

**Appendix A. General, basic and advanced forms of the QL assessment.**

MSU Quantitative Literacy Assessment

General form

*(correct answers and % students answering correctly are noted below each item)*

Directions:

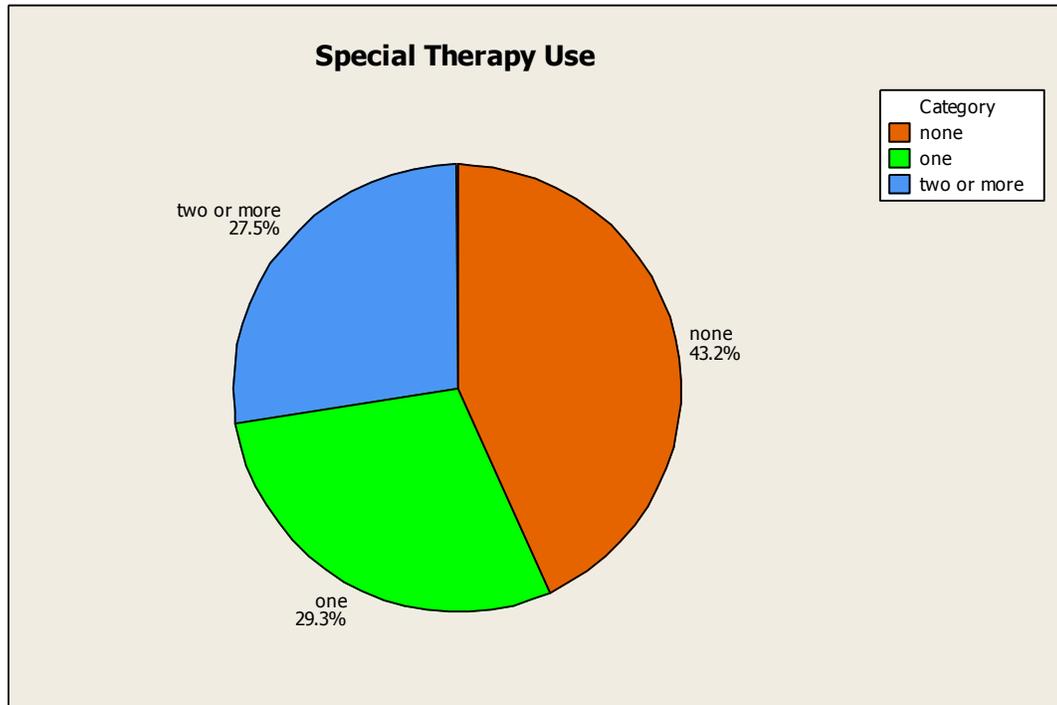
Mark your answers on the answer sheet.

Do NOT use a calculator.

Thank you for your participation in this project!

1. The chart below shows the number of special therapies used by women in a research study. Some women used none, some used one, and some used two or more therapies. Which statement is true?

- A. Women were more likely not to use any special therapies than to use some
- B. Women were more likely to use one or more special therapies than to not use any
- C. The chance of using or not using special therapies is the same



*Correct answer: B, percent correct: 69%*

2. A person needs a dose of 0.5 mg of a drug. The drug comes in a liquid that has 2.5 mg per dL (deciliter). How many dL should a person take?

