Gauntlet:
.NET / C#
Tips and Tricks

Kevin Griffin

#1 : Use DateTimeOffset

```
// create a time, but in what timezone?
DateTime meetingTimeInVirginia = new DateTime(2024, 2, 10, 15, 0, 0);

// let's use a Timezone!
DateTimeOffset meetingTimeInVirginia = new DateTimeOffset(2024, 2, 10, 15, 0, 0, TimeSpan.FromHours(-5));
```

#2 : Convert from DateTime to DateTimeOffset

```
// create a time, but in what timezone?
DateTime meetingTimeInVirginia = new DateTime(2024, 2, 10, 15, 0, 0);

TimeZoneInfo easternZone =
    TimeZoneInfo.FindSystemTimeZoneById("Eastern Standard Time");
DateTimeOffset meetingTimeInVirginiaOffset =
    TimeZoneInfo.ConvertTimeToUtc(meetingTimeInVirginia, easternZone);
```

#3 : NodaTime

```
// Define the time zones for Virginia and London
var virginiaZone = DateTimeZoneProviders.Tzdb['America/New_York']
var londonZone = DateTimeZoneProviders.Tzdb['Europe/London']

// Define the local time for the meeting in Virginia
var localMeetingTimeInVirginia = new LocalDateTime(2024, 2, 10, 15, 0) // 3 PM

// Convert the local time in Virginia to a ZonedDateTime
var zonedMeetingTimeInVirginia =
  localMeetingTimeInVirginia.InZoneLeniently(virginiaZone)

// Convert Virginia time to London time
var zonedMeetingTimeInLondon = zonedMeetingTimeInVirginia.WithZone(londonZone)

// Meeting Time in Virginia (Eastern Time): 2024-02-10T15:00:00 America/New_York (-05)
Console.WriteLine("Meeting Time in Virginia (Eastern Time): " + zonedMeetingTimeInVirginia)

// Meeting Time in London (GMT): 2024-02-10T20:00:00 Europe/London (+00)
Console.WriteLine("Meeting Time in London (GMT): " + zonedMeetingTimeInLondon)
```

#4 : DateOnly / TimeOnly

```
// Creating a DateOnly instance for the current date
DateOnly today = DateOnly.FromDateTime(DateTime.Now);

// Returns "02/06/2024"
Console.WriteLine($"Today's Date: {today}");
```

#4 : DateOnly / TimeOnly

```
// Creating a TimeOnly instance for the current date
TimeOnly today = TimeOnly.FromDateTime(DateTime.Now);

// Returns 23:20 (yes, 24-hour time)
Console.WriteLine($"Today's Time: {today}");
// Returns 11:22 PM
Console.WriteLine($"Today's Time: {today:hh:mm tt}");
```

