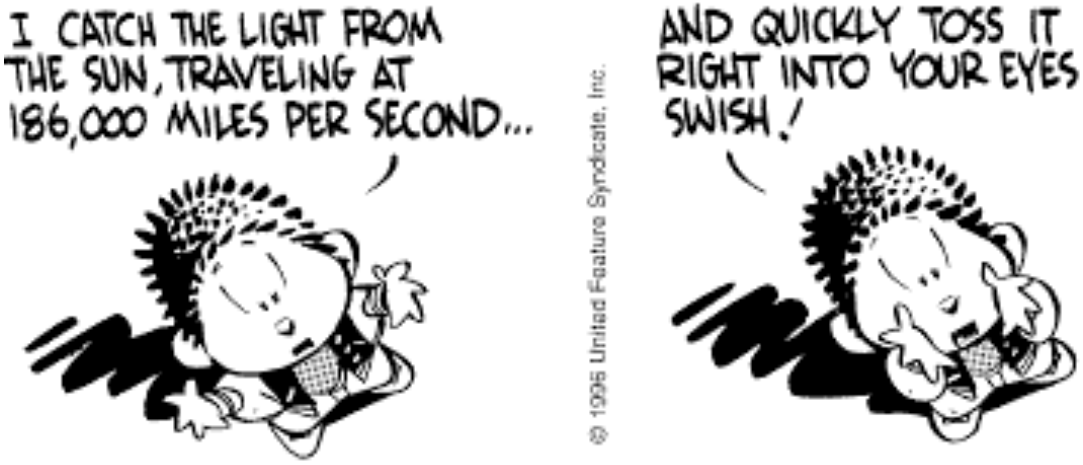
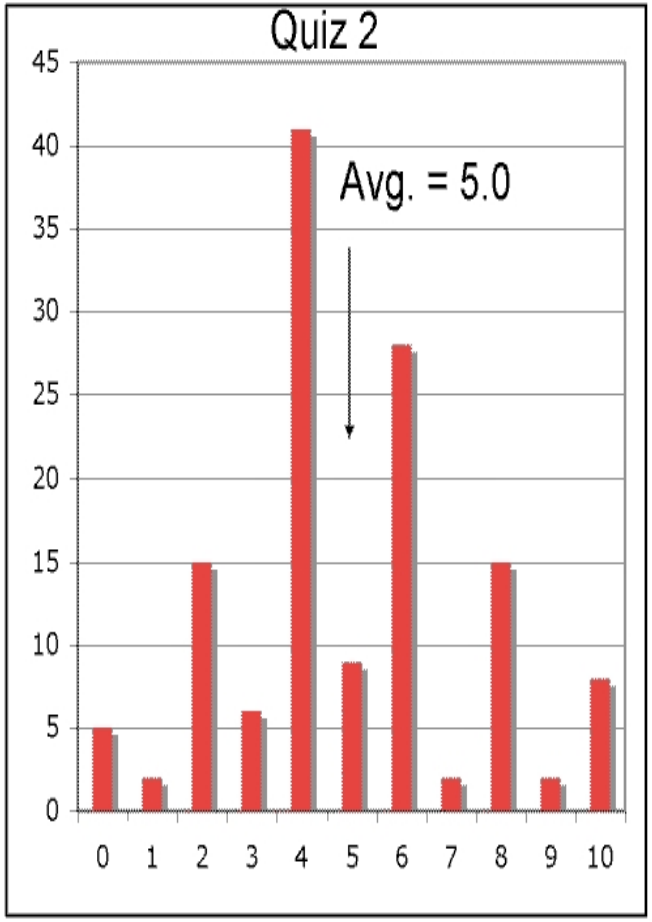
- **Theme Music: Madonna**
  Ray of Light
- **Cartoon: Pat Brady**
  Rose is Rose



