

QUESTIONS FROM 101 CLASSES

*Relive all those intro classes you thought you had
escaped forever!*

SUPER BONUS 1

ECON 101

Super Bonus 1

January 16, 2015

Welcome to ECON 101! Before you can start looking for that consulting internship, you have to learn the principles of micro and macroeconomics. **Answer the following ten (10) questions about ECONOMICS.**

Use the following table for Questions 1-3:

A recent study found that the demand and supply for pizza are as follows:

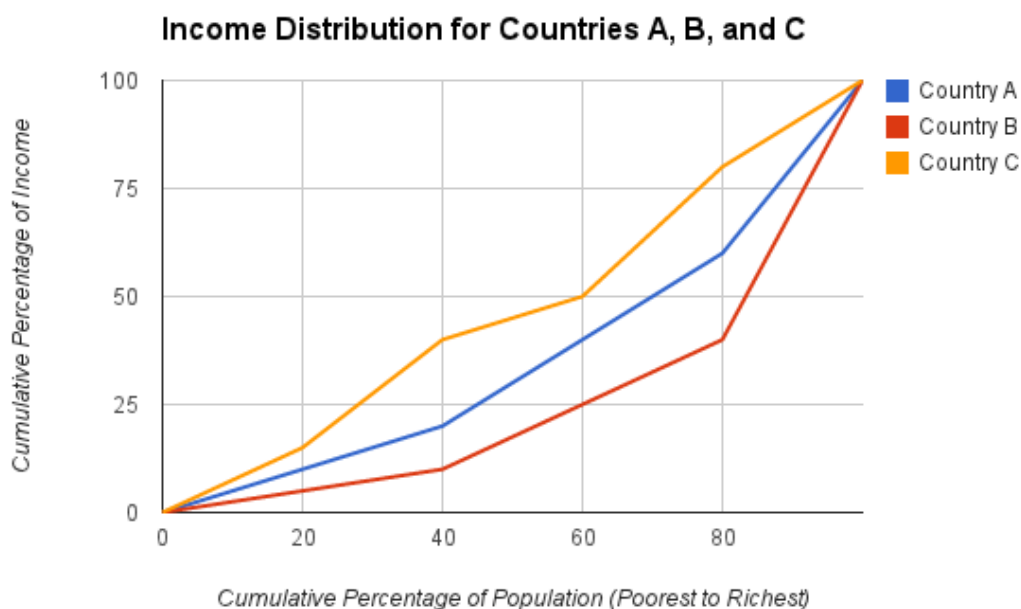
| Price (in dollars) | Quantity Demanded (in millions) | Quantity Supplied (in millions) |
|--------------------|---------------------------------|---------------------------------|
| 10 | 1 | 15 |
| 9 | 2 | 12 |
| 8 | 4 | 9 |
| 7 | 6 | 6 |
| 6 | 8 | 3 |
| 5 | 12 | 1 |

Question 1. As the price of pizza rises from \$5 to \$10, what is the price elasticity of demand?

Question 2. Pizza producers describe a recent study that indicates eating pizza on a regular basis is shown to increase IQ by up to 5 points. Overreacting, Congress decided to put a price floor \$2 above the equilibrium price of pizza to encourage more businesses to sell pizza. What is the new market price and quantity sold?

Question 3. What is the deadweight loss resulting from the policy implemented in Question 3?

Question 4. Consider the market for a good that has both a positive production externality and a negative consumption externality. Will the socially optimal quantity be higher or lower than the quantity that will be achieved by the private market without intervention?



Question 5. Based on the above graph, which country has the highest Gini coefficient?

Question 6. What equation can be used to define aggregate demand?

Question 7. Suppose Williamstown Savings Bank has \$20 million in checkable deposits, \$15 million in loans, and \$5 million in reserves. If the reserve requirement of deposits is 10%, calculate Williamstown Savings Bank's excess reserves.

For Questions 8-10, which components of GDP (if any) would the following transactions affect?