- A. 5 dL
- B. 2.5 dL
- C. 0.2 dL
- D. 1.25 dL
- E. 0.5 dL

*Correct answer: C, percent correct: 61%*

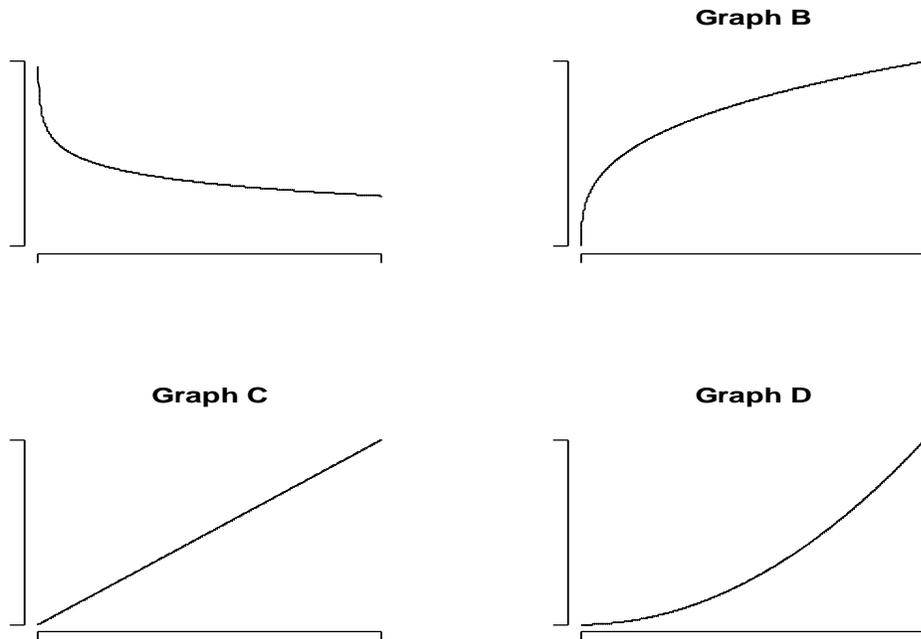
3. A person who needs 30 prescription refills a year is picking a new drug plan. Plan A costs \$800 a year, plus \$10 per refill. Plan B costs \$600 a year, plus \$20 per refill. Which plan costs less?

- A. Plan A
- B. Plan B
- C. Either plan; the costs are the same
- D. Cannot tell because do not know the actual cost of the drugs

*Correct answer: A, percent correct: 78%*

4. At an ice cream factory, a cone, like the one pictured below, is being filled by liquid ice cream at a constant rate, until it is full. Which of the following graphs is the best representation of the relationship between the height of the ice cream and the amount of time?

- A. Graph A
- B. Graph B
- C. Graph C
- D. Graph D



*Correct answer: B, percent correct: 37%*

5. About 50% of men and 33% of women will get cancer at some point. About 20% of cancers in men are found before age 55. What percent of men are expected to have cancer before age 55?

- A. 50%            B. 1%            C. 20%            D. 5%            E. 10%

*Correct answer: E, percent correct: 50%*

6. Due to an outbreak of strep at a college, all 100 students in a dormitory will be tested for strep infection. Ten of these students actually have strep. The test being used correctly identifies strep in 90% of those where strep is present, and correctly returns a negative result in 80% of cases where strep is not present. What percent of those who test positive actually have strep?

- A. 90%            B. 9%            C. 10%            D. 72%            E. 33%

*Correct answer: E, percent correct: 7%*

7. There is a 2 in 100 chance of living 5 years or longer without treatment for a type of cancer. Drug A increases the chance of living 5 years or longer to 6%. Drug B increases the chance of living 5 years or longer by 50%. If a patient wants the highest chance of living 5 years or longer, which drug should be picked?

- A. Drug A  
 B. Drug B  
 C. Either drug; the chance of living longer is the same  
 D. Neither drug; the chance of living longer is better without treatment

*Correct answer: A, percent correct: 24%*

8. About 1 in 4 adults are at risk for Type 2 diabetes, but healthy diet and regular exercise cut the risk by half. Of adults who eat a healthy diet and exercise regularly, how many are at risk for Type 2 diabetes?

- A. 0 in 8            B. 1 in 8            C. 2 in 8  
 D. 2 in 4            E. 3 in 4

*Correct answer: B, percent correct: 83%*

9. A concrete driveway that is 27 feet long and 12 feet wide is to be poured to a depth of 3 inches. A 60 lb bag of concrete mix creates 0.5 cubic feet of concrete. How many 60 lb bags of the concrete mix are required to pour the driveway?