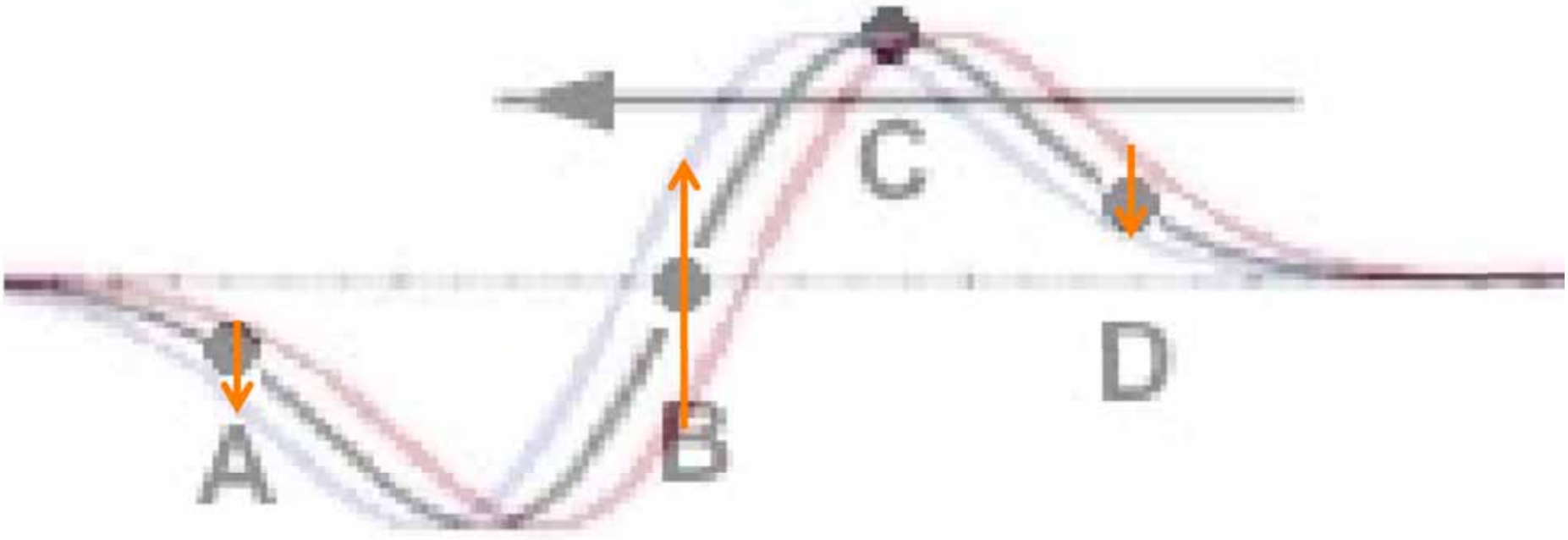
Quiz 2

	2.1		2.2		2.3
bca=d	16%	a	13%	a	14%
ba=dc	20%	b	11%	b	50%
a=dcb	9%	c	18%	c	13%
badc	4%	d	5%	d	41%
db=ca	4%	e	8%		
		f	26%		
		g	14%		
		h	7%		



Black = instant we are considering
Red = previous movie frame
Blue = subsequent movie frame

Problem Q2.1

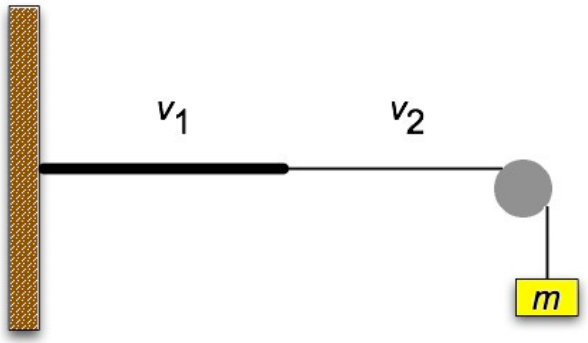


To get velocity of bead, look where it moves from the previous frame to the subsequent frame.

Problem Q2.1

Tensions, T, the same (and = mg) in both parts of the string.

