

Name:

Date:

Student Exploration: Ray Tracing (Lenses)

Directions: Follow the instructions to go through the simulation. Respond to the questions and prompts in the orange boxes.

Vocabulary: concave lens, convex lens, focal point, image, magnification, real image, refraction, virtual image

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

Agnes is trapped on a desert island with nothing but a magnifying glass. She wants to use the glass to focus sunlight and start a fire. She holds the glass above some dry grass as shown at right.

1. On the diagram, draw the path the Sun rays will likely take from the magnifying glass to the grass.
2. A magnifying glass is an example of a **convex lens**—a lens that curves outward on both sides. Why is a convex lens useful for starting fires?

Because the lens can direct the light to a point, it focuses all the light there so that point heats up, and can catch fire.



Gizmo Warm-up

The *Ray Tracing (Lenses)* Gizmo shows light rays passing through a lens. The light rays are bent by **refraction** as they pass through the lens and form a focused **image** to the right of the lens.

To begin, turn on the **Colorize lines** checkbox. Under **Show lines**, turn off the **Central line** and the **Line through focal point** so that only the **Parallel line** is showing.



1. The blue dots in front of and behind the lens are the **focal points** of the lens. Move the candle on the left back and forth and up and down.

What is always true about the light ray that emerges from the right side of the lens?

It always goes through the focal point.

2. Turn off the **Parallel line** and turn on the **Line through focal point**. Move the candle. What do you notice

Ray Tracing Gizmo Worksheet Answers

J Ma



Ray Tracing Gizmo Worksheet Answers:

An Introduction to Ray Tracing, 1989 *Ray Tracing Gems* Eric Haines, Tomas Akenine-Möller, 2019-02-25 This book is a must have for anyone serious about rendering in real time With the announcement of new ray tracing APIs and hardware to support them developers can easily create real time applications with ray tracing as a core component As ray tracing on the GPU becomes faster it will play a more central role in real time rendering Ray Tracing Gems provides key building blocks for developers of games architectural applications visualizations and more Experts in rendering share their knowledge by explaining everything from nitty gritty techniques that will improve any ray tracer to mastery of the new capabilities of current and future hardware What you ll learn The latest ray tracing techniques for developing real time applications in multiple domains Guidance advice and best practices for rendering applications with Microsoft DirectX Raytracing DXR How to implement high performance graphics for interactive visualizations games simulations and more Who this book is for Developers who are looking to leverage the latest APIs and GPU technology for real time rendering and ray tracing Students looking to learn about best practices in these areas Enthusiasts who want to understand and experiment with their new GPUs

Adventures in Ray Tracing Hermida, 1995-08-01 **Graphical Ray Tracing** Chan Street, 1973 **Ray Tracing Gems** Eric Haines, Tomas Möller, 2019 This book is a must have for anyone serious about rendering in real time With the announcement of new ray tracing APIs and hardware to support them developers can easily create real time applications with ray tracing as a core component As ray tracing on the GPU becomes faster it will play a more central role in real time rendering Ray Tracing Gems provides key building blocks for developers of games architectural applications visualizations and more Experts in rendering share their knowledge by explaining everything from nitty gritty techniques that will improve any ray tracer to mastery of the new capabilities of current and future hardware What you ll learn The latest ray tracing techniques for developing real time applications in multiple domains Guidance advice and best practices for rendering applications with Microsoft DirectX Raytracing DXR How to implement high performance graphics for interactive visualizations games simulations and more Who is this book for Developers who are looking to leverage the latest APIs and GPU technology for real time rendering and ray tracing Students looking to learn about best practices in these areas Enthusiasts who want to understand and experiment with their new GPUs *Ray Tracing Creations Book* Wells,

