IM2 Problem Set 3.2 - Using Stats and Probability

| BIG PICTURE of this UNIT:	- How do we analyze and then make conclusions from a data set? Or from a scenario in which probabilities are being considered? - How do I visually present my data and the outcomes of my analysis? How can we visualize events and outcomes when considering probability events? - How do I use data & statistics & probabilities to make decisions? - How do I decide on the validity/reliability of my data? Of my analysis? Of my conclusions? Of my decision?

1. You have 5 graphs, showing the mark distribution of our current classes of IM2.

   a. From your group's thinking about the graphs, you will record:

      i.   Initial thoughts that arise from the graphs and the context
      ii. Initial conclusions that arise from the graphs and the context
      iii. Initial questions that arise from the graphs and the context

   b. Rotate one spokesman to another group and share thoughts, conclusions, questions. Use post-it notes to add new ideas. Let's then consolidate as a class on ideas.
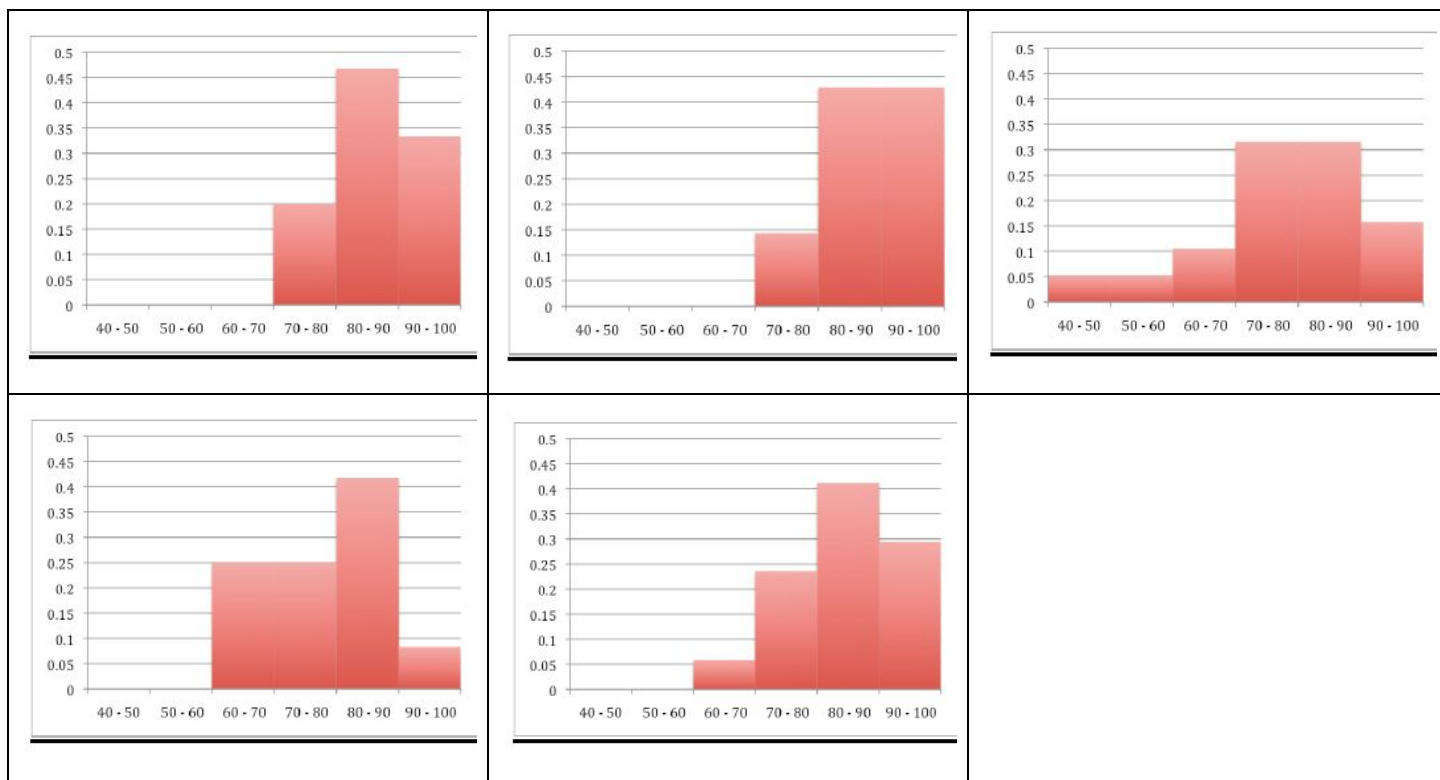
1. Students in Mr. R's statistics class were trying to determine if people speed along a certain section of Road 206. They collected speeds of vehicles, as displayed in the table:

Speed (mph)	Number of Cars
29	1
33	2
34	4
35	5
36	3
38	2
39	2
54	1

   a. Find the mean, median, and mode for this data set
   b. The speed limit along this part of the highway is 35 mph. Based on your results from part (a), is it fair to make the conclusion that the average driver does speed on this roadway?
   c. What does the term "outlier" mean? Is there an outlier in our data set? How can you be sure?
   d. How probable is it that a car is driving at a speed greater than 36 mph?