- A. 63                      B. 81                      C. 288                      D. 424                      E. 162

*Correct answer: E, percent correct: 35%*

10. College students were asked whether they had ever engaged in binge drinking. Their answers, classified by gender, are in the table below. What percent of those who reported engaging in binge drinking were male?

- A. 61%                      B. 46%                      C. 20%                      D. 86%                      E. 154%

	Binge Drinking	
Gender	Yes	No
Male	43	50
Female	28	92

*Correct answer: A, percent correct: 47%*

11. A recent advertisement by a computer company includes the claim that in one second its chip can perform 150 thousand multiplications for every person alive on Earth. Assume that there are 6 billion ( $6,000,000,000 = 6 \times 10^9$ ) persons alive on Earth. If the claim is true, how many multiplications can the chip perform in one second?

- A. 9 billion                      B. 900 million                      C. 90 billion  
D. 900,000,000,000,000                      E. none of these

*Correct answer: D, percent correct: 51%*

12. Four persons own an oil well with ownership shares:

- Mr. W owns  $\frac{1}{7}$     Ms. X owns  $\frac{2}{7}$     Mr. Y owns  $\frac{3}{7}$     Mr. Z owns  $\frac{1}{7}$

Mr. Y sells half his interest to Ms. X and one fourth his interest to Mr. Z. The new ownership shares are:

- A. Mr. W owns  $\frac{1}{7}$  Ms. X owns  $\frac{1}{2}$  Mr. Y owns  $\frac{3}{28}$  Mr. Z owns  $\frac{1}{4}$
- B. Mr. W owns  $\frac{1}{7}$  Ms. X owns  $\frac{3}{7}$  Mr. Y owns  $\frac{1}{14}$  Mr. Z owns  $\frac{2}{7}$
- C. Mr. W owns  $\frac{1}{7}$  Ms. X owns  $\frac{11}{28}$  Mr. Y owns  $\frac{3}{28}$  Mr. Z owns  $\frac{5}{14}$
- D. Mr. W owns  $\frac{1}{7}$  Ms. X owns  $\frac{3}{7}$  Mr. Y owns  $\frac{1}{7}$  Mr. Z owns  $\frac{2}{7}$

*Correct answer: A, percent correct: 45%*

13. You take a trip to Crystal Lake and back using the same route both ways. On the way to Crystal Lake you average 40 miles per hour, take 2 hours, and use 4 gallons of fuel. On the way back you average 60 miles per hour, take 1 hour and 20 minutes, and use 6 gallons of fuel. What is your fuel efficiency for the entire trip?

- A. 16.65 miles per gallon
- B. 16.80 miles per gallon
- C. 16.00 miles per gallon
- D. 10.00 miles per gallon
- E. None of these

*Correct answer: C, percent correct: 28%*

14. A garment is on sale at 40% off the original price. At checkout, the store will take an additional 20% off the sale price. The price you will pay is what percent of the original price?

- A. 40%
- B. 60%
- C. 92%
- D. 48%
- E. Can not be calculated without knowing the original price of the garment.

