DSP LAB - LAB 3 in C

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1 Fixed Point Arithmetic

1.1 C CODE

```c
#include <stdio.h>
#include <math.h>

int main()
{
    float float_num1 = 3.1425;
    float float_num2 = 4.2357;
    float float_result_add = float_num1 + float_num2;

    int q_format = pow(2, 12);
    int fixed_num1 = (int)(float_num1 * q_format);
    int fixed_num2 = (int)(float_num2 * q_format);

    float fixed_result_add = floor(fixed_num1 + fixed_num2) /
        q_format;

    printf("Floating-point addition result: %f\n",
       float_result_add);
    printf("Fixed-point addition result: %f\n",
       fixed_result_add);
    printf("Addition Error: %f\n", fabs(float_result_add -
       fixed_result_add));

    float fixed_result_multiply = floor(fixed_num1 *
       fixed_num2) / pow(q_format, 2);

    float float_result_multiply = float_num1 * float_num2;
    printf("Floating-point multiplication result: %f\n",
       float_result_multiply);
    printf("Fixed-point multiplication result: %f\n",
       fixed_result_multiply);
```

```
        printf("Multiplication Error: %f\n", fabs(
            float_result_multiply - fixed_result_multiply));

        return 0;
    }
```

1.2 Output

```
    Floating-point addition result: 7.378200
    Fixed-point addition result: 7.377930
    Addition Error: 0.000270
    Floating-point multiplication result: 13.310687
    Fixed-point multiplication result: 13.309656
    Multiplication Error: 0.001031
```