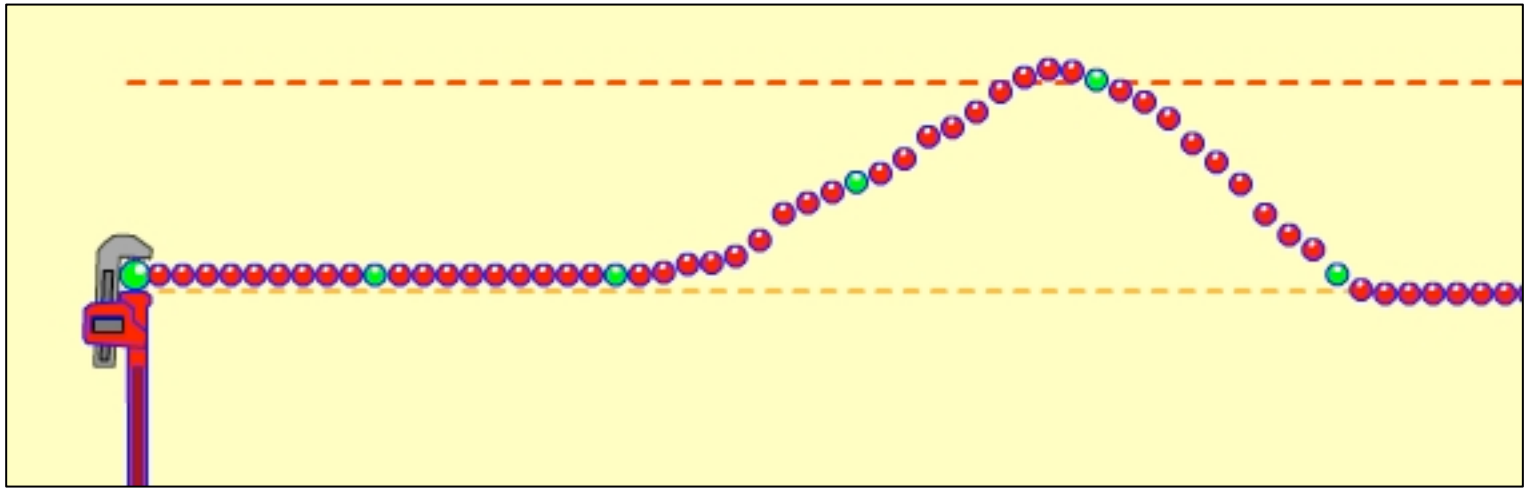
Mass density of thick string is twice that of the thin string.

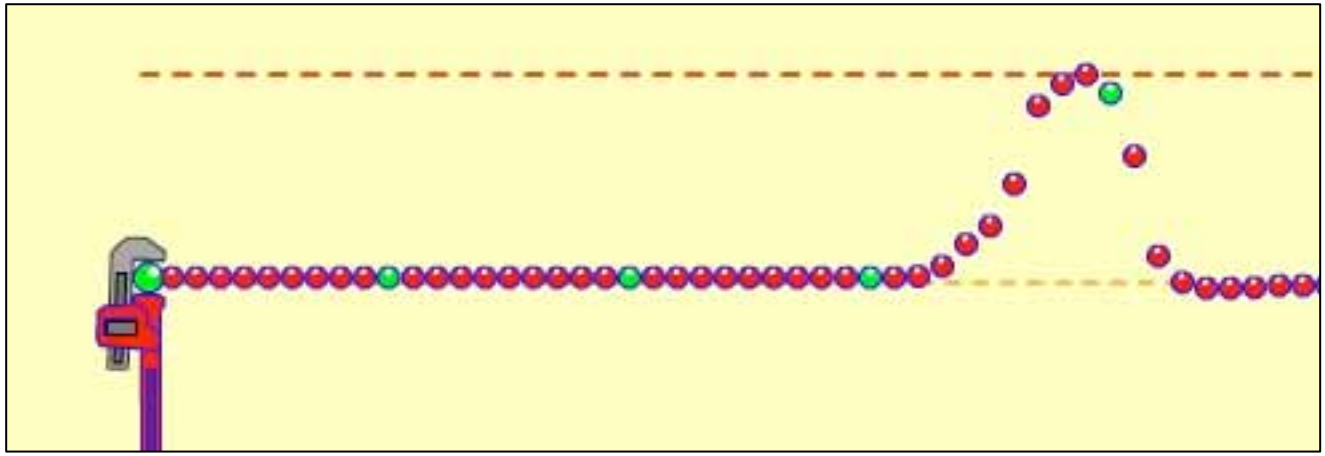


$$v_1 = \sqrt{\frac{T}{2\mu}} \qquad v_2 = \sqrt{\frac{T}{\mu}}$$

$$\frac{v_1}{v_2} = \sqrt{\frac{T}{2\mu}} \Big/ \sqrt{\frac{T}{\mu}} = 1/\sqrt{2}$$

Problem Q2.3





Light

- For the next few weeks
  we will study the properties of light.
- Light is a phenomenon with which we have considerable experience.
- Light gives us much of our information about the world that we tend to take it for granted and not think about what we know and how we know it.
- Studying the physics of light involves
  not only the physics of the external world,
  but the psychology of how we interpret
  the information we get.

