AUSTRALIAN MATHEMATICS COMPETITION
WARM-UP PAPER
SENIOR 9

Questions 1 - 4, 3 marks each

1. The value of

$$\frac{\sqrt{8}-\sqrt{2}}{\sqrt{2}}$$

is

(A) $2-\sqrt{2}$ (B) $\sqrt{3}$ (C) $\sqrt{8}-1$ (D) 1 (E) 2

2. Given that

$$P = 1 - \sqrt{\frac{Q}{R}},$$

then Q equals

(A) $\dfrac{(P-1)^2}{R}$ (B) $R(1-P)^2$ (C) $R(1-P^2)$

(D) $RP^2 - R$ (E) $\dfrac{1-P^2}{R}$

3. The equation of the straight line passing through $(3,5)$ perpendicular to $3x+y=6$ is

(A) $3y+x=6$ (B) $3y-x-12=0$ (C) $3y+x=18$

(D) $3y+x+6=0$ (E) $3y-x-18=0$

4. If $p+q=n$ and

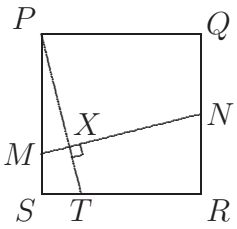
$$\frac{1}{p}+\frac{1}{q}=m,$$

where p and q are both positive, then $(p-q)^2$ equals

(A) n^2 (B) n^2-m (C) $\dfrac{n^2-m}{n}$ (D) $\dfrac{mn^2-4n}{m}$ (E) n^2-4mn

Questions 5 - 8, 4 marks each

5. $PQRS$ is a square of side 12 cm. T is a point on RS such that $ST = 5$ cm. MN is perpendicular to PT and intersects PT at X. If $MX = 4$ cm then the length of XN, in centimetres, is



(A) 5 (B) 7 (C) 13 (D) 9 (E) 11

6. Maria is about to travel on a bus, and she knows she must tender the exact fare. She is not sure what this is, but she knows it is greater than \$1.00 and less than \$3.00. What is the minimum number of coins she must carry to be sure of carrying the correct fare? (Assume that the available coins are 1c, 2c, 5c, 10c, 20c, 50c, \$1 and \$2.)

(A) 6 (B) 7 (C) 8 (D) 9 (E) 10

7. In a series of 5 games to be played between 2 equally matched teams, the first team to win 3 games becomes the champion. Team A has won the first game. The probability that team A will be the champion is

(A) $\frac{3}{5}$ (B) $\frac{11}{16}$ (C) $\frac{1}{2}$ (D) $\frac{13}{16}$ (E) $\frac{9}{16}$

8. The maximum value of the expression $ab + bc + db + dc$ if a, b, c and d are replaced by 2, 4, 6 and 8 in any order is

(A) 144 (B) 120 (C) 116 (D) 96 (E) 108

Questions 9 - 10, 5 marks each

9. The area of the set of points (x, y) defined by

$$|2x - 3y| \leq 12 \quad \text{and} \quad |2x + 3y| \leq 12$$

is

(A) 24 (B) 144 (C) 72 (D) 48 (E) 96

10. An astronaut lands on the equator of a spherical asteroid. He travels due north 100 km, without reaching the pole, then east 100 km, then south 100 km. He does not pass the same point more than once, and finds that he is due east of his original starting point by 200 km. How many kilometres would he now need to travel by continuing his journey in an easterly direction in order to reach his original starting point?

(A) 200 (B) 300 (C) 400 (D) 500 (E) 600