AP Paper 2 Stats 2019

1a)

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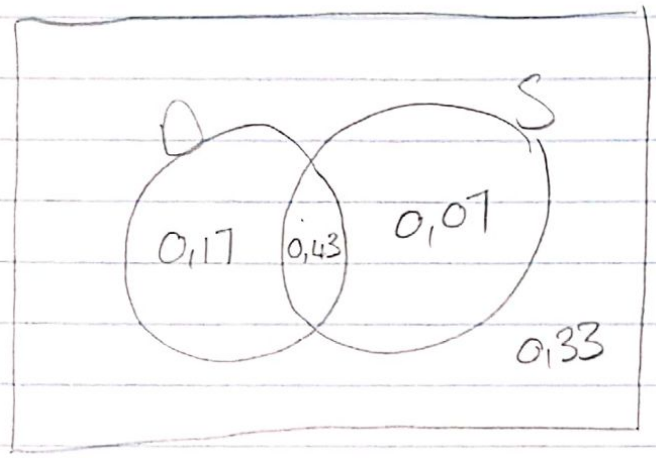
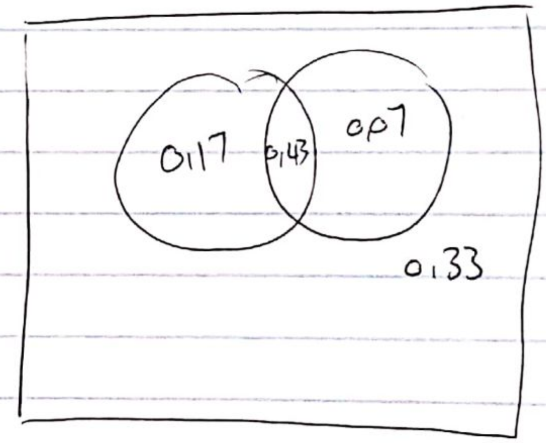


✓m

$0{,}17 + 0{,}43 + 0{,}07$ ✓a

$= 0{,}67$ ✓ca

b) $0{,}33$ ✓ca



c) $\dfrac{P(D \cap T)}{P(T)}$ ✓m

$= \dfrac{0{,}43}{0{,}5}$ ✓a

$= 0{,}86$ ✓ca

d) $P(D) \times P(T) = P(D \cap T)$ ✓m

LHS $= 0{,}6 \times 0{,}5$ ✓a

$= 0{,}3$ ✓ca

RHS $= 0{,}43$ ✓a

$\therefore$ D an T not independent

e) $0{,}6 \times 0{,}5 \times 0{,}67 \times 0{,}47$ ✓a

$= 0{,}09447$ ✓ca

f) $0{,}4 \times 0{,}5 \times 0{,}33 \times 0{,}53$ ✓ca

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2.1) OOAIO _ _ _ _ _ _

$$\frac{\underset{\checkmark a}{7!} \times \underset{\checkmark a}{5!}}{\underset{\checkmark a}{3!} \times \underset{\checkmark a}{2!}}$$

$= 50400$ ✓ca

2.2) $\boxed{35}$ $8 \times 7 \times 6 \times 5$ ✓a

$= 1680$ ✓ca

2.3) $\underset{\checkmark a}{\binom{7}{4}} \underset{\checkmark a}{+} \underset{\checkmark a}{\binom{2}{1}} \underset{\checkmark a}{\binom{7}{3}}$

$= 105$ ✓ca

2.4) $$\frac{\binom{4}{3}^{\checkmark a} \times \binom{5}{3}^{\checkmark a} \times \binom{8}{3}^{\checkmark a}}{\binom{17}{9}\checkmark a}$$

$= 0{,}092$ ✓ca

3) $\binom{50}{7}(0{,}15)^7 (0{,}85)^{43}$ ✓a $+$ ✓m $\binom{50}{8}(0{,}15)^8(0{,}85)^{42}$ ✓a

$+ \binom{50}{9}(0{,}15)^9(0{,}85)^{41}$ ✓a

$= 0{,}4297$ ✓ca

4.1.1) $E(X) = n \times p$ ✓a

$= 0,75 \times 38$

$= 28,5$ ✓ca

2

4.1.2) $\sigma = \sqrt{np(1-p}$ ✓m

$= \sqrt{38 . 0,75 . 0,25}$ ✓a

$= 2,669$ ✓ca

3

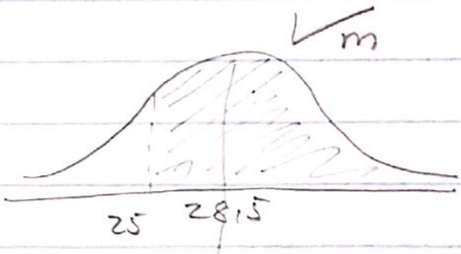
1-p ?

