LAPORAN TUGAS KECIL 1
IF2211 STRATEGI ALGORITMA
SEMESTER II 2022-2023

Penyelesaian Permainan Kartu 24
dengan Algoritma Brute Force

Disusun oleh:

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PROGRAM STUDI
TEKNIK INFORMATIKA
SEKOLAH TEKNIK ELEKTRO
DAN INFORMATIKA
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1. ALGORITMA

1.1. Algoritma Solver Game 24

1. Lakukan loop untuk setiap *starting point* dengan cara mengambil 2 kartu acak yang berbeda dari list kartu.
2. Lakukan algoritma *bruteforce* dengan melakukan permutasi 2 kartu dan 1 operator dari semesta 4 kartu dan 4 operator dengan cara *looping* tiap 2 kartu berbeda dan tiap operator.
3. Lakukan rekursi hasil dari kalkulasi 2 kartu tersebut dengan 2 kartu sisanya dan seterusnya sampai kartu habis yang merupakan basis fungsi.
4. Tambahkan ekspresi ke himpunan solusi bila ekspresi pada tahap 3 menghasilkan angka 24

2. SOURCE CODE DALAM BAHASA C++

2.1. Berkas 24solver.cpp

```
#include <stdio.h>
#include <iostream>
#include <deque>
#include <string>
#include <fstream>
#include <ctime>
#include <chrono>




//+ - * /
double operation(double a, double b, int op) {
        double ans = 0;
        switch (op) {
        case 0:
                ans = a + b;
                break;
        case 1:
                ans = a - b;
                break;
        case 2:
                ans = a * b;
                break;
        case 3:
                ans = a / b;
                break;
        }
        return ans;
}

std::string translator(std::string input, std::deque<int> cards) {
        int bracount = 0;
        int var = 0;
        bool lastop = false;
        bool justclosed = false;
        std::string output = "";
        for (int i = 1; i < input.size(); i++) {
```

```
        output += input[i];
        if (bracount > 0) {
            if (lastop) {

                if (input[i] == 'a' || input[i] == 'b' ||
input[i] == 'c' || input[i] == 'd') {
                    lastop = false;
                    for (int j = 0; j < var; j++) {
                        if (bracount > 0) {
                            output += ')';
                            bracount--;
                        }
                    }
                    var = 0;
                    justclosed = true;
                }
            }
            if (input[i] == '(') {
                bracount++;
                lastop = false;
            }
            if (input[i] == '0' || input[i] == '1' || input[i] ==
'2' || input[i] == '3') {
                lastop = true;
            }
            if (input[i] == 'a' || input[i] == 'b' || input[i] ==
'c' || input[i] == 'd') {
                var++;
            }
        } else {
            if (input[i] == '(') {
                bracount++;
            }
        }
    }
    for (int i = 0; i < bracount; i++) {
        output += ")";
    }

    std::string trueoutput = "";
    for (int i = 0; i < output.size(); i++) {
        switch (output[i]) {
            case 'a' :
                trueoutput += std::to_string(cards[0]);
                break;
            case 'b':
                trueoutput += std::to_string(cards[1]);
                break;
            case 'c':
                trueoutput += std::to_string(cards[2]);
                break;
            case 'd':
                trueoutput += std::to_string(cards[3]);
                break;
            case '0':
                trueoutput += '+';
                break;
            case '1':
                trueoutput += '-';
                break;
            case '2':
                trueoutput += '*';
                break;
            case '3':
                trueoutput += '/';
                break;
            default:
                trueoutput += output[i];
        }
    }

    return trueoutput;
}

int solve24(std::deque<int> intcards, std::deque<double> cards,
std::deque<std::string> outputs, int& count, std::deque<std::string>&
answers) {

    if (cards.size() == 0) {
        return 0;
    }
    double ans = 0;
    for (int i = 0; i < cards.size(); i++) {
        for (int j = 0; j < cards.size(); j++) {
            if (j != i) {
                for (int op = 0; op < 4; op++) {
                    ans = operation(cards[i], cards[j], op);
                    std::string result = "(" + outputs[i] +
std::to_string(op) + outputs[j];
                    if (ans == 24 && cards.size() == 2) {
                        std::string trueoutput =
translator(result, intcards);
                        answers.push_front(trueoutput);
                        std::cout << trueoutput <<
std::endl;
                        //std::cout << result <<
std::endl;
                        count++;
                    }
                    else {
                        std::deque<double> tempcards;
                        std::deque<std::string>
tempoutputs;

                        for (int l = 0; l < cards.size();
l++) {
                            if (l != i && l != j) {

    tempoutputs.push_front(outputs[l]);

    tempcards.push_front(cards[l]);
                            }
```

