Name:	School:	Marks:

Instructions: Write your name and that of your school in the boxes above. For rough work, you may use your notebook. This question paper is also the answer script. Turn it in but not any rough work.

Each of the first 10 questions below requires only a short answer. Write your answer clearly in the box provided (after the ‡ prompt). The last question—see overleaf—demands a slightly longer answer. Attempt this only after you're finished with the first 10, for your response to question 11 may not even be looked at if your score on the first 10 is below a threshold.

In all likelihood, there are more questions than you can reasonably finish in the allotted time. Do as many as you can without feeling tense. This question paper will be posted on the web page of the workshop and you are encouraged to work them out at home later. The purpose of the quiz is to get you to think about the concepts covered in the lectures, not at all to grade you.

1. How many edges does a tetrahedron have?

   ‡

2. Which has more edges? The icosahedron or the dodecahedron?

   ‡

3. A box has 3 red, 4 green and 5 white balls. One ball is drawn at random from the box.

   (a) What is the probability that the ball drawn is red?

   ‡

   (b) Given that the ball is not red, what is the conditional probability that the ball is green?

   ‡

4. Write down the prime factorization of 25! (the factorial of 25)

   ‡

5. Write the following sentences using the connectives *not*, *and*, *or*, *if* $\cdots$ *then*, *iff* and quantifiers *for each* and *there exists*:

   (a) All real numbers are not rational numbers.

   ‡

   (b) If there exists a rational number, then it is a real number.

   ‡

6. Let $A = \{1, \ldots, n\}$. Let $O = \{X \subseteq A : |X| \text{ is odd}\}$;. Define a function $g : O \to \mathcal{P}(A)$ as follows: For $X \in O$, let

$$g(X) = \begin{cases} X \cup \{1\} & \text{if } 1 \notin X \\ X \setminus \{1\} & \text{if } 1 \in X. \end{cases}$$

   What is the range of the function g ?

   ‡

7. What is the distance between the opposite vertices of a regular octahedron whose side has length 1?

   ‡

8. If θ is the interior angle between face planes of a regular tetrahedron, what is $\tan\theta$?

   ‡

Please turn page over.

9. A box has 3 red and 5 green balls. One ball is drawn at random from the box, its colour noted and put back in the box. One ball of that colour is added to the box. Now one ball is drawn at random from the box.

   (a) What is the probability that the second ball drawn is red? ‡

   (b) Given that the second ball is red what is the conditional probability that the first ball was red ? ‡

10. Let $f : A \to B$ be a one-one map. Let $X \subseteq A$. Which of the following are True statements ? ‡

    (a) $f(A \setminus X)$ is a proper subset of $f(A) \setminus f(X)$.

    (b) $f(A) \setminus f(X)$ is a proper subset of $f(A \setminus X)$.

    (c) $f(A \setminus X) = f(A) \setminus f(X)$.

    (d) None of the above are True.

11. Is $0.999999\cdots = 1$? Justify your answer in *two* ways.