Hi,
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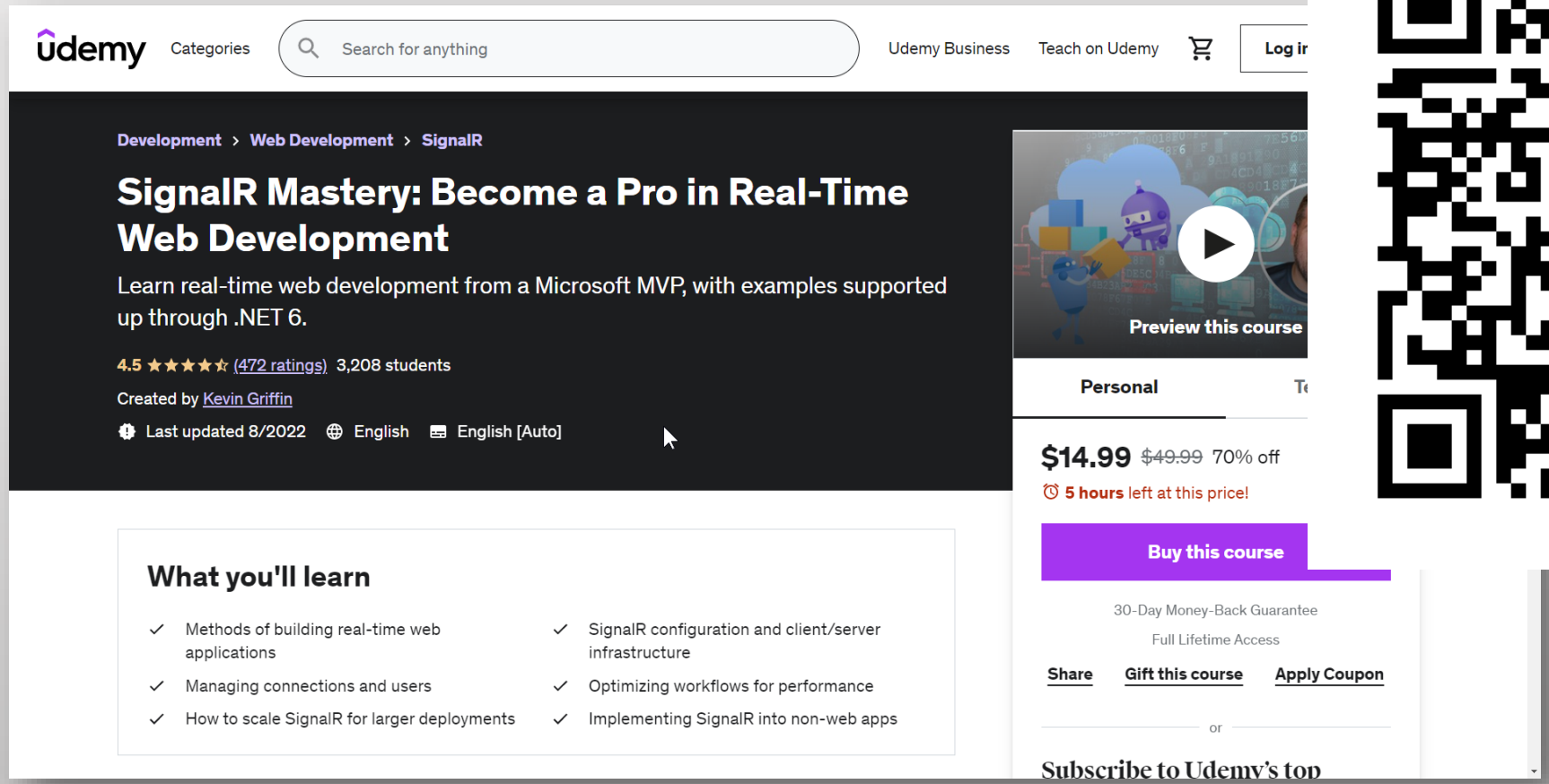
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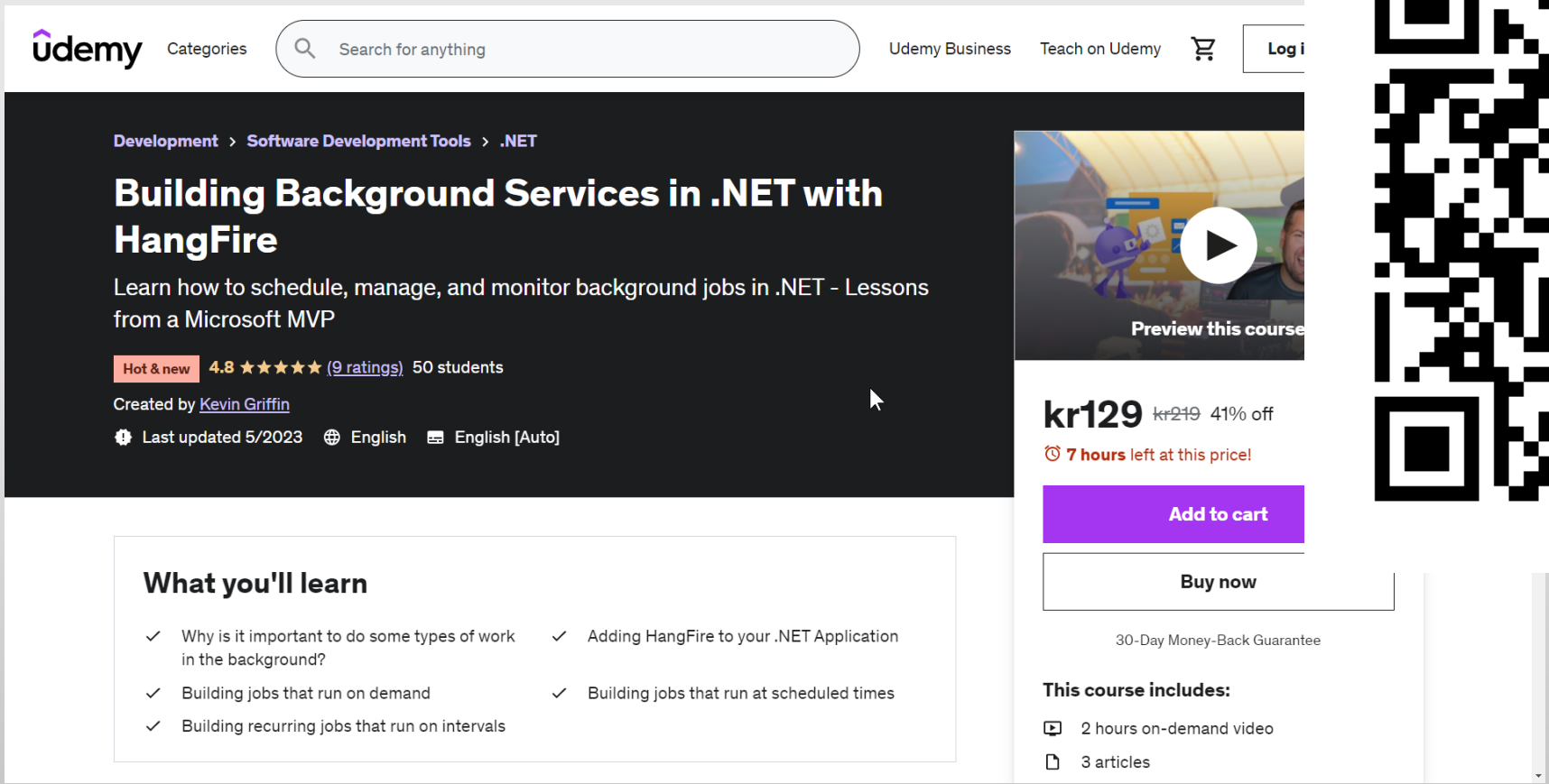
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#5 : Use Patterns

```
public string GetShapeName(Shape shape)
{
    switch (shape)
    {
        case Shape { NumberOfSides: 3, Color: "Red" }: return "Red Triangle";

        case Shape { NumberOfSides: 3, Color: "Blue" }: return "Blue Triangle";

        case Shape { NumberOfSides: 3 }: return "Triangle"; // Default for triangle

        case Shape { NumberOfSides: 4, Color: "Red" }: return "Red Rectangle";

        case Shape { NumberOfSides: 4, Color: "Blue" }: return "Blue Rectangle";

        case Shape { NumberOfSides: 4 }: return "Rectangle";

        // ... more
    }
}
```

