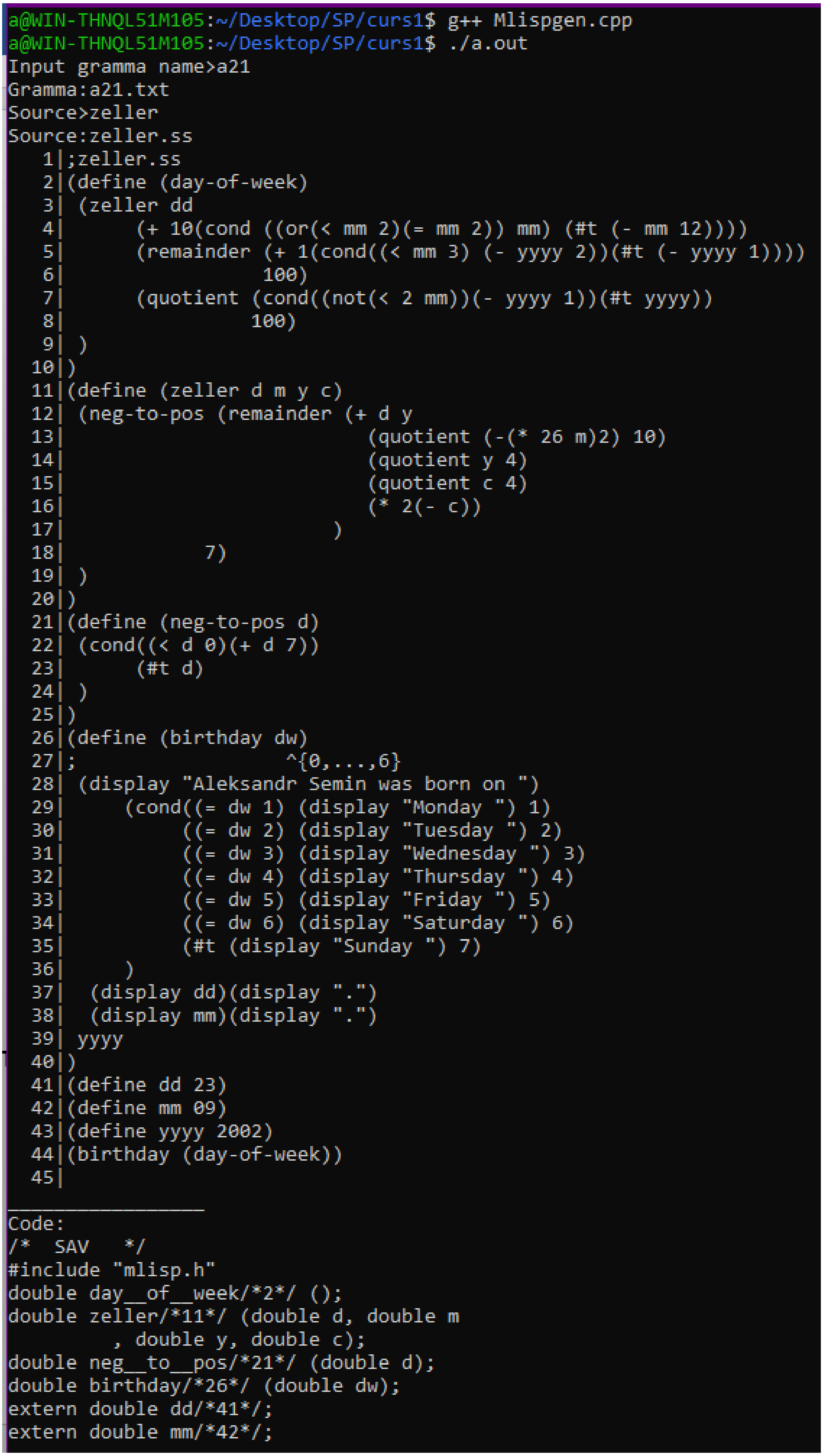
«СИСТЕМЫ ПРОГРАММИРОВАНИЯ»
Курсовая работа 2022.
Часть 1.

Вариант грамматики: a21(заменить своим)

