

UBMS STATE PROGRAM

MATHEMATICS

1.

The ABC Book Club charges a \$40 monthly fee, plus \$2 per book read in that month. The Easy Book Club charges a \$35 monthly fee, plus \$3 per book read in that month. For each club, how many books must be read in 1 month for the total charges from each club to be equal?

- F. 1
- G. 4
- H. 5
- J. 6
- K. 75

2. The 35-member History Club is meeting to choose a student government representative. The members decide that the representative, who will be chosen at random, CANNOT be any of the 3 officers of the club. What is the probability that Hiroko, who is a member of the club but NOT an officer, will be chosen?

- F. 0
- G. $\frac{4}{35}$
- H. $\frac{1}{35}$
- J. $\frac{1}{3}$
- K. $\frac{1}{32}$

3. For what value of x is the equation $2^{2x+7} = 2^{15}$ true?

- A. 2
- B. 4
- C. 11
- D. 16
- E. 44

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4.

In Cherokee County, the fine for speeding is \$17 for each mile per hour the driver is traveling over the posted speed limit. In Cherokee County, Kirk was fined \$221 for speeding on a road with a posted speed limit of 30 mph. Kirk was fined for traveling at what speed, in miles per hour?

- F. 13
- G. 17
- H. 43
- J. 47
- K. 60

5.

Which of the following expressions is equivalent to $x^{\frac{2}{3}}$?

- F. $\frac{x^2}{3}$
- G. $\frac{x(2)}{3}$
- H. $\sqrt{x^3}$
- J. $\sqrt[3]{x}$
- K. $\sqrt[3]{x^2}$

6.

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What is the value of the expression below?

$$| |-8 + 4| - |3 - 9| |$$

- A. -18
- B. -2
- C. 0
- D. 2
- E. 18

7.

8% of 60 is $\frac{1}{5}$ of what number?

- A. 0.96
- B. 12
- C. 24
- D. 240
- E. 3,750

8.

The average of a list of 4 numbers is 90.0. A new list of 4 numbers has the same first 3 numbers as the original list, but the fourth number in the original list is 80, and the fourth number in the new list is 96. What is the average of this new list of numbers?

- F. 90.0
- G. 91.5
- H. 94.0
- J. 94.5
- K. 94.8

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9.

The sum of 2 positive numbers is 151. The lesser number is 19 more than the square root of the greater number. What is the value of the greater number minus the lesser number?

- F. 19
- G. 66
- H. 85
- J. 91
- K. 121

10.

The list of numbers 41, 35, 30, X , Y , 15 has a median of 25. The mode of the list of numbers is 15. To the nearest whole number, what is the mean of the list?

- A. 20
- B. 25
- C. 26
- D. 27
- E. 30

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PHYSICS

Passage I

A study was conducted to examine whether female *Blattella germanica* (a species of cockroach) prefer to eat cat food, cheese, ham, or peanuts. First, 200 mg of each of the 4 foods was separately placed into a single box. Then, adult female *B. germanica* were added to the box. Figure 1 shows how the mass, in mg, of each food in the box changed over time after the addition of the *B. germanica*. Table 1 shows the percent by mass of carbohydrates, lipids, proteins, and water, respectively, present in each of the 4 foods tested in the study.

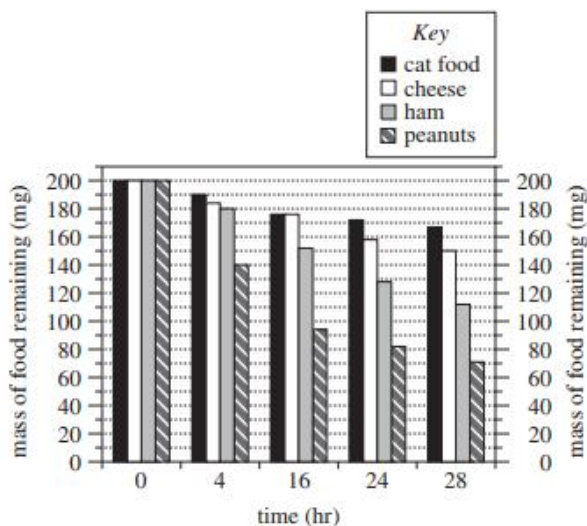


Figure 1

Figure adapted from Prachumporn Lauprasert et al., "Food Preference and Feeding Behavior of the German Cockroach, *Blattella germanica* (Linnaeus)." ©2006 by the Faculty of Science, Chulalongkorn University.

- Consider the 4 foods in order of the percent by mass of proteins, from lowest to highest. From food to food, as the percent by mass of proteins increased, the mass of food remaining at 28 hr:
 - increased only.
 - decreased only.
 - increased and then decreased.
 - decreased and then increased.
- Consider the statement "The *B. germanica* ate the food between 0 hr and 4 hr, between 4 hr and 16 hr, between 16 hr and 24 hr, and between 24 hr and 28 hr." This statement is consistent with the data in Figure 1 for how many of the 4 foods?
 - 1
 - 2
 - 3
 - 4
- According to Figure 1, the mass of cheese remaining at 4 hr was closest to which of the following values?
 - 140 mg
 - 176 mg
 - 185 mg
 - 190 mg
- Suppose a company wants to use food as bait in a trap designed to capture female *B. germanica*. Based on Figure 1, which of the 4 foods should the company place in the trap to maximize the chance of capturing female *B. germanica*?
 - Cat food
 - Cheese
 - Ham
 - Peanuts
- A student predicted that the *B. germanica* would eat less cat food than ham by the end of the study. Do the data in Figure 1 support this prediction?
 - Yes; at 28 hr, the mass of cat food remaining was about 55 mg greater than the mass of ham remaining.
 - Yes; at 28 hr, the mass of cat food remaining was about 95 mg greater than the mass of ham remaining.
 - No; at 28 hr, the mass of cat food remaining was about 55 mg less than the mass of ham remaining.
 - No; at 28 hr, the mass of cat food remaining was about 95 mg less than the mass of ham remaining.
- Based on Table 1, when 200 mg of each of the 4 foods was placed in the box, water accounted for more than 100 mg of the mass of which food(s)?
 - Peanuts only
 - Cat food and ham only
 - Cheese and peanuts only
 - Cat food, cheese, and ham only

Food	Percent by mass			
	carbohydrates	lipids	proteins	water
Cat food	1.2	6.0	16.9	66.2
Cheese	0.5	27.7	20.8	48.4
Ham	0.0	18.2	23.6	57.1
Peanuts	15.8	49.6	26.2	6.4

Table adapted from U.S. Department of Agriculture, *USDA National Nutrient Database for Standard Reference, Release 24*. 2011.