2. Mr Rawlings surveyed his IM2 class about how many pets they had at home. The results are tabulated.

Number of Pets	Number of Students
0	2
1	7
2	3
3	1
4	2

   a. Determine the mean and median number of pets owned by the students in this class.
   b. Draw a frequency histogram for this data set.
   c. Determine Q_1 and Q_3 and hence calculate the interquartile range.
   d. Draw a box and whisker plot.

3. The stem and leaf plot given here represents the scores on a Geometry test.

   a. Find the mean, median, mode and range of scores.
   b. Draw a frequency histogram for this data set.
   c. How probable is it that a randomly selected student scored:
      i.   An A on the test?
      ii. At least a B on the test?
      iii. At most a D on the test?
   d. Determine Q_1 and Q_3 and hence calculate the interquartile range.
   e. Draw a box and whisker plot.

Geometry Test Scores

Stem	Leaf
5	6 8 9
6	1 6 9
7	4 5 77 99
8	2 4 6 7 7 8 8 9
9	1 3 3 4 4 5 5 5 7
10	0 0

4. Here are the results of the Trig Unit Quiz given last week.

   a. Determine the mean, median and modal grades.
   b. How probable is it that a randomly selected student scored a B on the Quiz?
   c. Determine the values of Q_1 and Q_3. Hence, calculate the interquartile range of the data.

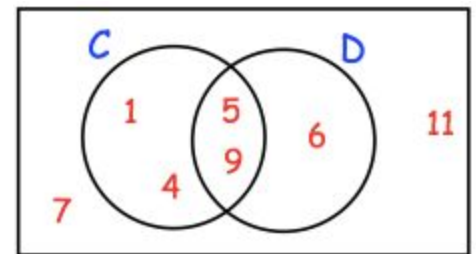| stem	leaf
5	6
6	7, 7, 9
7	2, 4, 7, 7, 8
8	1, 2, 2, 3, 4, 8
9	0, 2, 3, 4

Key: 5|6 = 56%

5. There are only red marbles and green marbles in a bag. There are 5 red marbles and 3 green marbles. Seung Jee takes at random a marble from the bag. She does not put the marble back in the bag. Hae Lin takes at random a second marble from the bag.

   a. Complete the probability tree diagram.
   b. How probable is it that the girls finish with two green marbles?
   c. Work out the probability that the girls take marbles of different colours.

1st Marble   2nd Marble

$\frac{4}{7}$ Red

$\frac{5}{8}$ Red

Green

Red

Green

Green
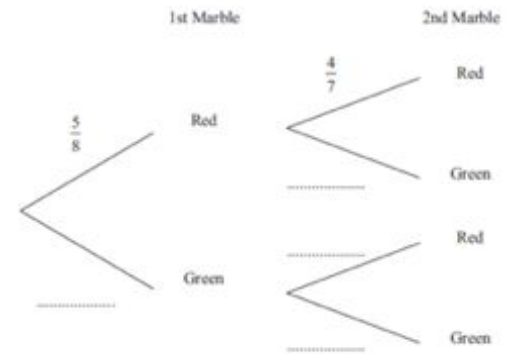
6. Here is a Venn diagram. Write down the numbers that are

   a. in set of D
   b. in the set of C ∪ D
   c. in the set of C'

C   D
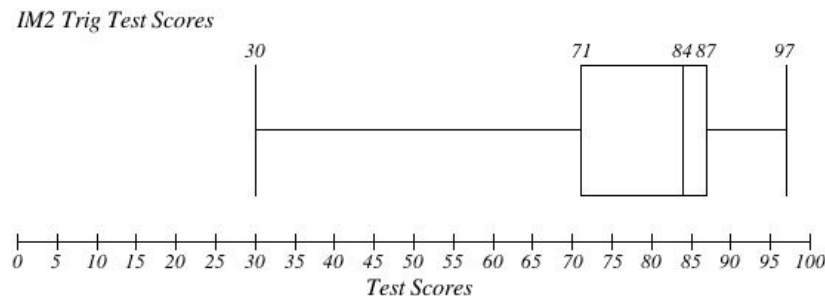
1   5   6   11

4   9

7

7. The following set of test scores on a Trigonometry test came from Mr S's IM2 class last year.

$$18, 27, 34, 52, 54, 59, 61, 68, 78, 82, 85, 87, 91, 93, 100$$

   a. Find the range, the median, Q_1 and Q_3 and the interquartile range of these test scores.
   b. Is the score of 18 an outlier? Mathematically, justify your response.

   Below, are the results of Mr. R's IM2 class from last year on the same test.

IM2 Trig Test Scores

30   71   84 87   97

0   5   10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Test Scores

   c. Compare the interquartile ranges of the two classes as well as the medians. Which class do you think performed better on the assessment? Give reasons for your choice.