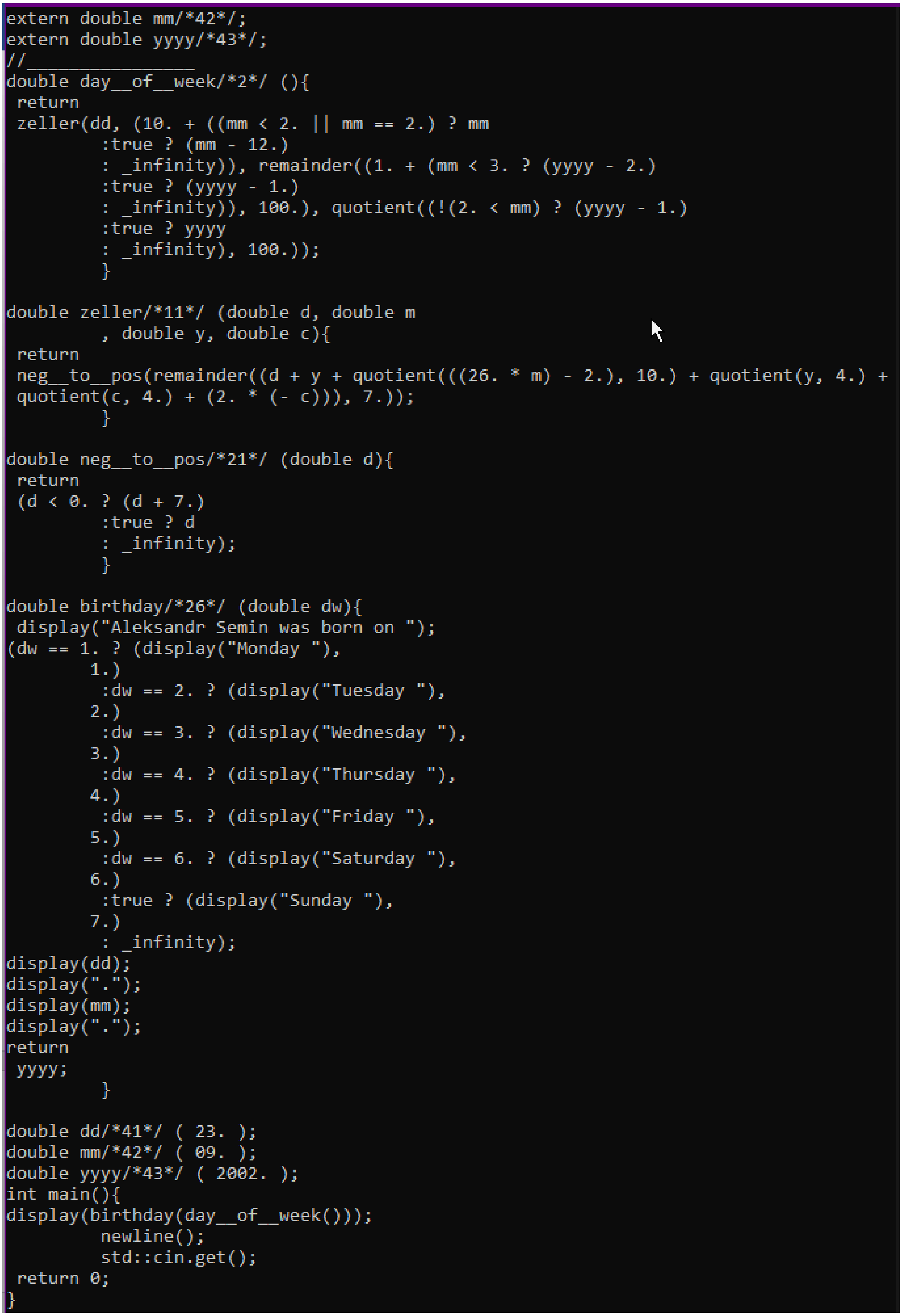
```
# $a21
   $id    $idq    $dec    $int
  $bool    $str      (       )
     +       -       *       /
     <       =       >      <=
    >=     and     not      or
   cond    else      if     let
 define  display  newline    set!

#
     S -> PROG #1
   PROG -> CALCS #2 |
          DEFS #3 |
          DEFS CALCS #4
     E -> $id #5 |
          $int #6 |
          $dec #7 |
          AREX #8 |
          COND #9 |
          CPROC #10
  CPROC -> HCPROC ) #11
 HCPROC -> ( $id #12 |
          HCPROC E #13
   AREX -> HAREX E ) #14
  HAREX -> ( AROP #15 |
          HAREX E #16
   AROP -> + #17 |
          - #18 |
      * #19 |
      / #20
    COND -> ( cond BRANCHES ) #21
BRANCHES -> CLAUS #22 |
      CLAUS BRANCHES #23
   CLAUS -> ( BOOL CLAUSB ) #24
  CLAUSB -> E #25 |
      INTER CLAUSB #26
     STR -> $str #27 |
      SIF #28
     SIF -> ( if BOOL STR STR ) #29
    BOOL -> $bool #30 |
      $idq #31 |
      REL #32 |
      OR #33 |
      ( not BOOL ) #34 |
      CPRED #35
      OR -> ( or ORARGS ) #36
  ORARGS -> BOOL ORARGS #37 |
      BOOL #38
   CPRED -> ( $idq ) #39 |
      ( $idq PDARGS ) #40
  PDARGS -> ARG #41 |
      ARG PDARGS #42
     ARG -> E #43 |
      BOOL #44
     REL -> ( = E E ) #45 |
      ( < E E ) #46
     SET -> HSET E ) #47
    HSET -> ( set! $id #48
 DISPSET -> ( display E ) #49 |
      ( display BOOL ) #50 |
      ( display STR ) #51 |
      ( newline ) #52 |
      SET #53
   INTER -> DISPSET #54 |
      E #55
   CALCS -> CALC #56 |
      CALCS CALC #57
    CALC -> E #58 |
      BOOL #59 |
      STR #60 |
          DISPSET #61
  DEFS -> DEF #62 |
          DEFS DEF #63
   DEF -> PRED #64 |
          VAR #65 |
          PROC #66
  PRED -> HPRED BOOL ) #67
 HPRED -> PDPAR ) #68
 PDPAR -> ( define ( $idq #69 |
          PDPAR $idq #70 |
          PDPAR $id #71
   VAR -> ( define $id VARINI ) #72
VARINI -> $int #73 |
          $dec #74
  PROC -> HPROC E ) #75
 HPROC -> PCPAR ) #76 |
          HPROC INTER #77 |
          HPROC VAR #78
 PCPAR -> ( define ( $id #79 |
          PCPAR $id #80
```

Контрольная задача №1 – zeller.

Полный скриншот трансляции без трассировки (крупный белый шрифт на ярком черном фоне).

