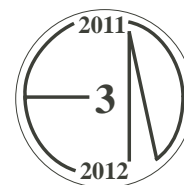


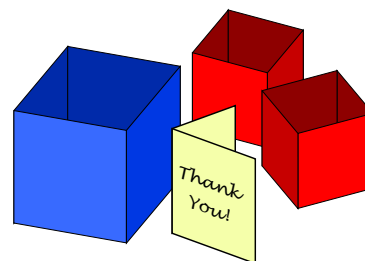
# Emmy Noether - Circle 3 for 2011-2012



## Part I: Problems

### Problem 1

Jasmina has a mix of boxes, some red and some blue. She sorts 27 greeting cards into the boxes, putting exactly 3 cards into each red box, and 7 cards into each blue box. How many blue boxes does Jasmina have?



### Problem 2



I am a two-digit number. Each of my digits is a prime number. When I subtract my ones digit from my tens digit the result is greater than the value of my ones digit. What number(s) could I be?

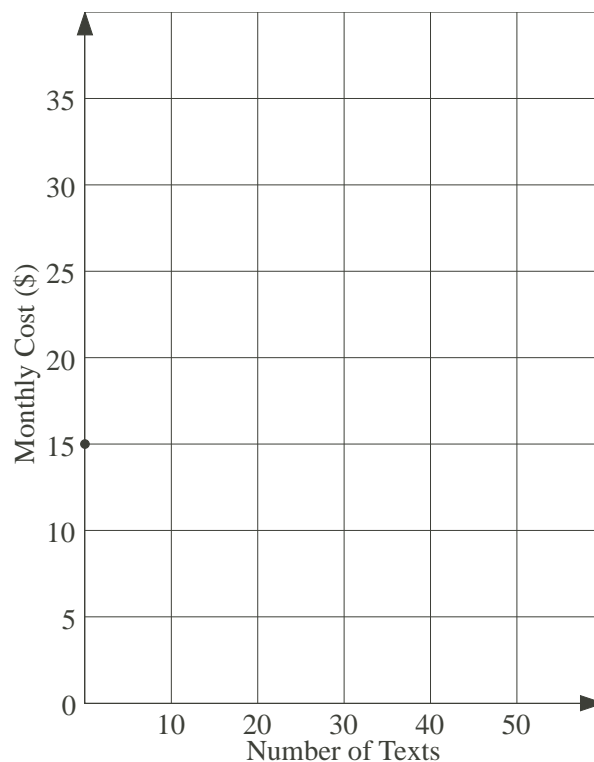
#### *Extension :*

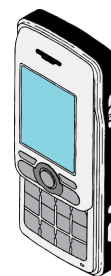
If I am a three-digit number with the same properties as above, what numbers could I be?

### Problem 3

- a) A cell phone plan costs \$15.00 per month plus 40 cents for each text. Fill in the left table below with the appropriate monthly cost for each number of texts. Plot the data from the table on the graph to display the different monthly costs.

No. of Texts	Total Monthly Cost
0	\$15
10	
20	
30	
40	
50	

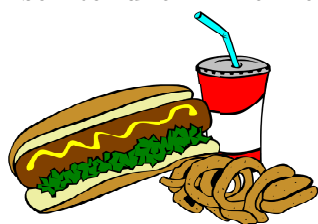




- b) You have the option of getting unlimited texting for an additional \$10.00 per month. How many texts would you have to send each month to make unlimited texting a better option? Use both your table and graph to prove your answer.

#### Problem 4

Hakim has received \$30.00 as a birthday gift and wants to spend it on treating three friends and himself to lunch. The menu includes:

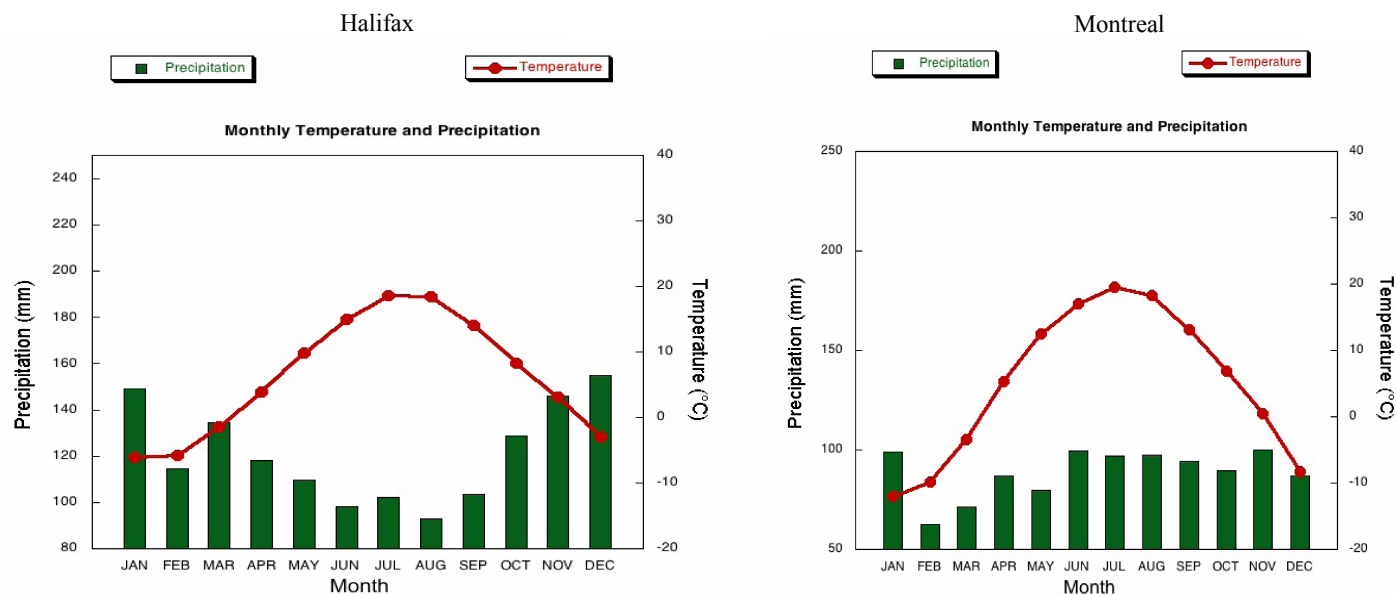


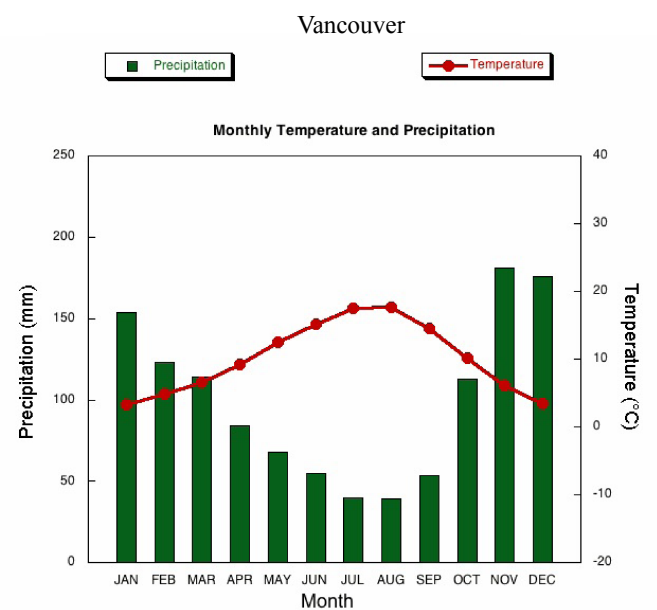
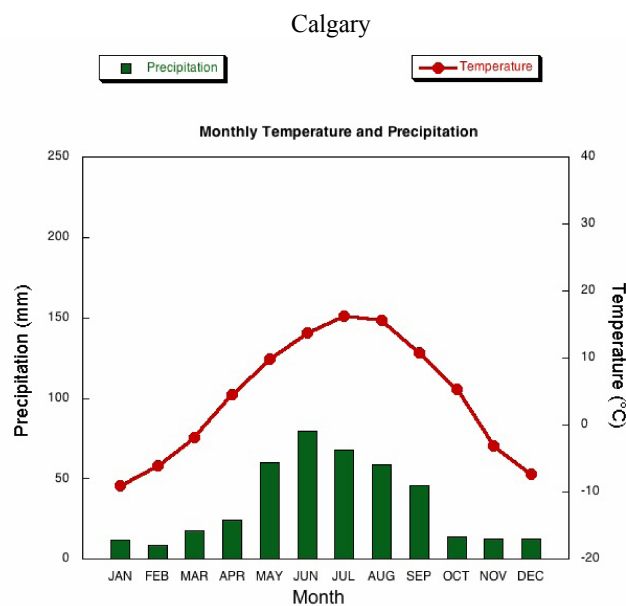
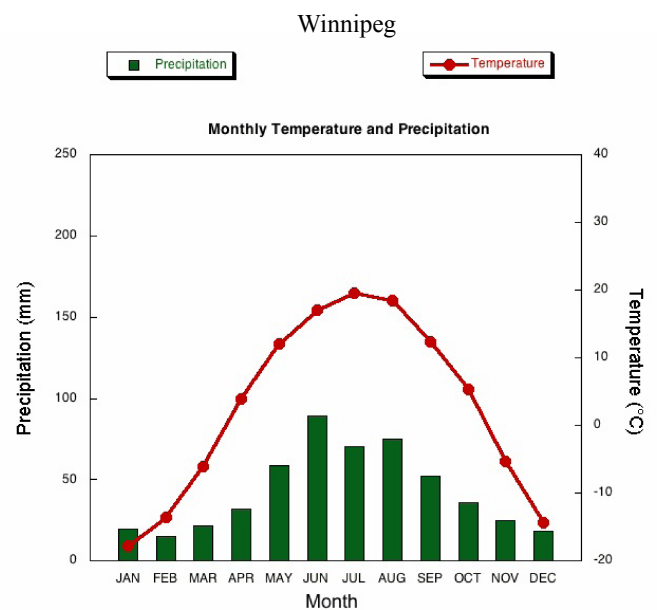
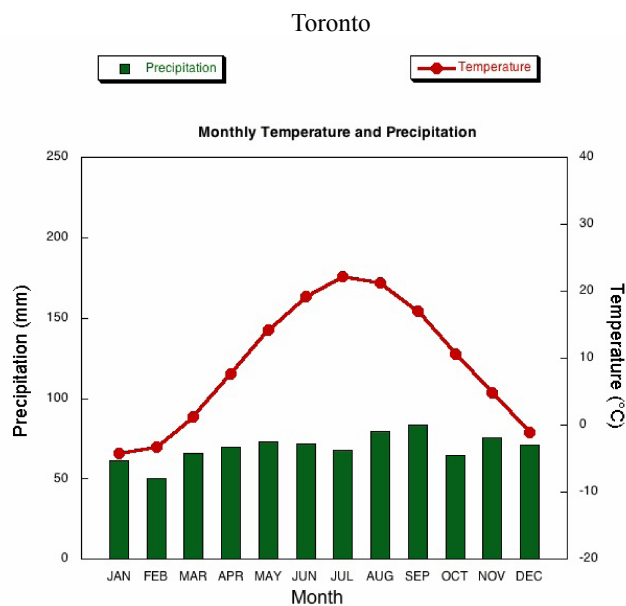
Main		Sides		Drinks	
Hamburger	\$4.00	French Fries	\$2.00	Regular	\$1.25
Cheeseburger	\$4.50	Onion Rings	\$2.50	Large	\$1.75
Veggie Burger	\$3.50				