*Correct answer: D, percent correct: 33%*

MSU Quantitative Literacy Assessment

Basic form

*(correct answers and % students answering correctly are noted below each item)*

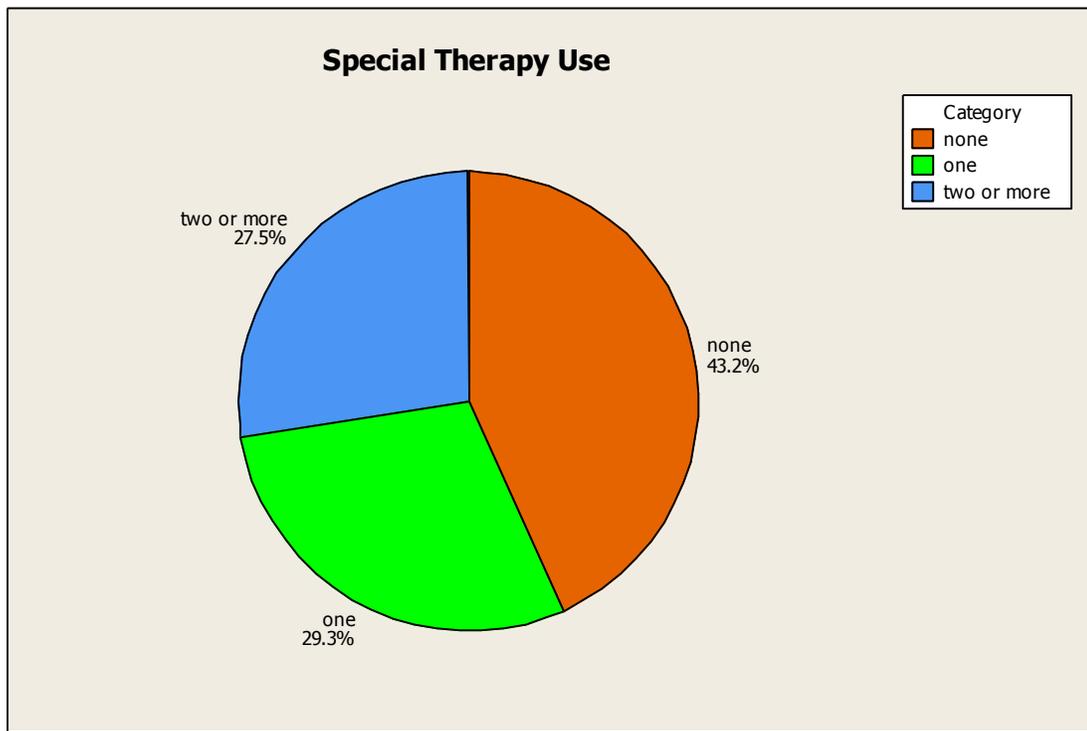
Directions:

Mark your answers on the answer sheet.

Do NOT use a calculator.

Thank you for your participation in this project!

1. The chart below shows the number of special therapies used by women in a research study. Some women used none, some used one, and some used two or more therapies. Which statement is true?
- A. Women were more likely not to use any special therapies than to use some
- B. Women were more likely to use one or more special therapies than to not use any
- C. The chance of using or not using special therapies is the same



*Correct answer: B, percent correct: 71%*

2. A person needs a dose of 0.5 mg of a drug. The drug comes in a liquid that has 2.5 mg per dL (deciliter). How many dL should a person take?
- A. 5 dL
- B. 2.5 dL
- C. 0.2 dL
- D. 1.25 dL
- E. 0.5 dL

*Correct answer: C, percent correct: 64%*

3. A person who needs 30 prescription refills a year is picking a new drug plan. Plan A costs \$800 a year, plus \$10 per refill. Plan B costs \$600 a year, plus \$20 per refill. Which plan costs less?

- A. Plan A
- B. Plan B
- C. Either plan; the costs are the same
- D. Cannot tell because do not know the actual cost of the drugs

*Correct answer: A, percent correct: 78%*

4. About 50% of men and 33% of women will get cancer at some point. About 20% of cancers in men are found before age 55. What percent of men are expected to have cancer before age 55?

- A. 50%
- B. 1%
- C. 20%
- D. 5%
- E. 10%

*Correct answer: E, percent correct: 52%*

5. There is a 2 in 100 chance of living 5 years or longer without treatment for a type of cancer. Drug A increases the chance of living 5 years or longer to 6%. Drug B increases the chance of living 5 years or longer by 50%. If a patient wants the highest chance of living 5 years or longer, which drug should be picked?

- A. Drug A
- B. Drug B
- C. Either drug; the chance of living longer is the same
- D. Neither drug; the chance of living longer is better without treatment

*Correct answer: A, percent correct: 26%*

6. About 1 in 4 adults are at risk for Type 2 diabetes, but healthy diet and regular exercise cut the risk by half. Of adults who eat a healthy diet and exercise regularly, how many are at risk for Type 2 diabetes?