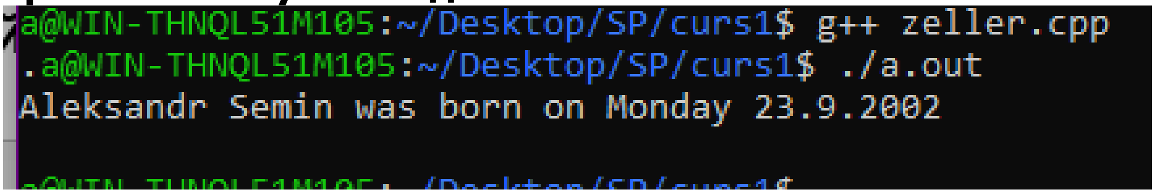


```
a@WIN-THNQL51M105:~/Desktop/SP/curs1$ g++ Mlispgen.cpp
a@WIN-THNQL51M105:~/Desktop/SP/curs1$ ./a.out
Input gramma name>a21
Gramma:a21.txt
Source>zeller
Source:zeller.ss
   1|;zeller.ss
   2|(define (day-of-week)
   3| (zeller dd
   4|      (+ 10(cond ((or(< mm 2)(= mm 2)) mm) (#t (- mm 12))))
   5|      (remainder (+ 1(cond((< mm 3) (- yyyy 2))(#t (- yyyy 1))))
   6|                 100)
   7|      (quotient (cond((not(< 2 mm))(- yyyy 1))(#t yyyy))
   8|                100)
   9| )
  10|)
  11|(define (zeller d m y c)
  12| (neg-to-pos (remainder (+ d y
  13|                          (quotient (-(* 26 m)2) 10)
  14|                          (quotient y 4)
  15|                          (quotient c 4)
  16|                          (* 2(- c))
  17|                       )
  18|            7)
  19| )
  20|)
  21|(define (neg-to-pos d)
  22| (cond((< d 0)(+ d 7))
  23|      (#t d)
  24| )
  25|)
  26|(define (birthday dw)
  27|;                  ^{0,...,6}
  28| (display "Aleksandr Semin was born on ")
  29|     (cond((= dw 1) (display "Monday ") 1)
  30|          ((= dw 2) (display "Tuesday ") 2)
  31|          ((= dw 3) (display "Wednesday ") 3)
  32|          ((= dw 4) (display "Thursday ") 4)
  33|          ((= dw 5) (display "Friday ") 5)
  34|          ((= dw 6) (display "Saturday ") 6)
  35|          (#t (display "Sunday ") 7)
  36|     )
  37|  (display dd)(display ".")
  38|  (display mm)(display ".")
  39| yyyy
  40|)
  41|(define dd 23)
  42|(define mm 09)
  43|(define yyyy 2002)
  44|(birthday (day-of-week))
  45|
_________________
Code:
/*  SAV   */
#include "mlisp.h"
double day__of__week/*2*/ ();
double zeller/*11*/ (double d, double m
         , double y, double c);
double neg__to__pos/*21*/ (double d);
double birthday/*26*/ (double dw);
extern double dd/*41*/;
extern double mm/*42*/;
```



```
extern double mm/*42*/;
extern double yyyy/*43*/;
//________________
double day__of__week/*2*/ (){
 return
 zeller(dd, (10. + ((mm < 2. || mm == 2.) ? mm
         :true ? (mm - 12.)
         : _infinity)), remainder((1. + (mm < 3. ? (yyyy - 2.)
         :true ? (yyyy - 1.)
         : _infinity)), 100.), quotient((!(2. < mm) ? (yyyy - 1.)
         :true ? yyyy
         : _infinity), 100.));
         }

double zeller/*11*/ (double d, double m
         , double y, double c){
 return
 neg__to__pos(remainder((d + y + quotient(((26. * m) - 2.), 10.) + quotient(y, 4.) +
 quotient(c, 4.) + (2. * (- c))), 7.));
         }

double neg__to__pos/*21*/ (double d){
 return
 (d < 0. ? (d + 7.)
         :true ? d
         : _infinity);
         }

double birthday/*26*/ (double dw){
 display("Aleksandr Semin was born on ");
(dw == 1. ? (display("Monday "),
        1.)
         :dw == 2. ? (display("Tuesday "),
        2.)
         :dw == 3. ? (display("Wednesday "),
        3.)
         :dw == 4. ? (display("Thursday "),
        4.)
         :dw == 5. ? (display("Friday "),
        5.)
         :dw == 6. ? (display("Saturday "),
        6.)
         :true ? (display("Sunday "),
        7.)
         : _infinity);
display(dd);
display(".");
display(mm);
display(".");
return
 yyyy;
         }

double dd/*41*/ ( 23. );
double mm/*42*/ ( 09. );
double yyyy/*43*/ ( 2002. );
int main(){
display(birthday(day__of__week()));
         newline();
         std::cin.get();
 return 0;
}
```

Скриншот запуска задачи на C++.

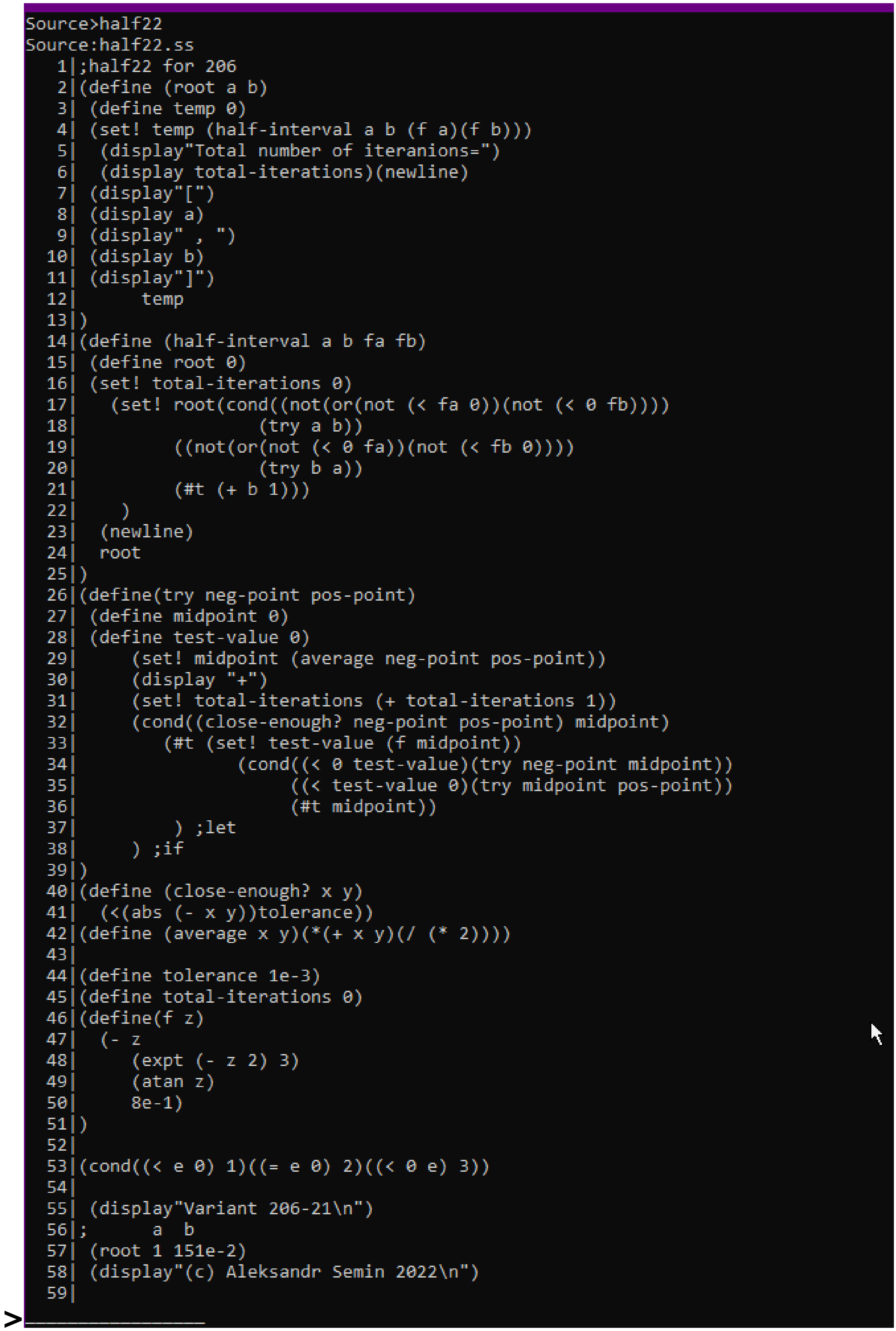


```
a@WIN-THNQL51M105:~/Desktop/SP/curs1$ g++ zeller.cpp
.a@WIN-THNQL51M105:~/Desktop/SP/curs1$ ./a.out
Aleksandr Semin was born on Monday 23.9.2002

a@WIN-THNQL51M105:~/Desktop/SP/curs1$
```

