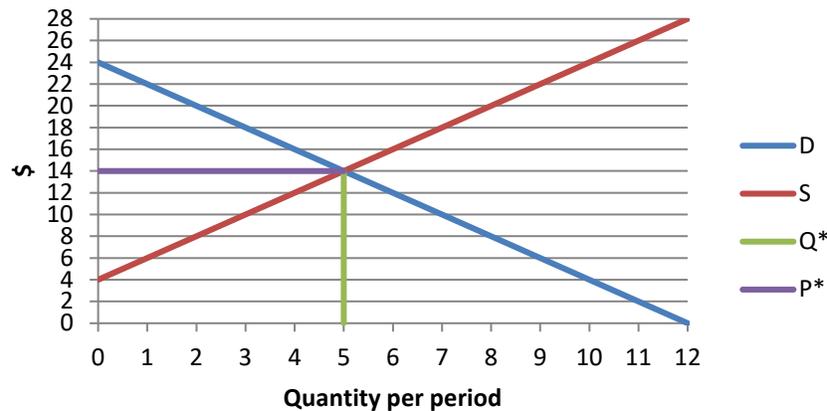


Use the space given to answer the questions. Write neatly and legibly and explain thoroughly. You should make the standard microeconomic assumptions unless the question gives you good reason to do otherwise. You will receive partial credit if you make logical progress toward an answer, so show your work. Feel free to ask me if you do not understand what a question is asking. To help you manage your time and effort, the possible points and estimated *maximum* time to work each question are in parenthesis.

Answers will be posted on the class web site as soon as possible. Good Luck!

1. (20 minutes; 29 points) Suppose that the demand for Coco-nutty Cookies is $P = 24 - 2Q$ and the supply of Coco-nutty Cookies is $P = 4 + 2Q$, where Q represents the number of boxes of cookies per period.

- a. (4 points) What are the equilibrium price and quantity in the Coco-nutty Cookie market?



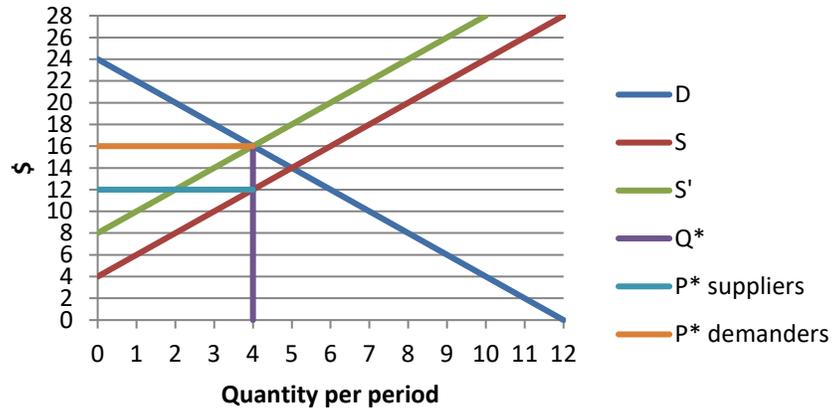
$$\begin{aligned}4 + 2Q &= 24 - 2Q \\4Q &= 20 \\Q &= 5 \text{ boxes per period} \\P &= 24 - 2(5) = \$14 \text{ per box}\end{aligned}$$

- b. (4 points) What are the consumer and producer surplus in this market?

$$CS = .5 * 5 * \$ (24 - 14) = \$25 \text{ per period}$$

$$PS = .5 * 5 * \$ (14 - 4) = \$25 \text{ per period}$$

- c. (15 points) Suppose the government wants to reduce cookie consumption and thus implements a tax of \$4 per box on the suppliers of Coco-nutty Cookies. Answer each of the questions below (Hint: a graph may help you).



- i. What is the new equilibrium quantity?

4 boxes per period

- ii. How much would a consumer have to pay for a box of Coco-nutties?

\$16 per box

- iii. What is the after-tax price received by producers?

\$12 per box

- iv. How much tax revenue is received per period?

\$16 per period

- v. How much deadweight loss results from this tax?

