

## GRADE 12 AP PREVM STATS

### Question 1

$$(a) \bar{x} = \frac{67}{10} = 6,7 \quad \checkmark$$

$$\bar{y} = \frac{2745}{10} = 274,5 \quad \checkmark \quad (2)$$

$$(b) b = \frac{n \sum xy - \sum x \sum y}{n(\sum x^2) - (\sum x)^2} = \frac{10(13470) - (67)(2745)}{10(553) - (67)^2} \checkmark$$

$$= \frac{-49195}{1041} = -47,26 \checkmark$$

$$y = a + bx$$

$$\text{subst } (\bar{x}; \bar{y}) \therefore 274,5 = a - 47,26(6,7) \checkmark \checkmark$$

$$\therefore a = \underline{591,12} \checkmark$$

$$\therefore \underline{y = 591,12 - 47,26x} \quad (b)$$

(c) R 591 120  $\checkmark$  not valid as model is for 2<sup>nd</sup>  $\checkmark$   
hand cars (NOT new cars), Extrapolation (2)

### QUESTION 2

$$(a) \int_0^5 q(15-2x) dx = 1 \quad \checkmark$$

$$q \left[ 15x - \frac{2x^2}{2} \right]_0^5 = 1$$

$$q \left[ (15(5) - (5)^2) - (0) \right] = 1$$

$$50q \checkmark = 1$$

$$q = \frac{1}{50} = 0,02 \checkmark$$

$$(b) \int_0^{2,5} 0,02(15-2x) dx = 0,02 \left[ 15x - x^2 \right]_0^{2,5}$$

$$= 0,02 \left[ (15(2,5) - (2,5)^2) - (0) \right]$$

$$= 0,02 (31,25)$$

$$= \frac{5}{8} = \underline{0,625} \checkmark$$

$$(c) \int_0^m 0,02(15-2x) dx = 0,5 \checkmark$$

$$0,02 \left[ 15x - x^2 \right]_0^m \checkmark = 0,5$$

$$15m - m^2 = 25$$

$$m^2 - 15m + 25 = 0 \checkmark$$

$$m = 13,09$$

not valid

$$m = \underline{1,91} \checkmark$$

### Question 3



$$\begin{aligned}
 P(\text{late}) &= 0,2(0,1 \times 0,4) + 0,8(0,9 \times 0,4) \\
 &= 0,008 + 0,288 \\
 &= \underline{0,296} \quad (3)
 \end{aligned}$$

#### QUESTION 4

$$(a) \binom{7}{2} = \underline{21} \quad (2)$$

$$(b) \binom{13}{3} \binom{10}{4} \binom{6}{6} = \underline{60060} \quad (4)$$

$$(c) \binom{10}{2} \binom{8}{3} \binom{5}{5} = \underline{2520} \quad (4)$$

$$\therefore \text{probability} = \frac{0,04196}{\underline{0,0420}} \quad (5)$$

#### QUESTION 5

$$\begin{aligned}
 (a)(i) P(X=2) &= \binom{50}{2} 0,03^2 0,97^{48} \\
 &= \underline{0,2555} \quad (3)
 \end{aligned}$$

$$\begin{aligned}
 (a) P(X \geq 1) &= 1 - P(X=0) \\
 &= 1 - \binom{50}{0} 0,03^0 0,97^{50} \\
 &= \underline{0,7819} \quad (4)
 \end{aligned}$$

$$(b) 200 \times 50 \times 0,03 = \underline{300} \text{ faulty} \quad (2)$$

#### QUESTION 6

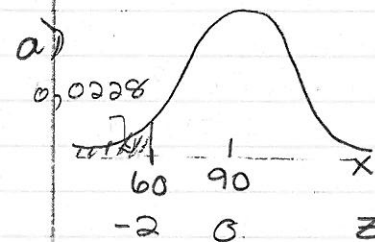
20 8 black  
12 white

$$(a) P(X=4) = \frac{\binom{12}{4} \binom{8}{2}}{\binom{20}{6}} = \underline{0,3576} \quad (3)$$

$$\begin{aligned}
 (b) & \frac{6b0w + 5b1w + 4b2w + 3b3w}{\binom{20}{6}} \\
 & \frac{\binom{8}{6} \binom{12}{0} + \binom{8}{5} \binom{12}{1} + \binom{8}{4} \binom{12}{2}}{\binom{20}{6}} \\
 & = \frac{5320}{38760} = \underline{0,1373} \quad (3)
 \end{aligned}$$

