

Question 3

Correct

Mark 1.00 out of 1.00

Flag question

Consider a triangle with the following texture coordinates at its vertices: $(u_1,v_1) = (0.3,0.2)$, $(u_2,v_2) = (0.4,0.9)$, and $(u_3,v_3) = (0.8,0.3)$. What will be the texture coordinates of a point P on the triangle identified by the following Barycentric coordinates: $\alpha = 0.2$, $\beta = 0.4$, associated with vertices 1 and 2 respectively? (Note: texture coordinate variables contain vertex ids) Enter your answers below.

uP	vP
0.54	0.52

Question 2

Correct

Mark 1.00 out of 1.00

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Assume that we want to organize 36228 three dimensional points into a k-D tree data structure. We perform each split using a random point along the splitting axis and alternate between the x-y-z axes. The points are directly stored in the first available node (could be an internal node or a leaf node). What can be the maximum depth of the resulting k-D tree? Note that the depth is defined as the longest distance of a node from the root element (the depth of a single element tree is zero).

Answer: 36227

The correct answer is: 36227

Question 3

Incorrect

Mark 0.00 out of 1.00

Remove flag

Given a triangle with the following vertices: $v_1 = (-3.7,0.0,12.6)$, $v_2 = (6.1,4.9,-5.1)$, and $v_3 = (23.9,1.325,4)$. If we know that one of the barycentric coordinates of a point on the edge (v_1,v_2) is 0.8 and the y coordinate of that point is 0.98, what is the sum of the x and z coordinates of that point?

Answer: 26.241

The correct answer is: 7.320001

Question 4

Correct

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Find the intersection point of a ray with origin $o = (2,2,1)$ and direction $d = (10,5,5)$ with a plane with surface normal in the direction $n_d = (10,-8,8)$ and passing through the point $a = (14,11,13)$. Write the (x,y,z) coordinates of the intersection point you find below:

x	y	z
16.4	9.2	8.2

Question 5

Correct

Mark 1.00 out of 1.00

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Consider a red sphere with diffuse reflectance coefficients (0.4,0,0) centered at $(-21,16,15)$. There is a single point light source in the scene at $(23.54,-2)$ with light intensity (178,178,178). Assuming that there is no light attenuation, what will be the red channel value of the diffuse (Lambertian) color component of the point $P = (-18,20,15)$ on this sphere?

Answer: 65.967

The correct answer is: 65.965263

Question 6

Incorrect

Mark 0.00 out of 1.00

Remove flag

Given a 2D axis-aligned square defined by its center at (48, 29) and edge length of 34 units. You want to rotate this square by 12 degrees around its center. What is the sum of the elements of the correct composite transformation matrix to achieve this?

Answer: 13

The correct answer is: -0.054373755623459

Question 7

Incorrect

Mark 0.00 out of 1.00

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You are given a 2D texture image with a resolution of 1599 x 1987 (given as width x height). You want to map this texture on the surface of a sphere. Assuming that you use nearest-neighbor interpolation, which texture image pixel will be used to compute the texture value at spherical coordinates $(\phi, \theta) = (45, 154)$ (both angles are in degrees)? Assume that the mapping will be accomplished by the following formulae: $u = \frac{-\phi + \pi}{2\pi}$ and $v = \frac{\theta}{\pi}$.

x	y
599.625	1700.0772

Question 8

Incorrect

Mark 0.00 out of 1.00

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Given the coordinates of a point $p = [6 \quad -4 \quad -35]^T$ in the Viewing Coordinate System (i.e., the camera coordinate system), what will be the 2D window coordinates of this point after all vertex transformation stages? The viewport parameters are $(x_{near}, y_{near}, width, height) = (183, 157, 876, 709)$ and the perspective viewing frustum is defined as $(l, r, b, t, nearDistance, farDistance) = (-11, 11, -5, 5, 2, 47)$. Note that x_{near} and y_{near} are the coordinates of the center of the bottom-left pixel.

$x_{viewport}$	$y_{viewport}$
1.024	1.024

Question 9

Correct

Mark 1.00 out of 1.00

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Assume that the uv coordinates of a grayscale texture point falls between four texels in such a way that its distance to the horizontal line passing through the centers of the pixels above is given by $a = 0.40$ and its distance to the vertical line passing through the centers of the pixels on the left by $b = 0.33$. The distances are given in texel space where the texel width and height are 1.0 units each. The intensities of the neighboring pixels are: top-left = 92, top-right = 78, bottom-left = 92, and bottom-right = 20. Compute the final color that should be used for this texture point assuming bilinear interpolation. Enter your answer below.

color

79.724

Question 10

Partially correct

Mark 0.29 out of 1.00

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Given the following camera vectors $u = [0.9932 \ 0.1168 \ 0]^T$, $v = [-0.1168 \ 0.9932 \ 0]^T$, and $w = [0 \ 0 \ 1]^T$ and the camera position $e = [-2 \ 3 \ -2]^T$, compute the camera transformation matrix and enter your answer by filling in the missing entries in the following 4x4 matrix.