*.5 * 1 * \$(16-12) = \$2 per period*

- d. (6 points) Suppose that instead of the tax discussed in part (c), the government is considering imposing a quota such that no more than 4 boxes of Coco-nutties can be sold per period.

- i. Will producers be better off with the tax policy or with the quota policy? Why?

Producers would be better off under the quota since producer surplus would be higher under the quota policy (\$32 per period versus \$16 per period).

- ii. Will consumers be better off with the tax policy or with the quota policy? Why?

Consumers will be no better or worse off between the tax or the quota since consumer surplus is the same under both policies (\$16 per period).

2. (10 minutes; 11 points) Cool Coders (CC), a new computer programming business, has just opened in Bozeman. CC hires programmers in the U.S. and in Italy to produce computer programs for its clients. Currently, the salary for CC programmers in the U.S. is \$60,000 per year and the salary for programmers in Italy is equal to \$40,000 per year. CC is producing 300 programs per year using 10 units of U.S. labor and 10 units Italian labor. CC charges \$4,000 for each program it produces. The marginal product of U.S. programmers is 30 programs per year and the marginal product of Italian programmers is 25 programs per year. Cool Coders also faces fixed costs of \$100,000 per year to cover overhead.
- a. (3 points) What are the firm's profits at its current level of operation and input use?

$$\begin{aligned} \text{Profit} &= TR - TC \\ TR &= P * Q = \$4000 * 300/\text{year} = \$1,200,000 \text{ per year} \\ TC &= W*L + r*K + FC = (\$60,000*10) + (\$40,000*10) + \$100,000 = \$600,000 + \$400,000 + \$100,000 = \\ &\quad \$1,100,000 \text{ per year} \\ \text{Profit} &= \$100,000 \text{ per year} \end{aligned}$$

- b. (4 points) Could Cool Coders increase profits by changing its use of U.S. and Italian labor? If so, explain how its labor mix should be changed. If not, explain why not.

$$MP_{US}/P_{US} = 30/\$60,000 = \$0.0005 \text{ per year}$$

$$MP_I/P_I = 25/\$40,000 = \$0.0006 \text{ per year}$$

The marginal product per dollar spent on U.S. programmers is lower than the marginal product per dollar spent on Italian programmers so Cool Coders could increase its profits by using more Italian programmers and fewer U.S. programmers.

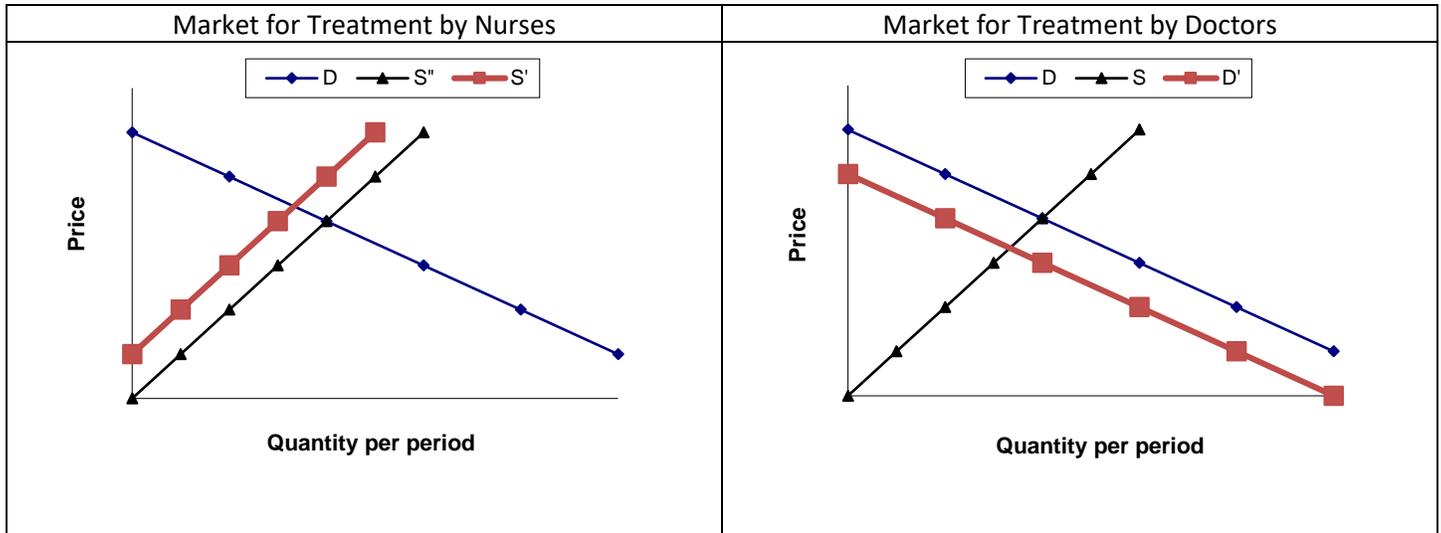
In other words, U.S. programmers cost $60,000/40,000 = 1.5$ times as much as Italian programmers, but U.S. programmers are only $30/25 = 1.2$ times as productive, so it would be better to hire more Italian programmers and fewer U.S. programmers.

