# Counting and statistics - Reasoning test 4

Name: _____ Date: _____

10 questions | 51 marks | 70 minutes

Explain methods, reverse calculations and challenge misleading conclusions. Supplied normal values may be used without further tables.

Use a graphics calculator or appropriate digital tool for labelled tasks.

**1.** A code has 3 letters chosen from A-E, followed by 2 digits 0-9. Repetition is allowed. [5 marks]

**(a)** Count the codes. [2 marks]

**(b)** How many codes have different letters and different digits? [3 marks]

**2.** Six cards show the letters B,A,N,A,N,A. [6 marks]

**(a)** Count distinct rows of all six cards. [3 marks]

**(b)** Count distinct rows that begin and end with A. [3 marks]

**3.** A club has $n$ members. It can choose a president and a different secretary in 56 ways. [5 marks]

**(a)** Form an equation and find $n$. [3 marks]

**(b)** How many unordered pairs can be chosen from the club? [2 marks]

**4.** Consider $(x-2)^5$. [5 marks]

**(a)** Find the coefficient of $x^2$. [3 marks]

**(b)** Without expanding, find the sum of its coefficients. [2 marks]

**5.** A sports survey asks only spectators at a basketball final whether the school should build another basketball court. [5 marks]

**(a)** Explain why the sample may be biased. [2 marks]

**(b)** Would selecting a random 100 spectators solve the population-coverage problem? Explain. [3 marks]

**6.** A sample of 8 has mean 12. Seven observed values sum to 77. [4 marks]

**(a)** Find the missing observation. [2 marks]

**(b)** If 19 is replaced by 3, find the new mean and describe the direction of change. [2 marks]

**7.** Data A are 0,2,4,6,8,10,12,14. Data B are 0,2,4,5,9,10,12,14. [6 marks]

**(a)** Find the five-number summary of each using median-of-halves. [3 marks]

**(b)** Do these equal summaries guarantee equal standard deviations? Explain. [3 marks]

**8.** A set of measurements has sample mean 18°C and $s = 2$°C. A new scale reports $F = 1.8C + 32$. [5 marks]

**(a)** Find the new mean. [2 marks]

**(b)** Find the new standard deviation and explain why 32 does not affect it. [3 marks]

**9.** $X$ is normally modelled with mean 75 and sd 10. Supplied $\Phi(1.2) = 0.88493$, $\Phi(-0.8) = 0.21186$. [5 marks]

**(a)** Find $P(67 < X < 87)$. [3 marks]

**(b)** Find the expected number outside this interval in a sample of 200. [2 marks]

**10.** A normal model has 10th percentile 41.03 and 90th percentile 58.97. The relevant standard-normal cutoffs are $\pm 1.28155$. [5 marks]

**(a)** Find the mean. [2 marks]

**(b)** Estimate the standard deviation. [3 marks]