8. Given the following histograms of class results in 4 four quizzes

i)

Pop Quiz Marks

ii)

Pop Quiz Marks

iii)

Pop Quiz Marks

iv)

Pop Quiz Marks
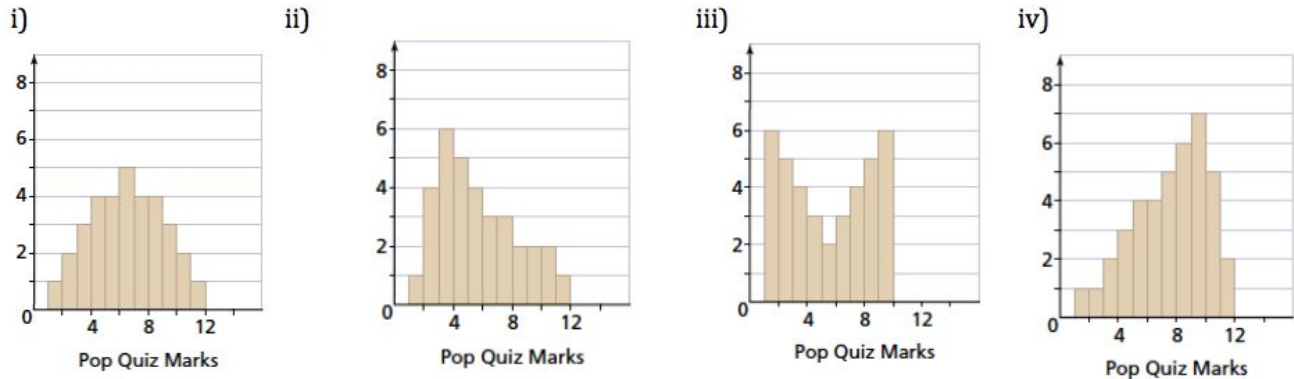
    a. Determine the mean, median and mode of each quiz.
    b. The shapes of the graphs of data distributions are categorized as symmetrical, skewed left (or skewed negatively) or skewed right (skewed positively). Categorize the four graphs accordingly.

9. Jennifer is playing darts. She throws two darts aiming for a Bullseye. The probability Jennifer hits the Bullseye on her first throw is ¼ and the probability she hits the Bullseye on her second throw ⅓.

    a. Complete the tree diagram.
    b. Work out the probability Jennifer hits the Bullseye at least once.
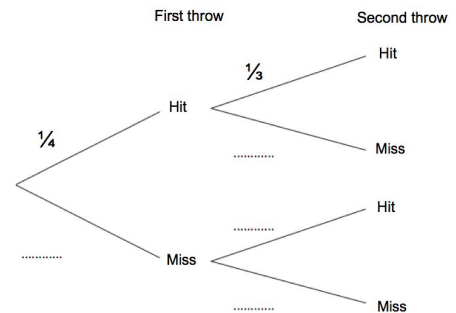
10. There are 80 students in year 11. Nine students study French and German. 35 students only study French 2 students do not study French or German.

    a. Complete the Venn diagram
    b. Work out how many students study only German.
    c. How probable is it that a randomly selected student studies:

        i.   French?
        ii.   Only German?
        iii. P(G∪F)?
        iv. P(G∩F)?
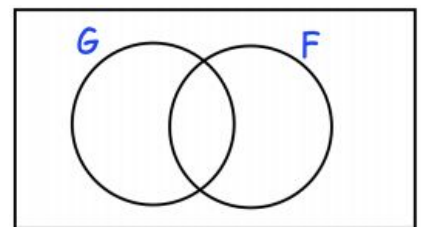
11. Determine the median of the data set, for which you have the following information: You know that 12 of the 29 measurements are below 20 cm and you know that 13 of the measurements are above 21 cm. The other 4 measurements are known to be 20.1 cm, 20.4 cm, 20.7 cm and 20.9 cm.

12. Eight sample values of a data set are 6, a, 7, a, 4, b, 6 and 8, where a and b are single digit numbers and the mean is 7.

    a. Show that a and b have two possible solutions.
    b. If there is a single mode, what is the median?

13. In a survey, 100 students were asked "do you prefer to play Minecraft or play Super Mario?" Of the 46 boys in the survey, 33 said they would choose Minecraft, while 29 girls made this choice. A student is selected at random, find the probability that:

    a. the student selected at random prefers to play Minecraft;
    b. the student prefers to play Super Mario given that the student is a boy

14. In the Grade 10 class of 100 kids, there are two sports commonly played, soccer and basketball. 76 students do only one of the sports, 14 students don't do any sport and 46 students play basketball. What is the probability when a student is selected that they play soccer.

15. In a Box

In a Box

There are **two red** ribbons and **four blue** ribbons in a box.

We take two ribbons out without looking.

You win if they are **the same colour**, and I win if they are **different colours**.

Is it a fair game?

nrich.maths.org