South Sydney High School
PERMUTATIONS
3 Unit Worksheet

1.   A class contains fifteen pupils.

    (a)   In how many different ways can 1st, 2nd and 3rd Prizes be awarded in the coming examinations ? In how many of these ways does Joanne win a prize ?

    (b)   In how many different ways can prizes in English, Maths and History be awarded if all fifteen study all three subjects ?

2.   The judges are to put seven candidates in order of merit. How many different orders are there

    (a)   with X next to Y ?   (b)   with X above Y ?

3.   The five letters A, B, C, D, E are arranged in a line at random.

    (a)   How many different sequences are possible ?

    (b)   What is the probability that

       (i)   A is on the left and E on the right ?

       (ii)   A and E are on the ends ?

       (iii)   C is in the middle ?

       (iv)   both B and D have other letters on either side of them ?

       (v)   A and B are together ?

       (vi)   the three consonants are together ?

       (vii)   the letters are not in alphabetical order in either direction ?

       (viii)   B, C and D occur in alphabetical order from left to right, but not necessarily together ?

4. (a)   A hat contains 7 names, four of which are men's and three women's names. They are withdrawn one at a time at random. What is the probability that men's and women's names come out alternately ?

    (b)   Repeat (a) if the hat contains 8 names, four of men and four of women.

5.   There are five cards numbered 1, 2, 3, 4 and 5. Of them, three are taken at random and placed from left to right to form a 3 digit number.

    (a)   How many different numbers can be formed ?

    (b)   What is the probability that the number formed is

       (i)   greater than 300 ?   (ii)   greater than 340 ?

6.   The letters of the word AGAIN are arranged at random in a line.

    (a)   How many different letter patterns are possible ?

    (b)   What is the probability that the A's are

       (i)   together ?   (ii)   separated ?

7.   The letters of the word RECEIVE are arranged at random in a line.

  (a)   How many different letter patterns are possible ?

  (b)   What is the probability that

     (i)   all the E's are together ?

    (ii)   the E's are all separated ?

   (iii)   exactly two of the E's are together ?

8. (a)   The letters of the word AROUND are written at random on the circumference of a circle.

     (i)   How many different arrangements are possible ?

    (ii)   What is the probability that the three vowels occur together ?

  (b)   The letters of the word CIRCLE are written at random on the circumference of a circle.

     (i)   How many different arrangements are possible ?

    (ii)   What is the probability that the C's are separated ?

9.   The digits 1, 2, 4, 5, 7 and 8 are arranged, equally spaced, at random on the circumference of a circle. What is the probability that the sum of each diametrically opposite pair is 9 ?

10.   On Monday, Jenny has seven lessons, four before and three after lunch, each of a different subject of which one is English and one Maths. If the time-table were arranged at random, what are the probabilities that

  (a)   English and Maths are the last two periods ?

  (b)   English and Maths both occur after lunch ?

  (c)   One of English or Maths is before lunch and the other after lunch ?

† 11.   The letters of the word GLENELG are arranged at random in a straight line. What is the probability that the sequence reads the same from right to left as from left to right ?

† 12.   In a History examination, Robert is asked to put five historical events, A, B, C, D, E into chronological order.

  (a)   If he only knows that A occurred some time before B, and otherwise guesses his answer, what is his probability of being correct ?

  (b)   What is his probability if he knows that A occurred sometime before D and that D occurred sometime before B ?

† 13.   A pack of six cards consists of a red and a black Jack, a red and black Queen and a red and black King. They are drawn, one at a time, at random. Find the probability that

  (a)   the sequence is red, red, red, black, black, black.

  (b)   the sequence is Jack, Jack, Queen, Queen, King, King.

  (c)   the pair of Jacks are drawn consecutively and also the Queens and the Kings.

  (d)   the cards alternate in colour but none of the pairs occur consecutively.

PERMUTATIONS

1. (a) 2730, 546 (b) 3375   2. (a) 1440 (b) 2520

3. (a) 120 (b) (i) $\frac{1}{20}$ (ii) $\frac{1}{10}$ (iii) $\frac{1}{5}$ (iv) $\frac{1}{10}$ (v) $\frac{2}{5}$

   (vi) $\frac{3}{10}$ (vii) $\frac{59}{60}$ (viii) $\frac{1}{6}$

4. (a) $\frac{1}{35}$ (b) $\frac{1}{35}$ 5. (a) 60 (b) (i) $\frac{3}{5}$ (ii) $\frac{1}{2}$

6. (a) 60 (b) (i) $\frac{2}{5}$ (ii) $\frac{3}{5}$

7. (a) 840 (b) (i) $\frac{1}{7}$ (ii) $\frac{2}{7}$ (iii) $\frac{4}{7}$

8. (a) (i) 120 (ii) $\frac{3}{10}$ (b) (i) 60 (ii) $\frac{2}{5}$

9. $\frac{1}{15}$ 10. (a) $\frac{1}{21}$ (b) $\frac{1}{7}$ (c) $\frac{4}{7}$ 11. $\frac{1}{105}$

12. (a) $\frac{1}{60}$ (b) $\frac{1}{20}$ 13. (a) $\frac{1}{20}$ (b) $\frac{1}{90}$ (c) $\frac{1}{30}$ (d) $\frac{1}{60}$