

AP MATHEMATICS
GRADE 12
PRELIMINARY EXAMINATION
PAPER 2
31 July 2019

QUESTION 1

1.1 a) $\binom{17}{11} = 12\,376$ ✓ (2)

b) $\frac{\binom{10}{6} \binom{7}{5}}{\binom{17}{11}} = 0,3563$ ✓ (4)

1.2 $\frac{7! \cdot 8P_4}{11!} = \frac{7}{33}$ or $0,2121$ ✓

1.3 $1 - \frac{\binom{13}{0} \binom{39}{12}}{\binom{52}{12}} - \frac{\binom{13}{1} \binom{39}{11}}{\binom{52}{12}}$ (6)

$= 1 - 0,0189495 \dots - 0,10557607 \dots$

$= 0,8755$ ✓

(8)
[20]

QUESTION 2

2.1 a) $E[X]$

$$= \left(3 \times \frac{5}{18}\right) + \left(4 \times \frac{6}{18}\right) + \left(5 \times \frac{7}{18}\right)$$

$$= 4,1111 \quad \text{OR} \quad \frac{37}{9}$$

(4)

b) $\text{Var}[X]$

$$= \left(3^2 \times \frac{5}{18}\right) + \left(4^2 \times \frac{6}{18}\right) + \left(5^2 \times \frac{7}{18}\right) - \left(\frac{37}{9}\right)^2$$

$$= \frac{158}{9} - \frac{1369}{81}$$

$$= 0,6543 \quad \text{OR} \quad 0,6544$$

(5)

2.2

$$\int_0^M (0,75 - 0,25x) dx = 0,5$$

$$\left[0,75x - 0,125x^2\right]_0^M = 0,5$$

$$0,75M - 0,125M^2 = 0,5$$

$$0,125M^2 - 0,75M + 0,5 = 0$$

$$M = 0,7639$$

(8)

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QUESTION 3

$$\begin{aligned} 3.1 \quad & P(X > 155) \checkmark \\ &= P\left(Z > \frac{155 - 153}{1,6}\right) \checkmark \\ &= P(Z > 1,25) \checkmark \\ &= 0,5 - 0,3944 \checkmark \\ &= 0,1056 \checkmark \end{aligned}$$

(6)

$$\begin{aligned} 3.2 \quad & P(X > 150) \\ &= P\left(Z > \frac{150 - 153}{1,6}\right) \checkmark \\ &= P(Z > -1,875) \checkmark \\ &= 0,5 + 0,4699 \checkmark \\ &= 0,9699 \checkmark \end{aligned}$$

$$\begin{aligned} & \binom{12}{10} (0,9699)^{10} (0,0301)^2 \checkmark \\ &= 0,0441 \checkmark \end{aligned}$$

(9)

$$\begin{aligned} 3.3 \quad & \frac{0,75}{2} = 0,375 \checkmark \\ & Z = 1,15 \checkmark \end{aligned}$$

$$1,15 = \frac{X - 153}{1,6} \checkmark$$

$$X = 154,84 \checkmark$$

$$\therefore 153 + b = 154,84 \checkmark \text{ and } b = 1,84 \checkmark$$

(3)

(6)
[21]

QUESTION 4

$$4.1 \quad \binom{40}{6} (0,15)^6 (0,85)^{34} \quad \checkmark$$

$$= 0,1742 \quad \checkmark \checkmark$$

(6)

$$4.2 \quad \mu = E[X] = 40(0,15) \quad \checkmark$$

$$= 6 \quad \checkmark$$

$$\sigma_x = \sqrt{\text{Var}[X]} = \sqrt{40(0,15)(0,85)} \quad \checkmark$$

$$= 2,2583 \quad \checkmark$$

(4)

$$4.3 \quad P(3,5 < X < 9,5) \quad \checkmark$$

$$= P\left(\frac{3,5-6}{2,2583} < z < \frac{9,5-6}{2,2583}\right) \quad \checkmark$$

$$= P(-1,11 < z < 1,55)$$

$$= 0,3665 + 0,4394$$

$$= 0,8059 \quad \checkmark$$

(6)

[16]

QUESTION 5

$$5.1 \quad a) \quad \bar{x} = 909,2 \quad \checkmark \checkmark \quad z = \pm 1,96 \quad \checkmark$$

$$909,2 \pm 1,96 \left(\frac{2,2}{\sqrt{81}}\right) \quad \checkmark$$

$$\left(907,6755 ; 910,7245\right)$$

(4)

(6)

$$b) \quad 910,32 - 909,2 \\ = 1,12 \checkmark$$

$$z \left(\frac{2,2}{\sqrt{81}} \right) = 1,12 \checkmark$$

$$z = 1,44 \checkmark \checkmark$$

$$0,4251 \times 2 = 0,8502 \checkmark$$

$$\therefore \infty = 85,02 \checkmark$$

(6)

5.2

$$\frac{0,98}{2} = 0,49 \checkmark \quad z = 2,33 \checkmark$$

$$2,33 \sqrt{\frac{(0,3)(0,7)}{n}} = 0,05 \checkmark$$

$$n = 456,0276 \checkmark \checkmark$$

$$\therefore n = 457 \checkmark$$

(6)

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QUESTION 6

$$\{ (B_1, B_2); (B_1, C_2); (C_1, B_2); (C_1, C_2) \} \checkmark \checkmark$$

$$\therefore P(B_1 \cap B_2) = \frac{1}{4} \checkmark$$

$$\text{and } P(B) = \frac{3}{4} \checkmark$$

$$P(B_2 | B_1) = \frac{\frac{1}{4}}{\frac{3}{4}} \checkmark \checkmark$$

$$= \frac{1}{3} \checkmark \checkmark$$

(8)

[8]