Started on	Friday, 11 May 2018, 1:22 PM
State	Finished
Completed on	Friday, 11 May 2018, 2:26 PM
Time taken	1 hour 4 mins
Grade	**10.00** out of 10.00 (**100**%)

Question 1

Correct

Mark 1.00 out of 1.00

If a ray-casting renderer takes 4 seconds to generate a 200 x 300 pixel image of a scene containing 4 spheres, roughly how long would you expect it to take to generate a 400 x 600 pixel image of a scene with 40 spheres?

Select one:

○ a. 4 seconds

◉ b. 160 seconds ✓

○ c. 8 seconds

○ d. 16 seconds

○ e. 40 seconds

Correct

Marks for this submission: 1.00/1.00.

Question 2

Correct

Mark 1.00 out of 1.00

A plane passes through the point a = (2, 5, 3) and has a normal vector n = (0, 1, 0). Which one of the following gives the equation of the plane? Hint: $(P - a).n = 0$

Select one:

○ a. $x + y + z = 1$

○ b. $2x + 5y + 3z - 1 = 0$

○ c. $2x + 5y + 3z = 0$

◉ d. $y - 5 = 0$ ✓

○ e. $y + 5 = 0$

Correct

Marks for this submission: 1.00/1.00.

A ray $p = p_0 + td$, where $p_0 = (0, 0, 0)$ and $d = (0.0, -0.8, -0.6)$ meets the plane $y = -16$. What is the value of t at the point of intersection?

Select one:

○ a. 0

○ b. -0.8

◉ c. 20 ✓

○ d. -16

○ e. 0.8

Correct

Marks for this submission: 1.00/1.00.

A ray-traced scene uses a light source with (0.2, 0.2, 0.2) as the ambient colour, and (1, 1, 1) as diffuse and specular colours. A primary ray intersects a sphere with material colour blue at a point that is completely in shadow. What is the colour value returned by the ray at this point? Assume that no other secondary ray (reflection, refraction ray) is traced from the point.

Select one:

○ a. (0, 0, 1)

○ b. (0, 0, 0)

○ c. (1, 1, 1)

◉ d. (0, 0, 0.2) ✓

○ e. (0.2, 0.2, 0.2)

Correct

Marks for this submission: 1.00/1.00.

A shadow ray with equation $p = p_0 + td$ traced from a vertex p_0 intersects an object at t =−5. If no other object in the scene intersects the shadow ray, we can conclude that

Select one:

○ a. The point p_0 lies on the intersecting object.

○ b. The light source is located at the point p_0.

○ c. The point p_0 is in shadow.

○ d. The point p_0 lies on a plane.

⊙ e. The point p_0 is not in shadow. ✓

Correct

Marks for this submission: 1.00/1.00.

Which one of the following vector equations represent a sphere with centre **c** and radius 5 units?

Select one:

○ a. $(\boldsymbol{p\text{-}c}) + (\boldsymbol{p\text{-}c}) = 25$.

○ b. $(\boldsymbol{p\text{-}c}).(\boldsymbol{p\text{-}c}) = 0$.

○ c. $|(\boldsymbol{p\text{-}c})| = 25$.

○ d. $(\boldsymbol{p\text{-}c}).(\boldsymbol{p\text{-}c}) = 5$.

⊙ e. $(\boldsymbol{p\text{-}c}).(\boldsymbol{p\text{-}c}) = 25$. ✓

Correct

Marks for this submission: 1.00/1.00.

The analytical equation of a torus is a fourth degree equation in the Cartesian coordinates x, y, z. What is the maximum number of intersection points that can be generated by a ray-torus intersection test?

Select one:

○ a. 0

○ b. 1

○ c. 2

○ d. 3

⊙ e. 4 ✓

Your answer is correct.

Correct

Marks for this submission: 1.00/1.00.

The following figure shows the unit light source vector *l*, the unit normal vector *n*, and the light's reflection vector *r* at the point of intersection of a primary ray with a sphere. The primary ray originates at the eye position and has a unit direction given by *d*. Which of the following code segments gives the correct value of the specular term $(r.v)^f$?
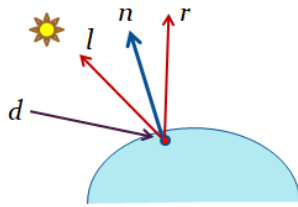
Select one:

○ a.   *r* = glm::reflect(*d*, *n*);
     rdotv = glm::dot(*r*, −*d*);
     specularTerm = glm::pow(rdotv, f);

○ b.   *r* = glm::reflect(−*l*, *n*);
     rdotv = glm::dot(*r*, glm::vec(−1));
     specularTerm = glm::pow(rdotv, f);

○ c.   *r* = glm::reflect(−*l*, *n*);
     rdotv = glm::dot(*r*, *d*);
     specularTerm = glm::pow(rdotv, f);

◉ d.   *r* = glm::reflect(−*l*, *n*);
     rdotv = glm::dot(*r*, −*d*);
     specularTerm = glm::pow(rdotv, f); ✔

○ e.   *r* = glm::reflect(*l*, *n*);
     rdotv = glm::dot(*r*, *d*);
     specularTerm = glm::pow(rdotv, f);
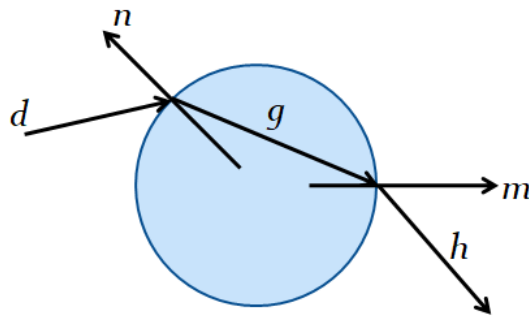
Your answer is correct.

Correct

Marks for this submission: 1.00/1.00.

The vectors given in the figure below are used for computing the refracted ray through a glass sphere (n_1 = 1, n_2 = 1.5).

Which of the following correctly computes the vectors **g** and **h** ?

Select one:

- a. **g** = glm::refract(**d**, **n**, 1.5);
     h = glm::refract(**g**, **m**, 1.5);

- b. **g** = glm::refract(**d**, **n**, 0.6667);
     h = glm::refract(**g**, –**m**, 1.5); ✓

- c. **g** = glm::refract(**d**, **n**, 1.5);
     h = glm::refract(**g**, –**m**, 1.5);

- d. **g** = glm::refract(**d**, **n**, 1.5);
     h = glm::refract(**g**, –**m**, 0.6667);

- e. **g** = glm::refract(**d**, **n**, 0.6667);
     h = glm::refract(**g**, **m**, 1.5);

Your answer is correct.

Correct

Marks for this submission: 1.00/1.00.

Question 10

Correct

Mark 1.00 out of 1.00

With reference to the previous question (Q.9), which of the following will generate the rendering of a transparent/hollow sphere ?

Select one:

- a. g = glm::refract(d, n, 0);
  h = glm::refract(g, m, 1);

- ⦿ b. g = glm::refract(d, n, 1);
  h = glm::refract(g, m, 1); ✓

- c. g = glm::refract(d, n, 1);
  h = glm::refract(g, m, 0);

- d. g = glm::refract(d, n, 1);
  h = glm::refract(g, m, −1);

- e. g = glm::refract(d, n, 0);
  h = glm::refract(g, m, 0);

Your answer is correct.

Correct

Marks for this submission: 1.00/1.00.