- A. 0 in 8
- B. 1 in 8
- C. 2 in 8
- D. 2 in 4
- E. 3 in 4

*Correct answer: B, percent correct: 87%*

7. A concrete driveway that is 27 feet long and 12 feet wide is to be poured to a depth of 3 inches. A 60 lb bag of concrete mix creates 0.5 cubic feet of concrete. How many 60 lb bags of the concrete mix are required to pour the driveway?

- A. 63                      B. 81                      C. 288                      D. 424                      E. 162

*Correct answer: E, percent correct: 36%*

8. You bowl 144 and 126 in your first two games. What must you bowl on your third and final game to bring your average for the three games to 150?

- A. 160                      B. 166                      C. 173                      D. 180                      E. 190

*Correct answer: D, percent correct: 72%*

9. A recent advertisement by a computer company includes the claim that in one second its chip can perform 150 thousand multiplications for every person alive on Earth. Assume that there are 6 billion ( $6,000,000,000 = 6 \times 10^9$ ) persons alive on Earth. If the claim is true, how many multiplications can the chip perform in one second?

- A. 9 billion                      B. 900 million                      C. 90 billion  
D. 900,000,000,000,000                      E. none of these

*Correct answer: D, percent correct: 53%*

10. The normal level of hemoglobin in adult men's blood is 13.8 to 17.2 g/dl. Is a level of 17.08 g/dl normal?

- A. Yes                      B. No

*Correct answer: A, percent correct: 88%*

11. About 75,000 people fit into two city blocks. Use this information to estimate the number of city blocks it would take to hold 1 million people.

- A. Between 6 and 7 city blocks  
B. Between 13 and 14 city blocks  
C. Between 26 and 27 city blocks  
D. Between 39 and 40 city blocks

*Correct answer: C, percent correct: 41%*

12. You want to walk at least  $1 \frac{1}{2}$  miles a day. You can take Route 1 and walk all the way around the block that is  $\frac{1}{4}$  miles long and  $\frac{1}{2}$  miles wide. Or you can take Route 2 and walk all the way around a circular drive that is  $\frac{1}{2}$  miles across in diameter. Which of the following is correct?

- A. Either Route 1 or Route 2 is fine; both are long enough
- B. Neither Route 1 nor route 2 is long enough
- C. Route 1, since it is long enough, but Route 2 is too short
- D. Route 2, since it is long enough, but Route 1 is too short

*Correct answer: A, percent correct: 38%*

13. The chance that an individual gets a certain side effect from a vaccination is 0.3%. If 100,000 persons are vaccinated, how many are expected to get the side effect?
- A. 3                      B. 30                      C. 300                      D. 3,000                      E. 30,000

*Correct answer: C, percent correct: 45%*

14. You are concerned about a pine tree falling on your house in a storm, and want to determine its height. In the afternoon sun, your 20 foot flagpole casts a shadow of length 30 feet. At the same time your pine tree casts a shadow of length 72 feet. How tall is your pine tree?
- A. 24 feet
  - B. 36 feet
  - C. 108 feet
  - D. 54 feet
  - E. 48 feet

*Correct answer: E, percent correct: 56%*

15. The label on a drug says it can be taken every 4 to 6 hours as needed to reduce fever. What is the largest number of doses that can be taken in 24 hours?
- A. 1                      B. 2                      C. 4                      D. 6                      E. 24

