AUSTRALIAN MATHEMATICS COMPETITION
WARM-UP PAPER
SENIOR 7

Questions 1 - 4, 3 marks each

1. If $3^{x+1} = 81$ then x equals

(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

2. $\dfrac{m}{m-n} + \dfrac{n}{n-m}$ is equal to

(A) $n^2 - m^2$ (B) $2mn$ (C) $\dfrac{mn + m^2 + n^2m^2}{m^2 - n^2}$ (D) 1 (E) $m - n$

3. George lives in a street with 12 houses. Every day he gets more letters than are delivered to any other home. Today 57 letters were delivered to his street. The number of letters delivered to George must have been at least

(A) 3 (B) 4 (C) 5 (D) 6 (E) 7

4. If $f(x) = \dfrac{1}{1+x}$ then $f(f(x))$ is

(A) $\dfrac{1}{(1+x)^2}$ (B) $\dfrac{1+x}{2+x}$ (C) 1 (D) $\dfrac{1}{2+x}$ (E) $\dfrac{2+x}{1+x}$

Questions 5 - 8, 4 marks each

5. A mushroom farmer has sent an order of 70 kg of mushrooms to the markets in standard cases. If he had used larger cases, each capable of holding 2 kg more, he would have used 4 fewer cases. The capacity of the standard case, in kilograms, is

(A) 2 (B) 5 (C) 7 (D) 10 (E) 14

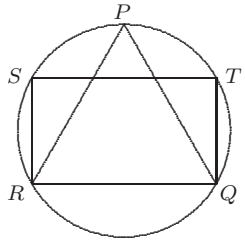
6. A golf ball is hit onto a circular green of radius 12 m. Assuming that all landing positions are equally likely, what is the probability that it lands less than 1 m from the hole (which is at least one metre from the edge of the green)?

(A) $\frac{1}{12}$ (B) $\frac{7}{12}$ (C) $\frac{11}{42}$ (D) $\frac{1}{24}$ (E) $\frac{1}{144}$

7. The average of n numbers is k. When another number x is added to the set, the average increases by 1. The value of x is

(A) $k+n+1$ (B) $k+1$ (C) n (D) $k+n$ (E) $\frac{n(k+1)}{n+1}$

8. A circle of radius 1 unit has an equilateral triangle PQR inscribed in it.



The points S and T are points on the circle such that $QRST$ is a rectangle.

The area, in square units, of the rectangle is

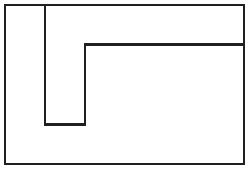
(A) 3 (B) $\frac{3}{2}$ (C) 2 (D) $\frac{\sqrt{3}}{2}$ (E) $\sqrt{3}$

Questions 9 - 10, 5 marks each

9. How many ways are there of choosing 3 different numbers in increasing order from $\{1, 2, 3, \ldots, 10\}$ so that no two of the numbers are consecutive?

(A) 20 (B) 48 (C) 56 (D) 54 (E) 72

10. A rectangle is cut by segments parallel to its sides into a hexagon and an octagon as shown in the diagram (not drawn to scale).



The lengths of the sides of the octagon are 1, 2, 3, 4, 5, 6, 7 and 8 units in some order. The maximum area, in square units, of the hexagon is

(A) 24 (B) 27 (C) 30 (D) 33 (E) 36