- **Theme Music: Gregory Paul Aubuchon**

  Pulse

- **Cartoon: Pat Brady**

  Rose is Rose

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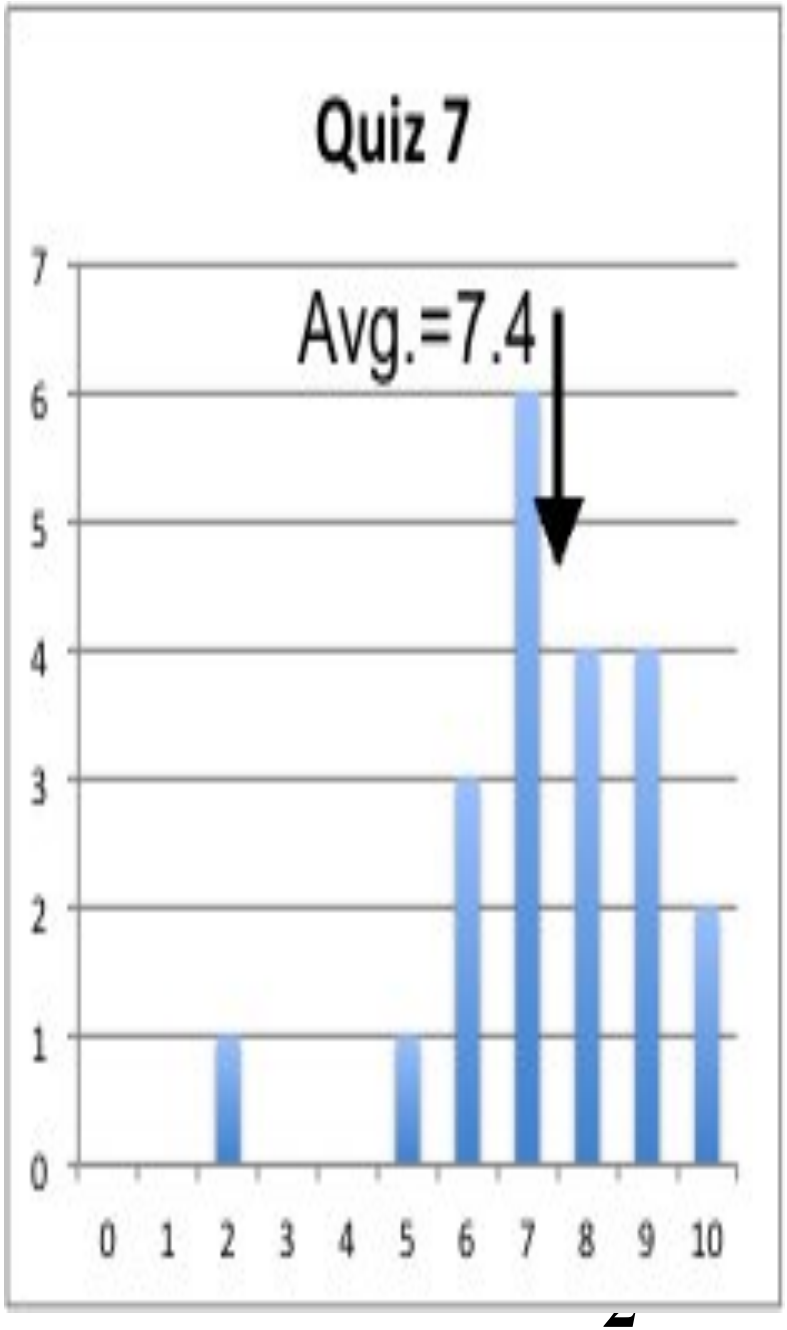
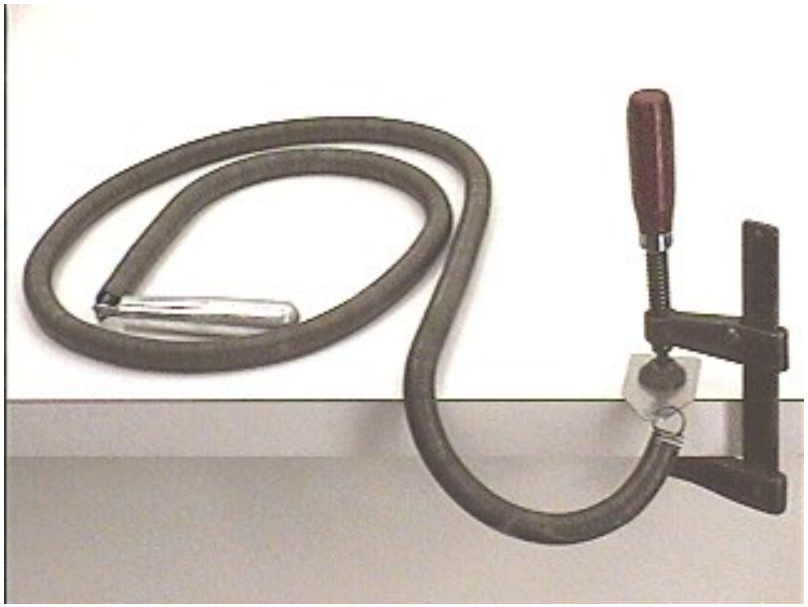
	7.1	7.2.1	7.2.2	7.3
A	10%	**90%**	**76%**	**43%**
B	**81%**	10%	5%	**52%**
C	**62%**	0%	19%	0%
D				**19%**
E				**57%**
F				14%