Alternatively, for the same cost you could hire 3 more Italians if you fire 2 U.S. workers; the Italian workers would increase output by 75 and you'd lose 60 units of output from the U.S. workers. So for the same cost you could increase output by 15 units.

- c. (4 points) Recently, protests against low wages and benefits in Italy have resulted in a new law that raises the salaries of Italian programmers to \$55,000 per year. How should CC respond if it wants to maximize profits? Explain.

At \$55,000 per year, the new $MP_I/P_I = 25/\$55,000 = \0.00045 . Because U.S. programmers are now relatively more productive per dollar spent, CC should increase its use of U.S. programmers and decrease its use of Italian programmers. In other words, U.S. programmers now only cost $60,000/55,000 = 1.09$ times as much as Italian programmers, but U.S. programmers are $30/25 = 1.2$ times as productive, so it would be better to hire more U.S. programmers and fewer Italian programmers.

3. (5 minutes; 8 points) Advances in technology and training are causing rapid changes in the healthcare industry. In particular, nurses can now effectively provide equal-quality service for many treatments that were previously only provided by doctors. Draw two clearly labeled demand and supply diagrams to illustrate the impact that the increased effectiveness of nurses has on the market for medical treatment by nurses and on the market for medical treatment by doctors. Clearly explain your graphs.



There will be an increase in the supply of treatment by nurses from S' to S'' , this will lower the cost of treatment by nurses and increase the equilibrium quantity of treatments by nurses. Since nurses and doctors are substitutes for many treatments, the lower cost of treatment by nurses will lower the demand for doctors from D to D' .

4. (10 minutes; 14 points) The price elasticity of demand for Fat Chance mountain bikes is -1.5. Suppose that the price of Fat Chance mountain bikes is currently \$1,000 each and that 500 Fat Chance bikes are sold per period.
- a. (3 points) Provide an interpretation of the elasticity coefficient (-1.5) for Fat Chance bikes. Is the demand for Fat Chance bikes elastic, inelastic, or neither. Why?

The elasticity coefficient of -1.5 implies that each 1% change in the price of Fat Chance bikes will cause a 1.5% change in the quantity of Fat Chance bikes sold. Because the percent change in quantity is larger than the percent change in price, demand is elastic.

- b. (3 points) How will total revenue change if Fat Chance lowers the price of their mountain bikes? Why?

Total revenue will rise. When demand is elastic, a given percent reduction in price generates a larger percent increase in quantity sold, which will raise total revenue.

- c. (4 points) If the price of Fat Chance bikes rises to \$1,100, how many fewer Fat Chance bikes will be sold per period?

