Tricks: Always guess

- If you can eliminate at least one answer, guess
- Correct answers worth 1 point
- Incorrect answers worth -.25 points
- Totally random guess:
  - .2*1 + .8*(-.25) = 0
  - 0 expected score gain
- Random guess, eliminating one answer:
  - .25*1 + .75*(-.25) = .0625
  - 1/16 of a point expected score gain
  - (Better than nothing)
- **All test-taking strategies that will make the Physics GRE easier depend on your ability to use intuition to immediately eliminate one or more answers.**

Tricks: Orders of Magnitude

$$e = 3 = \pi = 4 = 10^{1/2}$$

- Arithmetic does not need to be exact
- Save time by avoiding digits larger than 1 or 2.
- Collect orders of magnitude
- Numerical answers often differ by enough that you avoid rounding errors this way

Tricks: Orders of Magnitude

Which of the following is most nearly the mass the Earth? (The radius of the Earth is about 6.4×10^6 meters.)

(A) 6×10^{24} kg

(B) 6×10^{27} kg

(C) 6×10^{30} kg

(D) 6×10^{33} kg

(E) 6×10^{36} kg

Hint: $G = 6.67 \times 10^{-11}$ meter^3/(kilogram second^2)

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$$mg = \frac{GMm}{r^2}$$

$$M = \frac{gr^2}{G} = \frac{6^2 \cdot 10 \cdot (10^6)^2}{6 \cdot 10^{-11}}$$

$$M = 6 \cdot 10^{12+1+11} = 6 \cdot 10^{24}$$

Tricks: Dimensional analysis

- Can easily eliminate many possible answers because they have incorrect dimensions
- Quick example (you have 10 seconds to answer)

Q: How tall am I?

(A): 5 dollars

(B): 12 N

(C): 70 Gpa

(D): 6 feet

(E): 14 Ω

Tricks: Dimensional analysis

- A slightly harder question:

10. A massless spring with force constant k launches a ball of mass m. In order for the ball to reach a speed v, by what displacement s should the spring be compressed?

(A) $s = v\sqrt{\frac{k}{m}}$

(B) $s = v\sqrt{\frac{m}{k}}$

(C) $s = v\sqrt{\frac{2k}{m}}$

(D) $s = v\frac{m}{k}$

(E) $s = v^2\frac{m}{2k}$

Tricks: Dimensional analysis

- $[v] = m/s$
- $[k] = N/m = kg/s^2$
- $[m] = kg$
- $[k/m] = 1/s^2$
- $[answer] = m$

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(D) $s = v\frac{m}{k}$

(E) $s = v^2\frac{m}{2k}$

- $[A] = m/s^2$
- **$[B] = m$**
- $[C] = m/s^2$
- $[D] = m/s^3$
- $[E] = m^2$

Tricks: Taking Limits

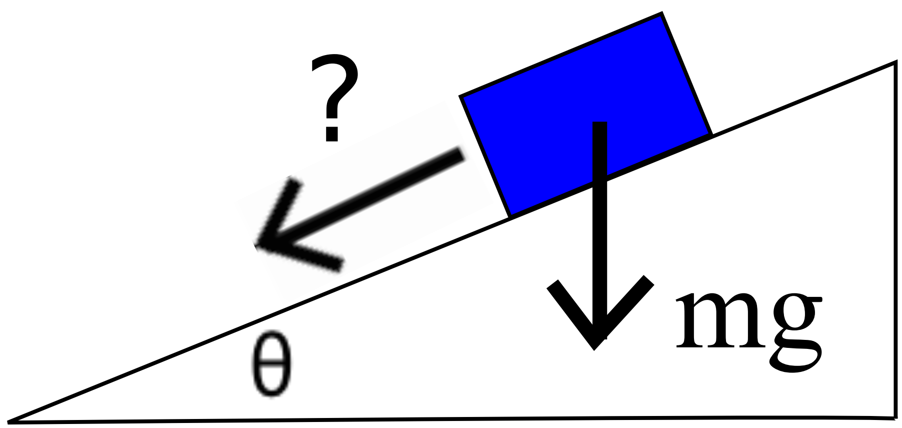
- Examine answers and check to see if they make sense in certain limits
- Quick example:

What is the force on the block in the direction parallel to the ramp?