Practical Ray Tracing in C. Craig A. Lindley, 1992 *Ray Tracing Creations Book* Young, 1994-11-01 **Graphical Ray Tracing** Graphical Ray Tracing Staff, **Ray Tracing and Beyond** E. R. Tracy, 2014 **Fotorealismus und ray tracing in C** Christopher D. Watkins, Stephen B. Coy, Mark Finlay, 1993 **An Introduction to Ray Tracing**, 1989 **Ray Tracing for Light and Radio Wave Simulations** Arne Schmitz, 2012-12-31 **Ray Tracing Creations** Chris Young, Drew Wells, 1994 This book disk package teaches anyone with an IBM PC or compatible how to create 3 D photorealistic images using the powerful updated ray tracing program POV Ray 2 0 included This new edition contains detailed explanations of all the

improvements and additions to version 2.0 of POV-Ray plus an extended reference section

Refined Ray Tracing inside Single- and Double-Curved Concave Surfaces Balamati Choudhury, Rakesh Mohan Jha, 2015-09-24 This book describes the ray tracing effects inside different quadric surfaces. Analytical surface modeling is a priori requirement for electromagnetic (EM) analysis over aerospace platforms. Although numerically specified surfaces and even non-uniform rational basis spline (NURBS) can be used for modeling such surfaces for most practical EM applications, it is sufficient to model them as quadric surface patches and the hybrids thereof. It is therefore apparent that a vast majority of aerospace bodies can be conveniently modeled as combinations of simpler quadric surfaces, i.e., hybrid of quadric cylinders and quadric surfaces of revolutions. Hence the analysis of geometric ray tracing inside is prerequisite to analyzing the RF build up. This book describes the ray tracing effects inside different quadric surfaces such as right circular cylinder, general paraboloid of revolution, GPOR, GPOR frustum of different shaping parameters and the corresponding visualization of the ray path details. Finally, ray tracing inside a typical space module which is a hybrid of a finite segment of right circular cylinder and a frustum of GPOR is analyzed for practical aerospace applications.

Visualization of Volumetric Data by Ray Tracing Miloš Šrámek, 1996

Ray Tracing Jon Peddie, 2019 This is the first book to offer a comprehensive overview for anyone wanting to understand the benefits and opportunities of ray tracing as well as some of the challenges without having to learn how to program or be an optics scientist. It demystifies ray tracing and brings forward the need and benefit of using ray tracing throughout the development of a film product or building from pitch to prototype to marketing. Ray Tracing and Rendering clarifies the difference between conventional faked rendering and physically correct, photo-realistic ray-traced rendering and explains how programmers' time and backend compositing time are saved while producing more accurate representations with 3D models that move. Often considered an esoteric subject, the author takes ray tracing out of the confines of the programmers' lair and shows how all levels of users from concept to construction and sales can benefit without being forced to be a practitioner. It treats both theoretical and practical aspects of the subject as well as giving insights into all the major ray tracing programs and how many of them came about. It will enrich the reader's understanding of what a difference an accurate high-fidelity image can make to the viewer; our eyes are incredibly sensitive to flaws and distortions, and we quickly disregard things that look phony or unreal. Such dismissal by a potential user or customer can spell disaster for a supplier, producer, or developer. If it looks real, it will sell, even if it is a fantasy animation. Ray tracing is now within reach of every producer and marketer and at prices one can afford and with production times that meet the demands of today's fast world.

Practical Ray Tracing in C Craig A. Lindley, 1992-11-09 An accessible introduction to this technique and how it works, complete with sophisticated code examples that can be used in applications. Includes leading edge methods for high-speed ray tracing as well as detailed coverage of design, procedures, generation, processing, storage, and photographic output of ray-traced images. The accompanying disk contains all code examples, gallery images, plus two complete ray tracing programs, one

of which is a high speed ray tracer *Ray Tracing and Radiosity Algorithms for Photorealistic Image Synthesis* Adrianus
Johannes Franciscus Kok, 1994 **GPU Ray Tracing in Non-Euclidean Spaces** Tiago Novello, Vinicius da Silva, Luiz
Velho, 2022

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