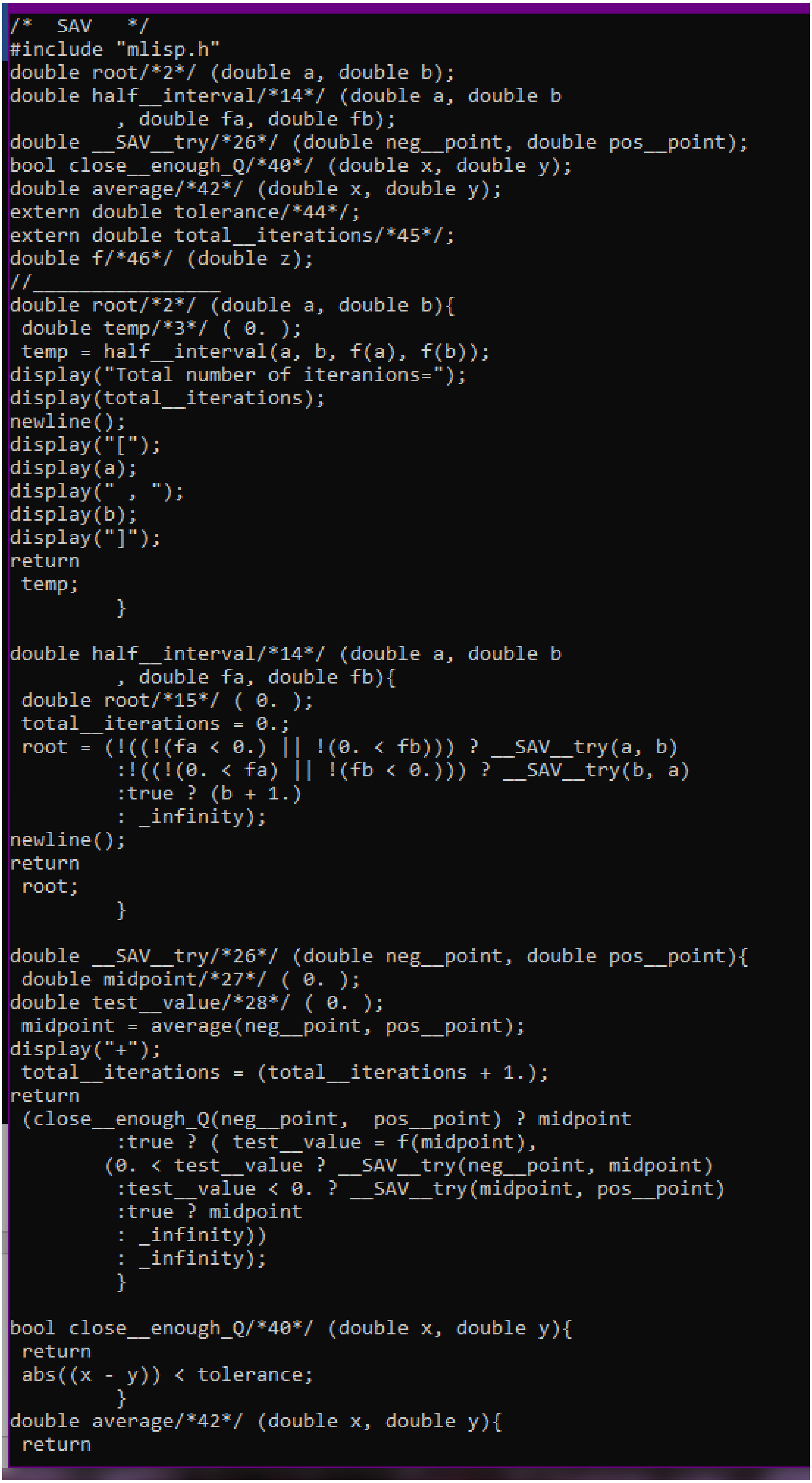
>

Контрольная задача №2 – half22.