- a) If each of the four boys orders 1 main, 1 side and 1 drink, in how many different ways could the boys select their lunch items?
- b) Suppose each boy orders the same three items. Which combinations can Hakim afford to pay for with his birthday money?

#### Problem 5

Below are ‘climographs’ which show typical data for both temperature and precipitation in several Canadian cities. Note that the precipitation scales for Halifax and Montreal are different from those of the remaining cities.



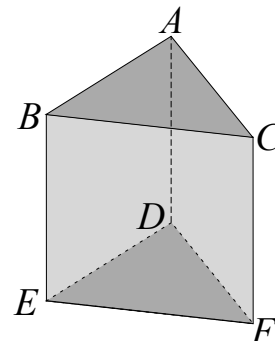


- Which city has the highest average July temperature?
- Which city has the lowest average January temperature?
- Which city has the most precipitation (snow and/or rain) in April?
- Which city is likely to get the most snow in January? Give reasons for your answer.
- Which city is likely to get the least amount of snow in January? Give reasons for your answer.
- In which city would you like to live based solely on average temperature? Why?
- In which city would you like to live based on both temperature and precipitation? Explain your choice.

**Problem 6: Minimal Paths (suitable for pairs or groups of students)**

In the solid shown below, all the edges are 1 cm in length. A ‘path’ is defined as follows:

1. A path goes from one vertex to a different vertex.
2. A path follows only edges.
3. A path cannot pass through any vertex more than once.



- a) Name the solid.
- b) Find the path of minimum total length from vertex  $A$  to vertex  $F$ . How many vertices does this path go through (not counting the end-points  $A$  and  $F$ )?
- c) Repeat part b) for the path of maximum total length from  $A$  to  $F$ .
- d) Are there any other paths from  $A$  to  $F$ ? If so, name them.
- e) List all the possible paths from  $A$  to  $F$ , their lengths, and the number of vertices, in a table like the one shown below.

Path	Length	Vertices
ACF	2	1

**Extension :**

Suppose the rules for a path change so that it can traverse any edge only once, but can pass through any vertex once or twice. How would your answer to part c) change?