Demonstration: Waves on a long spring

- Pulses
  - Transverse
  - Longitudinal

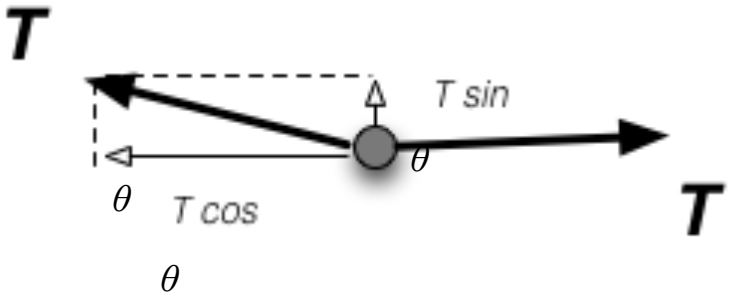


A Model of an elastic string / spring

- The critical characteristics for what happens on the spring are:
  - The bits of the spring are elastic, so they pull displaced bits back towards equilibrium.
  - The bits of the spring have mass (inertia) so they overshoot.
- We will create a model that separates these characteristics so we can talk about them more easily:
  - massive beads
  - massless springs (under tension)

Forces on the beads

- Small amplitudes ➔ Small angles



Small angles $\rightarrow$

$\sin\theta \approx \theta$

$\cos\theta \approx 1 - \frac{1}{2}\theta^2$

- Ignoring θ^2 ➔ horizontal forces cancel. Motion of the beads is vertical (*transverse*)

Displacements on an elastic string / spring

- Each bit of the string can move up or down (perpendicular to its length).
- To describe the motion of the string we need to describe the motion of each bit of the string at every instant of time.
- We therefore need to tell both which bit and when in order to specify a displacement.

$$y_i = f_i(t) \qquad y = f(x,t)$$

Foothold principles: Mechanical waves

- *Key concept*: We have to distinguish the motion of the bits of matter and the motion of the pattern.
- *Pattern speed*: a disturbance moves into a medium with a speed that depends on the properties of the medium (but not on the shape of the disturbance)
- *Matter speed*: the speed of the bits of matter depend on both the size and shape of the pulse and on the pattern speed.
- *Mechanism*: the pulse propagates by each bit of string pulling on the next.

