

TRAINER PREPARATION GUIDE 4.2: TRANSFORM OBJECTS

Lesson Objective 4.2:

Transform objects. *Topics:* forming, deforming, moving, point distances, planes, interpolation; frames per second (FPS); translation, scale, rotation.

Required materials to teach this lesson:

1. A workstation with Windows 7®, Windows Vista®, or Windows XP®
2. Microsoft Visual Studio® or Microsoft Visual C# Express® (2008 or 2010)
3. XNA® Game Studio 2.0, 3.0, 3.1, or 4.0
4. 98-374-ENU-4.2-LP
5. 98-374-ENU-4.2-IC
6. 98-374-ENU-4.2-IC_KEY
7. 98-374-ENU-4.2-IC_KEY.zip
8. 98-374-ENU-4.2-PC
9. Image.png, located in 98-374-ENU-4.2-IC-resources.zip

Preparation Tasks

Technical preparation activities:

1. Install Visual Studio Express C# and XNA.
 - a. Windows XP users: Download Visual C# 2010 Express and XNA Game Studio 4.0 separately at App Hub (<http://create.msdn.com/en-US/>).
 - b. Windows Vista or Windows 7 users: Download Windows Phone 7 Developer Tools (<http://go.microsoft.com/fwlink/?LinkID=189554>), which includes Visual Studio C# 2010 Express and XNA Game Studio 4.0.
2. Extract the RotationAndScale solution file, located in 98-374-ENU-IC-4.2_Key.zip.

3. Vocabulary:

animation: a simulation of movement created by displaying a series of pictures, or frames.

pixel: a single small area of the display screen. The more pixels that a screen contains, the higher the picture quality will be.

rotation: the process of turning an object on one or more axes. The object can be made to spin by moving the points in 3-D space.

scaling: the process of scaling making the object larger or smaller. This is done by actually moving the points in the object closer together or farther apart, depending on whether we are scaling down or scaling up.

sprite: a small bitmap image, often used in animated games but also sometimes used as a synonym for the word *icon*.

translation: the process of moving an object. We translate an object from one point to another point by moving each point inside the object correctly.

4. **Additional readings and resources:**

MSDN®:

Animating a Sprite: <http://msdn.microsoft.com/en-us/library/bb203866.aspx>

App Hub: <http://create.msdn.com/en-us/education/gamedevelopment>

Getting Started with XNA Game Studio: [http://msdn.microsoft.com/en-us/library/bb203894\(v=XNAGameStudio.31\).aspx](http://msdn.microsoft.com/en-us/library/bb203894(v=XNAGameStudio.31).aspx)

XNA Game Studio: <http://msdn.microsoft.com/en-us/library/cc178930.aspx>

Matrix Math Refresher: <http://www.purplemath.com/modules/matrices.htm>

Other resources (books, e-reference):

Miles, Rob. *Microsoft XNA Game Studio 4.0: Learn Programming Now!* (Redmond, Wash.: Microsoft Press, 2011).

Riemer's 2D & 3D XNA: <http://www.riemers.net/>.

Instructor computer setup:

1. Open the RotationAndScale program to preview for the students (98-374-ENU-4.2-IC_KEY.zip).

Instructional preparation activities:

1. Review the instructor notes in the notes panes of Microsoft PowerPoint® presentation 98-374-ENU-4.2-LP.
2. Make copies of student documents available as needed.
3. Instruct students to create their own image to use instead of the image.png provided, if desired.

Lesson sequence (50 minutes)

Activating prior knowledge/lesson staging (5 minutes):

Direct students to answer each question in the "Guiding questions" section of the In-class Activity document, or in their personal class notes.

Guiding questions:

1. **How are objects transformed?** Change the texture of a shape, the size, and the rotation.
2. **Where is translation (scale and rotation) applied within the code?** Apply scaling and rotation in the *Draw()* method.
3. **Describe each of the following in the context of animation: moving, point distances, planes.** Objects are moved by changing the position where they are drawn on the screen (changing the *(x,y)* values; point distances provide information about the distance between two objects, and planes are the 2-D representation of a 3-D world.

Lesson activity (40 minutes):

1. Teacher instruction (20 minutes)

Use the included PowerPoint® presentation to review transforming objects.

2. In-class activity (15 minutes)

Students are to complete the In-class Activity document 98-374-ENU-4.2-IC.

3. Post-class activity (5 minutes)

Provide instruction for the post-class activity as needed. Establish a completion date.

Lesson review (5 minutes):

1. Discuss the guiding questions.

2. Instruct students to write and submit any questions they have or any topics about which they would like more assistance.

3. After class, look through the student responses and follow up with any student requiring additional help.