ACCELERATED MATH BONUS PROJECT

Mangham's Marvelous 'Musement Park
*(For credit on this project all work must be attached on a separate sheet of paper.
All work is to be completed by YOU – questions should be directed to Mr. Mangham.)*

Texas is getting a new amusement park! Six Flags watch out because ***ManghamMania*** is going to have the biggest, fastest, and scariest rollercoasters and rides that you have ever seen. As president of the park, Mr. Mangham has hired you to be in charge of all financial and business operations. That means you are in charge of all mathematical aspects of daily operations of the park.

1. **Admission Prices**

ManghamMania has just set its prices for the upcoming season:

Single Adult	$30.00
Single Child (age 12 and under)	$24.00
Groups	$100 plus the rates below
Group Adult	$18.00
Group Child (age 12 and under)	$12.00

Group rates are available for groups of 10 or more.

a. Write an equation using variables to determine the price (P) for any group that wishes to enter the park. Let A represent the number of adults and C represent the number of children.

P =

b. As part of an advertising brochure, the ManghamMania wants you to include a table showing the admission prices for groups with certain numbers of adults and children. Complete the next table to show prices for groups with various numbers of adults and children.

Group Admission Prices

Number of children

	20	40	60	80	100
10					
20					
30					
40					

Number of adults

c. In your table on the previous page look for patterns in the rows and columns of the table. Describe each pattern you find and tell which part of the equation creates the pattern.

d. In your original equation that you wrote in part a) what does each number tell you about calculating the group price?

e. What mathematical operations do you need to perform to calculate the group price for a particular number of adults and children? In what order must you perform the operations?

f. A group of X adults and Y children show up at the park. They are not very mathematical so they need your help. They want to know how much money they are **saving** by getting the group rate compared to the regular rate. Write an equation using variables to show how much their savings (S) would be.

S =

2. Daily Operations

As the ManghamMania business manager, you have been asked to create equations to help predict about the daily operations of the park.

The daily profit in dollars (P) from the park concession stands depend on the number of visitors (V). You have determined the equation $P = 2.50V - 500$ can model this relationship.

a./b. If 300 people visit the park, about how much concession profit will be made? 600 people?

c. What mathematical operations did you perform to calculate your answers in parts a) and b)? In what order did you perform the operations?

You have determined the equation $V = 600 - 500R$ can predict the number of visitors based on the probability of rain, R.

d. If the probability of rain is 25% (or 0.25), about how many people will visit the park?

e. If the probability of rain is 75% (or 0.75), about how many people will visit the park?

f. If the probability of rain is 50%, about how much profit will be made from the concession stands?

g. If the probability of rain is 10%, about how much profit will be made from the concession stands?

3. Concession profit per visitor

As business manager you decide to use the daily concession profit equation to derive the following equation for the average daily concession profit per visitor:

$$A = \frac{2.50V - 500}{V}$$

a. If 300 people visit the park, about how much concession profit will be made?

b. About how much concession profit will be made per visitor?

c. Complete the table below to show the average per-visitor concession profit for various number of visitors.

Visitors	100	200	300	400	500	600	700	800
Average Profit								

d. What mathematical operations do you need to perform to calculate the average per-visitor profit for a given number of visitors? In what order must you perform the operations?

e. Mr. Mangham claims that the average concession profit per visitor can also be calculated with any of these equations:

  a. $A = \dfrac{1}{V}(2.50V - 500)$

  b. $A = (2.50V - 500) \div V$

  c. $A = V^{-1}(2.50V - 500)$

Do you agree? Explain.

4. The Arch

Mr. Mangham, president of ManghamMania, wants a large arch built at the entrance to the park. He gave the architect the sketch and the equation below. The equation gives the height, y, of the arch above a point, x, feet from one of the bases of the arch. This means that if you are standing under the arch x feet from one base, the point of the arch directly over your head will be $5x - 0.1x^2$ feet above the ground.

$$y = 5x - 0.1x^2$$

ground
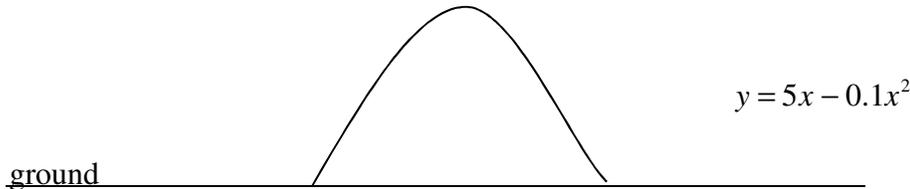
a. Use the equation to find the height of the arch at these distances from the left base.

10 feet	
30 feet	
50 feet	
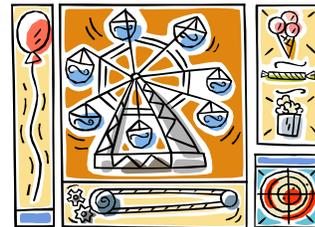
b. What operations did you perform to calculate your answers for part A? In what order did you perform these operations?

c. The expression $5x - 0.1x^2$ is equivalent to the expression $0.1x(50 - x)$. Use this second expression to check your answers in part a).

5. The Rollercoaster

ManghamMania is getting a lot of publicity because of one rollercoaster: The Fear Factor Fantastic Fall, which is now opening on the one-year anniversary of the park. It is especially fun to ride if you have just eaten tons of pizza, hot dogs, or nachos. This one ride has helped attendance at the park increase. You, as the business manager, have determined the equation $V = 1000(1.1^m)$ can estimate the daily number of visitors m months after this rollercoaster ride opened.

a. Estimate the number of visitors 1 month after the ride opened.

b. Estimate the number of visitors 5 months after the ride opened. You may use a calculator to calculate the exponent.

c. Estimate the number of visitors 12 months after the ride opened. You may use a calculator to calculate the exponent.

6. The Conclusion

You may use a calculator for all operations in this section. Round numbers to the nearest whole number when necessary to make the results realistic.

Mr. Mangham has asked you to make some projections about the park for the coming years. Using all the equations from this project, he is interested in knowing the following information for *12, 24, 36, 48, and 60 months* after the Fear Factor Fantastic Fall opened:

1. The number of visitors for each month listed using the equation $V = 1000(1.1^m)$.
2. The total daily concession profit for each month listed.
3. The amount of money for ticket sales assuming the following:
> 20% (0.20) of tickets are sold to individual adults
> 20% (0.20) of tickets are sold to individual children
> 30% (0.30) of tickets are sold to group adults
> 30% (0.30) of tickets are sold to group children
> The average group size is 20 (10 adults and 10 children)

4. The amount of profit (ticket sales plus concession sales minus operating cost) the park makes assuming that is takes this much each month to operate the park.

Month	Cost to operate park
12	$400,000
24	$500,000
36	$900,000
48	$1,800,000
60	$4,000,000

Which of the months listed above is the first one when the park will make a profit?

You are in charge of presenting all of this information to the president and vice-president of ManghamMania. Place all of information from this section in easy-to-read charts, tables, or graphs. Your final presentation should be on construction paper or poster board. Include all information and your conclusions from the data that you believe are important for the president and vice-president to know.