

WSMC High School State Competition

Topical Problems

Part One

April 23, 2005

Directions: Mark on the answer form the letter that is closest to the correct answer. Make sure that your name(s) are on the answer form. If you are on a team put your team number and school name on the answer form. Remember that there are 5 points awarded for a correct response, 1 point for no response, and 0 points for an incorrect response.

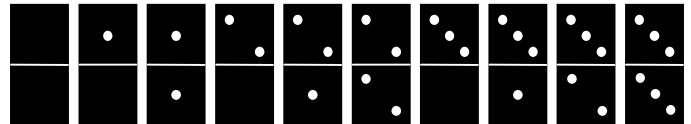
The table shows the price of regular gas in the United States for the first part of this year. The information comes from the US Department of Energy.

- Based on a linear least squares model, what will be the price of gas by the end of this year?
A. \$2.80 B. \$3.00 C. \$3.25 D. \$3.50
- If the trend of the price was modeled with a least squares line for week 8 through 15, what would the difference between the end of the year predictions for this model and the model in problem one?
A. \$0.20 B. \$0.40 C. \$0.60 D. \$0.80

Regular Gas Prices in Cents

Week #	Date	Price
1	Jan 03	174.5
2	Jan 10	177.1
3	Jan 17	180.2
4	Jan 24	183.9
5	Jan 31	189.6
6	Feb 07	189.0
7	Feb 14	187.3
8	Feb 21	187.8
9	Feb 28	190.4
10	Mar 07	197.9
11	Mar 14	203.9
12	Mar 21	209.5
13	Mar 28	213.7
14	Apr 04	219.6
15	Apr 11	225.1

“Double X” dominoes range from double 0 (double blank) to double X, with every combination in between and no combination repeated. A set of “Double 3” dominoes is shown.



- How many dominoes are there in a “Double 4” set?
A. 14 B. 15 C. 17 D. 16
- How many white dots total are there on the dominoes in a “Double 6” set?
A. 105 B. 155 C. 165 D. 175
- How many dominoes would there be in a “Double 16” set?
A. 180 B. 150 C. 170 D. 130
- How many white dots total are there on the dominoes in a “Double 12” set?
A. 250 B. 240 C. 230 D. 220

A clock runs 2% fast.

- If it is set for the correct time, how many seconds will it be ahead after one hour?
A. 80 B. 1 C. 120 D. 70
- If the clock is correct at noon what time in hours, minutes, and seconds is it when the clock reads 6 PM?
A. 5:52:56 B. 5:52:48 C. 6:07:20 D. 6:07:12
- If the clock was correct at noon, how much time would have to pass before the clock indicated the correct time again?
A. 12 hours B. 50 hours C. 12 days D. 25 days

There is a rectangular lawn that has a perimeter of 100 meters.

10. With only this information known, what is the difference in meters between the shortest and longest possible diagonals?
- A. 65 B. 20 C. 15 D. 10
11. If the diagonal is 40 meters, what is the area of the lawn?
- A. 400 B. 475 C. 425 D. 450
12. If the diagonal has length in meters of x , and makes an angle with a side of y degrees, how many of these expressions would give the area in square meters?
- $1250 - 0.5x^2$
 - $-(x-50)(x+50)$
 - $0.5(0.5x^2 + 100)$
 - $x^2 \sin(y) \cos(y)$
 - $\frac{1}{2}x^2 \sin(2y)$
- A. 4 B. 5 C. 3 D. 2

Given in 12/9/04 USA Today was,

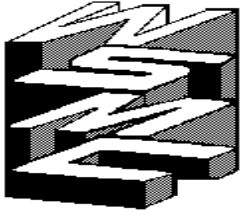
“Cereal turns out to be more than just snap, crackle, and pop. Here’s what people add to it once they get it into the bowl:

- 44%: milk only
- 8%: juice
- 4%: ice cream
- 3%: melted chocolate
- 2%: another cereal

Though 72% of breakfast eaters eat cereal only in the morning, more than 26% snack on cereal at other times; 10% of households eat cereal for other meals.

And the most popular cereal? Cheerios, with \$288 million in sales last year. (A 15-oz. box costs \$3.89 in the Washington D. C., area.) Frosted Flakes came in second with \$242 million.”

13. What is the maximum possible percentage of people who eat cereal without the additions bulleted in the article?
- A. 48 B. 40 C. 35 D. 30
14. At a cereal café, located by the University of Pennsylvania, one can choose up to three “additions” (include mixing another cereal as one option) for \$3.95 per bowl. From the additions listed in the article, how many different combinations could be created?
- A. 15 B. 20 C. 25 D. 30
15. The dimensions of a 15-oz box of Cheerios are 12”x 2”x 8” the cost of the cardboard to make the box is 3¢ per square foot. How much money would the company save in total sales last year if it made cubic shaped boxes have the same volume? Assume the amount of cardboard needed is equal to the surface area of the box and that all sales are in the 15 oz box.
- A. \$100,000 B. \$1,000,000 C. \$10,000,000 D. \$100,000,000



WSMC High School State Competition

Topical Problems

Part Two

April 23, 2005

Directions: Mark on the answer form the letter that is closest to the correct answer. Make sure that your name(s) are on the answer form. If you are on a team put your team number and school name on the answer form. Remember that there are 5 points awarded for a correct response, 1 point for no response, and 0 points for an incorrect response.