0.9932	-0.1168	0	-2
0.1168	0.9932	0	3
0	0	1	-2
0	0	0	0

Question 11

Correct

Mark 1.00 out of 1.00

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Assume that a digital camera applies gamma correction to the images that it captures using a gamma value of 0.65. What would be the ideal gamma of a display device to view these images?

Answer: 1.5385

The correct answer is: 1.54

Question 12

Correct

Mark 1.00 out of 1.00

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Given a ray whose origin and direction are defined respectively as $o = (-5.3,-4.8,-8.9)$ and $d = (-7.4,-5.1,0.7)$, what will be the sum of the x, y, z positions of this ray for $t = 18.5$?

Answer: -237.3

The correct answer is: -237.30

Question 13

Correct

Mark 1.00 out of 1.00

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Assume that a 3x3 modeling transformation matrix is defined as follows:

13	0	0
0	14	0
0	0	1

What is the correct transformation matrix to transform the normals? Enter the missing values in the 3x3 normal transformation matrix shown below.

0.07692	0	0
0	0.0714	0
0	0	1

Question 14

Incorrect

Mark 0.00 out of 1.00

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Assume that you are trying to compute the specular shading at a surface point using Blinn-Phong shading. Your shininess exponent (i.e. Phong exponent) is 2. The direction from the surface point to the eye is given with the non-unit vector $w_e o = (-8.8,8)$. The direction from the surface point to the light is given with the non-unit vector $w_l i = (1.4,-2)$. The direction of the normal vector of the surface at that point is given with the non-unit vector $n = (0.3,8)$. Assume that the radiance at this surface point due to the light is (220,220,220) units and the specular reflectance coefficients are given as $k_s = (0.8,0.8,0.8)$. What is the value of the red channel of the specular shading component, if we compute it using Blinn-Phong shading, i.e., the half-vector approach?

Answer: 96.380

The correct answer is: 32.126774

Question 15

Correct

Mark 1.00 out of 1.00

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You are given a scene with 81 vertices. Each vertex is represented by 3 single-precision (4 bytes) real numbers corresponding to its x - y - z coordinates. You have two meshes defined. The first mesh is made up of 133 triangular faces. The second mesh consists of 119 triangular faces. Assuming that you are using indexed-face-set representation where each index is represented by an unsigned long integer (4 bytes), what is the total number of bytes occupied by this data? (Do not consider whitespaces, newlines, etc. Calculate just the data size.)

Answer: 3996

The correct answer is: 3996

Question 16

Correct

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Imagine that you have a digital camera whose image sensor has a width and height of 8.8 and 6.3 millimeters respectively. You are also given the horizontal image resolution that will be recorded by this sensor as 962. What should be the vertical image resolution such that each image pixel corresponds to a square region on the sensor?

Answer: 688.704

The correct answer is: 689

Question 17

Correct

Mark 1.00 out of 1.00

Flag question

Find the unit reflection of a non-unit vector $w = [15 \ 10 \ 8]$ along the surface normal direction vector $n_p = [13 \ 0 \ -14]$. Both w and n_p are given as they are originating from a point on the surface and the angle between them is between 0 and 90 degrees. Enter the x, y, and z components of the unit-length reflection vector below.

x	y	z
-0.4608	-0.5070	-0.7284

Question 18

Incorrect

Mark 0.00 out of 1.00

Remove flag

$(-9, -3, -4)^T$ is a point defined in the coordinate system of a camera located at $e = (-6, -8, -3)^T$ and with orthonormal axes defined as $u = (0.4082, 0.4082, 0.8165)^T$, $v = (0.0, -0.8944, 0.4472)^T$, and $w = (0.9129, -0.1826, -0.3651)^T$. What are the global (x-y-z) coordinates of this point?

x	y	z
1.024	1.024	1.024

Question 19

Incorrect

Mark 0.00 out of 1.00

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What will be the binary PPM file size if you save a 2294 x 2549 three channel color image where each channel is represented using a single byte? Note that in a binary PPM no space is lost due to white space and each color value is represented using the same number of bytes. Please ignore the size of the header information and provide your answer in bytes.

Answer: 730926

The correct answer is: 17542218

Question 20

Correct

Mark 1.00 out of 1.00

Flag question

Enter the missing elements of the 4x4 matrix below for drawing the reflection of an object from a mirror with plane equation $z = 9$.

1	0	0	0
0	1	0	0
0	0	-1	18
0	0	0	1