

Name: _____

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COMP3021: Java Programming In-class Exercise

An arithmetic expression consists of two operands and an operator. For instance, the expression 3+4 has 3 and 4 as two operands and "+" as the operator. Suppose that we are assigned to design a calculator program with the following classes that have constructor definitions and the inheritance relationships missing.

```
abstract class Expression
{
    public abstract int result(); //equivalent to pure virtual
}

class Operand
{
    private int value;
    public int result(){ return value;}
}

abstract class AE
{
    protected Expression left;
    protected Expression right;
    public abstract int result();
}

class Addition
{
    public int result(){
        return left.result()+right.result();
    }
}

class Subtraction
{
    public int result() {
        return left.result() - right.result();
    }
}
```

```
class Multiply
{
    public int result() {
        return left.result() * right.result();
    }
}

class Divide
{
    public int result() {
        return left.result() / right.result();
    }
}
```

Please finish the following two tasks:

- a.) Please complete the constructor and inheritance definition for each class where necessary.
- b.) Please give the Java code to encode the following expressions using the classes defined above. Please think about how the expressions are evaluated.
 - a. $8 \times 9 + 1 \times 6$;
 - b. $8 \times (9 + 1) \times 6$;