Seven students took a make-up exam and only one earned 100%. The lowest score was 55%.

- If the median was 81% and the lower and upper quartiles were 76% and 86%, what was the mean?
A. 80 B. 77 C. 86 D. 83
- There were two modes until an eighth person took the test and raised the mean. After the eighth person took the test, what was the median?
A. 80 B. 77 C. 86 D. 83
- Again there were two modes until an eighth person took the test and raised the average then after the eighth person took the test, what was the difference between the two possible means?
A. 0 B. 1 C. 2 D. 3

In checking out round trip flight Seattle to Detroit and back, one airline gave these times:

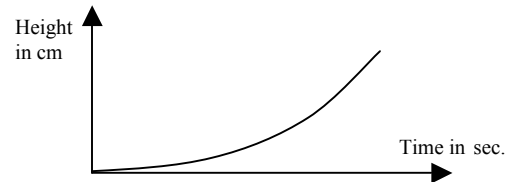
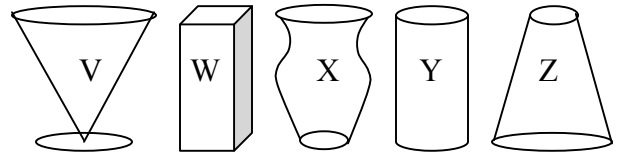
Departing Seattle	Arriving at Detroit	Departing Detroit	Arriving at Seattle	Air miles
10:35 AM PST	5:34 PM EST	12:05 PM EST	2:00 PM PST	1997
12:40 PM PST	7:58 PM EST	9:24 AM EST	11:24 AM PST	1997

Assume that the time of day doesn't effect the flight times and that the same type of plane flies these routes. The flights usually spend 20 minutes at each airport preparing for and taking-off and 10 minutes landing and docking.

- What is the difference in minutes in the average flight times between flying to Detroit versus returning?
A. 50 B. 3.5 C. 100 D. 30
- What is the planes average speed in miles per hour returning from Detroit?
A. 900 B. 400 C. 500 D. 600
- What is the average speed of the jet stream that speeds a flight in one direction and slows the flight in the other direction?
A. 50 B. 35 C. 20 D. 65
- On a flight from Seattle, how far in miles from Seattle would be the point of no return. That is the point where it takes the plane the same amount of time to return to Seattle as it would take to continue on to Detroit?
A. 950 B. 800 C. 900 D. 850

Each vase has the same height and volume. The cylindrical vase is 20 cm tall and 6 cm in radius.

8. If vase W has a square base, what is the width in millimeters of the base?
 - A. 120
 - B. 114
 - C. 108
 - D. 102
9. If the vases are filled at a constant rate, which vase would have the height versus time graph shown?
 - A. V
 - B. X
 - C. Y
 - D. Z
10. Which vase would have the most depth when half full?
 - A. V
 - B. W
 - C. X
 - D. Z
11. If the radius in centimeters of the top of vase Z is 3 cm, what is the radius in millimeters of the bottom?
 - A. 70
 - B. 80
 - C. 90
 - D. 100



A snowboard manufacturer makes two models of snow boards: the Xtreme and the Pro-Racer. The Xtreme uses 250 cc fiberglass and 270 g of graphite while the Pro-Racer uses 210 cc of fiberglass and 340 g of graphite. The company has 50,000 cc of fiberglass and 60,000 g of graphite on hand. The net profit on each Xtreme is \$75 and \$96 for each Pro-Racer. Fiberglass costs \$0.07 per cc and graphite is \$0.09 per g.

12. If 100 Xtremes are made what is the most Pro-Racers that could be made?
 - A. 120
 - B. 100
 - C. 110
 - D. 95
13. How many Xtremes should be made to maximize net profit?
 - A. 0
 - B. 155
 - C. 150
 - D. 200
14. How many Pro-Racers should be made to have the least total value in left over fiberglass and graphite combined?
 - A. 55
 - B. 0
 - C. 200
 - D. 50

Imagine a space craft that were cubical in shape with an astronaut tethered by a life support cord from one corner of the craft.

15. If the astronaut's tethering cord is equal in length to the diagonal of a face, what percent of the surface of the space craft can the astronaut reach?
 - A. 65
 - B. 70
 - C. 75
 - D. 80

Answer Key State Topical April 23, 2005

Part One		Part Two	
1.	D \$3.43	1.	A 80
2.	D \$0.84	2.	D 83.5
3.	B 15	3.	C 1.75
4.	C 168	4.	A 49
5.	B 153	5.	B 403
6.	C 234	6.	B 40
7.	D 72	7.	C ~910
8.	A 5:52:56	8.	C 106
9.	D 25	9.	D
10.	C 15	10.	A
11.	D 450	11.	C 85.6
12.	A 4	12.	D 97
13.	A 48	13.	A 0
14.	C 25	14.	A 53
15.	B \$925,000	15.	B 70