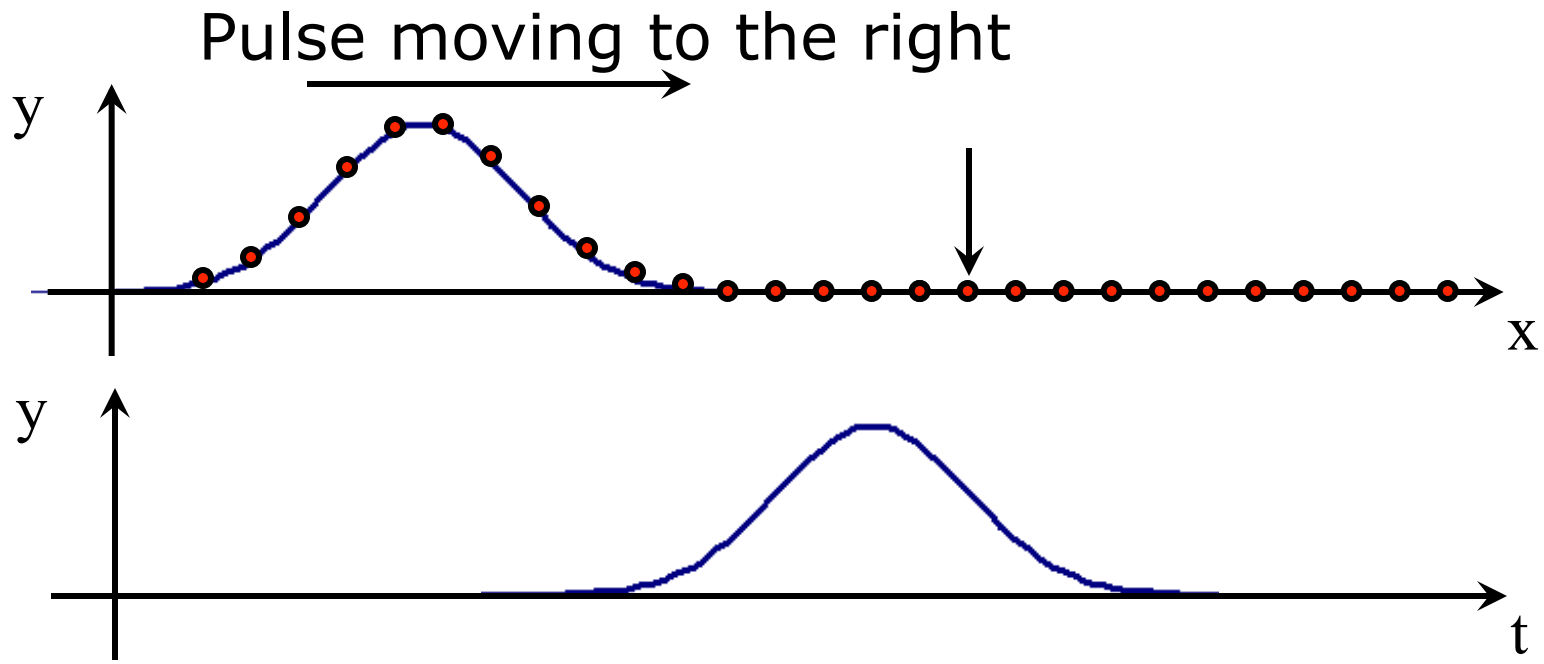
Reading questions

- Why are we ignoring the left-right forces components of the forces on each bead?
- I'm having trouble seeing how the momentum is perpendicular to the string. Does the momentum at the beginning end up as the momentum in the last bead? So why isn't that parallel?

How do the beads move?

What is the velocity of each bead in the top figure at the time shown?

How does the bead indicated by the arrow move as a function of time?



Why do I draw beads on the x-graph but not on the t?

Are the widths of the x- and t-graphs the same?