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# Properties (Solutions)

## Questions

1. What is the right syntax for an automatic property? *Select all that apply.*
	* public int Width { get; set; }
	* public int Width { set; get; }
	* public int Width { Set; Get; }
	* public int Width { Get; Set; }
	* public int Width { set(); get();}
	* public int Width { get(); set();}
2. Which of the following statements is *false*?
	* Properties can be static.
	* get and set accessors must always have bodies.
	* Properties have headers.
	* get and set accessors correspond to “getter” and “setter” methods for attributes.
3. Consider the following implementation of a class called Pet:
* class Pet{
 private string name;
 public string Name{
 get;
 set { name = value; }
 }
}
* This code will give a compilation error. Why?
	+ The set accessor has a body, but the get accessor does not.
	+ The instance variable for name is declared, but no value is assigned.
	+ value is not a keyword and hasn’t been declared, so it is meaningless here.
	+ The access modifier for name is private, but it should be public.

### Circle Example

For the following questions, imagine you’ve implemented a Circle class, with the attribute private decimal diameter; and a “getter” and “setter” method for that attribute. You’ve created an object in this Circle class called myCircle. If you were to implement the class with properties instead:

1. What would calling the get accessor do?
	* Return the value of diameter
	* Assign a value to diameter
2. What would calling the set accessor do?
	* Return the value of diameter
	* Assign a value to diameter
3. The statement myCircle.GetDiameter(); would have to be rewritten. How would you rewrite it?
	* myCircle.Diameter;
	* myCircle.diameter;
	* Diameter.myCircle;
	* myCircle = Diameter;
4. The statement myCircle.SetDiameter(5.0m); would also need to be rewritten. How would you rewrite it?
	* myCircle.diameter = 5.0m;
	* Diameter.myCircle(5.0m);
	* myCircle.Diameter = 5.0m;
	* myCircle.diameter(5.0m);

You would now like to add a Color property of type string to your Circle class.

1. How would you declare the instance variable?
	* public color string;
	* public string Color;
	* private string Color;
	* private string color;
2. How would you format the property header?
	* public string color;
	* public string Color;
	* private Color string;
	* private string color;
3. What would the get accessor’s body look like, in its most basic possible form?
	* color;
	* color = value;
	* return color;
	* string color;
4. What would the set accessor’s body look like, in its most basic possible form?
	* color;
	* color = value;
	* return color;
	* string color;
5. In the Main method, you would like to assign the value "yellow" to color. Which statement would do that?
	* yellow.myCircle;
	* myCircle.Color = "yellow";
	* myCircle.yellow = Color;
	* myCircle = "yellow";

### Plant Example

For the next questions, consider the following implementation of a class called Plant:

class Plant{
 private string species;
 public string Species
 {get;} = "Helianthus annus";
 private static bool hasChloroplasts;
 public static bool HasChloroplasts
 {get;} = true;
}

1. Will this code compile? Why or why not?
	* No, because there are no set accessors, and properties must have one.
	* No, because a property cannot be assigned a default value.
	* No, because a get accessor must always have a body.
	* Yes, because properties are *not* required to have set accessors.
	* Yes, because a default value must be assigned for each property.

Suppose you’ve created an object in the Plant class called myPlant.

1. In the Main method, what would the statement
* Console.Write(myPlant.Species);
* do?
	+ Display the current value of species, "Helianthus annus".
	+ Rename the myPlant object to Species.
	+ It won’t do anything–the code for the class doesn’t compile.
	+ It won’t do anything–the property is write-only.
1. The HasChloroplasts property is static. What does this mean? *Select all that apply.*
	* Every object in the Plant class has its own HasChloroplasts property.
	* The property is shared across the class and all of its instances.
	* The property can be accessed without creating a Plant object.
	* The property’s value cannot be changed from the default.
2. The statement myPlant.Species = "Coffea arabica"; would not compile. Why not?
	* The syntax is wrong.
	* Only a static property’s default value can be changed.
	* The code for the class doesn’t compile.
	* The property only has a get accessor, so it is read-only.
3. What modification to the Plant class would allow the statement myPlant.Species = "Coffea arabica"; to compile?
	* Remove the default value, "Helianthus annus".
	* Add set; to the Species property.
	* Add set; to the HasChloroplasts property.
	* Make the entire class static.
	* Change the access modifier for species from private to public