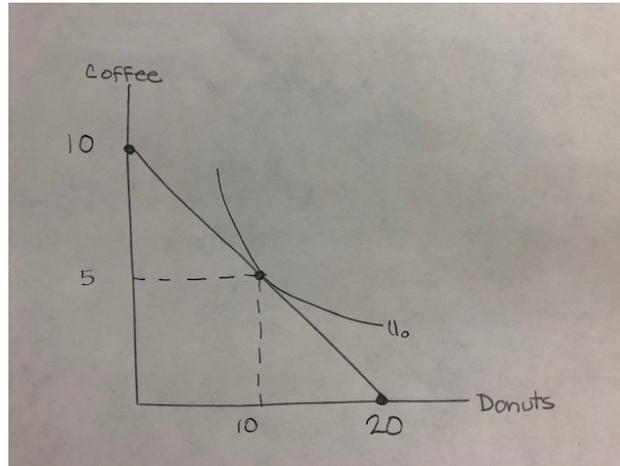
The elasticity coefficient of -1.5 implies that each 10 percent change in the price of Fat Chance bikes will cause a 15 percent change in the quantity of Fat Chance bikes sold. A change in the price of bikes to \$1,100 represents a 10% increase in price. Thus, the quantity sold will fall by 15%, to 425 bikes per period.

- d. (4 points) List and describe two factors that influence the elasticity of demand for Fat Chance bikes.

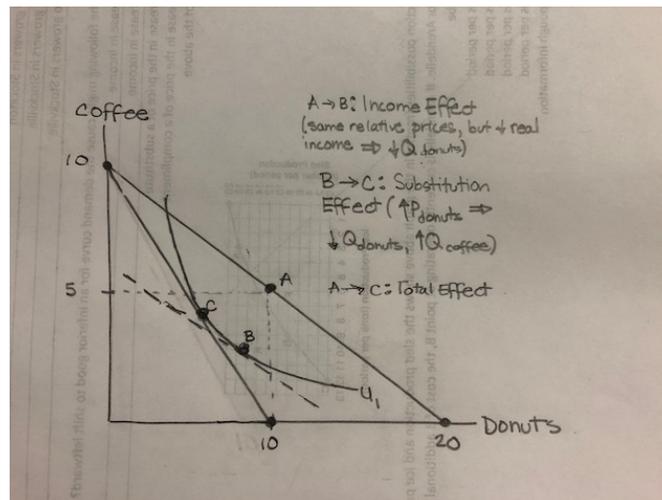
*The demand could be elastic because there are many substitutes for Fat Chance bikes.
The demand could be elastic because mountain bikes are a luxury rather than a necessity for many people.*

5. (10 minutes; 9 points) Suppose that Clarence devotes \$50 per week to buying fancy coffee and specialty donuts. Initially, the price of coffee is \$5 each and the price of a donut is \$2.50 each. At those prices, Clarence maximizes his utility by buying 5 cups of coffee and 10 donuts.

a. (3 points) Draw an indifference curve/budget constraint diagram to illustrate Clarence's optimal choice. Measure donuts on the horizontal axis. Clearly label the intercepts of the budget constraint.

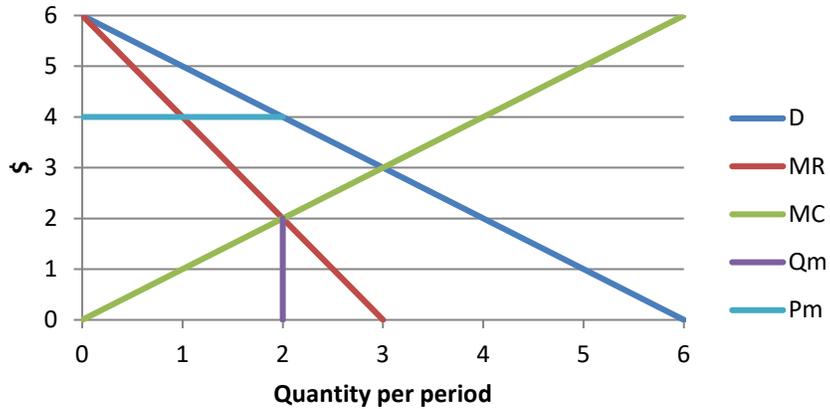


b. (6 points) Now suppose that the price of donuts rises to \$5 each. Assuming that coffee and donuts are normal goods, illustrate a possible new optimum quantity of coffee and donuts for Clarence to buy. Do not use the graph from part "a" above; draw a new one. Clearly label and describe in words the income and substitution effects of the price change and the new optimum choice.



