Com S 228

Fall 2015

Exam 1 Sample Solution

1.

`Point p = new Point(0, 0);` `Shape s = new Shape(p);`	compile error: cannot instantiate the type Shape

`Point p = new Point(0, 0);`
`Region r = new Rectangle(3, 4, p);`
`System.out.println(r.perimeter());`
	Rectangle perimenter: 14

`Solid c = new Cube(3, new Point(-1, -1));` `System.out.println(c.location());`	compile error: location() undefined for the type Solid

`Point p = new Point(0, 0);`
`Shape s = new Cube(2, p);`
`System.out.println(s.area());`
`s = new Rectangle(3, 5, p) ;`
`System.out.println(s.area());`
	Cube area: 24
	Rectangle area: 15

`Region r = new Square(2, new Point(3, 2));`
`Rectangle rt = (Rectangle) r;`
`System.out.println(rt.location());`
	(3, 2)

`Square s = new Square(4, new Point(0,0));`
`Cube c = (Cube) s;`
`System.out.println(c.location());`
	compile error: cannot cast from Square to Cube

`Shape s = new Rectangle(5, 2,`
`new Point(1, 1));`
`Square sq = (Square) s;`
	ClassCastException

2.

```
@Override
public Course clone()  // makes a deep copy.
{
     try
     {
         Course cloned = (Course) super.clone(); // calls Object.clone().
         cloned.lecture = lecture.clone();  // makes a deep copy.
         cloned.recitation = recitation.clone(); // makes a deep copy.
         return cloned;
     }

     catch (CloneNotSupportedException e)
     {
         return null;
     }
 }

@Override
public boolean equals(Object obj)
{
       if (obj == null || obj.getClass() != this.getClass())
             return false;

       Course c = (Course)obj;
       return lecture.equals(c.lecture) && recitation.equals(c.recitation);
}

@Override
public boolean equals(Object obj)
{
       if (obj == null || obj.getClass() != this.getClass())
             return false;

       Instruction i = (Instruction) obj;
       return time == i.time && teacher.equals(i.teacher) && room.equals(i.room);
}
```

3a)

i) n or $O(n)$

ii) $(n - i)/2$ or $O(n)$

iii) $O(n^2)$

b)

i) $n/3$ or $O(n)$

ii) $O(n)$

c)

i) $O(\log n)$

ii) $O(n^3)$

iii) $O(n^3 \log n)$

d) $O(n \log n)$

4a) C (MERGESORT)

b) D (QUICKSORT)

c) B (INSERTIONSORT)
d) D (QUICKSORT)
e) A (SELECTIONSORT)
f) B (INSERTIONSORT)

5a) 061 087 170 503 275 512 426 154 509 612 653 677 703 765 897 908
b) Yes, stable.