

EXERCISE 1.3

- B 1. Evaluate each expression.
- (a) $P(5, 3)$ (b) $P(9, 5)$
 (c) $P(11, 7)$ (d) $P(6, 3)$
 (e) $P(8, 4)$ (f) $P(10, 8)$
2. Your calculator may have a key for calculating $P(n, r)$. Consult the manual to see how to use this key. (Remember the alternate notations, ${}_n P_r$ and n_{P_r} , either of which might appear on the key.) Repeat the calculations for Question 1 by using this key.
3. A ship carries four signal flags of different colours. How many different signals can be sent by hoisting these flags on the ship's flagpole in various orders?
4. How many three-digit numbers can be made from the digits 1 to 5 if:
 (a) repetition of digits is not allowed?
 (b) repetition of digits is allowed?
 (c) no repetition is allowed and the number must be greater than 500? List all numbers fitting this description.
 (d) repetition is allowed and the number must be less than 300?
5. In how many ways can a chairman, treasurer, and secretary be selected from a Board of Directors with eight members?
6. The manager of a baseball team has picked the nine players for the starting line-up. In how many ways can he set the batting order so that the pitcher bats last?
7. If 1000 people enter a contest in which there is a first prize, a second prize, and a third prize, in how many ways could the prizes be given?
8. Emilio has picked up his textbooks for the seven courses he will study this year. In how many ways can he arrange them on his bookshelf if he wants to keep the French and German texts side by side?
9. Twelve different portraits are in the Ling family's collection.
 (a) In how many ways could five of them be hung in a row on the living room wall?
 (b) If Grandma Ling's picture must be included and must be hung in the middle of the group of five, how many different arrangements are there?
10. In how many ways can three different awards be distributed among 20 students in the following situations?
 (a) No student may receive more than one award.
 (b) There is no limit on the number of awards won by one student.

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1. (a) 60 (b) 15 120 (c) 1 663 200 (d) 120
 (e) 1680 (f) 1 814 400
3. 24 4. (a) 60 (b) 125 (c) 12 (d) 50
5. 336 6. 40 320 7. 997 002 000
8. 1440 9. (a) 95 040 (b) 7920
10. (a) 6840 (b) 8000
12. (a) 40 320 (b) 5040 (c) 24 (d) 720