

Homework Week 14

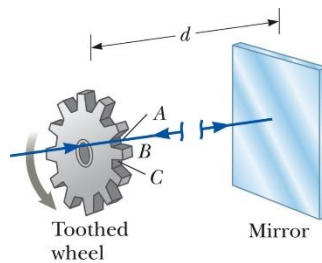
113-2 General Physics II

Due before 4:10 PM on May 26, 2025

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1. [10 points] Example 34.1 Measuring the Speed of Light with Fizeau's Wheel

Assume Fizeau's wheel has 360 teeth and rotates at 55.0 rev/s when a pulse of light passing through opening A in Figure 34.2 passes through opening C on its return. If the distance to the mirror is 7 500 m, what is the speed of light?

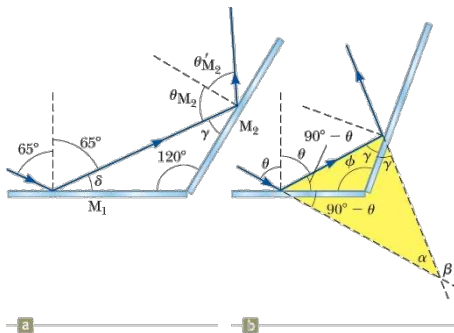


2. [5 points] Quick Quiz 35.1

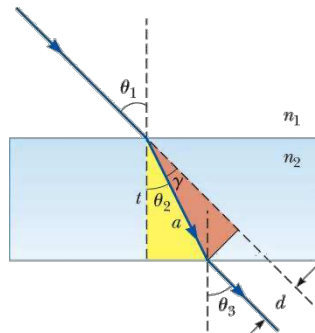
In the movies, you sometimes see an actor looking in a mirror and you can see his face in the mirror. It can be said with certainty that during the filming of such a scene, the actor sees in the mirror: (a) his face (b) your face (c) the director's face (d) the movie camera (e) impossible to determine

3. [10 points] Example 35.2

Two mirrors make an angle of 120° with each other as illustrated in the figure. A ray is incident on mirror M_1 at an angle of 65° to the normal. Find the direction of the ray after it is reflected from mirror M_2 .



Example 35.2



Example 35.4

勇敢地提出

笨的問題，

有一天就會

問到對的問題

截止後，已繳交需要解答的寄信助教：110104035@nccu.edu.tw

4. [15 points] **Example 35.4**

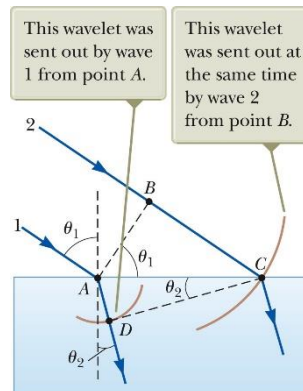
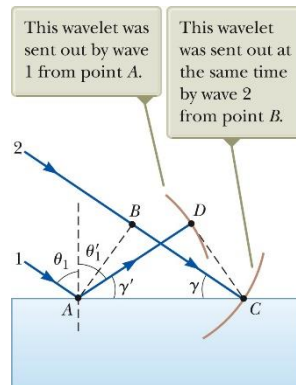
A light beam passes from medium 1 to medium 2, with the latter medium being a thick slab of material whose index of refraction is n_2 (Fig.35.15). (a) Show that the beam emerging into medium 1 from the other side is parallel to the incident beam. (b) What if the thickness t of the slab is doubled? Does the offset distance d also double?

5. [15 points] **Huygens's Principle for Reflection**

The wave at A sends out a wavelet toward D . The wave at B sends out a wavelet toward C

6. [15 points] **Huygens's Principle for Refraction**

The wave at A sends out a wavelet toward D . The wave at B sends out a wavelet toward C



Huygens's Principle for Reflection Huygens's Principle for Refraction

7. [30 points] (A) 嘗試問一個生活中跟物理有關的問題。[15 points]

(B) Google 關鍵字 or 查閱維基有無文章（注意維基不見得正確）。[15points]

螢幕截圖/照相，或是附上出處，線上繳交（如前面手寫，可分開繳交）。

有問就給分，鼓勵同學多方閱讀，自己整理資訊。

範例問題: 為什麼鏡子中的自己是**左右**相反，不是**上下**?

1.