## Problems

1. Consider the following implementation of a Rectangle class:
* class Rectangle
{
 private int length;
 private int width;

 public void SetLength(int lengthParameter)
 {
 length = lengthParameter;
 }

 public int GetLength()
 {
 return length;
 }

 public void SetWidth(int widthParameter)
 {
 width = widthParameter;
 }

 public int GetWidth()
 {
 return width;
 }

 public int ComputeArea()
 {
 return length \* width;
 }
}
	1. Write a Main method that
		1. Creates a Rectangle object,
		2. Sets its width to 5,
		3. Sets its length to 10,
		4. Displays its area.
		+ Solution
		+ using System;
		 class Program
		 {
		 public static void Main()
		 {
		 Rectangle test = new Rectangle(); // 1
		 test.SetWidth(5); // 2
		 test.SetLength(10); // 3
		 Console.WriteLine(test.ComputeArea()); // 4
		 }
		 }
	2. Write an implementation of the Rectangle class *using only properties* (included for the ComputeArea()).
	+ Solution
	+ class Rectangle{
	 public int Length{get; set;}
	 public int Width{get; set;}
	 public int Area{get{return Length \* Width;}}
	 }
	1. Write a Main method that performs the same tasks as above, but using the properties you just defined.
	+ Solution
	+ using System;
	 class Program
	 {
	 public static void Main()
	 {
	 Rectangle test = new Rectangle(); // 1
	 test.Width = 5; // 2
	 test.Length = 10; // 3
	 Console.WriteLine(test.Area); // 4
	 }
	 }
1. Implement a SDCard class to represent SD cards. Add attributes to your answer if needed.
	1. Implement a Nickname string property using automatic properties.
	* Solution
	* public string Nickname {get; set;}
	1. Implement a Capacity int property whose setter raises an ArgumentException exception if the value passed as argument is not 8, 16, 32, 64 or 128. The getter should simply return the value stored.
	* Solution
	* private int capacity;
	 public int Capacity {
	 set {
	 if (value == 8 || value == 16 || value == 32 || value == 64 || value == 128)
	 capacity = value;
	 else
	 throw new ArgumentException();
	 }
	 get { return capacity; }
	 }
	1. Implement a CapacityInGb int property with only a getter, that returns the Capacity times 8.
	* Solution
	* public int CapacityInGb {
	 get {return capacity \* 8;}
	 }
	1. Implement a ToString method that returns a string containing the nickname of the SD card, its capacity in gigabytes (GB, from question 2.), and its capacity in gigabits (Gb, from question 3.).
	* Solution
	* public override string ToString(){
	 return "Name: " + Nickname + "\nCapacity: " + Capacity + "GB" + "\nCapacity in Gb: " + CapacityInGb + "Gb";
	 }
* Solution
* A complete solution gives:
* using System;

class SDCard
{
 public string Nickname { get; set; }
 private int capacity;
 public int Capacity
 {
 set
 {
 if (
 value == 8
 || value == 16
 || value == 32
 || value == 64
 || value == 128
 )
 capacity = value;
 else
 throw new ArgumentException();
 }
 get { return capacity; }
 }
 public int CapacityInGb
 {
 get { return capacity \* 8; }
 }

 public override string ToString()
 {
 return "Name: "
 + Nickname
 + "\nCapacity: "
 + Capacity
 + "GB"
 + "\nCapacity in Gb: "
 + CapacityInGb
 + "Gb";
 }
}
* [*(Download this code)*](code/projects/SDCard.zip)
* And a possible test program is:
* ﻿using System;

class Program
{
 static void Main()
 {
 SDCard test = new SDCard();
 test.Nickname = "Blue";
 test.Capacity = 8;
 Console.WriteLine(test);
 try
 {
 test.Capacity = 7;
 }
 catch (Exception e)
 {
 Console.WriteLine(e.Message);
 }
 }
}
* [*(Download this code)*](code/projects/SDCard.zip)