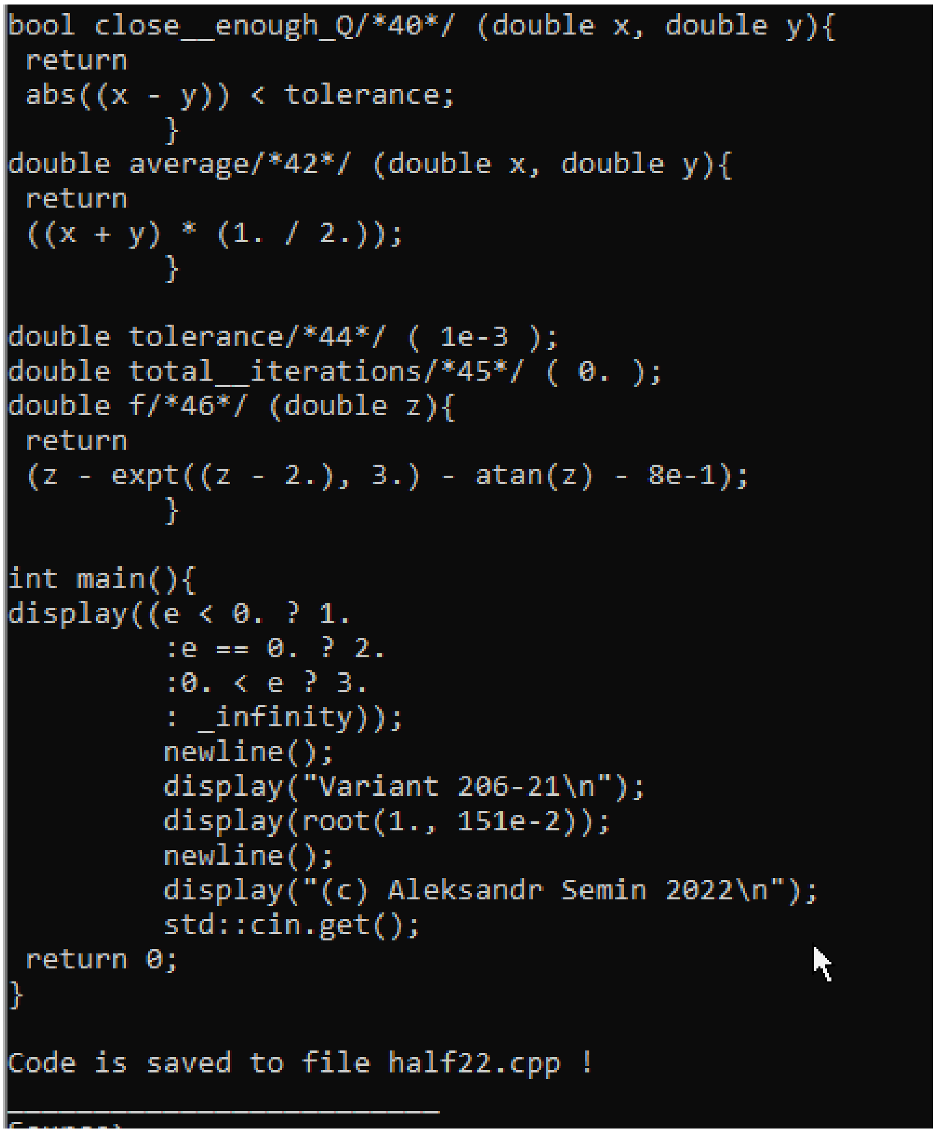
Полный скриншот трансляции без трассировки (крупный белый шрифт на ярком черном фоне).



```
Source>half22
Source:half22.ss
;half22 for 206
(define (root a b)
 (define temp 0)
 (set! temp (half-interval a b (f a)(f b)))
  (display"Total number of iteranions=")
  (display total-iterations)(newline)
 (display"[")
 (display a)
 (display" , ")
 (display b)
 (display"]")
      temp
)
(define (half-interval a b fa fb)
 (define root 0)
 (set! total-iterations 0)
   (set! root(cond((not(or(not (< fa 0))(not (< 0 fb))))
                 (try a b))
         ((not(or(not (< 0 fa))(not (< fb 0))))
                 (try b a))
         (#t (+ b 1)))
    )
  (newline)
  root
)
(define(try neg-point pos-point)
 (define midpoint 0)
 (define test-value 0)
     (set! midpoint (average neg-point pos-point))
     (display "+")
     (set! total-iterations (+ total-iterations 1))
     (cond((close-enough? neg-point pos-point) midpoint)
        (#t (set! test-value (f midpoint))
               (cond((< 0 test-value)(try neg-point midpoint))
                    ((< test-value 0)(try midpoint pos-point))
                    (#t midpoint))
         ) ;let
     ) ;if
)
(define (close-enough? x y)
  (<(abs (- x y))tolerance))
(define (average x y)(*(+ x y)(/ (* 2))))

(define tolerance 1e-3)
(define total-iterations 0)
(define(f z)
  (- z
     (expt (- z 2) 3)
     (atan z)
     8e-1)
)

(cond((< e 0) 1)((= e 0) 2)((< 0 e) 3))

 (display"Variant 206-21\n")
;      a  b
 (root 1 151e-2)
 (display"(c) Aleksandr Semin 2022\n")

>
```

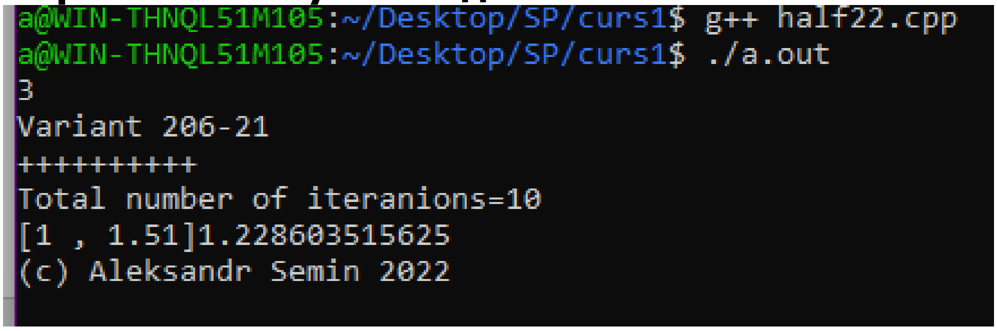


```
/*  SAV   */
#include "mlisp.h"
double root/*2*/ (double a, double b);
double half__interval/*14*/ (double a, double b
         , double fa, double fb);
double __SAV__try/*26*/ (double neg__point, double pos__point);
bool close__enough_Q/*40*/ (double x, double y);
double average/*42*/ (double x, double y);
extern double tolerance/*44*/;
extern double total__iterations/*45*/;
double f/*46*/ (double z);
//________________
double root/*2*/ (double a, double b){
 double temp/*3*/ ( 0. );
 temp = half__interval(a, b, f(a), f(b));
display("Total number of iteranions=");
display(total__iterations);
newline();
display("[");
display(a);
display(" , ");
display(b);
display("]");
return
 temp;
         }

double half__interval/*14*/ (double a, double b
         , double fa, double fb){
 double root/*15*/ ( 0. );
 total__iterations = 0.;
 root = (!((!(fa < 0.) || !(0. < fb))) ? __SAV__try(a, b)
         :!((!(0. < fa) || !(fb < 0.))) ? __SAV__try(b, a)
         :true ? (b + 1.)
         : _infinity);
newline();
return
 root;
         }

double __SAV__try/*26*/ (double neg__point, double pos__point){
 double midpoint/*27*/ ( 0. );
double test__value/*28*/ ( 0. );
 midpoint = average(neg__point, pos__point);
display("+");
 total__iterations = (total__iterations + 1.);
return
 (close__enough_Q(neg__point,  pos__point) ? midpoint
         :true ? ( test__value = f(midpoint),
        (0. < test__value ? __SAV__try(neg__point, midpoint)
         :test__value < 0. ? __SAV__try(midpoint, pos__point)
         :true ? midpoint
         : _infinity))
         : _infinity);
         }

bool close__enough_Q/*40*/ (double x, double y){
 return
 abs((x - y)) < tolerance;
         }
double average/*42*/ (double x, double y){
 return
```