6. (15 minutes; 27 points) A monopolist faces a demand curve given by $P = 6 - Q$, a marginal cost curve of $MC = Q$ and total cost of $TC = 2 + 0.5Q^2$.

- a. (6 points) Compute the profit maximizing quantity and the monopoly price per ticket. Draw a large and well-labeled graph that illustrates these values.



The monopolist sets $MR = MC$:

$$6 - 2Q = Q$$

$$Q = 2 \text{ units per period}$$

The monopolist determines price from its demand curve:

$$P = 6 - Q$$

$$P = 6 - 2 = \$4 \text{ per unit}$$

- b. (3 points) What is the monopolist's profit?

$$\text{Total Revenue: } P \cdot Q = \$4 \cdot 2 = \$8 \text{ per period}$$

$$\text{Total cost: } 2 + 0.5Q^2 = 2 + 0.5 \cdot 4 = \$4$$

$$\text{Profit} = \$4 \text{ per period.}$$

- c. (6 points) Compute the monopolist's producer surplus and the consumer surplus under monopoly.

$$PS = (.5 \cdot 2 \cdot \$2) + (2 \cdot \$2) = \$6$$

$$CS = (.5 \cdot 2 \cdot \$2) = \$2$$

- d. (6 points) What would be the price and quantity for this good under perfect competition?

Perfectly competitive industries, $P = MC$:

$$6 - Q = Q$$

$$Q = 3 \text{ trips per period}$$

$$P = MC = \$3 \text{ per unit}$$

- e. (6 points) Compute the loss of consumer surplus and the deadweight loss from the monopoly.

Under the monopoly, CS = \$2 per period

*Under perfect competition, CS = $.5 * 3 * (6-3) = \$4.5$ per period*

So consumer surplus is \$2.50 per period higher under perfect competition than under monopoly.

*The DWL from monopoly is $.5 * 1 * (2) = \$1$ per period*

7. (10 minutes; 15 points) The below table represents the production function for Tied & True Truthhunters, Bozeman's newest flyfishing guide service. Assume that Tied & True is a profit-maximizing employer. Suppose the price of a one-day guided flyfishing trip is \$500 and the wage for guides at Tied & True is \$1250 per week.

Guides/Week	Total Product (Trips/Week)	Marginal Product (Trips/Week)	Value of Marginal Product (\$/Week)	MC (\$/Week)
1	7	7	3500	1250
2	13	6	3000	1250
3	18	5	2500	1250
4	22	4	2000	1250
5	25	3	1500	1250
6	27	2	1000	1250

- a. (3 points) What quantity of guides/week maximizes profit for Tied & True Truthhunters?

Tied & True should hire guides as long as the value of the marginal product of labor \geq the wage, or 5 guides per week.

- b. (3 points) Assuming that in addition to paying wages for guides, Tied & True also faces \$5,000 per week in fixed costs. What will their profits be at the employment level you computed in part a?

$$TR = 25 * \$500 = \$12,500/\text{week}$$

$$TC = \$5000 + 5 * \$1250 = \$6250 + \$5000 = \$11,250/\text{week}$$

$$\text{Profit} = \$1250/\text{week}$$

- c. (2 points) Suppose that Tied & True's guides form a union that successfully lobbies to raise guide wages to \$2,250 per week. What will be the new optimal quantity of guides for Tied & True to hire?

3 guides per week

- d. (4 points) Based on your answer to part (c), is the total income to guides higher or lower than it was before the wage increase? Who wins and who loses from the wage increase (consider outcomes for both guides and Tied & True in your answer)?

The 3 guides who are able to keep their jobs see an increase in income and are thus winners from this policy. The 2 guides who are no longer hired lose from this policy.

*Before the wage increase, total income to guides was $\$1250 * 5 = \6250 per week. After the wage increase, total income to guides is $\$2250 * 3 = \6750 per week. Thus, total income to guides is higher after the wage increase.*

Tied & True's profits after the wage increase are

$$TR = 18 * \$500 = \$9,000/\text{week}$$

$$TC = \$5000 + 3 * \$2250 = \$6750 + \$5000 = \$11,750/\text{week}$$

$$\text{Profit} = -\$2,750/\text{week}$$

So Tied & True is worse off as a result of this policy.