*Correct answer: D, percent correct: 90%*

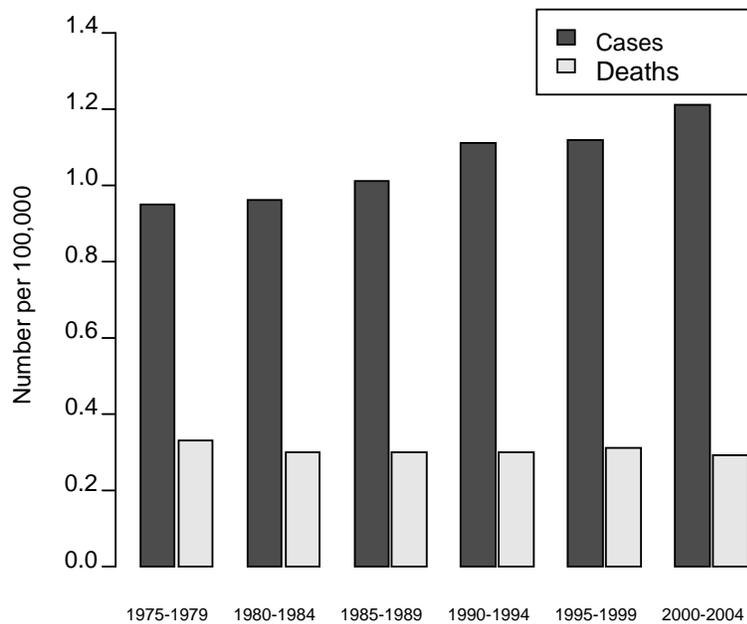
16. A garment is on sale at 40% off the original price. At checkout, the store will take an additional 20% off the sale price. The price you will pay is what percent of the original price?
- A. 40%                      B. 60%                      C. 92%                      D. 48%

E. Can not be calculated without knowing the original price of the garment.

*Correct answer: D, percent correct: 40%*

17. The chart below gives the number of prostate cancer cases and deaths from it, per 100,000 males, for 1975-2004. In 1990-1994, compared to 1985-1989, the number of cases per 100,000 (pick the true statement):

- A. Increased, but the number of deaths per 100,000 decreased
- B. Decreased, but the number of deaths per 100,000 increased
- C. Increased, but the number of deaths per 100,000 remained the same
- D. Remained the same, but the number of deaths per 100,000 decreased
- E. Remained the same, and the number of deaths per 100,000 remained the same



*Correct answer: C, percent correct: 82%*

MSU Quantitative Literacy Assessment

Advanced form

*(correct answers and % students answering correctly are noted below each item)*

Directions:

Mark your answers on the answer sheet.

Do NOT use a calculator.

Thank you for your participation in this project!

1. Two studies estimate the mean nicotine content of a brand of cigarettes. Each study does the same tests on a random sample of the cigarettes. Study 1 uses 10 cigarettes, and Study 2 uses 100 cigarettes. Which statement is true?
- A. The uncertainty in the estimate of the actual mean nicotine content will be smaller in Study 1 than in Study 2
- B. The uncertainty in the estimate of the actual mean nicotine content will be larger in Study 1 than in Study 2
- C. The estimates of the actual mean nicotine content from each study will be equally uncertain

*Correct answer: B, percent correct: 59%*

2. To prepare for a test, a student solves a set of practice problems. He solves one problem on the first day of the week, two on the second day, four on the third day, and so on, doubling the number of problems solved each day. Which expression represents the number of problems solved by the end of the week?
- A.  $1 + 2 + 3 + \dots + 7$
- B.  $1 + 2 + 4 + \dots + 2^6$
- C.  $1 + 2 + 4 + \dots + 2^7$
- D.  $\frac{7}{2}(1 + 7)$

*Correct answer: B, percent correct: 57%*

3. Suppose that your weight is at the 70<sup>th</sup> percentile in a group of 600 people of your height. Approximately, how many of these people weigh more than you?
- A. 240      B. 420      C. 70      D. 180      E. 30

*Correct answer: D, percent correct: 59%*

4. In the United States, 1 out of every 49 people are teachers and 7 out of 10 teachers are women. What proportion of people in the United States are female teachers?
- A. 1 out of 70      B. 10 out of 343      C. 7 out of 10  
D. 353 out of 490