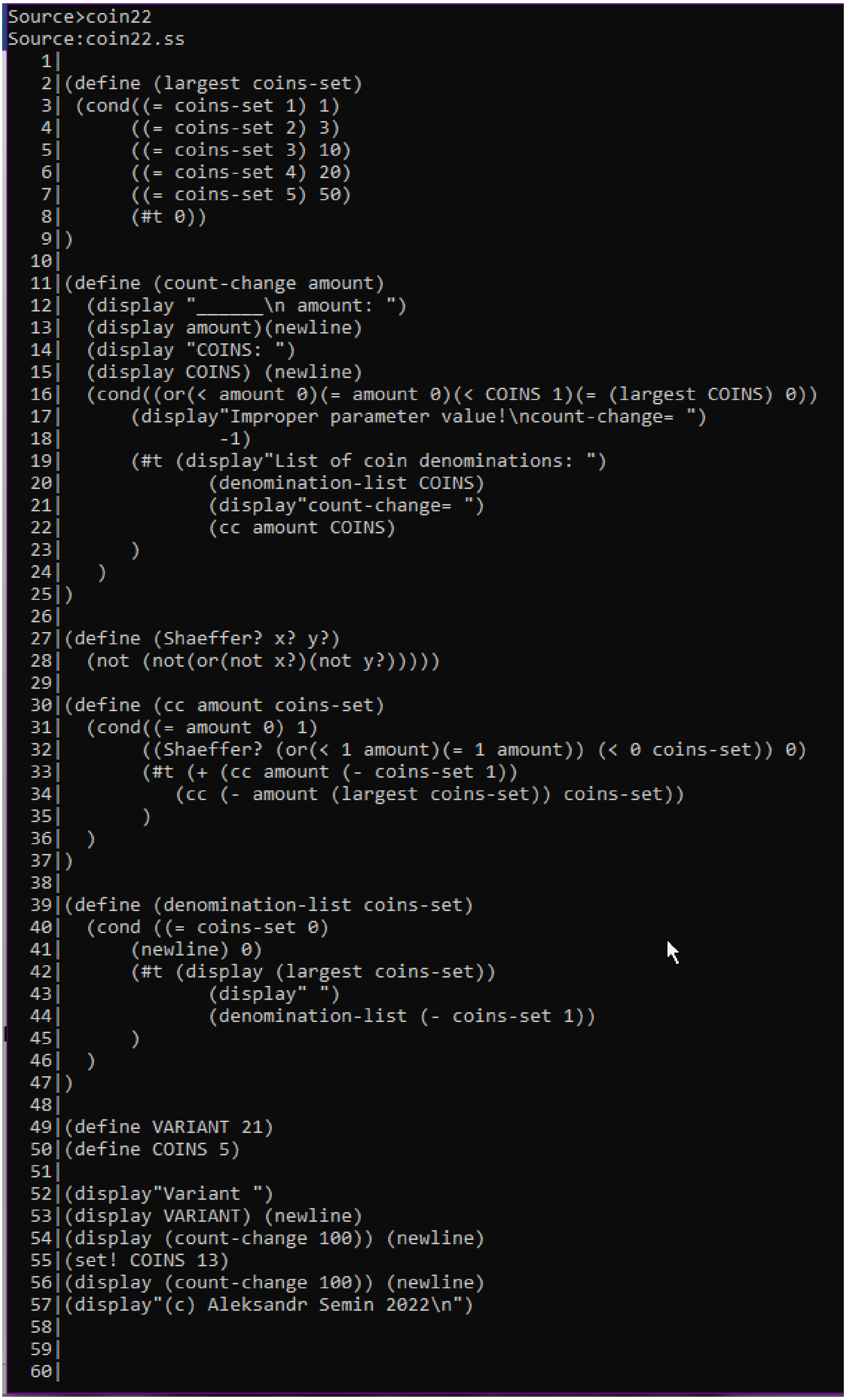


```
bool close__enough_Q/*40*/ (double x, double y){
 return
 abs((x - y)) < tolerance;
         }
double average/*42*/ (double x, double y){
 return
 ((x + y) * (1. / 2.));
         }

double tolerance/*44*/ ( 1e-3 );
double total__iterations/*45*/ ( 0. );
double f/*46*/ (double z){
 return
 (z - expt((z - 2.), 3.) - atan(z) - 8e-1);
         }

int main(){
display((e < 0. ? 1.
         :e == 0. ? 2.
         :0. < e ? 3.
         : _infinity));
         newline();
         display("Variant 206-21\n");
         display(root(1., 151e-2));
         newline();
         display("(c) Aleksandr Semin 2022\n");
         std::cin.get();
 return 0;
}

Code is saved to file half22.cpp !

_________________________
```

Скриншот запуска задачи на C++.