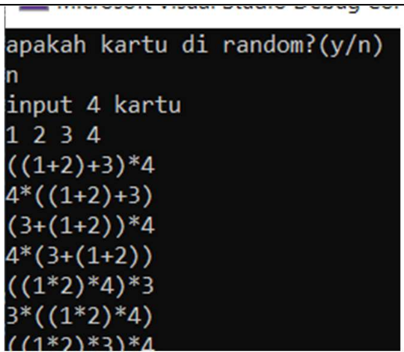
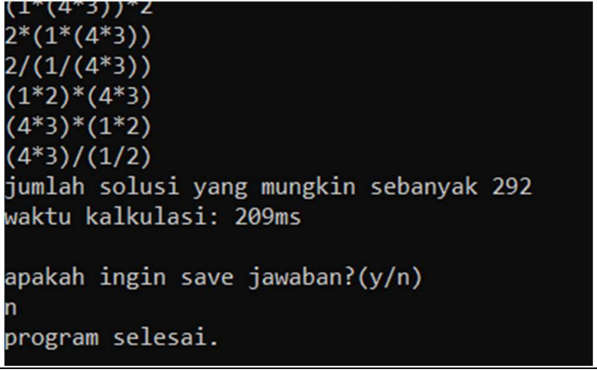
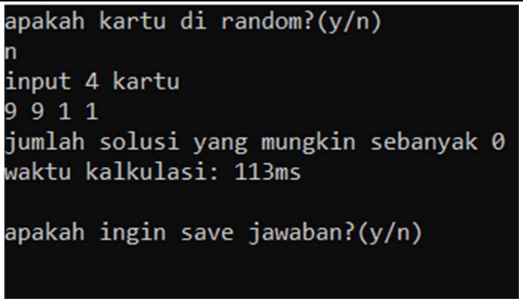
```
                                    }

                                    tempoutputs.push_front(result);
                                    tempcards.push_front(ans);
                                    solve24(intcards, tempcards, 
tempoutputs, count, answers);
                              }
                        }
                  }
            }
      }
      return 0;
}

int converttoint(std::string card) {
      if (card == "A") {
            return 1;
      }
      if (card == "J") {
            return 11;
      }
      if (card == "Q") {
            return 12;
      }
      if (card == "K") {
            return 13;
      }
      else {
            return stoi(card);
      }
}

std::string converttocard(int number) {
      if (number == 1) {
            return "A";
      }
      if (number == 11) {
            return "J";
      }
      if (number == 12) {
            return "Q";
      }
      if (number == 13) {
            return "K";
      }
      else {
            return std::to_string(number);
      }
}

bool validasiinput(std::string a, std::string b, std::string c, 
std::string d) {
      std::deque<std::string> cards = {a,b,c,d};
      std::deque<std::string> constrain = 
{ "A","2","3","4","5","6","7","8","9","10","J","Q","K" };
```