#6 : Use Switch Expressions

```
public string GetShapeName(Shape shape)
{
    return shape switch
    {
        { NumberOfSides: 3, Color: "Red" } => "Red Triangle",
        { NumberOfSides: 3, Color: "Blue" } => "Blue Triangle",
        { NumberOfSides: 3 } => "Triangle", // Default for triangle
        { NumberOfSides: 4, Color: "Red" } => "Red Rectangle",
        { NumberOfSides: 4, Color: "Blue" } => "Blue Rectangle",
        { NumberOfSides: 4 } => "Rectangle", // Default for rectangle
        // ... more patterns can be added here
        _ => "Unknown shape" // Default for all other cases
    };
}
```

#6 : Use Switch Expressions

```
private static string GeneratePricingData(ParagEvent src)
{
    return src switch
    {
        { LowPrice: 0, HighPrice: > 0 } => $"{src.HighPrice:C}",
        { LowPrice: > 0, HighPrice: 0 } => $"{src.LowPrice:C}",
        { LowPrice: 0, HighPrice: 0 } => string.Empty,
        _ => $"{src.LowPrice:C} - {src.HighPrice:C}"
    };
}
```

#7 : nameof() not Magic Strings

```
public static string PrintName(string name, int age)
{
    // don't do this
    if (string.IsNullOrWhiteSpace(name))
        throw new ArgumentException("Name cannot be null or empty.",
"name");

    // do this!
    if (string.IsNullOrWhiteSpace(name))
        throw new ArgumentException("Name cannot be null or empty.",
nameof(name));

    return $"{name} is {age} years old.";
}
```

#8 : String Interpolation

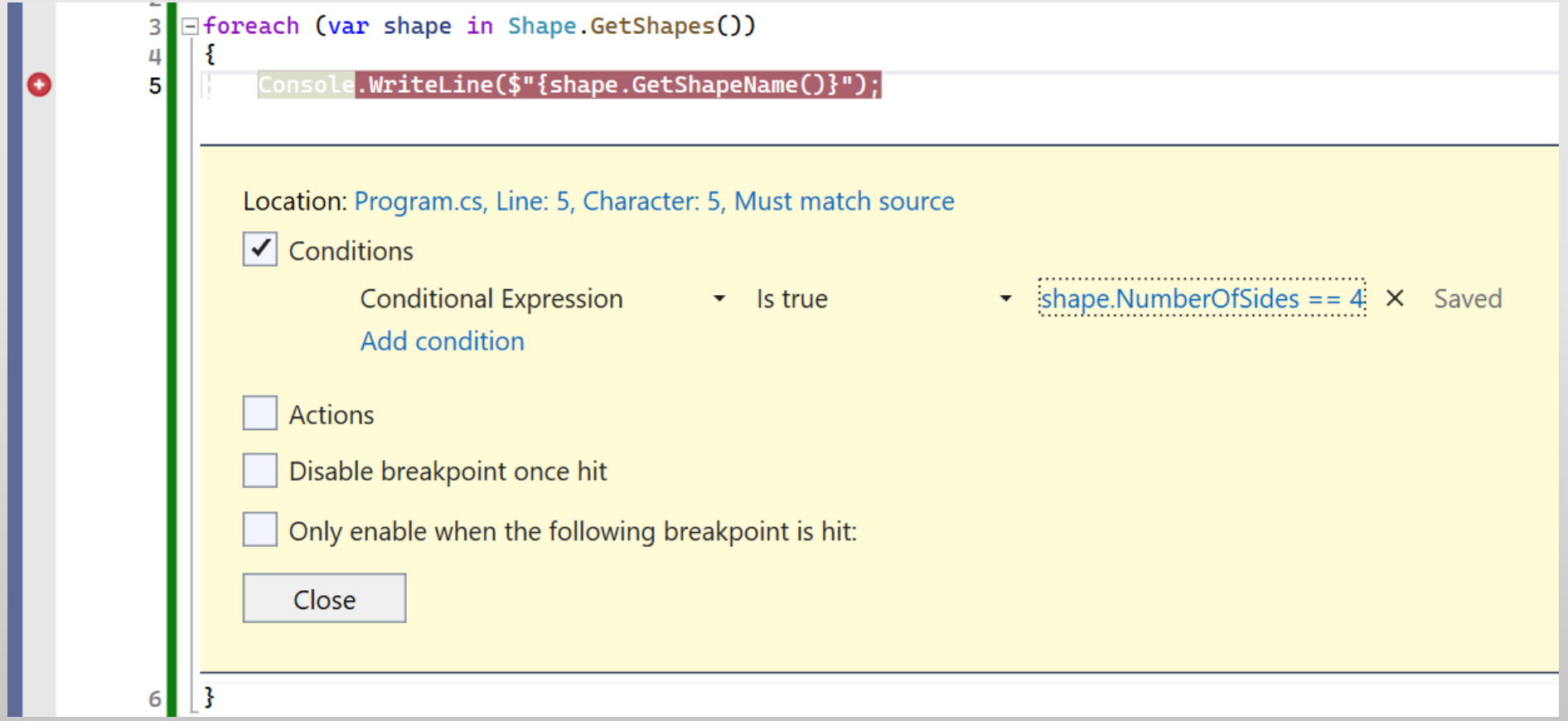
```
public static string PrintName(string name, int age)
{
    // old way
    return string.format("{0} is {1} years old.");

    // new hawtness
    return $"{name} is {age} years old.";
}
```