Shopping for Ideas: Light

- Let's begin by searching for experiences with vision that tell us something about the nature of light.
- Some questions:
  - How do we see?
  - Can cats see in the dark?
  - Can you "see" light?
  - How do shadows form?

Some Foothold Ideas

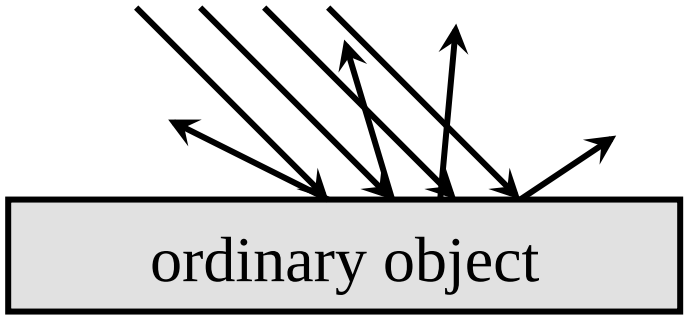
- Certain objects (the sun, bulbs,…) give off light.
- Other objects scatter light.
- We only see something when light coming from it enters our eyes.
- …

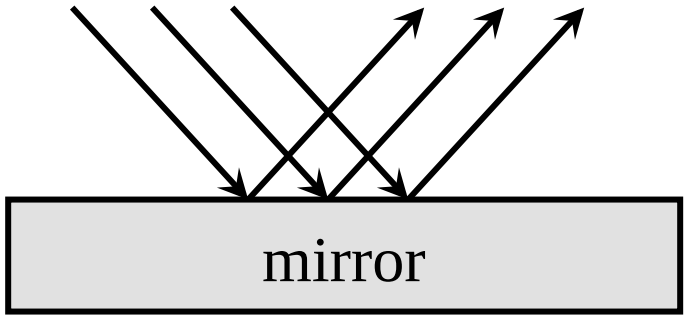
How do we see?

- We see by light entering our eyes and setting off energy receptors on our retina.
- These individual receptors (rods and cones) are like the individual dots on a TV or computer screen or the dots that can be seen using a magnifying glass on a newspaper photo.
- Our brains put these dots together into coherent, continuous images.
- Sometimes our brain can have trouble interpreting or can misinterpret the information given it by the retina. This can be either a problem or a benefit.

Seeing things

- To see something, light has to come into our eyes.
- Some objects (e.g., the sun, a light bulb) serve as sources of light.
- Other object scatter that light into our eyes.
  - For most objects, light scatters from them in all directions.
  - For some objects (mirrors) light scatters from them in controlled directions.