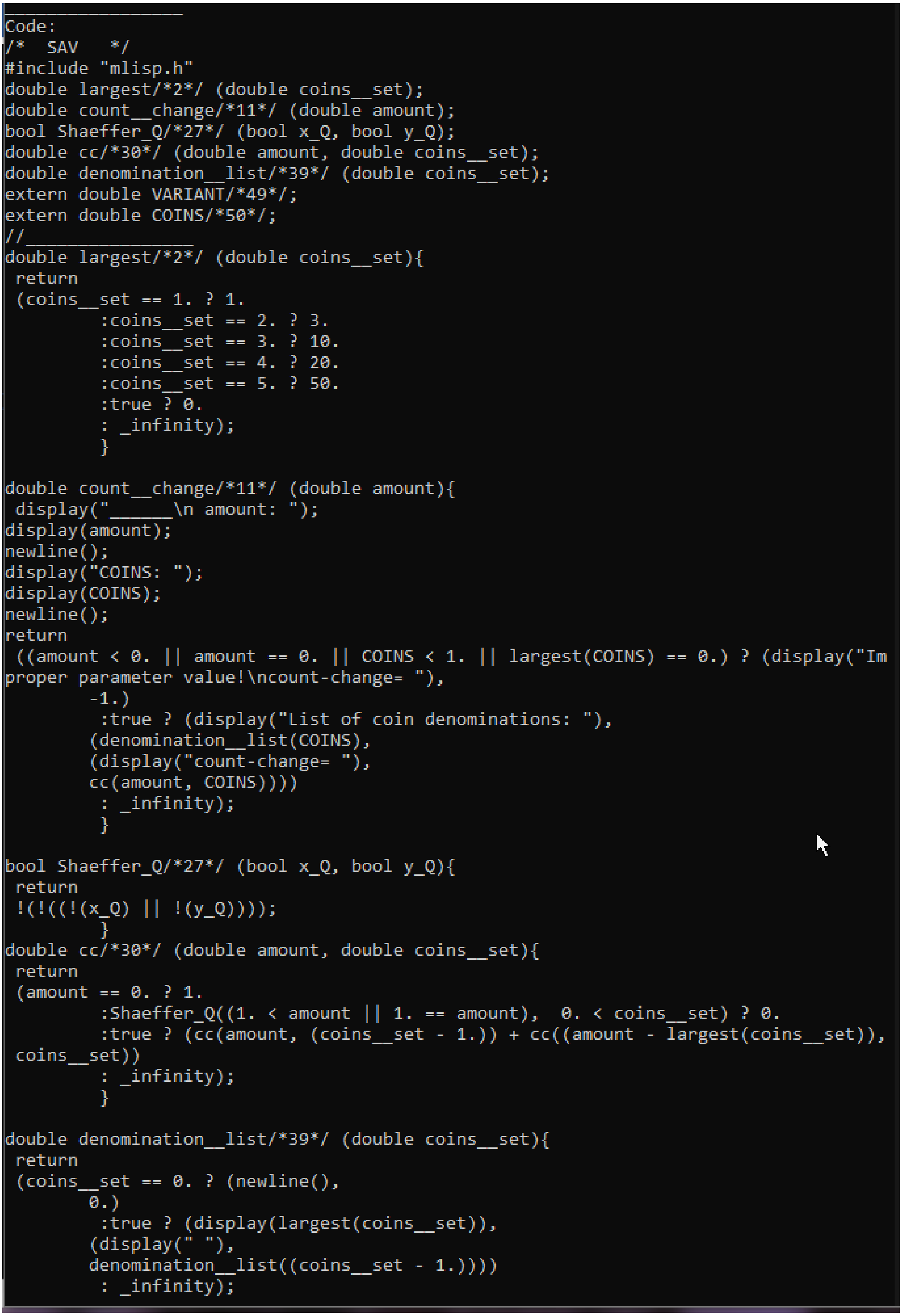


```
a@WIN-THNQL51M105:~/Desktop/SP/curs1$ g++ half22.cpp
a@WIN-THNQL51M105:~/Desktop/SP/curs1$ ./a.out
3
Variant 206-21
++++++++++
Total number of iteranions=10
[1 , 1.51]1.228603515625
(c) Aleksandr Semin 2022
```

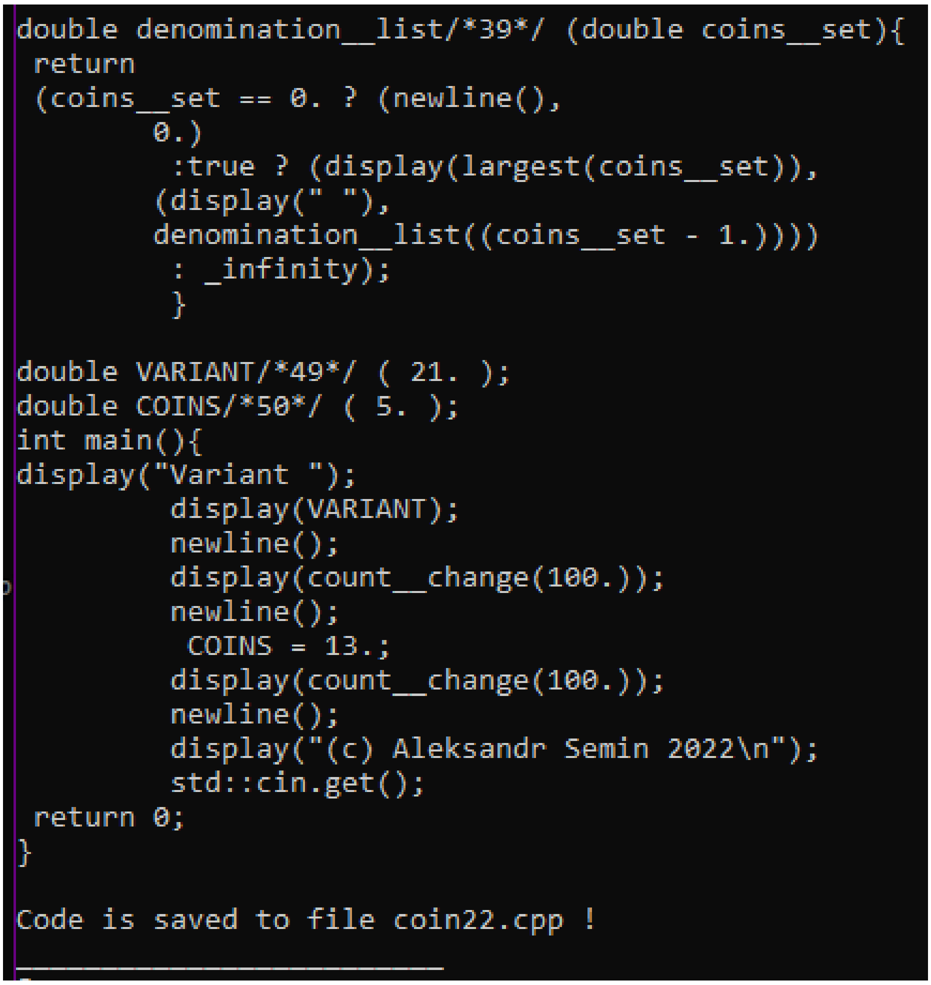


```
Source>coin22
Source:coin22.ss

(define (largest coins-set)
 (cond((= coins-set 1) 1)
      ((= coins-set 2) 3)
      ((= coins-set 3) 10)
      ((= coins-set 4) 20)
      ((= coins-set 5) 50)
      (#t 0))
)

(define (count-change amount)
  (display "______\n amount: ")
  (display amount)(newline)
  (display "COINS: ")
  (display COINS) (newline)
  (cond((or(< amount 0)(= amount 0)(< COINS 1)(= (largest COINS) 0))
      (display"Improper parameter value!\ncount-change= ")
              -1)
      (#t (display"List of coin denominations: ")
             (denomination-list COINS)
             (display"count-change= ")
             (cc amount COINS)
      )
   )
)

(define (Shaeffer? x? y?)
  (not (not(or(not x?)(not y?)))))

(define (cc amount coins-set)
  (cond((= amount 0) 1)
       ((Shaeffer? (or(< 1 amount)(= 1 amount)) (< 0 coins-set)) 0)
       (#t (+ (cc amount (- coins-set 1))
          (cc (- amount (largest coins-set)) coins-set))
       )
  )
)

(define (denomination-list coins-set)
  (cond ((= coins-set 0)
      (newline) 0)
      (#t (display (largest coins-set))
             (display" ")
             (denomination-list (- coins-set 1))
      )
  )
)

(define VARIANT 21)
(define COINS 5)

(display"Variant ")
(display VARIANT) (newline)
(display (count-change 100)) (newline)
(set! COINS 13)
(display (count-change 100)) (newline)
(display"(c) Aleksandr Semin 2022\n")



