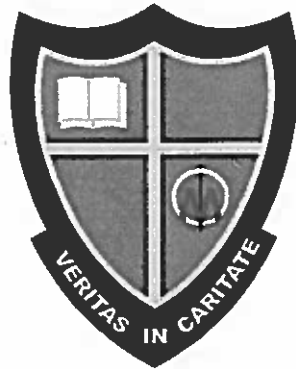


# ST BENEDICT'S COLLEGE

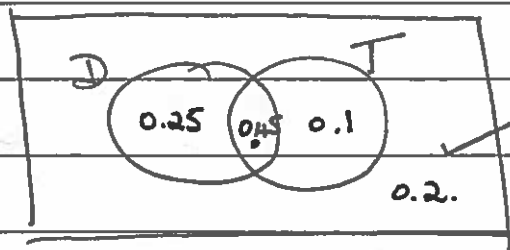
## Answer Booklet



Name	MEMO
Grade & Homeroom class (eg: 12 F)	
Date	
Subject	GRADE 12 AP PAPER 2
Teacher	STATS

Book ..... of .....

# QUESTION 1



$$a) P(D \cup T) = 0.25 + 0.45 + 0.1 = 0.8$$

or

$$P(D \cup T) = P(D) + P(T) - P(D \cap T) \quad \text{or} \quad (3)$$

$$= 0.7 + 0.55 - 0.45$$

$$= 0.8$$

$$b) 0.25 + 0.1 = 0.35 \quad (2)$$

$$c) P(D|T) = \frac{P(D \cap T)}{P(T)} = \frac{0.45}{0.55} = \frac{9}{11} \quad (3)$$

$$d) P(D) = 0.7 \quad P(T) = 0.55 \quad P(D) \times P(T) = 0.385$$

$$P(D \cap T) = 0.45$$

$$\therefore P(D) \times P(T) \neq P(D \cap T)$$

$\therefore$  Not independent.

$$e) 0.7 \times 0.55 \times 0.65 \times 0.45 = 0.1126 \quad (2)$$

$$f) 0.3 \times 0.45 \times 0.35 \times 0.55 \quad (2)$$

$$= 0.026$$

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### Question 2

$$a) \binom{30}{2} (0.06)^2 (0.94)^{28} = 0,2769 \quad (4)$$

$$b) \binom{50}{7} (0.15)^7 (0.85)^{43} + \binom{50}{8} (0.15)^8 (0.85)^{42} + \binom{50}{9} (0.15)^9 (0.85)^{41} \\ = 0.4298 \quad (5)$$

9 marks

### Question 3

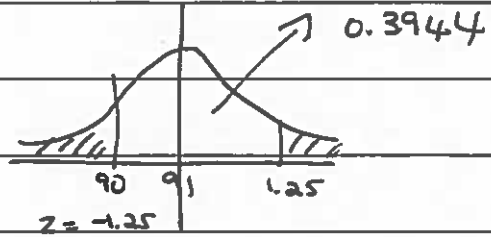
$$\binom{14}{5} \binom{9}{2} \binom{7}{3} \binom{4}{4} = \underline{2522520} \quad (6)$$

6 marks

### Question 4

a)  $X \sim (91; 0.8^2)$  ✓

i)  $P(X < 90)$  ✓



$$Z = \frac{X - \mu}{\sigma}$$
$$= \frac{90 - 91}{0.8}$$
$$= -1.25$$

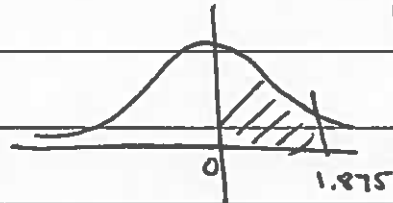
$$P(X < 90) = P(Z < -1.25) = 0.5 - 0.3944$$
$$= 0.1056 \quad \checkmark \quad (6)$$

ii)  $P(X \neq 90) = 1$  ✓ (2)

iii)  $P(91 < X < 92.5)$

$$= P(0 < Z < 1.875)$$
$$= 0.46996 \quad \checkmark$$

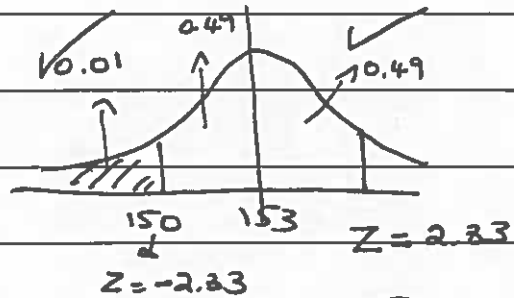
$$Z = \frac{92.5 - 91}{0.8}$$
$$= 1.875$$



b)  $X \sim N(153; \sigma^2)$

$$Z = \frac{X - \mu}{\sigma}$$
$$-2.33 = \frac{150 - 153}{\sigma}$$

$$\sigma = \frac{150 - 153}{-2.33} = 1.2876$$

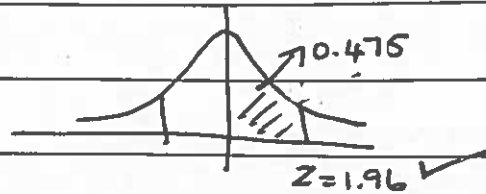


(5)