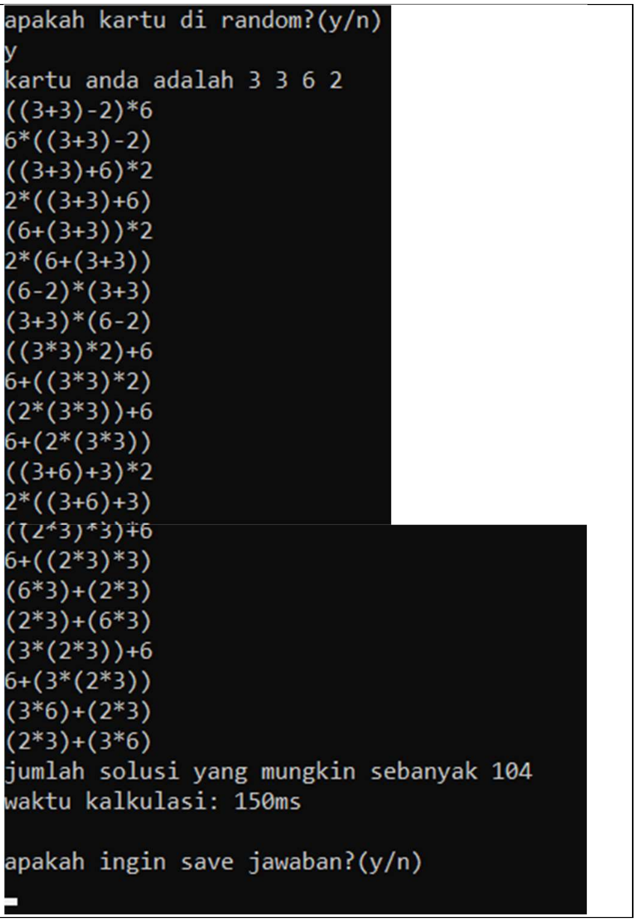
```
    bool validity = false;
    for (int i = 0; i < cards.size(); i++) {
        validity = false;
        for (int j = 0; j < constrain.size(); j++) {
            if (cards[i] == constrain[j]) {
                validity = true;
                break;
            }
        }
        if (!validity) {
            return false;
        }
    }
    return true;
}

int main() {


    /*std::deque<double> a = { 6,6,3,1 };
    std::deque<std::string> b = { "a","b","c","d" };
    std::deque<std::string> ans;
    std::deque<int> intcards = {6,6,3,1};
    int count = 0;
    solve24(intcards,a,b, count, ans);
    std::cout << count << " " << ans.size();*/
    char option;
    bool validity;
    do {
        std::cout << "selamat datang di solver24, ketik '4' untuk
exit. ketik '1' untuk mulai.\n\n" << std::endl;
        std::cin >> option;
        if (option == '1') {
            int A, B, C, D;
            do {

                std::cout << "apakah kartu di random?(y/n)" <<
std::endl;


                std::cin >> option;
                if (option == 'y') {
                    std::srand(static_cast<unsigned
int>(std::time(nullptr)));

                    A = std::rand() % 12 + 1;
                    B = std::rand() % 12 + 1;
                    C = std::rand() % 12 + 1;
                    D = std::rand() % 12 + 1;

                    std::cout << "kartu anda adalah " <<
converttocard(A) << " " << converttocard(B) << " " << converttocard(C) <<
" " << converttocard(D) << std::endl;

                }
                else if (option == 'n') {
```

```
                                 do {
                                        std::cout << "input 4 kartu" <<
std::endl;
                                        std::string a, b, c, d;
                                        std::cin >> a >> b >> c >> d;

                                        validity = validasiinput(a, b, c,
d);

                                        if (!validity) {
                                              std::cout << "terjadi
kesalahan input." << std::endl << std::endl;
                                        }
                                        else {
                                              A = converttoint(a);
                                              B = converttoint(b);
                                              C = converttoint(c);
                                              D = converttoint(d);
                                        }
                                 } while (!validity);
                          }
                          else if (option == '4') { return 0; }
                          else {
                                 std::cout << "terjadi kesalahan input."
<< std::endl << std::endl;
                          }
                    } while (!((option == 'y') || (option == 'n')));
                    std::deque<int> intcards = { A,B,C,D };
                    std::deque<double> doublecards =
{ static_cast<double>(A),static_cast<double>(B),static_cast<double>(C),sta
tic_cast<double>(D) };
                    std::deque<std::string> ans;
                    std::deque<std::string> mark = { "a","b","c","d" };
                    int count = 0;
                    auto started =
std::chrono::high_resolution_clock::now();


                    solve24(intcards, doublecards, mark, count, ans);

                    std::cout << "jumlah solusi yang mungkin sebanyak " <<
count << std::endl;

                    auto done = std::chrono::high_resolution_clock::now();

                    std::cout << "waktu kalkulasi: " <<
std::chrono::duration_cast<std::chrono::milliseconds>(done -
started).count() << "ms\n" << std::endl;

                    do {
                          std::cout << "apakah ingin save jawaban?(y/n) "
<< std::endl;
                          std::cin >> option;

                          if (option == 'y') {
                                 std::string nama;
                    std::cout << "tuliskan nama file
penyimpanan(tidak perlu .txt)" << std::endl;
                    std::cin >> nama;
                    std::fstream mfile;
                    mfile.open(nama + ".txt", std::ios::out);
                    if (!mfile) {
                        std::cout << "File not created!";
                    }
                    else {
                        std::cout << "File created
successfully!\n\n";
                        mfile << "kartu anda adalah " <<
converttocard(A) << " " << converttocard(B) << " " << converttocard(C) <<
" " << converttocard(D) << std::endl;
                        for (int i = 0; i < ans.size();
i++) {
                            mfile << ans[i] <<
std::endl;
                        }
                        mfile << "jumlah solusi yang
mungkin sebanyak " << count << std::endl;
                        mfile.close();
                    }

                }
                else if (option == 'n') {
                    std::cout << "ok,\n\n";
                }
                else {
                    std::cout << "terjadi kesalahan input."
<< std::endl << std::endl;
                }
            } while (!((option == 'y') || (option == 'n')));
        }
    } while (option != '4');
}
```

