

AP MATHEMATICS
GRADE 12
PRELIMINARY EXAMINATION
PAPER 2
23 SEPT. 2020

QUESTION 1

1.1 (a)
$$\frac{\binom{5}{2} \binom{8}{1}}{\binom{13}{3}} \checkmark$$

$$= \frac{40}{143} \checkmark \checkmark \text{ or } 0,2797$$

(5)

(b)
$$\binom{8}{13} \binom{5}{12} \binom{7}{11} + \binom{8}{13} \binom{5}{12} \binom{4}{11} +$$

$$\binom{5}{13} \binom{4}{12} \binom{8}{11} + \binom{5}{13} \binom{4}{12} \binom{3}{11} \checkmark$$

$$= \frac{5}{13} \checkmark \checkmark \text{ or } \binom{8}{13} \binom{5}{12} + \binom{5}{13} \binom{4}{12} = \frac{5}{13} \checkmark \checkmark \checkmark$$

(7)

1.2 (a)
$$40 \times 0,08 \checkmark$$

$$= 3,2 \checkmark$$

(2)

(b)
$$P(X \leq 6)$$

$$= 1 - P(X=7) - P(X=8) \checkmark$$

$$= 1 - \binom{8}{7} (0,36)^7 (\checkmark \checkmark 0,64)^1 - \binom{8}{8} (0,36)^8 (\checkmark \checkmark 0,64)^0$$

$$= 0,9957 \checkmark \checkmark$$

(7)

$$(c) \quad \mu = 180(0,56) \checkmark \\ = 100,8 \quad \checkmark$$

$$\sigma = \sqrt{180(0,56)(0,44)} \checkmark \\ = 6,6597 \quad \checkmark$$

$$z = \frac{110,5 - 100,8}{6,6597} \checkmark \\ = 1,46 \quad \checkmark$$

$$P(z > 1,46) = 0,5 - 0,4279 \checkmark \\ = 0,0721 \quad \checkmark$$

(8)

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QUESTION 2

$$2.1 (a) \quad \mu = E[X] = 1\left(\frac{3}{38}\right) + 2\left(\frac{6}{38}\right) + 3\left(\frac{11}{38}\right) + 4\left(\frac{18}{38}\right) \checkmark \\ = \frac{60}{19} \text{ or } 3,1579 \quad \checkmark$$

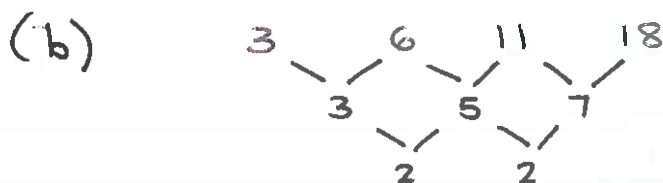
$$\sigma = \sqrt{\text{Var}[X]} \quad \checkmark$$

$$= \sqrt{1\left(\frac{3}{38}\right) + 4\left(\frac{6}{38}\right) + 9\left(\frac{11}{38}\right) + 16\left(\frac{18}{38}\right) - \left(\frac{60}{19}\right)^2} \checkmark \checkmark$$

$$= \sqrt{\frac{333}{361}}$$

$$= 0,9604 \quad \checkmark$$

(6)



$$2a = 2$$

$$a = 1 \quad \checkmark$$

$$3(1) + b = 3$$

$$b = 0 \quad \checkmark$$

$$1 + c = 3$$

$$c = 2 \quad \checkmark$$

$$P(X=x) = \begin{cases} \frac{1}{38} (x^2+2) & \text{for } x \in \{1; 2; 3; 4\} \\ 0 & \text{otherwise} \end{cases} \quad (7)$$

$$2.2 \quad \int_0^k \left(-\frac{3}{16} x^2 + \frac{3}{4} \right) dx = 1 \quad \checkmark \checkmark$$

$$\left[-\frac{1}{16} x^3 + \frac{3}{4} x \right]_0^k = 1 \quad \checkmark \checkmark$$

$$-\frac{1}{16} k^3 + \frac{3}{4} k - 0 = 1 \quad \checkmark$$

$$-\frac{1}{16} k^3 + \frac{3}{4} k - 1 = 0 \quad \checkmark$$

$$k = 2 \text{ years} \quad \checkmark \checkmark$$

(8)

