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Домашнє завдання №5

Скласти програму (C/C++), яка дозволяє знайти невідоме значення x методом повного перебору для заданих констант a, b, c, d, e, f, g та h та порівняти його з обчисленим.

Вибір варіанту

(Nж + Nг + 1) % 30 + 1

де: Nж – порядковий номер студента в групі, а Nг – номер групи(1,2,3,4,5,6,7 або 8)

Варіанти завдання

Варіант	Вираз
1	x + (a + b) + (c + d) + (e + f) + (g + h) = 0
2	x + (a + b) - (c + d) + (e + f) - (g + h) = 0
3	x + (a + b) * (c + d) + (e + f) * (g + h) = 0
4	x + (a + b) / (c + d) + (e + f) / (g + h) = 0
5	x + (a + b) + (c + d) + (e + f) + (g + h) = 0
6	x + (a + b) - (c + d) + (e + f) - (g + h) = 0
7	x + (a + b) * (c + d) + (e + f) * (g + h) = 0
8	x + (a + b) / (c + d) + (e + f) / (g + h) = 0
9	x + (a + b) + (c + d) + (e - f) + (g - h) = 0
10	x + (a + b) - (c + d) + (e - f) - (g - h) = 0
11	x + (a + b) * (c + d) + (e - f) * (g - h) = 0
12	x + (a + b) / (c + d) + (e - f) / (g - h) = 0
13	x + (a + b) + (c + d) + (e - f) + (g - h) = 0
14	x + (a + b) - (c + d) + (e - f) - (g - h) = 0
15	x + (a + b) * (c + d) + (e - f) * (g - h) = 0
16	x + (a + b) / (c + d) + (e - f) / (g - h) = 0
17	x + (a - b) + (c - d) + (e + f) + (g + h) = 0
18	x + (a - b) - (c - d) + (e + f) - (g + h) = 0
19	x + (a - b) * (c - d) + (e + f) * (g + h) = 0
20	x + (a - b) / (c - d) + (e + f) / (g + h) = 0
21	x + (a - b) + (c - d) + (e + f) + (g + h) = 0
22	x + (a - b) - (c - d) + (e + f) - (g + h) = 0
23	x + (a - b) * (c - d) + (e + f) * (g + h) = 0
24	x + (a - b) / (c - d) + (e + f) / (g + h) = 0
25	x + (a - b) + (c - d) + (e - f) + (g - h) = 0
26	x + (a - b) - (c - d) + (e - f) - (g - h) = 0
27	x + (a - b) * (c - d) + (e - f) * (g - h) = 0
28	x + (a - b) / (c - d) + (e - f) / (g - h) = 0
29	x + (a - b) + (c - d) + (e - f) + (g - h) = 0
30	x + (a - b) - (c - d) + (e - f) - (g + h) = 0

Приклад коду

Лістинг

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
#include <time.h>

#define A  0.33333333
#define B  0.
#define C -3.

#define REPEAT_COUNT 1000000
#define REPEATOR(count, code) \
for (unsigned int indexIteration = (count); indexIteration--;){ code; }
#define TWO_VALUES_SELECTOR(variable, firstValue, secondValue) \
	(variable) = indexIteration % 2 ? (firstValue) : (secondValue);

float getCurrentTime(){
	clock_t time = clock();
	if (time != (clock_t)-1) {
		return ((float)time / (float)CLOCKS_PER_SEC);
	}
	return 0.; // else
}

void run_native(float * const dArr){
	float * const dAC = dArr;
	float * const dA = &dAC[0];
	float * const dC = &dAC[1];
	float * const dB = &dArr[2];
	float * const dResult = &dArr[4];
	float * const dX1 = &dResult[1];
	float * const dX2 = &dResult[0];

	REPEATOR(REPEAT_COUNT,
		TWO_VALUES_SELECTOR(*dA, 4., A);
	TWO_VALUES_SELECTOR(*dB, 3., B);
	TWO_VALUES_SELECTOR(*dC, 1., C);
	float vD = sqrt((*dB)*(*dB) - 4.*(*dA)*(*dC));
	(*dX1) = (-(*dB) + vD) / (2.*(*dA));
	(*dX2) = (-(*dB) - vD) / (2.*(*dA));
	)
}

void run_search(float * const dArr){
	float * const dAC = dArr;
	float * const dA = &dAC[0];
	float * const dC = &dAC[1];
	float * const dB = &dArr[2];
	float * const dResult = &dArr[4];
	float * const dX1 = &dResult[1];
	float * const dX2 = &dResult[0];

	*dX1 = 0.; // reset the result
	*dX2 = 0.; // reset the result
	//printf("x1 = %5.2f; x2 = %5.2f;\r\n", *dX1, *dX2);

	*dA = A;
	*dB = B;
	*dC = C;

	unsigned int * const uX1 = (unsigned int * const)dX1;
```

```
	for (*uX1 = 0; *uX1 < ~0; ++*uX1){
		if (*dA * *dX1 * *dX1 + *dB * *dX1 + *dC == 0){
			break;
		}
	}

	unsigned int * const uX2 = (unsigned int * const)dX2;
	for (*uX2 = *uX1 + 1; *uX2 < ~0; ++*uX2){
		if (*dA * *dX2 * *dX2 + *dB * *dX2 + *dC == 0){
			break;
		}
	}
}


void printResult(char * const title, float * const dArr, unsigned int runTime, unsigned
int runTimeBySeconds){
	float * const dAC = dArr;
	float * const dA = &dAC[0];
	float * const dC = &dAC[1];
	float * const dB = &dArr[2];
	float * const dResult = &dArr[4];
	float * const dX1 = &dResult[1];
	float * const dX2 = &dResult[0];

	printf("%s:\r\n", title);
	printf("%fx^2 + %fx + %f = 0;\r\n", *dA, *dB, *dC);
	printf("x1 = %5.2f; x2 = %5.2f;\r\n", *dX1, *dX2);
	if (runTime){
		printf("run time: %dns\r\n\r\n", runTime);
	}
	else if (runTimeBySeconds){
		printf("run time: %ds (~%d.000.000.000ns)\r\n\r\n", runTimeBySeconds,
runTimeBySeconds);
	}
}

int main() {
	float * const dArr = (float *)malloc(6 * sizeof(float));

	float * const dAC = dArr;
	float * const dA = &dAC[0];
	float * const dC = &dAC[1];
	float * const dB = &dArr[2];
	float * const dResult = &dArr[4];
	float * const dX1 = &dResult[1];
	float * const dX2 = &dResult[0];

	float startTime, endTime;

	// compute by the formula with compiler optimization
	startTime = getCurrentTime();
	run_native(dArr);
	endTime = getCurrentTime();
	printResult((char*)"compute by the formula with compiler optimization",
		dArr,
		(unsigned int)((endTime - startTime) * (1000000000 / REPEAT_COUNT)), 0);

	printf("please wait, the full search takes a few tens of seconds...");
	startTime = getCurrentTime();
	run_search(dArr);
	endTime = getCurrentTime();
	printf("\r                                                          \r");
	printResult((char*)"search",
		dArr,
```

```
                0, (unsigned int)(endTime - startTime));

        printf("Press any key to continue . . .");
        getchar();
        return 0;
}
```