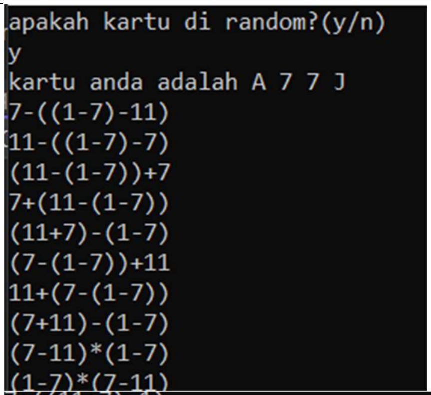
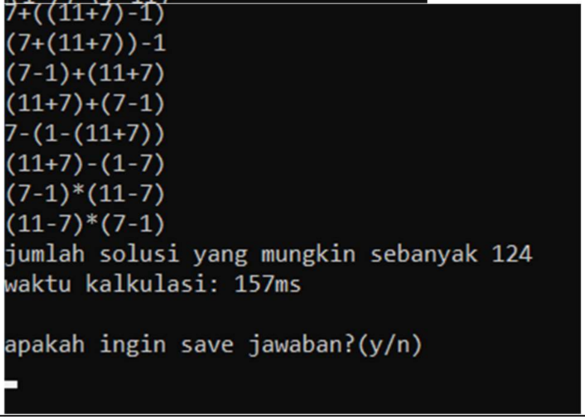
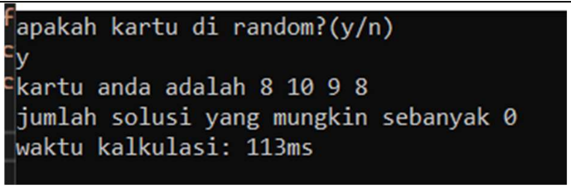
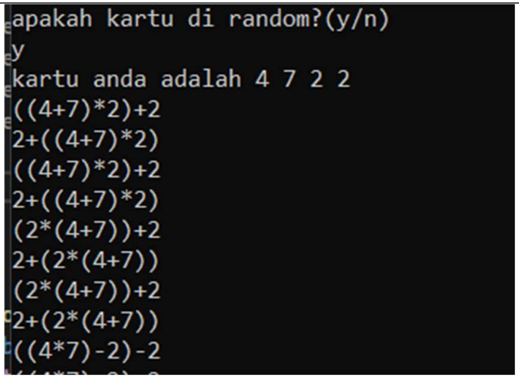
3. HASIL EKSEKUSI PROGRAM