[21]

QUESTION 3

$$3.1 \quad P(z < k) = 0,8$$

$$P(0 < z < k) = 0,3 \quad \checkmark$$

$$k = 0,84 \quad \checkmark \checkmark$$

$$0,84 = \frac{120 - 90}{\sigma} \quad \checkmark$$

$$0,84 \sigma = 30 \quad \checkmark$$

$$\sigma = 36 \text{ minutes} \quad \checkmark$$

(6)

$$3.2 \quad P(z < k) = 0,05$$

$$P(k < z < 0) = 0,45 \quad \checkmark$$

$$k = -1,645 \quad \checkmark \checkmark$$

$$-1,645 = \frac{X - 90}{36} \quad \checkmark$$

$$X = 30,78 \text{ minutes} \quad \checkmark \checkmark$$

(6)
[12]

QUESTION 4

$$4.1 \quad (a) \quad \frac{1023,3 + 1101,7}{2} \quad \checkmark$$

$$= 1062,5 \quad \checkmark$$

(2)

$$(b) \quad \frac{0,95}{2} = 0,475 \quad \checkmark$$

$$Z = 1,96 \quad \checkmark \checkmark$$

$$1062,5 - 1,96 \left(\frac{\sigma}{\sqrt{36}} \right) = 1023,3 \quad \checkmark \checkmark$$

$$\frac{\sigma}{6} = 20 \quad \checkmark$$

$$\sigma = 120 \text{ hours} \quad \checkmark \checkmark$$

(8)

$$4.2 \quad \frac{0,98}{2} = 0,49 \quad \checkmark$$

$$Z = 2,33 \quad \checkmark \checkmark$$

$$2,33 \sqrt{\frac{0,15(0,85)}{n}} = 0,05 \quad \checkmark \checkmark$$

$$n = 277 \text{ people} \quad \checkmark \checkmark \checkmark$$

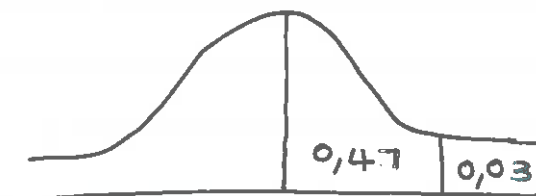
(8)

4.3

$$H_0 : \mu = 920 \checkmark \checkmark$$

$$H_1 : \mu > 920 \checkmark \checkmark$$

Rejection Region:



$$z = 1,88 \checkmark \checkmark$$

Test statistic: $z = \frac{973,40 - 920}{\frac{150}{\sqrt{45}}} \checkmark$

$$= 2,3881 \checkmark$$

$\therefore$ I reject H_0 at a 3% l.o.s. $\checkmark$
 The students' claim is supported $\checkmark$

(10)

[28]

QUESTION 5

$$5.1 \quad 7! \checkmark = 5040 \checkmark$$

(2)

$$5.2 \quad \begin{array}{ccccccc} G & B & B & G & B & B & G \\ 3 & 4 & 3 & 2 & 2 & 1 & 1 \\ B & G & B & G & B & G & B \\ 4 & 3 & 3 & 2 & 2 & 1 & 1 \\ B & B & G & G & G & B & B \\ 4 & 3 & 3 & 2 & 1 & 2 & 1 \end{array} \left. \vphantom{\begin{array}{ccccccc} G & B & B & G & B & B & G \\ 3 & 4 & 3 & 2 & 2 & 1 & 1 \\ B & G & B & G & B & G & B \\ 4 & 3 & 3 & 2 & 2 & 1 & 1 \\ B & B & G & G & G & B & B \\ 4 & 3 & 3 & 2 & 1 & 2 & 1 \end{array}} \right\} 3 \checkmark \checkmark \checkmark \text{ ways}$$

$$\checkmark 3 \left(\checkmark 3! \times \checkmark 4! \right) = 432 \checkmark \checkmark$$

(5)

(8)
[10]