PM 12 - Combinatorics PED Questions

1. Simplify: $\dfrac{n(n+1)!}{(n-1)!}$.

   a) $2n!$ b) $n!(n^2+n)$ c) $2n$ d) n^3+n^2

2. How many odd 3-digit whole numbers are there? For example, 203 is acceptable, but 023 is not.

   a) 360   b) 450   c) 500   d) 900

3. Simplify: $\dfrac{(n-2)!}{(n-1)!}$

   a) $\dfrac{n-3}{n-1}$ b) $n-2$ c) $\dfrac{1}{n-1}$ d) $\dfrac{1}{n(n-1)}$

4. Car license plates consist of 6 characters. Each of the first 3 characters can be any letter from A to Z inclusive except I or O. Each of the last 3 characters can be any digit from 2 to 9 inclusive. If repititions of letters and digits are not allowed, how many different license plates are possible? An example of this format is GRT 492.

   a) 4 080 384   b) 5 241 600   c) 7 077 888   d) 11 232 000

5. A couple is planning an evening out. They have a choice of 4 restaurants for dinner, 6 movies following dinner, and 4 coffee establishments for after the movie. How many different ways can they plan the evening if they choose one of each?

   a) 6   b) 14   c) 48   d) 96

6. A student has 7 different textbooks. Which expression gives the number of different ways 4 of these books can be selected and arranged on a shelf?

   a) $4!$ b) $\dfrac{7!}{4!}$ c) $_7C_4$ d) $_7P_4$

7. Codes with 5 digits are made from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9. If repititions are not permitted and each code must contain 2 odd digits followed by 3 even digits, determine the number of different codes that can be made.

   a) 126   b) 480   c) 1 600   d) 15 120

8. Solve algebraically using factorial notation: $_nP_2 = 90$. (4 m)

9. Twelve buttons differ only by colour. There are 4 red buttons, 4 green buttons, and 4 yellow buttons. If the buttons are placed in a row, how many different arrangements are possible?

   a) 11 880   b) 34 650   c) 19 958 400   d) 479 001 600

10. How many different ways are there to arrange the letters in the word T S A W W A S S E N ?

   a) 25 200   b) 151 200   c) 302 400   d) 3 628 800

11. Moving only to the right or down, how many different paths are there from A to B?
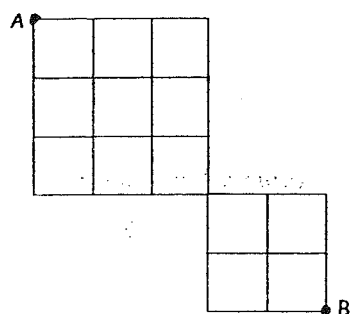
a) 26   b) 52

c) 120   d) 252

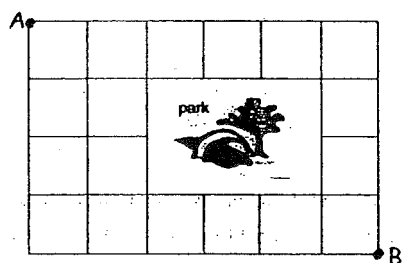12. Moving only to the right or down, how many different routes are there from A to B?
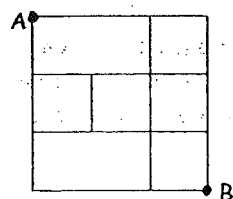
a) 10   b) 12

c) 14   d) 18

13. Determine the number of different arrangements of the letters in the word N A N A I M O .

a) 210   b) 1 260   c) 2 520   d) 5 040

14. The diagram below represents a street map. If a person can only travel east or south on the streets, how many different routes are there from A to B?

a) 60   b) 68

c) 80   d) 200

15. How many different ways can 7 chairs be arranged in a row if 2 of the chairs are blue, 3 are yellow, 1 is red, and 1 is green? (Assume that all of the chairs are identical except for colour.) (2m)

16. Moving only to the right or down, determine the number of different pathways from A to B.
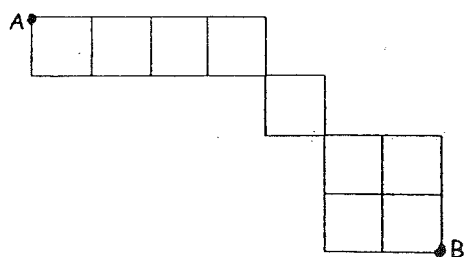
a) 13   b) 24

c) 60   d) 80

17. When playing the 6/49 lottery, a customer must choose 6 different numbers from 1 to 49 inclusive. How many combinations are possible?

    a) 49! b) $\frac{49!}{6!43!}$ c) $\frac{49!}{43!}$ d) $\frac{49!}{6!}$

18. From a class of 12 boys and 10 girls, a committee of 3 people is selected. How many different committees have at least 1 boy?

    a) 120 b) 540 c) 1 420 d) 1 540

Use the following information to answer questions 19 and 20.

The winner of a lottery chooses 4 vehicles from a warehouse that contains 12 different cars, 8 different trucks, and 5 different motorcycles.

19. How many different choices of 4 vehicles are possible?

    a) 480 b) 570 c) 12 650 d) 303 600

20. How many different choices of 4 vehicles are possible if there must be at least one car?

    a) 1 171 b) 3 432 c) 9 218 d) 11 935

Use the following information to answer questions 21 and 22.

A class of 14 students is made up of 6 girls and 8 boys. From this class, a group of 5 students is chosen to represent the class at a competition.

21. Determine the number of different groups of 5 that can be formed if there must be 2 girls and 3 boys in each group.

    a) 71 b) 560 c) 840 d) 10 080

22. Determine the number of different groups of 5 that can be formed if there must be at most 1 boy in each group.

    a) 23 b) 30 c) 120 d) 126

23. How many groups of 3 chairs can be chosen from 7 chairs if the chairs are all different colours? (2m)

24. A toy box contains 4 different cars and 6 different trucks.

    a) In how many ways can a collection of 5 toys be chosen if the collection must consist of 2 cars and 3 trucks? (2 m)

    b) In how many ways can a collection of 5 toys be chosen if the collection must consist of at least 3 cars? (2 m)

25. There are 7 boys and 5 girls in a group of students.

   a) Calculate the number of ways that a committee of 4 students can be chosen from this group if the committee must have exactly 1 boy.   (2 m)

   b) If the committee of 4 students must have a female president, a male vice-president, and 2 other members chosen from the remaining students, how many ways can such a committee be chosen? (2 m)

26. a) A theatre company of 13 actors consists of 8 men and 5 women. How many different ways are there to choose from the theatre company a group of 7 with exactly 3 men? (2 m)

   b) A theatre company of 13 actors consists of 8 men and 5 women. How many different ways are there to choose from the theatre company a group of 6 with at least 4 women? (2m)