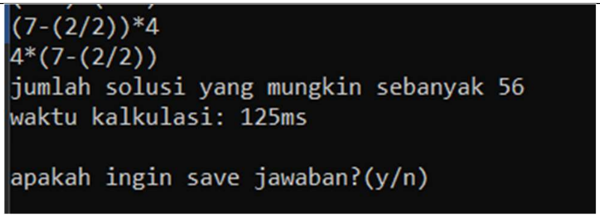
3.1. Tes Kartu

1 2 3 4	 Microsoft Visual Studio Debug Co apakah kartu di random?(y/n) n input 4 kartu 1 2 3 4 ((1+2)+3)*4 4*((1+2)+3) (3+(1+2))*4 4*(3+(1+2)) ((1*2)*4)*3 3*((1*2)*4) ((1*2)*3)*4  (1*(4*3))*2 2*(1*(4*3)) 2/(1/(4*3)) (1*2)*(4*3) (4*3)*(1*2) (4*3)/(1/2) jumlah solusi yang mungkin sebanyak 292 waktu kalkulasi: 209ms apakah ingin save jawaban?(y/n) n program selesai.
9 9 1 1	 apakah kartu di random?(y/n) n input 4 kartu 9 9 1 1 jumlah solusi yang mungkin sebanyak 0 waktu kalkulasi: 113ms apakah ingin save jawaban?(y/n)

3 3 6 2	

```
apakah kartu di random?(y/n)
y
kartu anda adalah 3 3 6 2
((3+3)-2)*6
6*((3+3)-2)
((3+3)+6)*2
2*((3+3)+6)
(6+(3+3))*2
2*(6+(3+3))
(6-2)*(3+3)
(3+3)*(6-2)
((3*3)*2)+6
6+((3*3)*2)
(2*(3*3))+6
6+(2*(3*3))
((3+6)+3)*2
2*((3+6)+3)
((2*3)*3)+6
6+((2*3)*3)
(6*3)+(2*3)
(2*3)+(6*3)
(3*(2*3))+6
6+(3*(2*3))
(3*6)+(2*3)
(2*3)+(3*6)
jumlah solusi yang mungkin sebanyak 104
waktu kalkulasi: 150ms

apakah ingin save jawaban?(y/n)
```

A 7 7 J	 apakah kartu di random?(y/n) y kartu anda adalah A 7 7 J 7-((1-7)-11) 11-((1-7)-7) (11-(1-7))+7 7+(11-(1-7)) (11+7)-(1-7) (7-(1-7))+11 11+(7-(1-7)) (7+11)-(1-7) (7-11)*(1-7) (1-7)*(7-11)  7+((11+7)-1) (7+(11+7))-1 (7-1)+(11+7) (11+7)+(7-1) 7-(1-(11+7)) (11+7)-(1-7) (7-1)*(11-7) (11-7)*(7-1) jumlah solusi yang mungkin sebanyak 124 waktu kalkulasi: 157ms apakah ingin save jawaban?(y/n)
8 10 9 8	 apakah kartu di random?(y/n) y kartu anda adalah 8 10 9 8 jumlah solusi yang mungkin sebanyak 0 waktu kalkulasi: 113ms
4 7 2 2	 apakah kartu di random?(y/n) y kartu anda adalah 4 7 2 2 ((4+7)*2)+2 2+((4+7)*2) ((4+7)*2)+2 2+((4+7)*2) (2*(4+7))+2 2+(2*(4+7)) (2*(4+7))+2 2+(2*(4+7)) ((4*7)-2)-2

```
(7-(2/2))*4
4*(7-(2/2))
jumlah solusi yang mungkin sebanyak 56
waktu kalkulasi: 125ms

apakah ingin save jawaban?(y/n)
```

4. LAMPIRAN

4.1. Pranala *Repository GitHub* https://github.com/tobisns/Tucil1_13521090

4.2. Tabel Ketercapaian Program

Poin	Ya	Tidak
1. Program berhasil dikompilasi tanpa kesalahan	✓	
2. Program berhasil *running*	✓	
3. Program dapat membaca input / generate sendiri dan memberikan luaran	✓	
4. Solusi yang diberikan program memenuhi (berhasil mencapai 24)	✓	
5. Program dapat menyimpan solusi dalam file teks	✓	