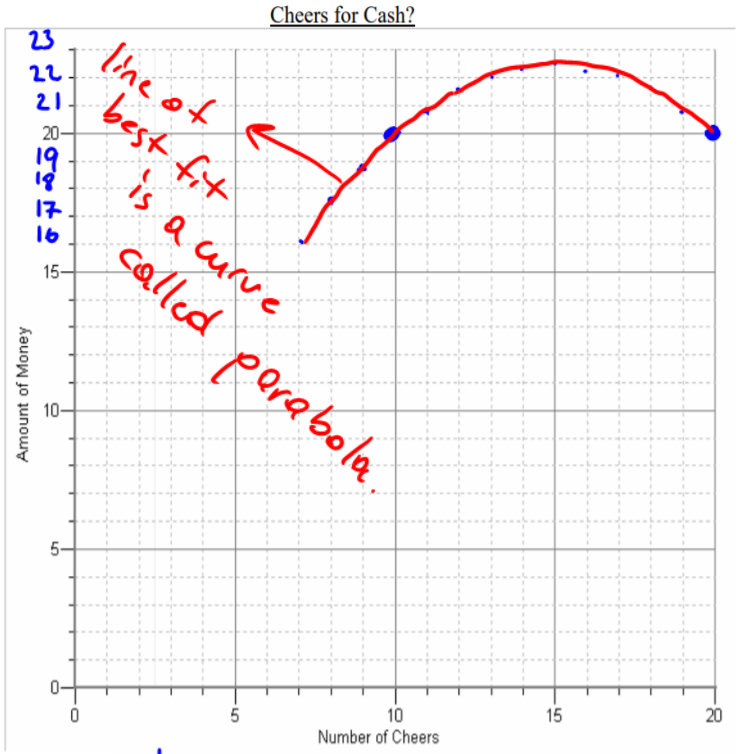
Congratulations! You have made it to the math cheerleading team. Just imagine a group of dedicated mathletes spreading the cheer of math throughout the school! The best part about being on the math cheerleading team is that you get paid… per cheer! Of course, since the team is a MATH team, it takes a bit of calculating to figure out how much you get paid.
Here's what the coach told you:

If you do 10 cheers, you get paid $2 per cheer (NOT BAD!)
You will get 10¢ less per cheer for every cheer over 10 cheers,
but you will get 10¢ more per cheer for every cheer under 10 cheers.

The question going around the team is "How many cheers do we need to do in order to get the most money?"

Fill in the table below to find out (start at 10 cheers and work up and down). **Plot** the points on the grid below. **Draw** a line of best fit.

Number of Cheers	Price per Cheer	Total Money Paid (1st x 2nd columns)	1st differences	2nd differences
7	$2.30	7 x 2.30 = $16.10		
8	$2.10 + 10¢ = $2.20	8 x 2.20 = $17.60	17.60 - 16.10 = 1.50	
9	$2.00 + 10¢ = $2.10	9 x 2.10 = $18.90	18.90 - 17.60 = 1.30	1.30 - 1.50 = -0.20
10	$2.00	10 x $2.00 = $20.00	20 - 18.90 = 1.10	1.10 - 1.30 = -0.20
11	$2.00 - 10¢ = $1.90	11 x $1.90 = $20.90	0.90	0.90 - 1.10 = -0.20
12	$1.90 - 10¢ = $1.80	12 x $1.80 = 21.60	0.70	0.70 - 0.90 = -0.20
13	1.70	13 x 1.70 = 22.10	0.50	-0.20
14	1.60	14 x 1.60 = 22.40	0.30	-0.20
15	1.50	15 x 1.50 = 22.50	0.10	-0.20
16	1.40	16 x 1.40 = 22.40	22.40 - 22.50 = -0.10	-0.20
17	1.30	22.10	22.10 - 22.40 = -0.30	-0.20
18	1.20	21.60	-0.50	-0.20
19	1.10	20.90	-0.70	-0.20
20	1.00	20	-0.90	-0.20



Conclusion:

- The maximum money of $22.50 is paid when you do 15 math cheers. This point on the graph is called vertex .
- In the table of values, the 1st differences are changing, 2nd differences are equal.

Thinking: Describe the trends in the graph and state when would you stop cheering?

from 7 to 10 cheers, money paid increases rapidly
from 10 to 17 cheers, the increase in money paid slows down.
At 15th cheer, maximum occurs. After this point, there is no point in cheering to earn $.

QUADRATIC MODELS

Represent quantities that are non-linear which do not have a constant rate of change

- In a table of values, the second differences are equal
- The graph is a curve called a parabola
- The equation has a degree of two and is written in the form $y = ax^2 + bx + c$ where a is not 0

KEY WORDS
Non-linear
Constant
Second
Parabola
Two
$y = ax^2+bx+c$
a is not 0.

EXAMPLE 1: Which models represent quadratic relations?

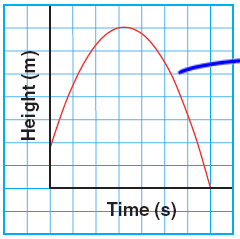
* *Find 2nd differences*

h	p
0	250
1	238
2	202
3	142

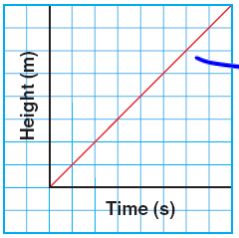
1st: 238−250 = −12; 202−238 = −36; 142−202 = −60
2nd: −36−(−12) = −24; −60−(−36) = −24
2nd dif are equal ∴ QUADRATIC

r	Q
0	32
1	48
2	72
3	108

48−32 = 16; 72−48 = 24; 108−72 = 36
24−16 = 8; 36−24 = 12
∴ NOT QUADRATIC



→ PARABOLA
QUADRATIC



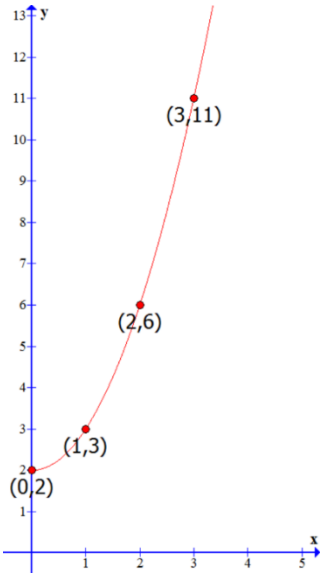
→ STRAIGHT LINE
∴ LINEAR

e) $y = x^2 + 7$ → 2nd degree
QUADRATIC

f) $y = 3x + 2$ → LINEAR

THINKING

Determine if the graph shown represents a quadratic relation or an ~~exponential~~ relation. Show/explain how you got your answer.



Create a table of values

x	y	1st	2nd
0	2		
		3−2 = 1	
1	3		3−1 = 2
		6−3 = 3	
2	6		5−3 = 2
		11−6 = 5	
3	11		

∴ Since 2nd differences are equal, it is a quadratic relation.

COMPLETE: page 303 #1 – 3, 7bc, 8ab