#### QUESTION 7

$$\begin{aligned}
 \mu &= 90 \text{ months} \\
 \sigma &= 15 \text{ months}
 \end{aligned}$$



$$5 \text{ years} = 60 \text{ months}$$

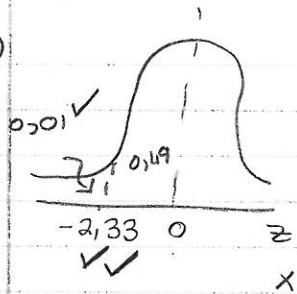
$$z = \frac{x - \mu}{\sigma} = \frac{60 - 90}{15}$$

$$z = -2 \quad (3)$$

$$\begin{aligned}
 \therefore P(X \leq 60) &= P(Z \leq -2) = 0,5 - 0,4772 \\
 &= \underline{0,0228} \quad (3)
 \end{aligned}$$

$$\therefore \underline{2,28\%} \text{ fail} \quad (2)$$

(b)



$$z = \frac{x - \mu}{\sigma}$$

$$-2,33 = \frac{x - 90}{15} \quad \checkmark \checkmark$$

$$x = 55,05 \text{ months} \quad \checkmark$$

$$= \underline{44107 \text{ months}} \quad \checkmark$$

(7)

QUESTION 8

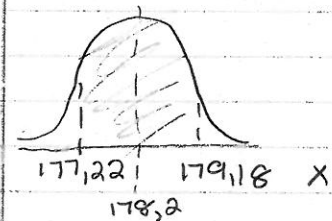
$$n = \frac{z^2 \sigma^2}{d^2} = \frac{z^2 p(1-p)}{d^2}$$

$$= \frac{(1,96)^2 \cdot 0,15 \cdot (0,85)}{0,02^2} \quad \checkmark \checkmark \checkmark$$

$$= 1224,51 \quad \checkmark$$

$$\therefore \underline{1225 \text{ people}} \quad \checkmark$$

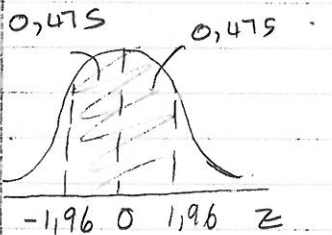
(6)

QUESTION 9

$$a) \bar{x} = \frac{177,22 + 179,18}{2}$$

$$= \underline{178,2} \quad \checkmark \checkmark$$

(2)

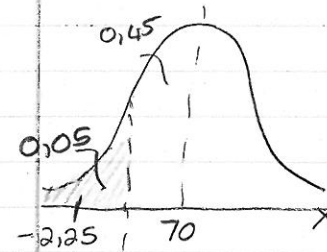


$$b) z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$1,96 = \frac{179,18 - 178,2}{\frac{\sigma}{\sqrt{10}}} \quad \checkmark$$

$$\therefore \sigma = 5 \quad \checkmark$$

(4)

QUESTION 10

$$\mu = 70$$

$$\sigma = 6$$

$$H_0: \mu = 70 \quad \checkmark$$

$$H_1: \mu < 70 \quad \checkmark$$

$$\text{critical value} = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$= \frac{67,3 - 70}{\frac{6}{\sqrt{25}}} \quad \checkmark$$

$$= \underline{-2,25} \quad \checkmark$$

one tail test

$\therefore$  Critical value lies in rejection region  $\therefore$  reject  $H_0$ , ie accept that at the 5% level significance that the mean mark is lower