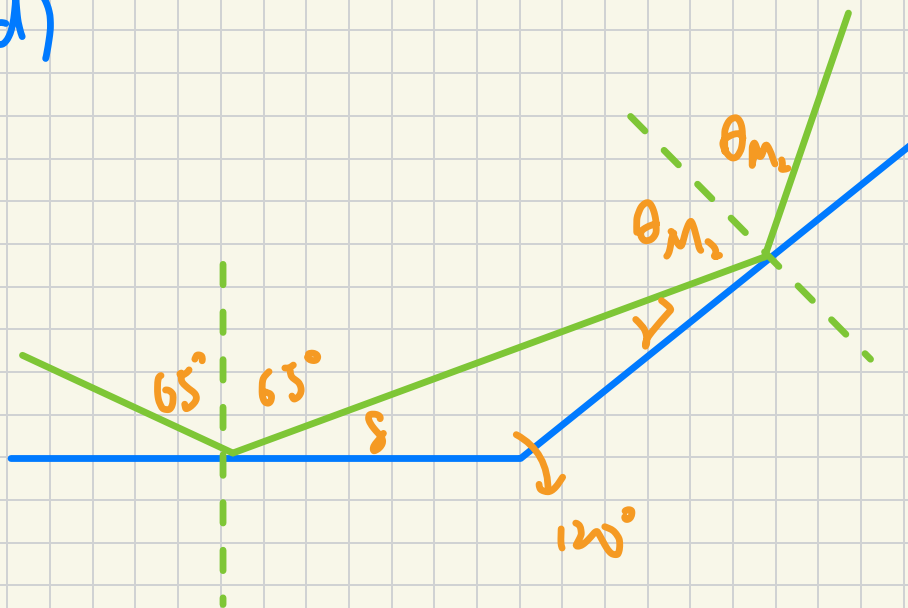
$$c = \frac{2d}{\Delta t}$$

$$= \frac{2d\omega}{\Delta\theta} \quad \Delta t = \frac{\Delta\theta}{\omega}$$

$$= \frac{2(1500 \text{ m})(55 \text{ rev/s})}{(1/360 \text{ rev})}$$

$$= 2.97 \times 10^8 \text{ (m/s)} \quad \# \quad \checkmark$$

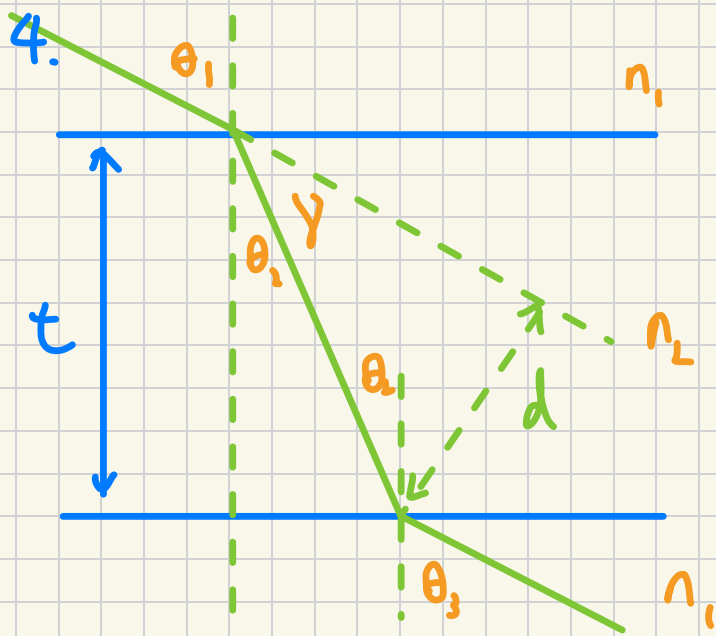
2. (d)



$$\delta = 90^\circ - 65^\circ = 25^\circ$$

$$\gamma = 180^\circ - 25^\circ - 120^\circ = 35^\circ$$

$$\theta_{m_1} = 90^\circ - 35^\circ = 55^\circ \quad \# \quad \checkmark$$



(a) Snell's Law:

$$\begin{cases} n_1 \sin \theta_1 = n_2 \sin \theta_2 \\ n_2 \sin \theta_2 = n_1 \sin \theta_3 \end{cases}$$

