PERMUTATIONS

1. There are five expressways between city A and city B and three expressways between city B and city C. How many different routes can one take in going from A to C by way of B? $5 \cdot 3$

2. A building has eight entrances and five exits. How many different routes can a person take in going into the building and coming out of it? $8 \cdot 5$

3. On a particular hike Trevor has five different paths to chose from that will take him from the starting point to the river. At the river he has four choices on how to cross; on the other side he has a choice of three different paths to take him to the pick-up point. How many different paths can Trevor take from the starting to the pick-up point? $5 \cdot 4 \cdot 3$

4. A room has six doors. In how many ways can a person enter and leave if:
   a) it must be by a different door? $6 \cdot 5$
   b) it may be by any door? $6 \cdot 6$

5. A certain make of car is available in five body types, nine different colours, four kinds of upholstery and three types of sound systems. How many different cars would a dealer have to keep in stock in order to be able to show his complete line to prospective customers? $5 \cdot 9 \cdot 4 \cdot 3$

6. A cafeteria offers five different types of sandwiches, three different types of beverages and three types of desserts. How many different types of luncheon menus can be arranged, each to consist of a sandwich, beverage and dessert? $5 \cdot 3 \cdot 3$

7. In how many ways can a student answer a multiple choice exam if the exam consists of eight questions and each question has four possibilities listed? $4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$

8. There are five different high schools in a particular city. In how many different ways can friends select a high school if no two of them attend the same school? $5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

9. In a certain high school there are 10 English teachers, 6 social studies teachers, 9 mathematics teachers, 8 science teachers and 3 language teachers. In how many different ways can a student select his teachers if the student is going to take

these five subjects? $10 \cdot 6 \cdot 9 \cdot 8 \cdot 3$

10. If a student is able to select from English, mathematics, science, social studies and language to create a five period timetable; in how many ways can a student create a timetable containing:
a) these five subjects $5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
b) any four subjects and a spare in the last period $\_ \cdot \_ \cdot \_ \cdot \_ \cdot s \Rightarrow 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
c) any three subjects and both spares in the afternoon $\_ \cdot \_ \cdot \_ \cdot s \cdot s \Rightarrow 5 \cdot 4 \cdot 3 \cdot 1 \cdot 1$
d) English in the first period and any other three in period 2, 3 and 4 and a spare in 5. $En \cdot \_ \cdot \_ \cdot \_ \cdot s \Rightarrow 1 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
e) English in period one and mathematics in period two and any other one class in period three with spares in periods 4-5. $En \cdot Al \cdot \_ \cdot s \cdot s \Rightarrow 1 \cdot 1 \cdot 3 \cdot 1 \cdot 1$

11. A boy has 3 pairs of pants, 4 shirts, 2 sweaters, 3 pairs of runners and four coats. In how many different outfits can he appear? $4 \cdot 2 \cdot 3 \cdot 4$

12. A person has to buy a loaf of bread at a bakery and a kilogram of hamburger at a butcher shop. He can buy the bread at one of seven different bakeries and the meat at one of five different butcher shops. How many sets of two stores does he have available? $7 \cdot 5$

13. In making a bar graph a student has drawn five different bars. He plans to colour each a different colour and he has eight different coloured crayons to choose from. In how many different ways can the colours be selected? $8 \cdot 7 \cdot 6 \cdot 5 \cdot 4$

14. In how many ways can a baseball team be arranged if one player always pitches? $p \cdot \_ \cdot \_ \cdot \_ \cdot \_ \cdot \_ \cdot \_ \cdot \_ \cdot \_ \Rightarrow 1 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

15. In how many ways can a baseball team be arranged if the pitcher, catcher and first baseman never change positions? $p \cdot c \cdot fb \cdot \_ \cdot \_ \cdot \_ \cdot \_ \cdot \_ \cdot \_ \Rightarrow 1 \cdot 1 \cdot 1 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

16. If each arrangement of the letters spells a word, how many words can be made using all the letters of the word:
a) house $5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
b) spring $6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
c) camelot $7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

17. How many different symbols each consisting of 4 letters in succession can be formed from the letters a, b, c, d, e, if:
a) repetition is not allowed $5 \cdot 4 \cdot 3 \cdot 2$ b) repetition is allowed $5 \cdot 5 \cdot 5 \cdot 5$