

NMP II CONTENT TEST FUNCTIONS 8th GRADE

1. Sam is in 8th grade and he wishes to help his little sister in 3rd grade with her multiplication facts. He tells her $3 \times 1 = 3$, $3 \times 2 = 6$, ..., $3 \times 9 = 27$. Sam understands that he is specifying a function consisting of 9 ordered pairs. What are these ordered pairs? What is an algebraic description of this function?

2. Bob wants to charge his phone and his kindle. He knows that the kindle will charge 10% every 15 minutes. The kindle currently has a 20% charge. Bob's phone is brand new and has zero charge. The owner's manual provides the following chart of charge times. (Notice that the battery does indeed charge faster in the first 10 minutes when the battery is really low.)

TIME(MIN)	0	10 min	20 min	30 min	40 min	50 min
% CHARGED	0	20%	30%	40%	50%	60%

- (a) How long will it take to charge the kindle?

- (b) Assuming the given table of values continue, how long will it take to charge the phone?

- (c) If you wanted to make sure that the kindle and phone complete their charging in the same amount of time, what percentage of a full charge would need to be in the kindle when the charging of both devices commences?

3. Two of the functions defined below are linear and one is non-linear. Identify the non-linear function (explain how you know) and for the other two find m and b for their formulation as $y=mx+b$.

Input ONE	y_1	***	Input TWO	y_2	***	Input THREE	y_3
0	5		-1	-15		1	1
1	-5		2	15		2	4
3	-25		4	35		3	9
5	-45		5	55		4	16
6	-65		6	75		5	25

4. Ernie the entomologist is raising two populations of fictitious bugs. The tiny Ely bug grows according to the function $y=5t^2$ where t is specified in days. Thus after 1 day there will be 5 Elyies and after 3 days there will be 45 Elyies. The larger Elko bug grows according to the rule $y=10t$. Thus after 1 day there are 10 Rubies and after 3 days there are 30 Rubies (We call the Elko bugs Rubies for the beautiful Ruby Mountains). Ernie wishes to compute, as a function of the number of days t, the ratio R of Elyies to Rubies on day t. Fill out the following chart and express this ratio R as a function of t algebraically.

DAYS	ELYIES	RUBIES	R=ELYIES/RUBIES
1	5	10	$5 \div 10 = \frac{1}{2}$
2			
3	45	30	$45 \div 30 = \frac{3}{2}$
4			
5			
6			
7			
8			

5. Draw approximate qualitative graphs (i.e. no numerical values) to describe the following situations:
- (a) Distance from home as a function of time when you go to school – first driving slowly to get to the highway and then speeding up. Then you must slow down, park your car, and walk (still farther from home in the same direction) to your classroom.
 - (b) Plot creative freedom as a function of structure as described by pianist Chris Donnelly:
“With no structure there is no creativity. Initially, as structure increases, creativity increases rapidly. However, continued increases in structure lead to ever slower increases in creativity until a maximum possible creativity is reached for a certain optimal amount of structure. After this, creativity begins to fall with increasing structure. First the decrease is slow but ultimately it becomes great until there is no creativity left.”