

PRE-CALCULUS SUMMER PROJECT

DIRECTIONS

- **CHOOSE FIVE OF THE SIX PROBLEMS (EACH WILL BE WORTH 20 POINTS)**
- **ANSWER THE PROBLEMS IN OPEN-ENDED HSPA FORMAT**
- **THESE PROBLEMS INCLUDE SOME OF THE NECESSARY SKILLS NEEDED IN PRE-CALCULUS**
- **DUE SEPTEMBER 13, 2010 AND COUNTS AS A TEST GRADE FOR THE FIRST MARKING PERIOD**

Name: _____
Date: _____

Pre Cal B
Summer

Summary: You are a NJ student taking the HSPA exam. You will answer the question to the best of your ability.

Purpose: To explain and inform (and to get the best grade possible on this HSPA question!)

Role: NJ High School Student

Audience: State Test Readers

Scoring Rubric

- All questions are clearly answered 1 point
- Adequate details – expressed in both numbers and words – are included 1 point
- Computations and explanations are founded on correct mathematic principles 1 point

Procedure:

- Read the question carefully, marking it up as necessary
- Complete all necessary math to the best of your ability
- Complete the written response, which should include both numbers and words, in HSPA format – which means do not skip lines

Question:

Suppose you are selling cases of mixed nuts and roasted peanuts. You can order no more than a total of 500 cans and packages and spend no more than \$600. How can you maximize your profit? How much is the maximum profit.

Mixed Nuts	Roasted Peanuts
• 12 cans per case	• 20 packages per case
• You pay \$24 per case	• You pay \$15 per case
• Sell at \$3.50 per can	• Sell at \$1.50 per package
• \$18 profit per case	• \$15 profit per case

	Mixed Nuts	Roasted Peanuts	Total
Number of cases	X	Y	X + Y
Number of units	12x	20y	500
Cost	24x	15y	600
Profit	18x	15y	18x + 15y

- Write the constraints and objective function
- Graph the constraints, find the vertices, and evaluate each vertex with the objective function.
- State how many cases of each you would buy and what would be your profit?

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Question:

The table below shows the number of beach balls produced during one shift at two manufacturing plants. Plant 1 has two shifts per day, and Plant 2 has three shifts per day. Write matrices to represent one day's total output at the two plants. Use the matrices to find:

- The difference between production totals at the plants.
- Which plant produces more three-color plastic balls and by how much?
- Which plant produces more one-color rubber balls and by how much?

Beach Ball Production Per Shift

	1-color		3-color	
	Plastic	Rubber	Plastic	Rubber
Plant 1	500	700	1300	1900
Plant 2	400	1200	600	1600

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Question:

A company knows that $-2.5p + 500$ models the number it sells per month of a certain make of skateboard, where the price p can be set as low as \$70 or as high as \$120. Revenue from sales is the product of the price and the number sold. The function $R = -2.5p^2 + 500p$ models the revenue. Perform each of the following:

- Graph the revenue function.
- Find the price which maximizes revenue and circle the answer.
- Find the maximum revenue and circle the answer.

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Question:

The Verrazano-Narrows Bridge in New York has the longest span of any suspension bridge in the United States. A suspension cable of the bridge forms a curve that resembles a parabola. The curve can be modeled with the function $y = 0.0001432(x - 2130)^2$ where x and y are measured in feet. The origin of the function's graph is at the base of one of the towers that support the cable. Answer each of the following:

- Draw a diagram and sketch a graph.
- Find the span between the towers and circle your answer.
- Find the height of each tower and circle your answer.



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Question:

Smoke jumpers are in free fall from the time they jump out of a plane until they open their parachutes. The function $y = -16t^2 + 1600$ models a jumper's height y in feet at t seconds for a jump from 1600 feet. How long is a jumper in free fall if the parachute opens at 1000 feet?

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Question:

A model for the height of a toy rocket shot from a platform is

$$y = -16x^2 + 145x + 7$$

where x is the time in seconds and y is the height in feet.

- Graph the function.
- Find the zeros of the function and underline them. What do they represent and are they realistic?
- About how high does the rocket fly before hitting the ground? Underline your answer and explain.

