Newton's Law of Motion (II)

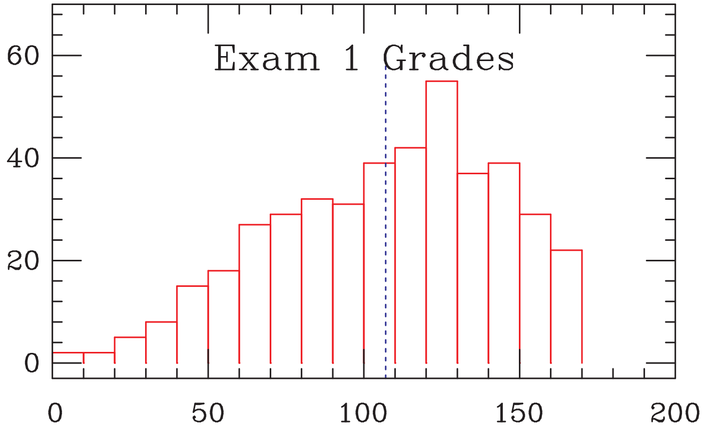
Physics 211
Syracuse University, Physics 211 Spring 2015
Walter Freeman

February 10, 2015

Announcements

- Homework 3 due tomorrow

Exam 1 statistics



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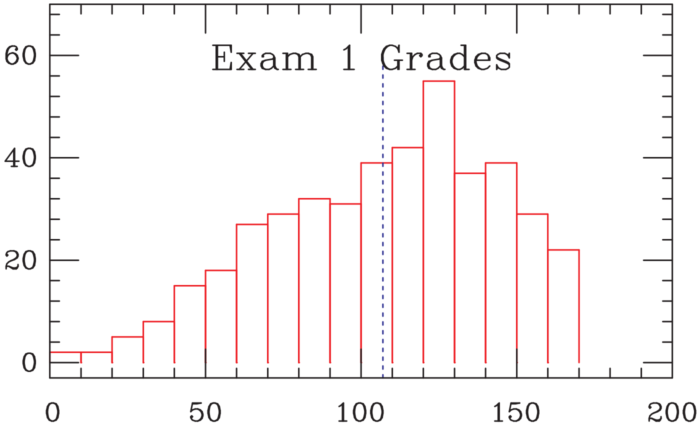

Your average was 71%

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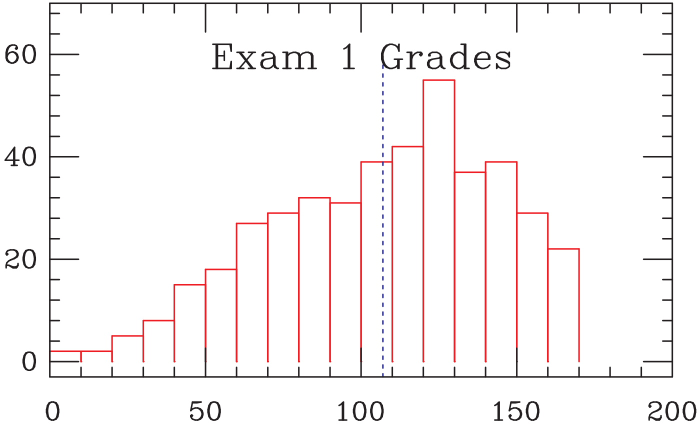

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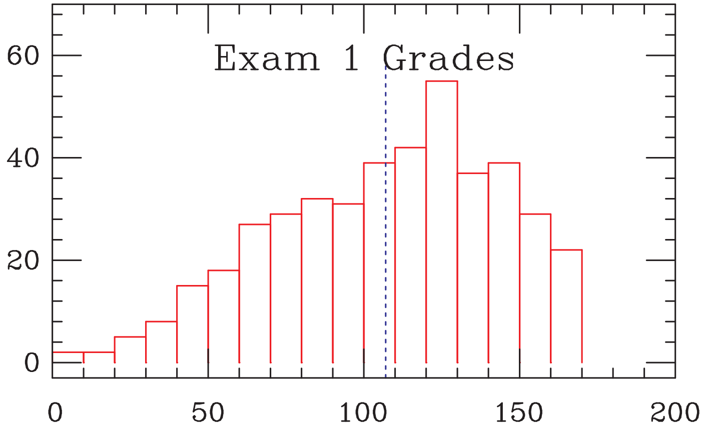