#9 : Formatting with String Interpolation

```
var standardFormat = currentUtcTime.ToString("yyyy-MM-dd HH:mm:ss");
```

```
var currentUtcTime = DateTime.UtcNow;

// Sample Output: "2024-02-06 15:45:30"
var standardFormat = $"{currentUtcTime:yyyy-MM-dd HH:mm:ss}";

// Sample Output: "2024-02-06T15:45:30.0000000Z"
var iso8601Format = $"{currentUtcTime:O}";

// Sample Output: "Mon, 06 Feb 2024 15:45:30 GMT"
var rfc1123Format = $"{currentUtcTime:R}";

// Sample Output: "2024-02-06T15:45:30"
var sortableFormat = $"{currentUtcTime:s}";

// Sample Output: "Monday, February 06, 2024"
var fullDayMonthFormat = $"{currentUtcTime:dddd, MMMM dd, yyyy}";

// Sample Output: "03:45 PM"
var time12HourFormat = $"{currentUtcTime:hh:mm tt}";

// Sample Output: "Monday, February 6, 2024 3:45:30 PM"
var universalLongTimeFormat = $"{currentUtcTime:U}";

// Sample Output: "Mon, Feb 06, 2024 15:45"
var customAbbreviatedFormat = $"{currentUtcTime:ddd, MMM dd, yyyy
HH:mm}";
```

#10 : Use Debugger.Break()



#10 : Use Debugger.Break()

```
foreach (var shape in Shape.GetShapes())
{
    if (shape.NumberOfSides == 4) Debugger.Break();

    Console.WriteLine($"{shape.GetShapeName()}");
}
```

#11 : Top-Level Statements

```
using Microsoft.Extensions.DependencyInjection;
using Microsoft.Extensions.Hosting;
using System.Threading.Tasks;

// look ma! no Program or Main()

var builder = Host.CreateDefaultBuilder(args)
    .ConfigureServices((hostContext, services) =>
    {
        // Register services here
    });

var host = builder.Build();

// Application logic here

await host.RunAsync();
```

#12 : Use .NET Host

```
using Microsoft.Extensions.DependencyInjection;
using Microsoft.Extensions.Hosting;
using System.Threading.Tasks;

var builder = Host.CreateDefaultBuilder(args)
    .ConfigureServices((hostContext, services) =>
    {
        // Register services here
    });

var host = builder.Build();

// Application logic here

await host.RunAsync();
```

Add Configuration
Add Logger
Add Dependency Injection
(and more!)