Question 8. Williamstown repaves Route 2 at the end of the fall.

Question 9. An American family purchases a new minivan from Ford.

Question 10. The government provides a family with unemployment benefits.

PHYS 101

Super Bonus 1

January 16, 2015

Welcome to PHYS 101! We hope you understand the gravity of your decision to take this class. **Answer the following six (6) questions about PHYSICS. Unless otherwise stated, give all numerical answers to two decimal places. Recall that the acceleration due to gravity is 9.8 m/s^2 .**

Question 1. Suppose that we drop an object of mass 4 kg from the top of the Sears Tower (height 442 m). The object starts at rest and we release it at time $t = 0$. Ignore air resistance. At what time (in seconds) does the mass hit the ground?

Question 2. Consider two satellites orbiting the earth at distances R_1 and R_2 from the center of the planet. The masses of the satellites are m_1 and m_2 , respectively, with $m_{\text{Earth}} \gg m_1, m_2$. Suppose that we set $R_2 = 2R_1$ and $m_2 = 2m_1$. What is the ratio v_1/v_2 , where v_i is the orbital speed of the i th satellite?

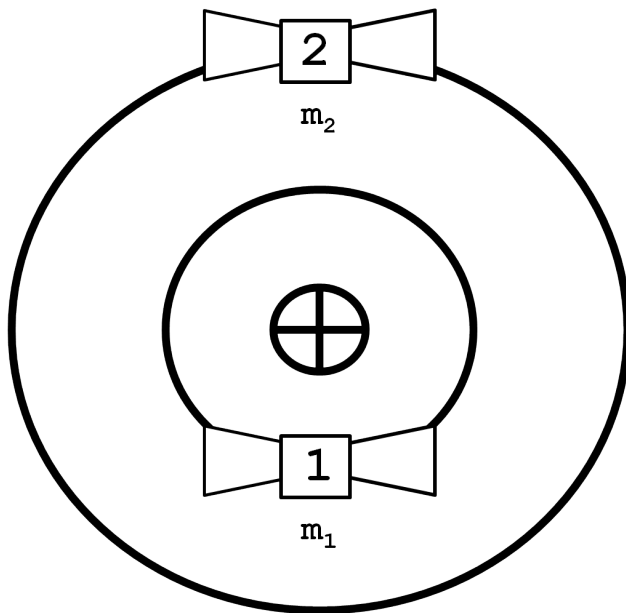


Figure 1: Question 2

Question 3. The following four waves propagate along strings with the same linear densities. The position x is given in meters; the time t is given in seconds. Order the waves from greatest to least in terms of wave speeds:

- (a) $\sin(3x - t)$
- (b) $3 \sin(x - 2t)$
- (c) $2 \sin(x - 4t)$
- (d) $4 \sin(2x - t)$

Question 4. Consider an analog 12-hour clock (ask an elder if you don't know what this is). Assuming that the clock is working properly, give the angular speed (in radians / second) of the following, to the first three nonzero decimal places:

- (a) Second hand
- (b) Minute hand
- (c) Hour hand

Question 5. Two ice sleds, each with mass 25 kg, are placed a distance 0.5 m apart on a sheet of ice. The sleds are lined up in the same direction. A surprisingly agile baby goat, of mass 20 kg, is on one of the sleds. It gracefully leaps onto the other sled, jumping at a constant speed of 5 m/s relative to the ice. How fast (in m/s) and in which directions are the sleds going now?

Question 6. As a practical joke, some nasty teenage hooligans decide to place one of Farmer Ben's prized spherical cows (with mass 500 kg) at the top of ramp of length 10 m angled 30° off of the horizontal. If the cow starts from rest, how fast (in m/s) will the cow be traveling when it reaches the bottom of the ramp? You may ignore the effects of friction and air resistance. Assume no energy is lost in rotation.