*Correct answer: A, percent correct: 35%*

5. For one month, 500 people wrote down how much they watched television (TV). The average number of hours a week watching TV was 28. Most people who watched TV more than 28 hours a week had higher-than-average cholesterol levels. Based on these 500 people, which of the following is correct?
- A. People should watch TV less than four hours a day
  - B. If people watch less TV, their cholesterol levels will improve
  - C. Watching TV does not necessarily increase cholesterol levels

*Correct answer: C, percent correct: 42%*

6. If  $P$  dollars are invested at an interest rate of 5 percent per year, compounded annually, then the amount of money after  $N$  years is given by the expression  $P(1.05)^N$ . How many years would it take for such an investment to double in value?
- A.  $2 \div 0.05$
  - B.  $2^{1.05}$
  - C.  $\log(2) \div \log(1.05)$
  - D.  $2\log(1.05)$

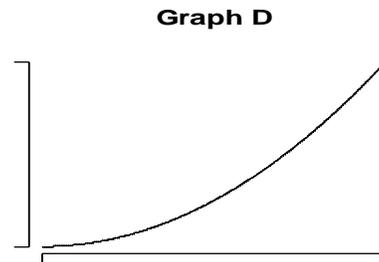
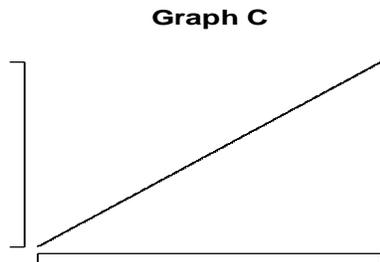
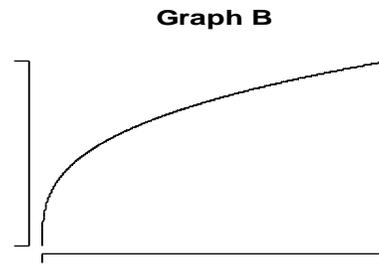
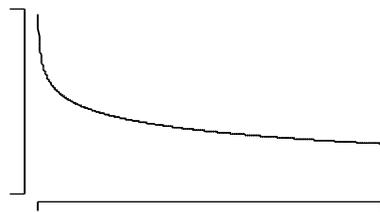
*Correct answer: C, percent correct: 29%*

7. Tom wants to replace the floor in his laundry room. His laundry room is a 3 ft by 6 ft rectangle. He is using square tiles that are 9 inches on a side. If one package of tiles contains 10 tiles, what is the minimum number of boxes he needs to buy? (There are 12 inches in 1 foot.)
- A. 2 boxes
  - B. 3 boxes
  - C. 4 boxes
  - D. 5 boxes

*Correct answer: C, percent correct: 53%*

8. At an ice cream factory, a cone, like the one pictured below, is being filled by liquid ice cream at a constant rate, until it is full. Which of the following graphs is the best representation of the relationship between the height of the ice cream and the amount of time?

- A. Graph A  
 B. Graph B  
 C. Graph C  
 D. Graph D



*Correct answer: B, percent correct: 40%*

9. Four persons own an oil well with ownership shares:

Mr. W owns  $1/7$  Ms. X owns  $2/7$  Mr. Y owns  $3/7$  Mr. Z owns  $1/7$

Mr. Y sells half his interest to Ms. X and one fourth his interest to Mr. Z. The new ownership shares are:

- A. Mr. W owns  $1/7$  Ms. X owns  $1/2$  Mr. Y owns  $3/28$  Mr. Z owns  $1/4$   
 B. Mr. W owns  $1/7$  Ms. X owns  $3/7$  Mr. Y owns  $1/14$  Mr. Z owns  $2/7$   
 C. Mr. W owns  $1/7$  Ms. X owns  $11/28$  Mr. Y owns  $3/28$  Mr. Z owns  $5/14$   
 D. Mr. W owns  $1/7$  Ms. X owns  $3/7$  Mr. Y owns  $1/7$  Mr. Z owns  $2/7$

*Correct answer: A, percent correct: 49%*

10. College students were asked whether they had ever engaged in binge drinking. Their answers, classified by gender, are in the table below.