#13 : ILogger

```
public class MyService
{
    private readonly ILogger<MyService> _logger;

    public MyService(ILogger<MyService> logger)
    {
        _logger = logger;
    }

    public void DoWork()
    {
      try
      {
        _logger.LogInformation("Doing work in MyService");
      } catch (Exception ex)
      {
        _logger.LogError(ex, "Error while doing work!");
      }
    }
}
```

#14 : Know Your Injection Types

```
var builder = Host.CreateDefaultBuilder(args)
    .ConfigureServices((_, services) =>
    {
        // New Instance Always
        services.AddTransient<MyService>();

        // New Instance Per Request
        services.AddScoped<MyService>();

        // One Instance Forever
        services.AddSingleton<MyService>();
    });
```

#15 : Multiple Injections for Same Type

```
public interface IValidationRule
{
    bool Validate(string input);
}

public class RuleNotNull : IValidationRule
{
    public bool Validate(string input) => !string.IsNullOrEmpty(input);
}

public class RuleLength : IValidationRule
{
    public bool Validate(string input) => input.Length > 5;
}

public class RuleUpperCase : IValidationRule
{
    public bool Validate(string input) => input.All(char.IsUpper);
}
```

```
// Configure Services
services.AddSingleton<IValidationRule, RuleNotNull>();
services.AddSingleton<IValidationRule, RuleLength>();
services.AddSingleton<IValidationRule, RuleUpperCase>();

public class MyService
{
    private readonly IEnumerable<IValidationRule> _rules;

    public MyService(IEnumerable<IValidationRule> rules)
    {
        _rules = rules;
    }

    public bool Validate(string input)
    {
        return _rules.All(rule => rule.Validate(input));
    }
}
```

#16 : Primary Constructors

```
public class MyService(IEnumerable<IValidationRule> rules,
                       ILogger<MyService> logger)
{
    public bool Validate(string input)
    {
        logger.LogInformation("Validating rules...");
        return rules.All(rule => rule.Validate(input));
    }
}
```

#17 : Default Values of Lambda

```
Func<int, int, int> add = (int x, int y = 10) => x + y;

add.Method.GetParameters()[1].DefaultValue; // 10
```

#18 : Use Records for Immutable Data

```
public record Person(string FirstName, string LastName);

var kevin = new Person("Kevin", "Griffin");
kevin.FirstName = "Bob"; // ERROR
```

#19 : Records, but smarter!

```
public record Person(string FirstName, string LastName)
{
    public string FullName => $"{FirstName} {LastName}";
}

var kevin = new Person("Kevin", "Griffin");
// kevin.FullName = "Kevin Griffin"
```

#20 : MinBy/MaxBy

```
List<Employee> employees = new List<Employee>
{
    new Employee("Alice", 30, 70000),
    new Employee("Bob", 28, 80000),
    new Employee("Charlie", 35, 60000),
    new Employee("Diana", 40, 90000)
};

employees.OrderBy(p => p.Salary).First(); // Diana has highest salary
employees.OrderBy(p => p.Salary).Last(); // Charlie has lowest salary
```

#20 : MinBy/MaxBy

```
List<Employee> employees = new List<Employee>
{
    new Employee("Alice", 30, 70000),
    new Employee("Bob", 28, 80000),
    new Employee("Charlie", 35, 60000),
    new Employee("Diana", 40, 90000)
};

var highestPaidEmployee = employees.MaxBy(e => e.Salary); // Diana
var lowestPaidEmployee = employees.MinBy(e => e.Salary); // Charlie
```

#21 : ValueTask over Task

```
public class Example
{
    public async ValueTask<string> GetDataAsync()
    {
        // method sometimes completes synchronously
        string data = CheckDataFromLocalCache();

        if (!string.IsNullOrWhitespace(data))
        {
            return data;
        }
        else
        {
            // Simulate an asynchronous operation
            return await GetData()
        }
    }

    private string CheckDataAvailability()
    {
        // TODO: get cached data
    }
}
```