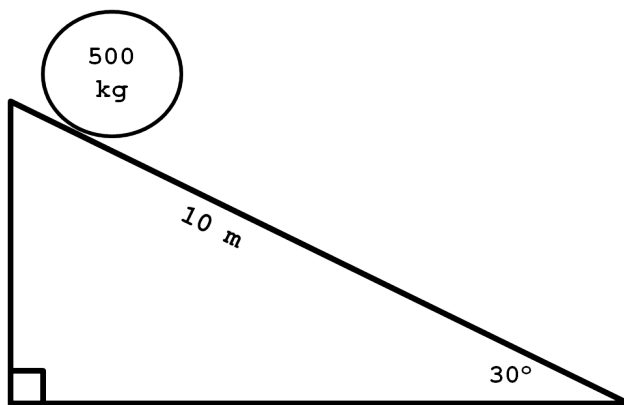


Figure 2: Question 6

MATH 101

Super Bonus 1

January 16, 2015

Welcome to MATH 101! We're counting on you to be a great addition to our class. **Answer the following seven (7) questions about MATH.**

Question 1. Find $f'(0)$ of $f(x) = (\sin(17x) - 4e^x)(97x^2 + 155)$.

Question 2. You are on the hit TV game show *Let's Make a Deal*. Host Monty Hall gives you the choice of three doors. Behind one of the doors is a brand new car. Behind the other two are goats. Having had an unpleasant history with goats, you want to win the car. Once you pick a door, Monty will open one of the remaining doors, revealing the location of a goat. If both remaining doors conceal goats, he will select the door to open at random. You select Door 1. Monty opens Door 3, revealing a goat.

- (a) What is the probability that you have selected the door concealing the car?
- (b) Suppose now that Monty gives you a choice: you may keep your door or change your choice and take Door 2 instead. If you take Monty up on his offer, what is the probability that you will win the car? Are you more likely to win than if you had stuck with your original choice?

Question 3. The thickness of a sheet of paper is roughly 0.1 mm. When you fold a piece of paper in half, the resulting piece has twice the thickness of the pre-folded paper. For example, folding the initial piece of paper once will yield a piece having thickness 0.2 mm. How many times would you have to fold a piece of paper such that the resulting thickness reaches from the surface of the Earth to the surface of the moon? [Hint: Use 4.0×10^5 km as the relevant distance.]

Question 4. Rocketlauncher Steve is trying to blow the largest bubblegum bubble he's ever blown. He starts off with a bubble that is 2 cm in diameter. He then lets loose a steady gust of air from his lungs, which serves to increase the diameter of the bubble by 2 cm/s. How much air is he blowing into the bubble per second after 4 seconds have passed?

Question 5. Farmer Ben would like to build a rectangular enclosure for his spherical cows, but he has a steep budget of only \$500 to spend. He realizes he can reduce the amount of fence he has to buy by using his barn as one wall of the enclosure. However, the barn would need to be repaired first. There is a one-time cost of \$20 to repair the barn, with an additional \$1 per every 5 feet repaired. Fencing costs \$1 per foot. What is the maximum area Ben can hope to provide for his spherical cows? (Assume his barn is as long as is needed.)

Question 6. Each year during Commencement Weekend, the class presidents drop a watch from the top of Thompson Chapel. If the watch takes two seconds to hit the ground, what is the average velocity (in m/s) of the watch from the time it is dropped to the time that it hits the ground? (Note: Assume $g = 9.8$ m/s).

Question 7. You are in charge of Infinity Hotel, a hotel that features countably infinite rooms. Business is booming and all of the rooms are currently occupied. However, a bus arrives, carrying a countably infinite number of potential guests looking to secure a room for the night. Is there any way to accommodate all these new guests? You can tell any new or old guest to go to a numbered room but you cannot tell anyone to go “infinitely far out.”