Gender	Binge Drinking	
	Yes	No
Male	43	50
Female	28	92

What percent of those who reported engaging in binge drinking were male?

- A. 61% B. 46% C. 20% D. 86% E. 154%

*Correct answer: A, percent correct: 49%*

**Items 11 - 12.** Due to an outbreak of strep at a college, all 100 students in a dormitory will be tested for strep infection. Ten of these students actually have strep. The test returns a true positive result in 90% of cases where strep is present, and is false positive in 20% of cases where strep is not present.

11. How many of the 100 students should be expected to test positive?

- A. 90 B. 80 C. 72 D. 27 E. 9

*Correct answer: D, percent correct: 37%*

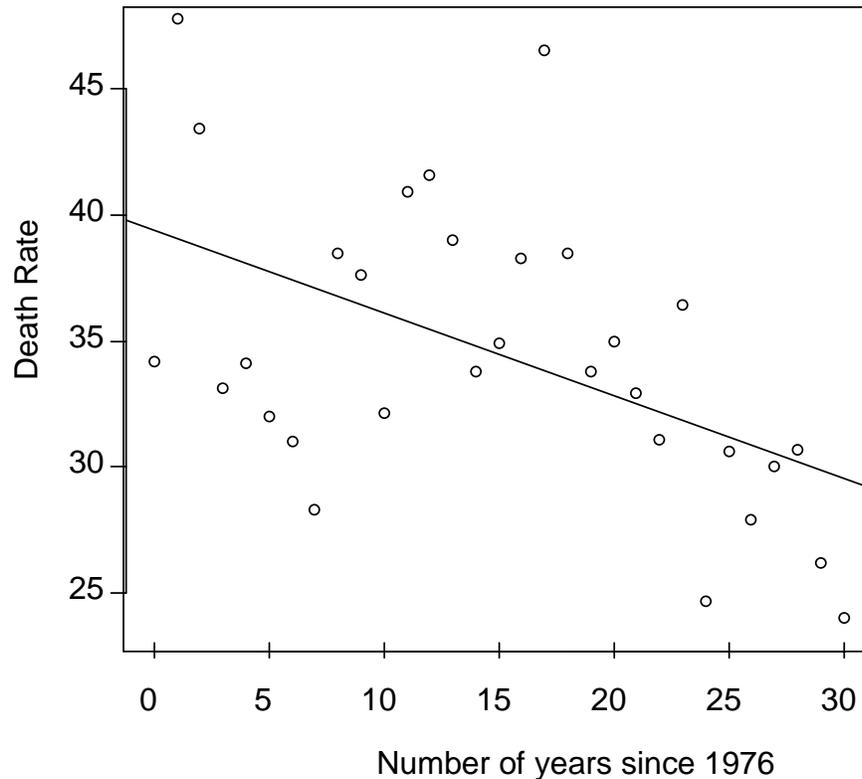
12. What percent of those who test positive actually have strep?

- A. 90% B. 9% C. 10% D. 72% E. 33%

*Correct answer: E, percent correct: 21%*

**Items 13 - 14.** The chart below shows the death rate per 100,000 women from breast cancer for each year since 1976. The best fit line is drawn on the figure:

$$\text{Death Rate} = 39.4 - 0.33 * (\text{Number of years since 1976})$$



13. If the trend continues, what death rate in 2010 can be predicted from this line?
- A. 39      B. 28      C. 1      D. 11      E. 663

*Correct answer: B, percent correct: 79%*

14. Based on the line **Death Rate = 39.4 - 0.33\*(Number of years since 1976)** in the chart above, about how many years will it take for the deaths per 100,000 to go down by 1?
- A. 0.33      B. 39.4      C. 39.07      D. 1      E. 3

*Correct answer: E, percent correct: 38%*