#22 : Fun with Flags

```
[Flags]
public enum PersonAttributes
{
    None = 0,
    HasBlondeHair = 1 << 0,     // 0000_0001 in binary
    HasBrownHair = 1 << 1,      // 0000_0010 in binary
    HasBlackHair = 1 << 2,      // 0000_0100 in binary
    HasGreyHair = 1 << 3,       // 0000_1000 in binary
    HasNoHair = 1 << 4,         // 0001_0000 in binary
    HasBlueEyes = 1 << 5,       // 0010_0000 in binary
    HasBrownEyes = 1 << 6,      // 0100_0000 in binary
    HasHazelEyes = 1 << 7       // 1000_0000 in binary
}
```

#22 : Fun with Flags

```
// Set Kevin's attributes
PersonAttributes kevinsAttributes =
  PersonAttributes.HasBrownHair | PersonAttributes.HasGreyHair | PersonAttributes.HasBlueEyes;

// Convert Kevin's attributes to an integer for database storage
int kevinsAttributesValue = (int)kevinsAttributes;

// does Kevin have grey
// Check if Kevin has grey hair
if (kevinsAttributesValue.HasFlag(PersonAttributes.HasGreyHair))
{
    Console.WriteLine("Kevin has grey hair.");
}
else
{
    Console.WriteLine("Kevin does not have grey hair.");
}
```

#23 : Tuples instead of objects

```
class Program
{
    static void Main()
    {
        var (a, b) = SwapNumbers(5, 10);
        Console.WriteLine($"After swap: a = {a}, b = {b}");
    }

    static (int, int) SwapNumbers(int x, int y)
    {
        return (y, x);
    }
}
```

#23 : Tuples instead of objects

```
public class Program
{
    public static void Main()
    {
        var projectInfo = GetProjectInfo();
        Console.WriteLine($"Project Name: {projectInfo.Item1}");
        Console.WriteLine($"Number of Developers: {projectInfo.Item2}");
        Console.WriteLine($"Current Version: {projectInfo.Item3}");
        Console.WriteLine($"Estimated Completion: {projectInfo.Item4.ToShortDateString()}");
    }

    private static (string, int, string, DateTime) GetProjectInfo()
    {
        // Example data
        string projectName = "AlphaProject";
        int devCount = 5;
        string version = "1.2.3";
        DateTime estimatedCompletion = new DateTime(2024, 12, 31);

        return (projectName, devCount, version, estimatedCompletion);
    }
}
```

#24 : DataAnnotations

```
using System.ComponentModel.DataAnnotations;

public class User
{
    [Required(ErrorMessage = "Name is required.")]
    [StringLength(50, ErrorMessage = "Name cannot be longer than 50 characters.")]
    public string Name { get; set; }

    [Required(ErrorMessage = "Email is required.")]
    [EmailAddress(ErrorMessage = "Invalid Email Address.")]
    public string Email { get; set; }

    [Range(18, 60, ErrorMessage = "Age must be between 18 and 60.")]
    public int Age { get; set; }

    // Additional properties and methods...
}
```

#24 : DataAnnotations

```
[HttpPost]
public ActionResult CreateUser(User user)
{
    if (ModelState.IsValid)
    {
        // Proceed with saving user, etc.
        return RedirectToAction("Success");
    }

    // Validation failed, return to form
    return View(user);
}
```

#24 : DataAnnotations

```
var validationResults = new List<ValidationResult>();
var context = new ValidationContext(person, serviceProvider: null, items: null);
bool isValid = Validator.TryValidateObject(person, context, validationResults, true);

if (!isValid)
{
    foreach (var validationResult in validationResults)
    {
        Console.WriteLine(validationResult.ErrorMessage);
    }
}
```

