



**2018 Year 11 math topic test: Counting methods** © itute 2018

Q1 Find the exact value of each of the following expressions.

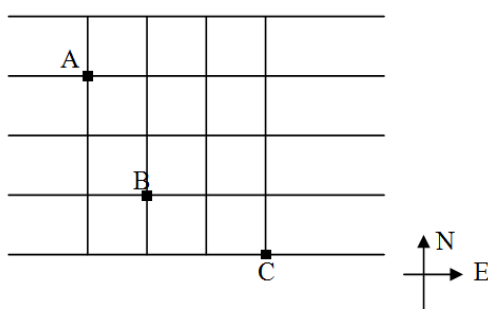
- a.  $0! \times 1!$  1 mark
- b.  ${}^{1000000000}C_1$  1 mark
- c.  $\frac{95!}{6! \times 89!}$  2 marks
- d.  ${}^{32}C_2 + {}^{32}C_3 + {}^{32}C_4 + \dots + {}^{32}C_{29} + {}^{32}C_{30}$  3 marks
- e.  ${}^{33}C_0 + {}^{33}C_1 + {}^{33}C_2 + \dots + {}^{33}C_{16} + {}^{33}C_{17}$  2 marks

Q2 From a group of students consisting of 55 girls and 45 boys, in how many ways can a school captain and a vice captain be chosen if at least one is a girl?

4 marks

Q3 The diagram below shows a network of paths. A, B and C are three particular intersections. In how many ways can a person travel either **east** or **south** only at each intersection along the paths from point A to point C if the person is not allowed to pass through intersection B?

4 marks





Q4 Arrange 4 different brown chairs and 4 different green chairs in a circle.

a. In how many ways can it be done so that no chairs of the same colour are together? 3 marks

b. In how many ways can it be done so that **exactly** 2 chairs of the same colour are together? 3 marks

Q5 Simplify  $\frac{(n-2)! \times (n+1)!}{n! \times (n+2)!}$ . 3 marks

Q6 3 different books and 2 identical books are to be arranged in a bookcase which has 2 shelves.

a. In how many ways can it be done if any number of books can be placed on each shelf? 2 marks

b. In how many ways can it be done if each shelf must have at least 2 books? 3 marks



Q7 Consider the ten letters in the two words HIGH SCHOOL.

a. Find the number of combinations of **two** letters in the two words. 2 marks

b. Find the number of combinations of **two different** letters in the two words. 2 marks

c. Find the number of different arrangements of **all** the letters in the two words. 2 marks

d. Find the number of different arrangements of **five** letters in the two words. 3 marks

Q8 Find the number of possible sum of money if a person can take **two or more** coins at the same time out of a bag containing a 5<sup>c</sup> coin, a 10<sup>c</sup> coin, a 20<sup>c</sup> coin, a 50<sup>c</sup> coin a \$1 coin and a \$2 coin.

3 marks



Q9 Solve equation  $(n-3)(n-5)(n-7)(n-9) = 384384$  for  $n$ .

3 marks

Q10 How many non-negative integer solutions are there for the linear equation  $x + y + z = 13$  with three variables  $x$ ,  $y$  and  $z$ ? For examples,  $(0, 9, 4)$  and  $(4, 0, 9)$  are two possible solutions.

4 marks