BIOL 101

Super Bonus 1

January 16, 2015

Welcome to BIOL 101! We're hoping that this class leaves you a bit more cultured. **Answer the following fifteen (15) questions about BIOLOGY.**

Question 1. Briefly describe the following 3 experiments and summarize their main findings:

- a) Griffith
- b) Avery et al.
- c) Hershey-Chase

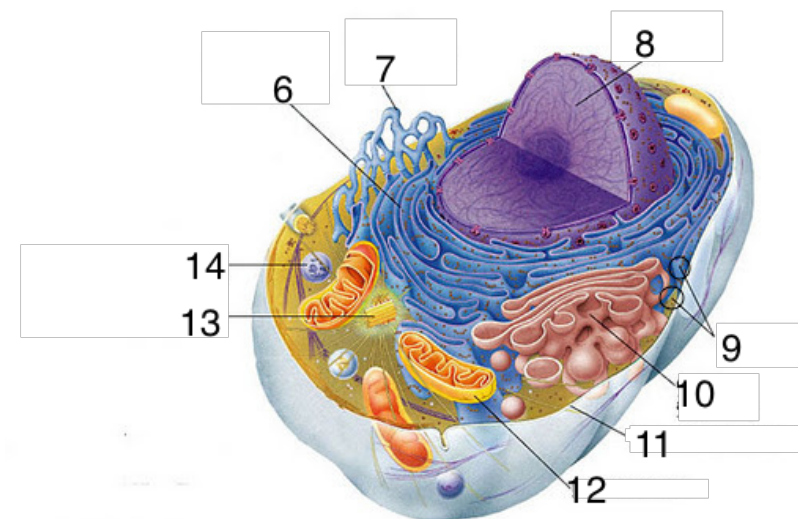
Question 2. Describe the function of the following enzymes used in DNA replication: helicase, DNA polymerase, topoisomerase.

Question 3. Explain the difference between transcription and translation.

Question 4. DNA replication is semiconservative. Explain what this means.

Question 5. What is the difference between the primary, secondary, tertiary, and quaternary structures of a protein?

Questions 6-15 use the following diagram:



Question 15. Is this an animal cell or a plant cell? How can you tell?

CHEM 101

Super Bonus 1

January 16, 2015

Welcome to CHEM 101! Remember to periodically go to office hours to touch base with your professor. **Answer the following nine (9) questions about CHEMISTRY.**

Question 1. How much of a 0.1 M NaOH solution should you use to make 100 mL of a 0.0025 M solution?

For Questions 2-5, name the given compound:

Question 2. Na_2O_2

Question 3. $(NH_4)HCO_3$

Question 4. S_2Cl_2

Question 5. HNO_2 (aq)

Question 6. According to the VSEPR model, what is the shape of a PCl_5 molecule?

For Questions 7-9, refer to the reaction and thermodynamic data below:



$$H_2O(l) : \Delta_f H = -285.83 \text{ kJ/mol}, \quad S_0 = 69.91 \text{ J/K} * \text{mol}$$

$$H_2(g) : \Delta_f H = 0, \quad S_0 = 130.68 \text{ J/K} * \text{mol}$$

$$O_2(g) : \Delta_f H = 0, \quad S_0 = 205.14 \text{ J/K} * \text{mol}$$

Question 7. Calculate ΔS_{sys} for this reaction.

Question 8. Calculate ΔG for the reaction.

Question 9. At what temperature might you expect this reaction to occur spontaneously?

MUS 101

Super Bonus 1

January 16, 2015

Welcome to MUS 101! Stay sharp, and watch out for accidentals! **Answer the following seven (7) questions about this piece of MUSIC.**

Ach wie fluchtig, ach wie nichtig

J.S. Bach

The image displays a musical score for the piece "Ach wie fluchtig, ach wie nichtig" by J.S. Bach. The score is written in common time (C) and consists of three systems of music. The first system includes a bracketed section labeled "Cadence A" at the end. The second system has a bracketed section labeled "Melodic Interval" in the bass line. The third system features a circled area in the bass line containing two accidentals (sharps) on the notes G and A, and a boxed area in the treble line containing two accidentals (sharps) on the notes G and A. The score is presented in a grand staff format with treble and bass clefs.