17 marks

### Question 5

$$\hat{p} = \frac{136}{400} = \frac{17}{50}$$



$$a) \hat{p} - z \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} < p < \hat{p} + z \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$\frac{17}{50} - 1.96 \sqrt{\frac{\frac{17}{50} \times \frac{33}{50}}{400}} < p < \frac{17}{50} + 1.96 \sqrt{\frac{\frac{17}{50} \times \frac{33}{50}}{400}}$$

$$0.2936 < p < 0.3864$$

(7)

$$b) 2\% \div 2 = 1\% = 0.01 \checkmark$$

$$1.96 \sqrt{\frac{\frac{17}{50} \times \frac{33}{50}}{n}} = 0.01 \checkmark$$

$$\sqrt{\frac{\frac{17}{50} \times \frac{33}{50}}{n}} = \frac{1}{196}$$

$$\sqrt{\frac{561}{2500n}} = \frac{1}{196}$$

$$\frac{561}{2500} = \left(\frac{1}{196}\right)^2 \times n$$

$$\frac{561}{2500} \times (196)^2 = n$$

$$n = 8621$$

method

12 marks

# Question 6

a)  $\int_0^4 q(4-x) dx = 1 \checkmark$

$$\int_0^4 (4q - qx) dx = 1$$

$$\left[ 4qx - \frac{1}{2}qx^2 \right]_0^4 = 1 \checkmark \checkmark$$

$$16q - 8q = 1 \checkmark$$

$$+ 8q = 1$$

$$q = \frac{1}{8} \checkmark$$

(5)

b)  $\int_1^2 \frac{1}{8}(4-x) dx \checkmark$

$$= \int_1^2 \left( \frac{1}{2} - \frac{1}{8}x \right) dx$$

$$= \left[ \frac{1}{2}x - \frac{1}{16}x^2 \right]_1^2 \checkmark \checkmark$$

$$= 1 - \frac{1}{4} - \left[ \frac{1}{2} - \frac{1}{16} \right]$$

$$= \frac{3}{4} - \frac{7}{16}$$

$$= \frac{12-7}{16}$$

$$= \frac{5}{16} \checkmark (4)$$

c)  $\int_0^m \left( \frac{1}{2} - \frac{1}{8}x \right) dx = 0.5 \checkmark$

$$\left[ \frac{1}{2}x - \frac{1}{16}x^2 \right]_0^m \checkmark = 0.5$$

$$\frac{1}{2}m - \frac{1}{16}m^2 = 0.5$$

$$8m - m^2 = 8$$

$$m^2 - 8m + 8 = 0$$

$$-m = 6.8284$$

N/A

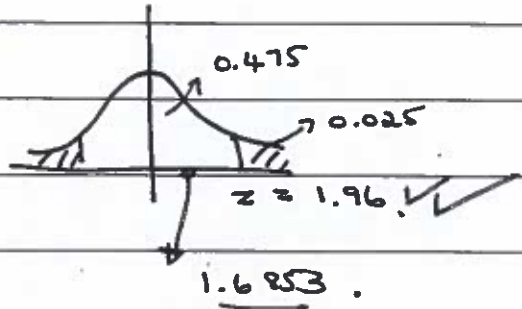
$$m = 1.1715 \checkmark$$

(5)

### Question 7

a)  $H_0: \mu = 9$  ✓

$H_1: \mu \neq 9$  ✓



Test stat:  $z = \frac{\bar{X} - \mu}{\frac{s}{\sqrt{n}}}$   
 $= \frac{9.2 - 9}{\frac{1.3}{\sqrt{120}}}$

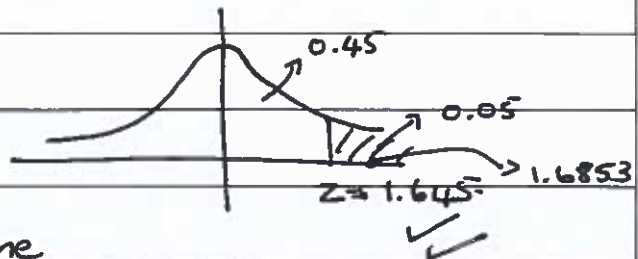
$= 1.6853$  ✓

reject the null

There is insufficient data to support the claim that the power required by bulb has changed. (8)

b)  $H_0: \mu = 9$

$H_1: \mu > 9$  ✓



Test stat remains same

(1.6853) ✓

reject the null

There is sufficient data to support the claim that power required by bulb has increased. (6)

14 marks

### Question 8

a) As the  $x$  value increases the  $y$  value decreases. ✓ (1)

b)  $r = -0.9815$  ✓

Very strong negative linear correlation. ✓ (3)

c) 
$$b = \frac{n \sum(xy) - \sum x \sum y}{n(\sum x^2) - (\sum x)^2}$$

$$= \frac{12(3291,88) - (511)(78,52)}{12(28949) - (511)^2} \checkmark \checkmark$$

$$= -7.2 \times 10^{-3} \checkmark$$

$$y - \bar{y} = m(x - \bar{x})$$

$$y - 6.54 = -7.2 \times 10^{-3} (x - 42.58) \checkmark \checkmark \text{ (5)}$$

$$y = -7.2 \times 10^{-3} x + 6.84995$$

d) i)  $pH = 6.16595$  ✓ (1)

Although  $r$  indicates a very strong correlation the  $x$  value is extrapolated and as a result cannot be deemed very reliable. ✓ (2)

12 marks