

COMSC 200

Summer 2024

Programming Assignment 8

Worth 12.5 points (1.25% of your grade)

**DUE: Saturday, 7/6/24 by 11:59 P.M. on
Canvas**

**Late Pass Deadline: Tuesday, 7/9/24 by
11:59 P.M. on Canvas**

**You need to start by downloading the following file from
Canvas: Polynomial_app.cpp**

Your solution that you submit should consist of three (3) files:

Polynomial.h (class specification file)

Polynomial.cpp (class implementation file)

And the first-name_last-name.pdf file should contain your five (5) sample runs.

The application program (Polynomial_app.cpp) has already been completed for you. **Your Polynomial class should work with the Polynomial_app.cpp application program that has been given to you.**

Please continue to use the same **naming convention** as before, where each filename should contain both your first name and your last name. If your first name is "James" and your last name is "Smith", then your header file should be named James_Smith_Polynomial.h, and your cpp file should be named James_Smith_Polynomial.cpp

Comments – worth 1.25 points (10%) of your programming assignment grade:

Your program should have at least **ten (10)** different detailed comments explaining the different parts of your program. Each individual comment should be, at a minimum, a sentence explaining a particular part of your code. You should make each comment as detailed as necessary to fully explain your code. You should also number each of your comments (i.e., comment 1, comment 2, etc.).

Sample Runs – worth 1.25 points (10%) of your programming assignment grade:

You should submit screenshots of at least **five (5)** different sample runs of your program. You should also number each of your sample runs (i.e., sample run 1, sample run 2, etc.). **NOTE: Your sample runs should be different from my sample runs shown in this write-up for the programming assignment.** Each sample run should follow this format:

Enter number of polynomial terms: 5

Enter coefficient: 1

Enter exponent: 4

Enter coefficient: 2

Enter exponent: 3

Enter coefficient: 3

Enter exponent: 2

Enter coefficient: 4

Enter exponent: 1

Enter coefficient: 5

Enter exponent: 0

Enter number of polynomial terms: 4

Enter coefficient: 5

Enter exponent: 4

Enter coefficient: 4

Enter exponent: 3

Enter coefficient: 3

Enter exponent: 2

Enter coefficient: 2

Enter exponent: 1

```
First polynomial is:
5+1x^4+2x^3+3x^2+4x

Second polynomial is:
5x^4+4x^3+3x^2+2x

Adding the polynomials yields:
5+6x^4+6x^3+6x^2+6x

+= the polynomials yields:
5+6x^4+6x^3+6x^2+6x

Subtracting the polynomials yields:
5-4x^4-2x^3+2x

-= the polynomials yields:
5-4x^4-2x^3+2x

Press any key to continue . . .
```

Develop class `Polynomial`. The internal representation of a `Polynomial` is an array or vector of terms. Each term contains a coefficient and an exponent, e.g., the term

□ $2x^4$

has the coefficient 2 and the exponent 4. Develop a complete class containing proper constructor and destructor functions as well as *set* and *get* functions. The class should also provide the following **overloaded operator** capabilities:

- a. Overload the addition operator (+) to add two **Polynomials**.
- b. Overload the subtraction operator (-) to subtract two **Polynomials**.
- c. Overload the assignment operator (=) to assign one **Polynomial** to another.
- d. Overload the addition assignment operator (+=).
- e. Overload the subtraction assignment operator (-=).

Beyond overloading these operators, the code in the `polynomial_app.cpp` will give you an idea of what member functions you need to implement in the **Polynomial** class.

Sample Run 1 (using **polynomial_app.cpp**):

Enter number of polynomial terms: 5

Enter coefficient: 1

Enter exponent: 4

Enter coefficient: 2

Enter exponent: 3

Enter coefficient: 3

Enter exponent: 2

Enter coefficient: 4

Enter exponent: 1

Enter coefficient: 5

Enter exponent: 0

Enter number of polynomial terms: 4

Enter coefficient: 5

Enter exponent: 4

Enter coefficient: 4

Enter exponent: 3

Enter coefficient: 3

Enter exponent: 2

Enter coefficient: 2

Enter exponent: 1

First polynomial is:

$$5+1x^4+2x^3+3x^2+4x$$

Second polynomial is:

$$5x^4+4x^3+3x^2+2x$$

Adding the polynomials yields:

$$5+6x^4+6x^3+6x^2+6x$$

+= the polynomials yields:

$$5+6x^4+6x^3+6x^2+6x$$

Subtracting the polynomials yields:

$$5-4x^4-2x^3+2x$$

-= the polynomials yields:

$$5-4x^4-2x^3+2x$$

Press any key to continue . . .

Sample Run 2 (using `polynomial_app.cpp`):

Enter number of polynomial terms: 4

Enter coefficient: 8

Enter exponent: 3

Enter coefficient: 6

Enter exponent: 2

Enter coefficient: 4

Enter exponent: 1

Enter coefficient: 2

Enter exponent: 0

Enter number of polynomial terms: 4

Enter coefficient: 2

Enter exponent: 3

Enter coefficient: 4

Enter exponent: 2

Enter coefficient: 6

Enter exponent: 1

Enter coefficient: 8

Enter exponent: 0

First polynomial is:

$$2+8x^3+6x^2+4x$$

Second polynomial is:

$$8+2x^3+4x^2+6x$$

Adding the polynomials yields:

$$10+10x^3+10x^2+10x$$

+= the polynomials yields:

$$10+10x^3+10x^2+10x$$

Subtracting the polynomials yields:

$$-6+6x^3+2x^2-2x$$

-= the polynomials yields:

$$-6+6x^3+2x^2-2x$$

Press any key to continue . . .

Sample Run 3 (using `polynomial_app.cpp`):

Enter number of polynomial terms: 3

Enter coefficient: 1

Enter exponent: 2

Enter coefficient: 2

Enter exponent: 1

Enter coefficient: 3

Enter exponent: 0

Enter number of polynomial terms: 3

Enter coefficient: 1

Enter exponent: 2

Enter coefficient: 2

Enter exponent: 1

Enter coefficient: 3

Enter exponent: 0

First polynomial is:

$$3+1x^2+2x$$

Second polynomial is:

$$3+1x^2+2x$$

Adding the polynomials yields:

$$6+2x^2+4x$$

+= the polynomials yields:

$$6+2x^2+4x$$

Subtracting the polynomials yields:

$$0$$

-= the polynomials yields:

$$0$$

Press any key to continue . . .