```

>



```
________________
Code:
/*  SAV   */
#include "mlisp.h"
double largest/*2*/ (double coins__set);
double count__change/*11*/ (double amount);
bool Shaeffer_Q/*27*/ (bool x_Q, bool y_Q);
double cc/*30*/ (double amount, double coins__set);
double denomination__list/*39*/ (double coins__set);
extern double VARIANT/*49*/;
extern double COINS/*50*/;
//________________
double largest/*2*/ (double coins__set){
 return
 (coins__set == 1. ? 1.
         :coins__set == 2. ? 3.
         :coins__set == 3. ? 10.
         :coins__set == 4. ? 20.
         :coins__set == 5. ? 50.
         :true ? 0.
         : _infinity);
         }

double count__change/*11*/ (double amount){
 display("______\n amount: ");
display(amount);
newline();
display("COINS: ");
display(COINS);
newline();
return
 ((amount < 0. || amount == 0. || COINS < 1. || largest(COINS) == 0.) ? (display("Im
proper parameter value!\ncount-change= "),
        -1.)
         :true ? (display("List of coin denominations: "),
        (denomination__list(COINS),
        (display("count-change= "),
        cc(amount, COINS))))
         : _infinity);
         }

bool Shaeffer_Q/*27*/ (bool x_Q, bool y_Q){
 return
 !(!((!(x_Q) || !(y_Q))));
         }
double cc/*30*/ (double amount, double coins__set){
 return
 (amount == 0. ? 1.
         :Shaeffer_Q((1. < amount || 1. == amount),  0. < coins__set) ? 0.
         :true ? (cc(amount, (coins__set - 1.)) + cc((amount - largest(coins__set)),
 coins__set))
         : _infinity);
         }

double denomination__list/*39*/ (double coins__set){
 return
 (coins__set == 0. ? (newline(),
        0.)
         :true ? (display(largest(coins__set)),
        (display(" "),
        denomination__list((coins__set - 1.))))
         : _infinity);
```



```
double denomination__list/*39*/ (double coins__set){
 return
 (coins__set == 0. ? (newline(),
        0.)
         :true ? (display(largest(coins__set)),
        (display(" "),
        denomination__list((coins__set - 1.))))
         : _infinity);
         }

double VARIANT/*49*/ ( 21. );
double COINS/*50*/ ( 5. );
int main(){
display("Variant ");
         display(VARIANT);
         newline();
         display(count__change(100.));
         newline();
          COINS = 13.;
         display(count__change(100.));
         newline();
         display("(c) Aleksandr Semin 2022\n");
         std::cin.get();
 return 0;
}

Code is saved to file coin22.cpp !
_________________________
```

Контрольная задача №3 – coin22.

Полный скриншот трансляции без трассировки (крупный белый шрифт на ярком черном фоне).

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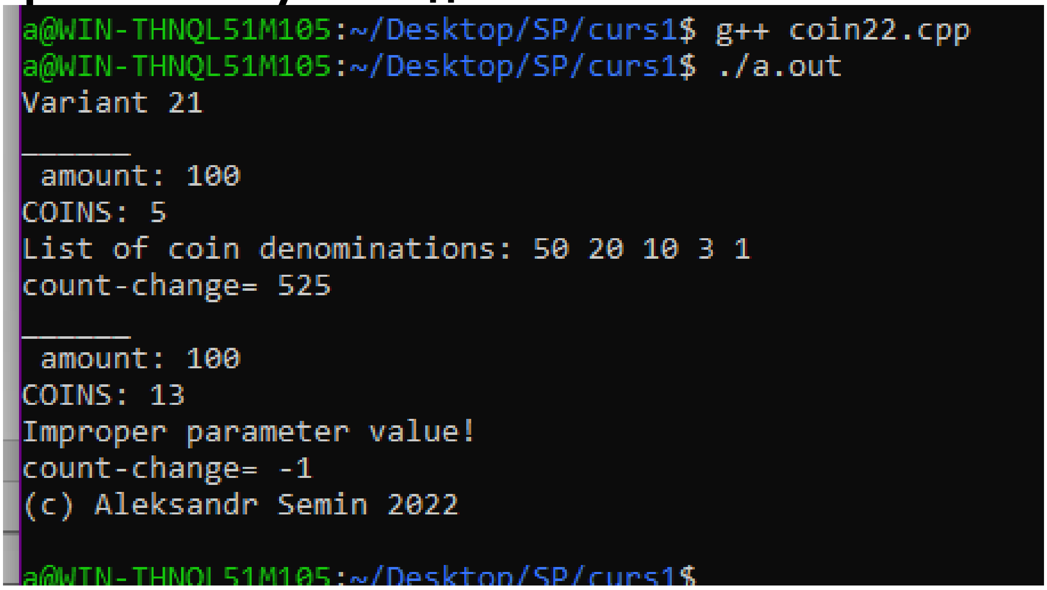
Скриншот запуска задачи на C++.



```
a@WIN-THNQL51M105:~/Desktop/SP/curs1$ g++ coin22.cpp
a@WIN-THNQL51M105:~/Desktop/SP/curs1$ ./a.out
Variant 21
______
 amount: 100
COINS: 5
List of coin denominations: 50 20 10 3 1
count-change= 525
______
 amount: 100
COINS: 13
Improper parameter value!
count-change= -1
(c) Aleksandr Semin 2022

a@WIN-THNQL51M105:~/Desktop/SP/curs1$
```

>