- e. (3 points) Based on your answer to part (d), should Tied & True stay in business? Why or why not?

Tied & True is making a loss as a result of the higher guide wages, however since they have \$5,000 in fixed costs, they are still better off by staying in business because their loss would be larger if they shut down.

MULTIPLE CHOICE QUESTIONS
20 minutes; 15 questions; 3 points each

GOOD	PRICE in 2015	PRICE in 2016	PRICE in 2017
Ski Passes (each)	75.00	85.00	95.00
Peanut Butter & Jelly Sandwich (each)	2.00	2.50	2.50
Espresso (each)	3.00	3.50	3.25
CPI Base 2015	100	114	

1. Suppose you want to determine the cost of living for workers in Big Sky. You construct a market basket consisting of 20 ski passes, 30 peanut butter and jelly sandwiches, and 30 cups of espresso. The prices of these goods are given in the table above. Based on the table, the **CPI** in 2017, using 2015 as the base year, is

- a. $(1650/1880)*100 = 87.8$
- b. $(2072.50/1880)*100 = 110$
- c. $(1880/1650)*100 = 114$
- d. $(2072.50/1650)*100 = 126$
- e. $(1650/2072.50)*100 = 79.6$

2. Suppose you want to determine the cost of living for workers in Big Sky. You construct a market basket consisting of 20 ski passes, 30 peanut butter and jelly sandwiches, and 30 cups of espresso. The prices of these goods are given in the table above. Based on the table, the **inflation rate** from 2016 and 2017, using 2015 as the base year, was

- a. $((114-100)/100)*100 = 14\%$
- b. $((126-100)/100)*100 = 26\%$
- c. $((126-114)/114)*100 = 10.5\%$
- d. $((126-114)/100)*100 = 12\%$
- e. $((126-100)/114)*100 = 22.8\%$

3. The economy of Bozone can produce only two goods; dog toys and backpacks. In 2015 Bozone produced 300 dog toys at a price of \$10 each and 100 backpacks at \$300 each. In 2016 Bozone produced 300 dog toys at a price of \$15 each and 100 backpacks at \$300 each. Bozone's **nominal** GDP for 2015 was

- a. \$30,000
- b. \$34,500
- c. \$40,000
- d. \$33,000
- e. \$31,000

4. To engage in expansionary fiscal policy, the federal government could

- a. raise taxes and increase government spending
- b. lower taxes and decrease government spending
- c. raise taxes and decrease government spending
- d. lower taxes and increase government spending
- e. buy bonds in the open market

5. The Bureau of Labor Statistics website reports that for March, 2018, the total civilian population was 258 million, the number in the labor force was 163 million, the number employed was 156 million, the number unemployed was 7 million, and the number not in the labor force was 95 million. Based on these figures, the **unemployment rate** was:

- a. $156 / 163 = 96$ percent
- b. $156 / 258 = 60.5$ percent
- c. $7 / 258 = 2.7$ percent
- d. $7 / 163 = 4.3$ percent
- e. $7 / 156 = 4.5$ percent

6. The Bureau of Labor Statistics website reports that for March, 2018, the total civilian population was 258 million, the number in the labor force was 163 million, the number employed was 156 million, the number unemployed was 7 million, and the number not in the labor force was 95 million. Based on these figures, the **labor force participation rate** was:

- a. $156 / 163 = 96$ percent
- b. $156 / 258 = 60.5$ percent
- c. $163 / 258 = 63.2$ percent
- d. $95 / 163 = 58.3$ percent
- e. $156 / 95 = 164$ percent

7. To increase the money supply, the Federal Reserve could

- a. increase the required reserve ratio, increase the discount rate, or sell securities on the open market
- b. increase the required reserve ratio, decrease the discount rate, or buy securities on the open market
- c. decrease the required reserve ratio, decrease the discount rate, or sell securities on the open market
- d. decrease the required reserve ratio, decrease the discount rate, or buy securities on the open market

8. Imports to the U.S. will ____ U.S. GDP, while exports from the U.S. will ____ U.S. GDP

- a. not impact; increase
- b. decrease; increase
- c. increase; decrease
- d. decrease; not impact