(A) mg sin(θ)

(B) mg cos(θ)

(C) mg tan(θ)

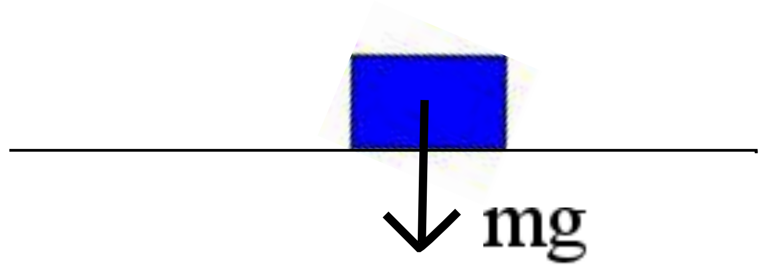


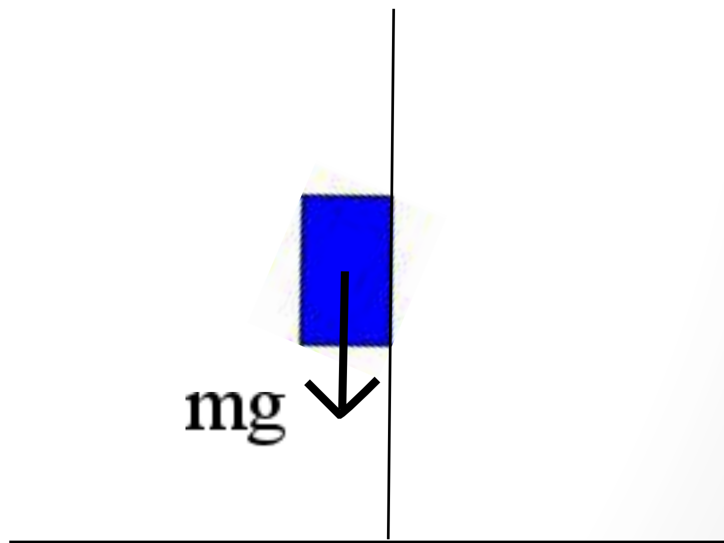
Tricks: Taking Limits

(A) mg sin(θ)
(B) mg cos(θ)
(C) mg tan(θ)

Examine answers and check to see if they make sense in certain limits

- Let θ -> 0
- Force goes to 0,
  like sin(θ) and tan(θ)

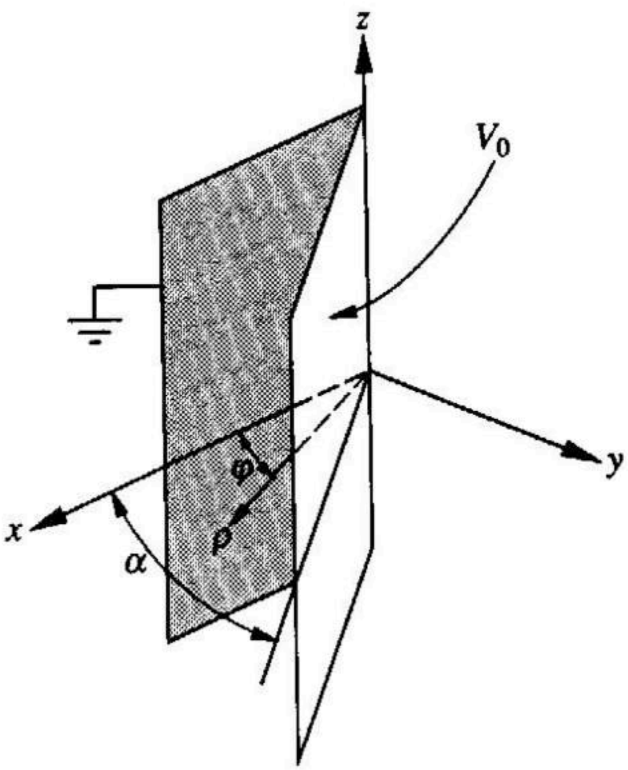




- Let θ -> π/2
- Force goes to mg

Answer: mg sin(θ)

Tricks: Taking Limits



12. Two large conducting plates form a wedge of angle α as shown in the diagram above. The plates are insulated from each other; one has a potential V_0 and the other is grounded. Assuming that the plates are large enough so that the potential difference between them is independent of the cylindrical coordinates z and ρ, the potential anywhere between the plates as a function of the angle φ is

- Look at potential at:
  - $\phi \to 0$
  - $\phi \to \alpha$
- Which answers make sense? Which answers do not?

(A) $\frac{V_0}{\alpha}$

(B) $\frac{V_0 \varphi}{\alpha}$

(C) $\frac{V_0 \alpha}{\varphi}$

(D) $\frac{V_0 \varphi^2}{\alpha}$

(E) $\frac{V_0 \alpha}{\varphi^2}$