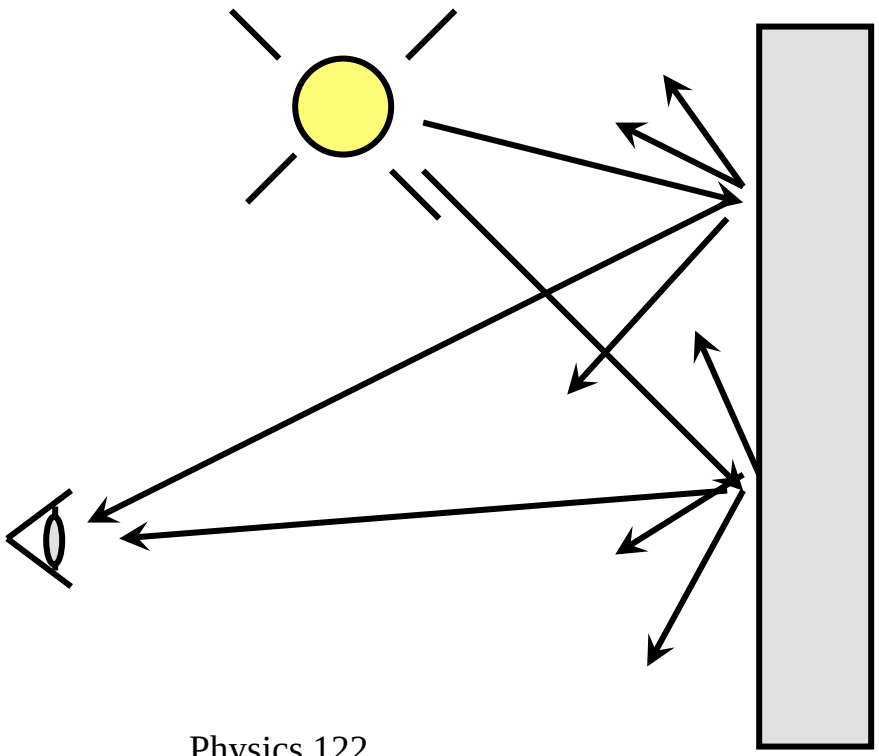




Light and Shadow

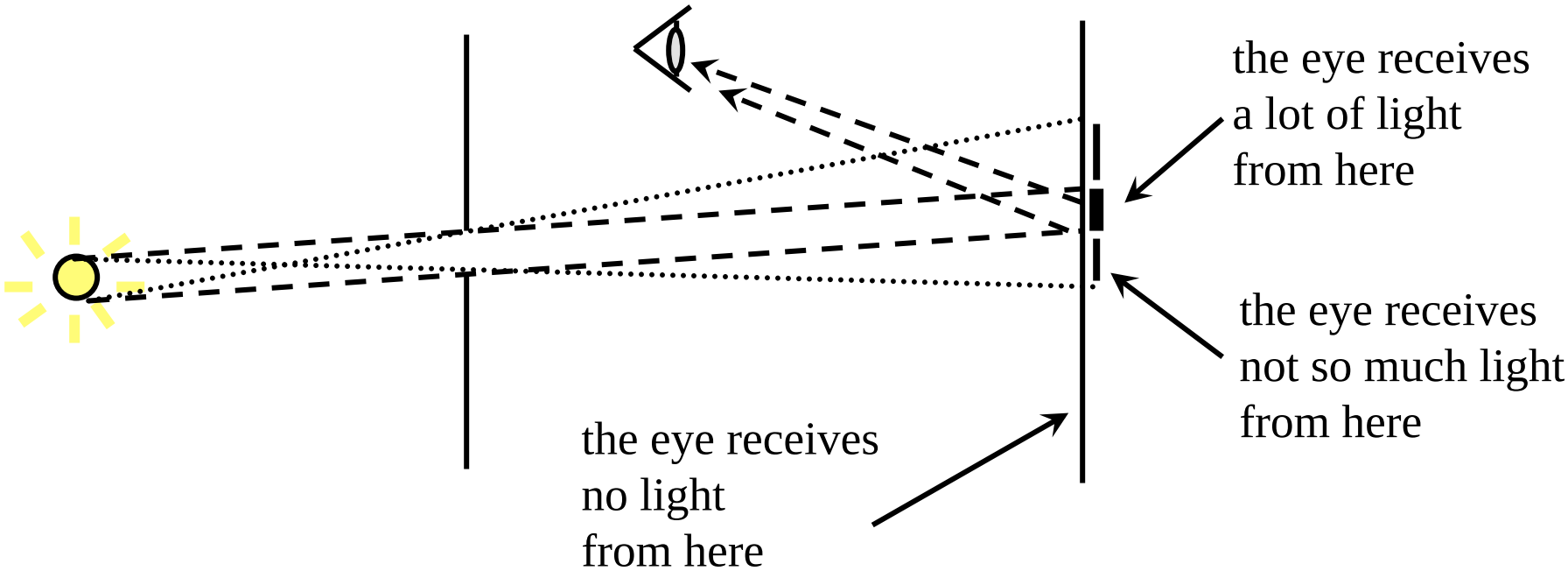
- If we shine a light on a uniform (rough – not mirrored) screen, what will we see?

Since light hitting the surface at each point scatters in all directions our eye will receive some light from each point. The entire object can be seen.



Partial lighting

- Consider a small bulb ("point source") lighting a screen through a hole in a mask.



Models of Light and Vision

- Historical models of light
  - Light comes out of the eye
  - Visible objects are sources of light
  - Some objects are sources of light, others are seen by scattered light

Scientific Models of Light

- Light is a complex phenomena. Different situations are most easily treated with different descriptions (models).
- Models of light
  - *Rays* – energy moving in straight lines
  - *Waves* – electromagnetic oscillations
  - *Photons* – quanta (discrete packets) of energy having both wave-like and particle-like properties.
- Each of the models in this list can be interpreted (in principle) as a restriction (approximation) of the model below it.

Foothold Ideas

- Certain objects (the sun, bulbs,…) give off light (emitters).
- Each point on a non-emitting object scatters light, spraying it off in all directions.
- Through empty space (or ~air) light travels in straight lines.
- We only see something when light coming from it enters our eyes.
- Light is transparent.