The class invariant

```
public class TimeOfDay {
  private int time= 0;
  private String zone= "GMT";
  private boolean ampm= false;

  public TimeOfDay()     — 0 GMT in 24-hr time
  public TimeOfDay(sec, zone)
  public TimeOfDay(hrs, mins, secs, zone, display)

  public int getTime()
  public String getZone()
  public boolean getDisplayIndication()

  public void setDisplay(ampm)

  public String toString()


}
```

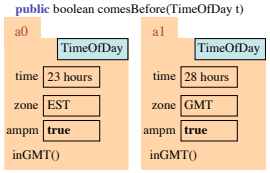

The class invariant

```
public class TimeOfDay {
  private int time= 0;
  private String zone= "GMT";
  private boolean ampm= false;

  /** = same time as this time but in zone GMT */
  public TimeOfDay inGMT()

  /** = same time as this time but in zone z */
  public TimeOfDay inZone(z)

  /** = "this time comes before time t" */
  public boolean comesBefore(TimeOfDay t)
```



The class invariant

```
public class TimeOfDay {
  /** The zone must be one of GMT BST EST
  EDT CST CDT MST MDT PST PDT IND.
      Field time is a time of day, in seconds. It
  has the property that, in some time zone, it is
  in the range 0.. 24*360–1.
  So, time < 0 and 24*360 ≤ time are possible.
      If ampm is true, present the time in am-pm
   mode; if false, in 24-hour clock mode.
   */
   private int time= 0;
   private String zone= "GMT";
   private boolean ampm= false;
  /** Constructor: an instance with time s seconds
      and zone z. If z is not a legal zone, use GMT.
      0 ≤ s < 24*360.   */
  public TimeOfDay(int s, String z) {
  }
```

NY time 23 hours is London time 28 hours.
London time 0 seconds in NY time -5 hours.

```
}
```


The class invariant

```
public class TimeOfDay {
```

```
  /** The zone must be one of GMT BST EST
  EDT CST CDT MST MDT PST PDT IND.
      Field time is a time of day, in seconds. It
  has the property that, in some time zone, it is
  in the range 0.. 24*360–1.
  So, time < 0 and 24*360 ≤ time are possible.
      If ampm is true, present the time in am-pm
  mode; if false, in 24-hour clock mode.
  */
   private int time= 0;
   private String zone= "GMT";
   private boolean ampm= false;
```

Class invariant: A description of the meaning of the fields of an instance, along with constraints on them.

Every method assumes the class invariant of all objects is true when it is called. The class invariant must be true when the call is completed.

The class invariant

```
public class TimeOfDay {
```

```
  /** The zone must be one of GMT BST EST
  EDT CST CDT MST MDT PST PDT IND.
      Field time is a time of day, in seconds. It
  has the property that, in some time zone, it is
  in the range 0.. 24*360–1.
  So, time < 0 and 24*360 ≤ time are possible.
      If ampm is true, present the time in am-pm
  mode; if false, in 24-hour clock mode.
  */
   private int time= 0;
   private String zone= "GMT";
   private boolean ampm= false;
```

Class invariant: A description of the meaning of the fields of an instance, along with constraints on them.

Programmer's duty: Write class invariant when the field declarations are first written in the class.

Programmer is the main beneficiary!!!

The programmer benefits from a good class invariant

```
public class TimeOfDay {
```

```
  /** The zone must be one of GMT BST EST
  EDT CST CDT MST MDT PST PDT IND.
  …
  */
   private int time= 0;
   private String zone= "GMT";
   private boolean ampm= false;

  /** Constructor: an instance with time s seconds
      and zone z. If z is not a legal zone, use GMT.
      */
  public TimeOfDay(int s, String z) {
```

Knowing the constraints in the class invariant can make the task of writing the body easier.

Knowing the constraints in the class invariant helps you ensure that they are true when the method body ends.

```
  }
}
```

The class invariant

```
public class TimeOfDay {
  /** The zone must be one of GMT BST EST
  EDT CST CDT MST MDT PST PDT IND.
      Field time is a time of day, in seconds. It
  has the property that, in some time zone, it is
  in the range 0.. 24*360–1.
  So, time < 0 and 24*360 ≤ time are possible.
      If ampm is true, present the time in am-pm
  mode; if false, in 24-hour clock mode.
  */
    private int time= 0;
    private String zone= "GMT";
    private boolean ampm= false;

}
```


The class invariant

```
public class TimeOfDay {
  /** Time of day, in seconds. Property: in some
      time zone, it is in the range 0.. 24*360–1.
      time < 0 and 24*360 ≤ time are possible.
    */
  private int time= 0;

  /** one of GMT BST EST EDT CST CDT
     MST MDT PST PDT IND. */
  private String zone= "GMT";

  private boolean ampm= false; // true: describe in
                               //  24-hr; false, am-pm time
```