MDM4U Course Review – 2018-06-19

1. Write each expression as a **factorial**.
   a) $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$
   b) $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2$
   c) $12 \times 11 \times 10!$
2. **Expand** and **evaluate** each factorial.
   a) $4!$
   b) $6!$
   c) $9!$
3. Write each permutation as an expression **with factorials**, then **evaluate**.
   a) $P(4,2)$
   b) $P(7,3)$
   c) $P(5,5)$
   d) $P(8,3) \div 3!$
   e) $P(100,0)$
4. Write each combination as an expression **with factorials**, then **evaluate**.
   a) $\binom{4}{2}$
   b) $\binom{7}{3}$
   c) $\binom{5}{5}$
   d) $\binom{100}{2}$
5. Use a **tree diagram** to show all possible orders to arrange the letters of the word EDDY.
6. How many **different arrangements** are there of the letters of the word MAGICAL?
7. How many arrangements are there of the letters of the word CUPCAKE that do **not** begin with C or U?
8. You have the following Scrabble tiles: SEVENTY. How many different **4-letter** arrangements are there using these tiles?
9. There are 20 questions on your History exam, and you must choose any 15 questions to complete. How many **different ways** are there to choose?
10. How many **different** three-digit numbers are there which do **not** contain a 3?
11. You play a game in which there is a randomly-generated, secret code. It's two digits long and can range from 00 to 99. To play the game, you guess a single digit.
    - If the digit you guessed occurs 0 times, you pay $1.
    - If the digit you guessed occurs 1 time, you receive $3.
    - If the digit you guessed occurs 2 times, you receive $10.

    What is the **probability of winning**?
    What is the **probability of losing**?
    What is the **expected value** of one play of the game?

Example: You guess the digit 4. If the secret code was 27, 08, etc. (no 4s), you pay $1. If the secret code was 42, 04, etc. (one 4), you receive $3. If the secret code was 44 (two 4s), you receive $10.

12. A committee of 5 people is being chosen from a group of 25 people. If Amy and Zeta can't both be on the committee at the same time, how many different ways can the committee be formed?

13. A Print-On-Demand (POD) publisher has a quality-control process which successfully finds 75% of misprinted (defective) books. Their printing machine has a 2% misprint rate. An author orders a print run of 300 books.
    a) How many misprints would the publisher **expect to have** in this print run?
    b) How many misprints would the publisher **expect will be found** in this print run?
    c) How many misprints would the publisher **expect will make it past quality-control** (and be shipped to the author)?
    d) What is the **probability** that the **print run will have fewer than 2 misprints** in total?
14. You open a new deck which contains the usual 52 cards as well as 2 Joker cards. After shuffling you draw 3 cards.
    a) What is the probability that you do not get a Joker?
    b) What is the probability that you get exactly 1 Joker?
    c) What is the probability that you get exactly 2 Jokers?
15. You draw 3 cards in a row from a standard deck of 52 cards.
    a) What is the probability that you get no face cards?
    b) What is the probability that the first card is a heart and the next two cards are face cards?
16. You have an idea that students might learn math better when they **write songs** about the concepts than if they complete **review assignments** about the concepts. Explain **how you might test** your idea.
17. A survey of universities found that final marks in first year math courses were normally distributed, with a mean of 72% and a standard deviation of 11.5%.
    a) What percentage of students have final marks that are less than 50%?
    b) What percentage of student have final marks between 50% and 70%?
    c) In a faculty with 1275 students in first year math courses, how many students does this survey predict will have final marks above 90%?
18. In MDM4U there are 20 students, and 12 of these students are left-handed. If Mr. Grasley selects 4 different students at random to answer questions at the board, what is the probability that exactly two of them are left-handed?