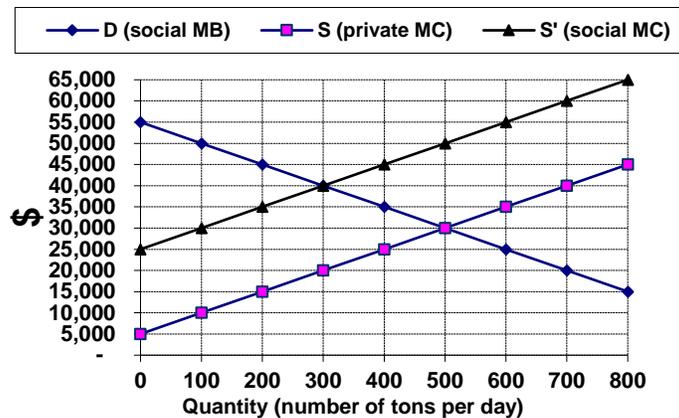
9. The supplemental poverty measure is designed to

- a. reflect the poverty rate based on income rather than on the cost of living
- b. reflect the poverty rate after accounting for the impact of income transfers and other programs for the poor
- c. reflect the poverty rate for the bottom 20% of income earners in the US
- d. reflect the poverty rate after accounting for imports
- e. reflect the poverty rate based on the CPI

10. Cyclical unemployment arises from ____ while structural unemployment arises from ____
- economic recessions; seasonal changes
 - increases in the money supply; expansionary fiscal policy
 - economic expansions; a mismatch between the skills of workers and the types of jobs available
 - a mismatch between the skills of workers and the types of jobs available; economic recessions
 - economic recessions; a mismatch between the skills of workers and the types of jobs available

11. Suppose that in one year, Stockton can produce either 20 units of potatoes or 10 units of tomatoes. Stockville can produce either 12 units of potatoes or 3 units of tomatoes. Based on this information, ____ has **absolute advantage** in producing potatoes and ____ has **comparative advantage** in producing potatoes.

- Stockton; Stockville
- Stockton; Stockton
- Stockville; Stockville
- Stockville; Stockton



12. Elsa is a princess who has magic powers that she can use to produce ice, frost, and snow. The graph above shows Elsa's marginal benefits (D) and private marginal costs (S) of producing snow. The curve S' reflects the social marginal costs of Elsa's snow production. Suppose that Elsa is currently producing 400 tons of snow per day. At this level of production, the marginal external cost is

- \$10,000
- \$20,000
- \$25,000
- \$35,000
- \$45,000

13. Elsa is a princess who has magic powers that she can use to produce ice, frost, and snow. The graph above shows Elsa's marginal benefits (D) and private marginal costs (S) of producing snow. The curve S' reflects the social marginal costs of Elsa's snow production. Suppose that Elsa is currently producing 400 tons of snow per day. This level of production is

- Less than the social optimum but more than the private optimum
- Less than the social optimum and less than the private optimum
- More than the social optimum and more than the private optimum
- More than the social optimum but less than the private optimum
- Not enough information

14. Suppose that new technology allows Metallica's road crew to set up for concerts faster than before, so that the supply of Metallica concerts increases. Ceteris paribus, which of the following is most likely to occur as a result of this situation?

- a. Metallica concert ticket prices would rise, and total revenues would rise if Metallica concert demand is elastic
- b. Metallica concert ticket prices would fall, and total revenues would rise if Metallica concert demand is elastic
- c. Metallica concert ticket prices would rise, and total revenues would rise if Metallica concert demand is inelastic
- d. Metallica concert ticket prices would fall, and total revenues would rise if Metallica concert demand is inelastic

15. Suppose that in one year, Stockton can produce **either** 20 units of potatoes **or** 10 units of tomatoes. Stockville can produce **either** 12 units of potatoes or 3 units of tomatoes. Based on this information, if Stockton and Stockville agree to specialize and trade with one another according to the law of comparative advantage, who will be hurt from that trade (you can circle more than one answer)?

- a. Tomato growers in Stockton
- b. Potato growers in Stockton
- c. Potato growers in Stockville
- d. Tomato growers in Stockville