

## E26

Describe Pros and Cons for each design. Factor including:

- simplicity of code.
- efficiency when creating instances.
- efficiency when converting systems.
- amount of memory used.

	pros	cons
Design 1	<ul style="list-style-type: none"><li>• Take less memory since there is only one instance.</li><li>• easier to code since no subclass are required.</li></ul>	<ul style="list-style-type: none"><li>• Take more time to convert from one system to another.</li><li>• Take more time to create instance since system type are required.</li></ul>
Design 2	<ul style="list-style-type: none"><li>• Easier to code since only one type of system are considered.</li><li>• Take less time to create instance.</li></ul>	<ul style="list-style-type: none"><li>• take more memory since new instance are created when converting coordinate system.</li><li>• Take less time to convert from one system to another since no need to check system type.</li></ul>
Design 3	<ul style="list-style-type: none"><li>• Easier to code since only one type of system are considered.</li><li>• Take less time to create instance.</li></ul>	<ul style="list-style-type: none"><li>• take more memory since new instance are created when converting coordinate system.</li><li>• Take less time to convert from one system to another since no need to check system type.</li></ul>
Design 5	<ul style="list-style-type: none"><li>• Take less time to create instance since we have subclasses representing different system.</li><li>• Take less time to convert from one system to another since no need to check system type.</li></ul>	<ul style="list-style-type: none"><li>• take more memory since new instance are created when converting coordinate system.</li><li>• complex to code since methods for each system have individual subclass.</li></ul>

## E28,29,30

This test considers the constant value and system, we are trying to find out the efficiency of system converting from Design1 and Design5. The test will generate a random integer for both Design1 and Design5 to iterate and do the system converting method during each iteration. The timer for both design is considering milliseconds.

	Design 1	Design 5
Test1	8258 times of design1: 0 milli seconds	8258 times of design5: 2 milli seconds
Test2	3862 times of design1: 1 milli seconds	3862 times of design5: 0 milli seconds
Test3	9575 times of design1: 1 milli seconds	9575 times of design5: 2 milli seconds
Test4	4439 times of design1: 1 milli seconds	4439 times of design5: 2 milli seconds
Test5	7338 times of design1: 2 milli seconds	7338 times of design5: 1 milli seconds
average	1 millisecond	1.4 milliseconds

## Conclusion:

From the result of 5 tests above, we can tell that the average time required for the same amount of iteration for Design1 is 1 millisecond and for Design5 is 1.4 millisecond, which means that Design 5 usually takes more time to do the coordinate system conversion than Design1. This proved the hypothesis on E26 that Design 5 takes more memory space than Design1 when converting coordinate systems.

