Sample 1

April 17 2013

A New Arena Project

① Row number and seat number assumptions (calculations are below)

40 rows (similar to Mr. Dog's first arena)
20 000 seats (close to the median of Mr. Dog's first arena) starting estimate.
Starting row has 200 seats (a reasonable number based on the amount of seats in Rexall and the Saddledome)
Difference between rows and first and last seat numbers will be determined below in the calculations.

$$S_n = \frac{n(2t_1 + (n-1)d)}{2}$$

$$20\,000 = \frac{40(2(200) + (40-1)d)}{2}$$

$$20000 = \frac{40(400 + 39d)}{2}$$

$$20000 = \frac{16000 + 1560d}{2}$$

$$20\,000 = 8000 + 780d$$

$$12000 = 780d$$

$$d = 15.38$$

I will increase the "d" to 16 for it to be possible, keep the same number (40) of rows, and keep the same number of seats in the first row (200), while staying within the 22500 seat limit.

Criteria 1 and 2 - Excellent
Assumptions are stated within the calculations. See notes below in rubric.

$$S_n = \frac{40(2(200) + (40-1)16)}{2}$$

$$S_n = \frac{40(1024)}{2}$$

$$S_n = \frac{40960}{2}$$

$S_n = 20480$ (total number of seats)

The number of seats in the first row is 200. Now, I will find the number of seats in the last row.

$$t_n = t_1 + (n-1)d$$

$$t_{40} = 200 + (40-1)16$$

$$t_{40} = 200 + 624$$

→ 1/3

$t_{40} = 824$ (row 40, final row)

Final seat/row number design:
Seats in row 1 (t_1): 200
Number of rows required: 40
The number of seats by which each row increases: 16
The total number of seats in the last row: 824
The total number of seats in the arena: 20480

② Assumptions for the price of seats:
Assume fans do not want to pay much more for tickets than they are in the old arena, especially for cheap seats. 40 games in a season will be used to determine the price per game.
Based on Mr. Dog's current price per seat per game (assuming 40 games) of $150 for rows 1-10 $100 for rows 11-20, $75 for rows 21-30, and $50 for rows 31-40, I will start with $150 per seat per game for the first row because it is now a geometric series. The most expensive seats stay the same as in the old arena. A ratio of 0.99 will give a total revenue of about $60 000 000 (seasonal)

a) Assume $r = 0.99$
$t_1 = \$150$ in the first row
$n = 40$ rows

Criteria 3 and 4 - Excellent
Assumptions are stated above and embedded in the calculations below.

$t_n = t_1 r^{n-1}$
$t_{40} = 150 \times (0.99^{40-1})$
$= \$101.36$ This is almost double the cost for the cheap seats, and probably not acceptable.

b) Assume $r = 0.98$
$t_1 = \$150$ in the first row
$n = 40$ rows

$t_n = t_1 r^{n-1}$
$t_{40} = 150 \times (0.98^{40-1})$
$= \$68.22$ This is still a bit high compared to $50 per seat for cheap seats in the old arena.

c) Assume $r = 0.97$

$t_1 = \$150$ in the first row

$h = 40$ rows

$$t_n = t_1 r^{n-1}$$

$$t_{40} = 150 \times (0.97^{40-1})$$

$$= \$45.73$$

This is much more reasonable for the cheap seats compared to the original arena's cheap seat price.

Conclusion:

To match the original arena's prices and stay attractive to most fans by trial and error, the most reasonable seat pricing starts with seats in the first row for $150 per game, and ending at $45.73 per game in row 40 (final row). The cost per row is determined using a common ratio of 0.97 in a geometric sequence.

Price per seat per game in the first row (t_1): $150

Number of rows in design: 40

Common ratio used to decrease successive row's price: 0.97

Price per seat per game in row 40 (final row): $45.73

Mathematics 20-1
Performance Assessment: Rubric

A New Arena

Student Sample 1 **Date** _____

Level / Criteria	4 Excellent	3 Proficient	2 Adequate	1 Limited *	Insufficient/ Blank *
Solve a problem that involves an arithmetic sequence or series (Relations and Functions 9) [CN, PS, R]	Selects appropriate arithmetic sequences and series formulae and applies them **correctly** to determine the total number of seats and the number of seats in the last row. The student has made the required calculations with detailed explanations and formulae provided. The student has identified why the values were chosen.	Selects appropriate arithmetic sequences and series formulae and applies them in a **substantially correct** manner to determine the total number of seats and the number of seats in the last row.	Selects appropriate arithmetic sequences and series formulae and applies them in a **partially correct** manner to determine the total number of seats and the number of seats in the last row.	**Unable** to select correct formulae and/or **unable** to apply them to solve the problem.	No score is awarded because there is insufficient evidence of student performance based on the requirements of the assessment task.
Identify assumptions made in the seat number calculation (Relations and Functions 9) [R]	Provides a **perceptive** explanation of assumptions. The student clearly explains (embedded in the calculations for Criterion 1) why he chose the values he did.	Provides a **logical** explanation of assumptions.	Provides a **reasonable** explanation of assumptions.	Provides a **vague** explanation of assumptions.	

Solve a problem that involves a geometric sequence or series (Relations and Functions 10) [PS, R]	Selects a geometric sequence formula and applies it **correctly** to determine the price of seats in the last row. The student provides several geometric sequence calculations as he works his way towards a reasonable answer.	Selects a geometric sequence formula and applies it **substantially correct** manner to determine the price of seats in the last row.	Selects a geometric sequence formula and applies it **partially correct** manner to determine the price of seats in the last row.	**Unable** to select correct formula and/or **unable** to apply it to solve the problem.	
Identify assumptions made in the seat price calculation (Relations and Functions 10) [R]	Provides a **perceptive** explanation of assumptions. The student explains why he is changing his numbers as he re-calculates to get a value he believes is reasonable.	Provides a **logical** explanation of assumptions.	Provides a **reasonable** explanation of assumptions.	Provides a **vague** explanation of assumptions.	

* When work is judged to be limited or insufficient, the teacher makes decisions about appropriate intervention to help the student improve.