PERMUTATIONS

Simplify

${}^5P_3 =$	${}^4P_2 =$	${}^9P_1 =$	${}^{10}P_{10} =$	${}^nP_4 =$
$5! =$	$\frac{7!}{6!} =$	$\frac{10!}{8!} =$	$\frac{n!}{(n-2)!} =$	

3 How many different arrangements can be made using three of the letters of the word SUNDAY?

4 In how many different ways can five people be arranged in a row?

A 20 **B** 60 **C** 120 **D** 720

6 How many different arrangements of the letters of the word MINOR are possible if:

(a) the two vowels are next to each other **(b)** the first and last letters are consonants?

10 Five different magazines and four different books are arranged in a row with the books standing together. Indicate whether each statement below is a correct or incorrect step in the calculation of the total number of arrangements.

(a) $5! \times 5!$ **(b)** $6! \times 4!$ **(c)** $9!$ **(d)** 17 280

13 How many numbers greater than 4000 can be formed using the digits 3, 5, 7, 8, 9 if repetition is not allowed?

PERMUTATIONS

15 In how many ways can five different Mathematics books, four different Physics books and two different Chemistry books be arranged on a shelf if the books in each subject must be together?

16 In how many ways can three doctors, three nurses and three patients be arranged in a row if the three patients must be together?

19 A car holds three people in the front seat and four in the back seat. In how many ways can seven people be seated in the car if two particular people must sit in the back seat and one particular person is the driver?

20 If ${}^{6}P_{r} = 120$, find the value of r.

23 A father, a mother and six children stand in a ring. In how many ways can they be arranged if the father and the mother do not stand together?

25 The ratio of the number of arrangements of $(2n + 2)$ different objects taken n at a time to the number of arrangements of $2n$ different objects taken n at a time is 14 : 5. Find the value of n.

26 If ${}^{2n}P_n = 8 \times {}^{2n-1}P_{n-1}$, find the value of n.

27 Prove from the formula for ${}^nP_r$ that: ${}^{n+1}P_r = {}^nP_r + r \times {}^nP_{r-1}$

28 Show that: ${}^{n}P_{r} = {}^{n-2}P_{r} + 2r \times {}^{n-2}P_{r-1} + r(r-1) \times {}^{n-2}P_{r-2}$

29 In how many ways can five writers and five artists be arranged in a circle so that the writers are separated? In how many ways can this be done if two particular artists must not sit next to a particular writer?

HSC 2018

8 Six men and six women are to be seated at a round table.

In how many different ways can they be seated if men and women alternate?

A. 5! 5!

B. 5! 6!

C. 2! 5! 5!

D. 2! 5! 6!

4. Combinatorics, EXT1 A1 2012 HSC 5 MC

How many arrangements of the letters of the word $OLYMPIC$ are possible if the C and the L are to be together in any order?

(A) $5!$

(B) $6!$

(C) $2 \times 5!$

(D) $2 \times 6!$

30. Combinatorics, EXT1 A1 2006 HSC 3c

Sophie has five coloured blocks: one red, one blue, one green, one yellow and one white. She stacks two, three, four or five blocks on top of one another to form a vertical tower.

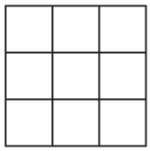
i. How many different towers are there that she could form that are three blocks high? ***(1 mark)***

ii. How many different towers can she form in total? ***(2 marks)***

PERMUTATIONS

HSC EXT 2017 (not permutations)

10 Three squares are chosen at random from the 3×3 grid below, and a cross is placed in each chosen square.



What is the probability that all three crosses lie in the same row, column or diagonal?

A. $\frac{1}{28}$

B. $\frac{2}{21}$

C. $\frac{1}{3}$

D. $\frac{8}{9}$

The probability that a particular type of seedling produces red flowers is $\frac{1}{5}$. Eight of these seedlings are planted.

a) Write an expression for the probability that none of the eight seedlings produces red flowers.

b) Write an expression for the probability that at least one of the eight seedlings produces red flowers.