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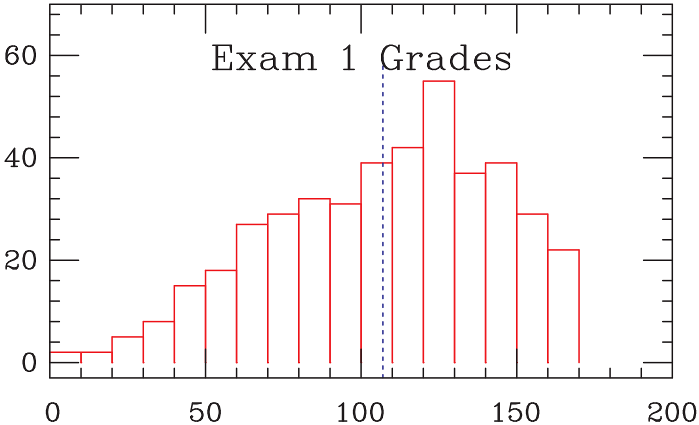

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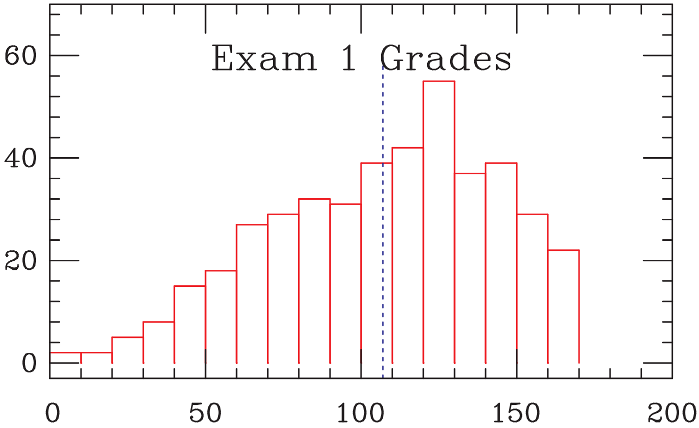

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I am very proud of you all!

Ask a Physicist: Water wheels and power stations

Forces so far:

- Gravity
  - Every object near Earth feels a force with magnitude *mg* directed downward. No exceptions!
- Normal forces
  - Always directed normal (perpendicular) to a surface
  - Magnitude is as large as it needs to be to stop objects from "crossing" ($a_\perp = 0$)
  - Newton's third law: if A pushes on B, B pushes back on A (the book problem)
- Tension
  - The force transmitted through a rope from one thing to another
  - Same on both sides of the rope (Newton's 3rd...)

Force diagrams

- Accounting devices for your use, to keep straight forces for $\vec{F} = m\vec{a}$
- Some guidelines:
  - Draw a separate diagram for each object (book problem again!)
  - Each force gets a separate arrow
  - Draw them big enough that you can draw "component-triangles"
  - "Net force", velocity, acceleration not forces; only physical agents are

(Examples on document camera)

Forces in 2D (and 3D)

Force is a vector; handle it like any other

One copy of Newton's second law in each direction (per object)

$$\vec{F} = m\vec{a} \rightarrow \binom{F_x = ma_x}{F_y = ma_y}$$

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Important: When dealing with inclines, choose your axes to align with the incline! (F_N is easy that way)

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"Ask physics the question, don't tell it the answer"

Sample questions

A stone hangs from the roof of a car by a string; the car accelerates forward at 3 $\mathrm{m/s^2}$.

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Two masses of 20 and 40 kg hang from a massless pulley on either side. How do they move?

Two masses of m_1 and m_2 kg hang from a massless pulley on either side. How do they move?