Question 1. In what key is this chorale written?

Question 2. What type of cadence is cadence A?

Question 3. Name the circled chord. What function does it serve in the given key?

Question 4. Name the rectangled chord (just before the circled chord). What function does it serve in this key?

Question 5. While not in the original key signature, a sharp is added on the C of the final chord. What is the name of this phenomenon?

Question 6. What kind of sequence is used in measures 5-8?

Question 7. What is the melodic interval between the two indicated notes (encased in triangles)?

PSYC 101

Super Bonus 1

January 16, 2015

Welcome to PSYC 101! We're psyched that you chose the largest (and reportedly, most failed) class at Williams College! **Answer the following nine (9) questions about PSYCHOLOGY.**

Question 1. Drugs of abuse enhance transmission of which neurotransmitter?

Question 2. What psychology term refers to when something continues to exist even after it becomes hidden from view?

Question 3. This strip of brain is responsible for planning and carrying out voluntary movements.

Question 4. Reaction formation, regression, and repression are all examples of what?

Question 5. What is the term for when a person has a response to a medically ineffective treatment for a disease or other condition?

Question 6. What is the term for a distinct, vivid, and detailed memory of an intense event?

Question 7. This railroad construction worker is one of psychology's most famous case studies.

Question 8. What are the two types of schizophrenia symptoms?

Question 9. There's a famous psychology experiment in which participants were asked to administer fake shocks to actors. Who originally conducted the study, and what social phenomenon did it observe?



ARTH 101

Super Bonus 1

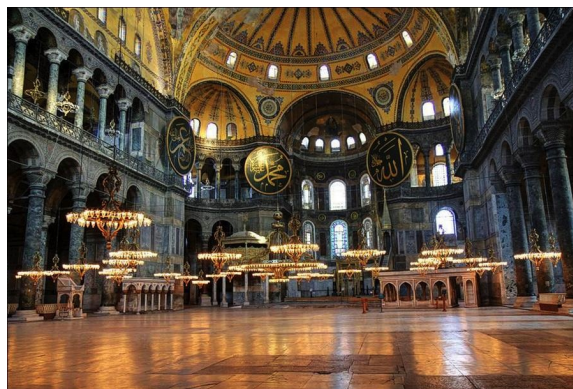
January 16, 2015

Welcome to ARTH 101! We hope you enjoy your brush with these iconic pieces of art. **Identify the following ten (10) pictures of famous artwork and architecture from ART HISTORY.** For the first five images, give the name, location, and era of each piece. For the last five images, give the name, artist, and era of each piece.

1.



2.



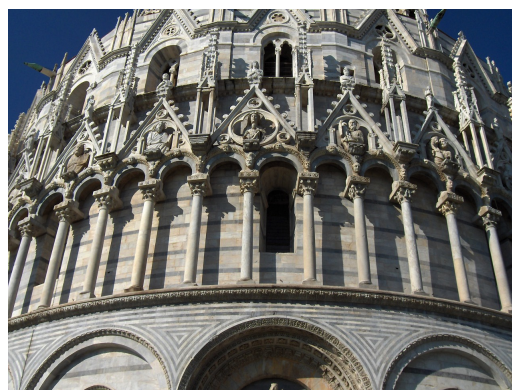
3.



4.



5.



6.



7.



8.



9.



10.



LANG 101

Super Bonus 1

January 16, 2015

Welcome to LANG 101! We're here to translate your potential into greatness. You've just made it through eight of the toughest intro classes Williams has to offer, so it's time to step up your game and take on 19 classes at once! Click on the link below. It will take you to a YouTube video featuring a sequence of recordings of a common phrase spoken in various world languages. **Answer the following twenty (20) questions about LANGUAGES.**

Questions 1-19. Identify the languages being spoken in [THIS](#) video.

Question 20. Now that you've heard it 19 times, translate the spoken phrase into English.