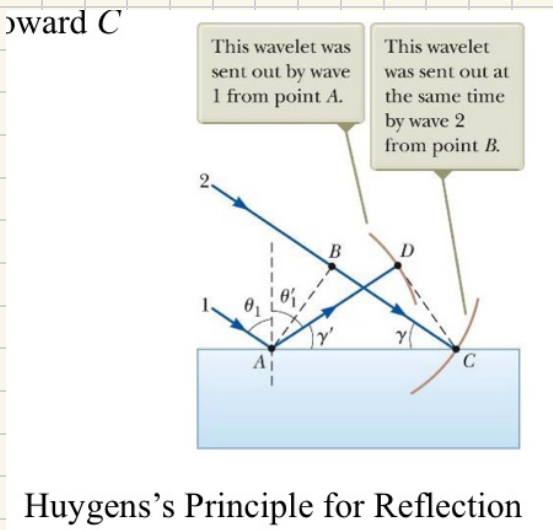
$$\Rightarrow \sin \theta_1 = \sin \theta_3$$

$$\Rightarrow \theta_1 = \theta_3 \quad \# \quad \checkmark$$

(b) $d = \frac{t}{\cos \theta_2} \sin (\theta_1 - \theta_2) \propto t$

$$\Rightarrow \text{Yes} \quad \# \quad \checkmark$$

5. toward C



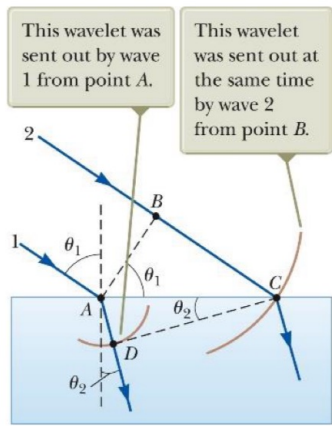
$$\begin{cases} AD = BC = v \Delta t \\ \Delta ABC : \cos \gamma = \frac{BC}{AC} \\ \Delta ADC : \cos \gamma' = \frac{AD}{AC} \end{cases}$$

$$\Rightarrow \cos \gamma = \cos \gamma' \Rightarrow \gamma = \gamma'$$

$$\Rightarrow 90 - \theta_1 = 90 - \theta_1'$$

$$\Rightarrow \theta_1 = \theta_1' \quad \checkmark$$

6.



Huygens's Principle for Refraction

$$\begin{cases} \triangle ABC: \sin \theta_1 = \frac{BC}{AC} \\ \triangle ADC: \sin \theta_2 = \frac{AD}{AC} \end{cases}$$

$$\Rightarrow \frac{\sin \theta_1}{\sin \theta_2} = \frac{BC}{AD} = \frac{v_1 \Delta t}{v_2 \Delta t} = \frac{v_1}{v_2}$$

$$= \frac{c/n_1}{c/n_2} = \frac{n_2}{n_1} \quad \checkmark$$

7. (A) Why do objects in a car's side mirror appear smaller and further away?

(B) convex mirror, virtual image

Curved mirror

Article Talk

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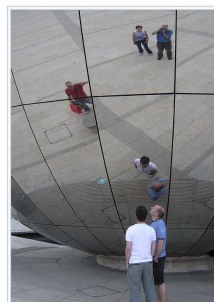
From Wikipedia, the free encyclopedia

A **curved mirror** is a **mirror** with a curved reflecting surface. The surface may be either *convex* (bulging outward) or *concave* (recessed inward). Most curved mirrors have surfaces that are shaped like part of a **sphere**, but other shapes are sometimes used in optical devices. The most common non-spherical type are **parabolic reflectors**, found in optical devices such as **reflecting telescopes** that need to image distant objects, since spherical mirror systems, like spherical **lenses**, suffer from **spherical aberration**. **Distorting mirrors** are used for entertainment. They have convex and concave regions that produce deliberately distorted images. They also provide highly magnified or highly diminished (smaller) images when the object is placed at certain distances.

Convex mirrors [[edit](#)]

A **convex mirror** or **diverging mirror** is a curved mirror in which the reflective surface bulges towards the light source.^[1] Convex mirrors reflect light outwards, therefore they are not used to focus light. Such mirrors always form a **virtual image**, since the **focal point** (*F*) and the centre of curvature (*2F*) are both imaginary points "inside" the mirror, that cannot be reached. As a result, images formed by these mirrors cannot be projected on a screen, since the image is inside the mirror. The image is smaller than the object, but gets larger as the object approaches the mirror.

A **collimated** (parallel) beam of light diverges (spreads out) after reflection from a convex mirror, since the **normal** to the surface differs at each spot on the mirror.



Reflections in a convex mirror. The photographer is seen reflected at top right