#25 : Custom Validations

```
public class ValidReleaseYearAttribute : ValidationAttribute
{
    protected override ValidationResult IsValid(object value, ValidationContext validationContext)
    {
        if (value is int year)
        {
            if (year >= 1900 && year <= DateTime.Now.Year)
            {
                return ValidationResult.Success;
            }
            else
            {
                return new ValidationResult($"Release year must be between 1900 and {DateTime.Now.Year}.");
            }
        }
        return new ValidationResult("Invalid year format.");
    }
}
```

#25 : Custom Validations

```
public class Movie
{
    public int Id { get; set; }

    [Required]
    [StringLength(100)]
    public string Title { get; set; }

    [ValidReleaseYear]
    public int ReleaseYear { get; set; }
}
```

#26 : Span<T>

```
int[] numbers = { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 };

// Create a span over a portion of the array.
Span<int> span = new Span<int>(numbers, 2, 5); // Span over elements 3 to 7 (inclusive).

// Modify the span.
for (int i = 0; i < span.Length; i++)
{
    span[i] = span[i] * 2; // Double each element in the span.
}

// { 1, 2, 6, 8, 10, 12, 14, 8, 9, 10 }
```

#27 : yield return

```
// before
public List<int> GetNumbers(int max)
{
    List<int> numbers = new List<int>();
    for (int i = 1; i <= max; i++)
    {
        numbers.Add(i);
    }
    return numbers;
}

// after
public IEnumerable<int> GetNumbers(int max)
{
    for (int i = 1; i <= max; i++)
    {
        yield return i;
    }
}
```

#28 : IHostedService for Background Work

```
namespace Tactic.WindowsService;

public class CleanupFolderService(ILogger<CleanupFolderService> _logger) : BackgroundService
{
    private const string FolderToCheck = "C:\\Temp";
    private const int DelayBetweenChecks = 1000 * 15; // 15 seconds

    protected override async Task ExecuteAsync(CancellationToken stoppingToken)
    {
        while (!stoppingToken.IsCancellationRequested)
        {
            _logger.LogInformation("Checking folder {FolderToCheck}", FolderToCheck);

            // TODO: delete any files older than 5 seconds in FolderToCheck

            await Task.Delay(DelayBetweenChecks, stoppingToken);
        }

        _logger.LogInformation("Shutting down worker");
    }
}
```

#28 : IHostedService for Background Work

```
IHost host = Host.CreateDefaultBuilder(args)
    .ConfigureServices(services =>
    {
        services.AddHostedService<CleanupFolderService>();
    })
    .Build();

host.Run();
```

#29 : IHostApplicationLifetime

```
public class StatusGeneratorWorker(ILogger<StatusGeneratorWorker> logger, Engine engine, IHostApplicationLifetime lifetime)
    : BackgroundService
{
    private readonly TimeSpan _interval = TimeSpan.FromSeconds(5);

    protected override async Task ExecuteAsync(CancellationToken stoppingToken)
    {
        var validateConnection = await engine.ValidateConnection();
        if (!validateConnection.IsSuccess)
        {
            logger.LogError("Engine is reporting it's unable to connect to database: {message}", validateConnection.Message);
            lifetime.StopApplication(); // This line triggers the shutdown of the application
            return;
        }

        // TODO: other stuff
    }
}
```

#30 : PeriodicTimer

```
public class StatusGeneratorWorker(ILogger<StatusGeneratorWorker> logger, Engine engine, IHostApplicationLifetime lifetime)
    : BackgroundService
{
    private readonly TimeSpan _interval = TimeSpan.FromSeconds(5);

    protected override async Task ExecuteAsync(CancellationToken stoppingToken)
    {
        // OTHER CODE...

        var periodicTimer = new PeriodicTimer(_interval);

        do
        {
            try
            {
                logger.LogInformation("Generating status");
                await engine.CreateStatusUpdateAsync();
            }
            catch (Exception e)
            {
                logger.LogError(e, "Error generating status");
            }

        } while (!stoppingToken.IsCancellationRequested && await periodicTimer.WaitForNextTickAsync(stoppingToken));
    }
}
```

Thanks!