

## Review Questions and Answers

### Chapter 1:

- Why are **x**, **y**, and **z** so important for working with 3D space?
  - **The x, y, and z axes allow us to specify locations in 3D space.**
- What is the global origin?
  - **The global origin is the center of the computer graphics universe—the point where the x, y, and z axes intersect. In systems that allow for local origins, the global origin is the one that never changes. (Also called “world origin.”)**
- Why are the 2D orthographic views so important for understanding 3D space?
  - **Our monitor screen presents us with a two-dimensional image. A single two-dimensional view may not be sufficient to convey all essential information about a 3D model. Multiple orthographic views serve to inform us about all three dimensions of a 3D model.**
- What are the most important geometric components of 3D models?
  - **Points and polygons are essential, as well as edges.**
- What is the relationship between surface normals and backfacing polygons? Why are backfacing polygons important?

- **Surface normals point in the direction that a polygon is facing. Backfacing polygons can be easily identified by the computer as polygons that don't need to be drawn, and not drawing them speeds render time.**
- What are the four basic transformations?
  - **Translation, rotation, scaling, and skewing.**
- Name **and describe** as many of the various transform systems as you can.
  - **Global, or world, and local are discussed in this chapter. Others offered by 3D Studio MAX include view, screen, parent, gimbal, and grid.**

## Chapter 2:

- What are some ways in which texture maps are used to make up for the lack of polygonal detail?
  - **Brick is a common example; rather than modeling the rough surface of the brick and the recessed mortar, a texture map of brick is applied to a quad.**
  - **Details such as wall lamps can be included in textures. A rough rule is that the more an object protrudes from a surface, the less effective it will be to try to represent it using texture alone.**
  - **Shadows can be included in textures, enhancing the illusion of**

***objects protruding from the surface.***

- What are the advantages of textures that tile?
  - ***Large surfaces can be textured using relatively small textures that tile.***
- When can textures be said to have an actual size in 3D space?
  - ***When a game engine uses a “solid texture” approach, which may also be called “world coordinate mapping.” In such cases each pixel has an actual size in 3D space, at least by default.***
- Discuss the value of using source and reference.
  - ***“Reference material is what gives your game art the authority of authenticity.” – Paul Jaquays***
  - ***This topic is discussed thoroughly in the section titled “Source and Reference.”***
- If you have a texture image that is 300 x 300 pixels, and you need to use it on a system that uses OpenGL, to what resolution should you resize it?
  - ***The nearest resolution that is a power of two is 256 x 256. The system will resize the texture to 256 x 256 in order to use it, but Photoshop will produce a better-looking texture, therefore you should resize the texture yourself.***

- Discuss the uses of texture sets, and describe some of the textures that might be included.
  - *Use textures that tile well and don't show obvious patterns.*
  - *Add a texture similar to the first one used, perhaps with more character, to break up the repetition of the first texture.*
  - *Try variations on the theme of the first two textures, such as plants on grass, or stained or cracked versions of a brick texture.*
  - *Use textures that can be combined in different ways to create a variety of architectural detail.*
  - *This topic is discussed thoroughly in the section titled "Texture Sets."*

### Chapter 3:

- How many polygons are in a low polygon model?
  - *The answer depends on many factors, including the game engine and the intended use of the model.*
  - *Models which appear in medium to high numbers will need to have fewer polygons. Set pieces, or visual high points, tend to use many more polygons than the average for a given game*

**engine.**

- **Use of LOD can allow greater detail to be used, since the game engine will use the LOD appropriate for the distance of the viewer.**
- **This topic is discussed thoroughly in Chapter 3.**
- What are some differences between models and environments?
  - **Environments are often built using software designed specifically for that purpose.**
  - **Environments are often integral to the gameplay, as in the case of platform games involving jumping. They are often integral to the efficiency of the game engine. Models are more often present for purely aesthetic reasons.**
- List some details which are typically included in textures.
  - **Shallow relief, such as brick and mortar.**
  - **Objects which protrude slightly from the surface, such as wall lamps, or small plants.**
  - **Lighting and shadows.**
- If you have made a model with 900 polygons, what would be a good polycount for two lower Level Of Detail models?
  - **Typically the polycount of such models would be around 600 polys and 300 polys.**

Chapter 4:

- Name some 3D Studio MAX features that are useful when you are starting with a reference map.
  - ***The ability to load an image into the background of a viewport as reference.***
  - ***The Unwrap UVW modifier is useful for applying an existing texture to a model.***
- What makes a model suitable for modeling from primitives?
  - ***Models that are relatively simple, and made up of geometric shapes, are usually easy to model starting from geometric primitives.***
- What are U, V, and W?
  - ***U, V, and W are the labels given to the three dimensions of 3D space for the purpose of assigning a two-dimensional image to the surface of a three-dimensional model.***
- What is the function of Unwrap UVW?
  - ***Unwrap UVW allows the user to adjust UVW coordinates by superimposing them over the texture image.***
- How is a texture with transparent pixels created?
  - ***In 3D Studio MAX, an opacity map is used, in which white is opaque, black is transparent, and shades of gray are partially***

***transparent.***

- ***In many game engines, an alpha channel is added to the texture, in which white is opaque, black is transparent, and shades of gray are partially transparent.***
- Discuss the advantages and disadvantages of 100% transparent pixels.
  - ***They often add no time to the rendering unless the texture is quite large.***
  - ***The edges of the transparent area can appear jagged.***
  - ***Partially transparent pixels along the edge can reduce this effect.***
- How is bump mapping useful to the artist?
  - ***Bump mapping is a trick performed when lighting a surface. It adds to the illusions that a flat surface is actually three-dimensional, for example by adding highlights.***

Chapter 5:

- What is the purpose of splines?
  - ***Easy creation of curved lines.***
  - ***Two-dimensional shapes (such as splines) are often the first steps toward creation of three-dimensional models.***
- What are the advantages of a procedural approach to modeling?

- ***A procedural or parametric approach to modeling allows changes to the model to be made easily without rebuilding.***
- Why is the modifier stack useful?
  - ***The modifier stack is a type of record of the steps taken to make a model. It allows you to back up to a given step, and make changes at that point in the process. This can often save rebuilding all or large portions of the model.***
- Name the modeling methods used in this chapter, and state which ones are procedural.
  - ***Lathe and extrusion are procedural.***
  - ***Edit Mesh and box modeling are not procedural.***
- What are the two parts of texture mapping a model?
  - ***Creating the texture, and applying it to the surface. The latter process, also called UVW Mapping, involves assigning UVW coordinates to each vertex of the model.***

#### Chapter 6:

- What are some advantages of loft modeling?
  - ***Lofting offers excellent parametric control over the model, and thus over polycount. It also offers a unique and useful default texture mapping.***



- What is the minimum number of splines needed to make a lofted model? Name them.
  - ***Two: a path, and at least one shape.***
- What can you do when creating your path and shapes to maintain the greatest control over polycount?
  - ***Use the minimum number of vertices to create the desired shape.***
- What can be done when placing shapes on a path to keep the greatest control over polycount?
  - ***Make sure to place shapes onto the path in precisely the same location as vertices on the path, or as vertices in any deformation curve.***
- What can be done when creating fit curves to keep the greatest control over polycount?
  - ***If the fit shape is symmetrical, make sure that vertices on one side of the shape lie in the exact same location as the vertices on the opposite side. The easiest way to do this is to create one half of the shape, and then mirror it to create the other half.***

#### Chapter 7:

- What are the advantages of patch modeling?

- ***Patch models allow easier modeling of smooth or organic surfaces.***
- ***Patch surfaces can be divided into polygonal surfaces with good control over polycount.***
- When is patch modeling a poor choice?
  - ***When the model has many flat surfaces, polygons are more efficient. A cube is a simple example.***
- What are the advantages of unwrapping the model, as described in this chapter?
  - ***Unwrapping the model allows for great control over the assignment of UVWs.***
  - ***It is good for creating a template as a start to painting a texture.***
- What are the disadvantages?
  - ***It takes a great deal of time.***
  - ***Failing to clone the model at just the right stage will mean repeating at least part of the unwrap process.***

## Chapter 8:

- Name a few of the tools offered by Mesh tools.
  - ***Edge Ring, Connect,***
- What is the function of Edge Ring?
  - ***The user selects a single edge, and using Edge Ring causes a ring of edges to be selected.***
  - ***Edge Ring is often used before adding new edges. By selecting a ring of edges, you can keep the polygonal layout of the surface orderly, and composed of quads.***
- What is the function of Connect 2?
  - ***Connect is used to divide edges.***
  - ***Connect is often used with Edge Ring. With Connect 2, two edges are added, connecting each selected edge.***