4.2) $P(X \geq 25)$

$P(X > 24,5)$ ✓a

$Z = \dfrac{24,5 - 28,5}{2,669}$ ✓a

$= -1,4987$ ✓a



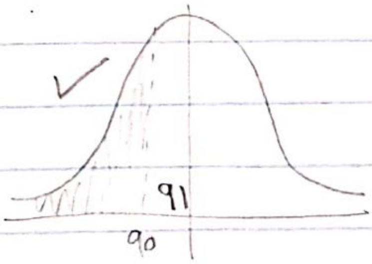
$\therefore$ 0,4332 ✓ca

6

$P(Z > 24,5) = 0,4332 + 0,5$

$= 0,9332$ ✓ca

5.11)



$\sigma = 0,8$

5

$\therefore$ 0,3944 ✓

$P(X < 90)$

$P(X < 90) = 0,5 - 0,3944$

$= 0,1056$ ✓

$Z = \dfrac{90 - 91}{0,8}$ ✓

$= -1,25$ ✓

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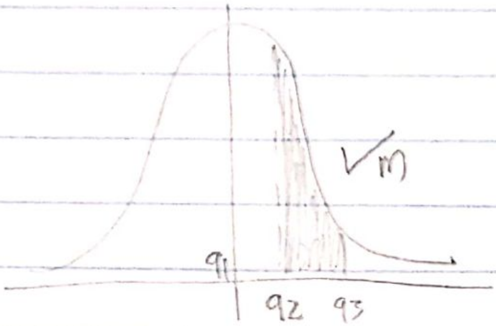
5.1.2)

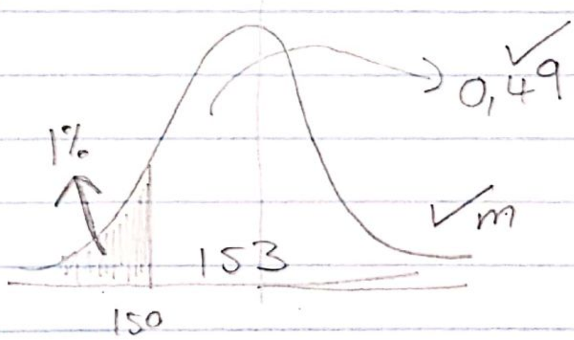


$$Z = \frac{92-91}{0,8} = 1,25 \checkmark \qquad Z = \frac{93-91}{0,8} = 2,5 \checkmark$$

(5)

$$P(92 < X < 93) = 0,49379 - 0,3944 = 0,09939 \checkmark$$

5.2)



$$Z = \frac{150-153}{\sigma}$$

(5)

$$-2,33 = \frac{150-153}{\sigma}$$

$$\sigma = \frac{-3}{-2,33} \checkmark ca$$

$$= 1,288 \checkmark ca$$

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6.1) The sample size > 30 ✓

$\therefore$ appropriate to use central limit theorem (2)

6.2) $\hat{p} = \frac{120}{350}$

$= 0{,}343$

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

$$0{,}343 - 1{,}96\sqrt{\frac{0{,}343 \times 0{,}657}{350}} < p < 0{,}343 + 1{,}96\sqrt{\frac{0{,}343 \times 0{,}657}{350}}$$

$$0{,}2933 < p < 0{,}3927$$ ✓ca

$\cdot z\ ?$

Thus we are 95% confident that the true proportion for specimens infected by IBOLA will be somewhere between 29,33% and 39,27% of the whole population. ✓ca (7)

7.1) $\int_0^4 q(4-x) = 1$ ✓

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

$$4q(4) - \frac{1}{2}q(4)^2 - \boxed{0} = 1$$

$$16q - 8q = 1$$

$$8q = 1$$

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

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7.2) $\int_1^2 \frac{1}{8}(4-x)$ ✓

$\left[\frac{4}{8}x - \frac{1}{16}x^2\right]_1^2$ ✓

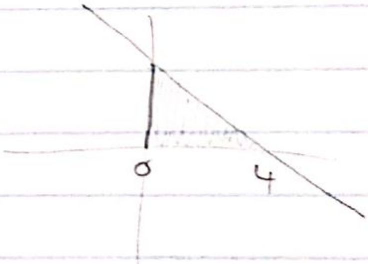
$= \frac{4}{8}(2) - \frac{1}{16}(2)^2 - \left[\frac{4}{8}(1) - \frac{1}{16}(1)^2\right]$ ✓

$= \frac{5}{16}$ ✓a (if calculator used full marks)

4

7.3) $\int_0^m \frac{1}{8}(4-x) = 0,5$ ✓

$\left[\frac{4}{8}x - \frac{1}{16}x^2\right]_0^m = 0,5$ ✓



$\frac{4}{8}m - \frac{1}{16}m^2 = 0,5$ ✓

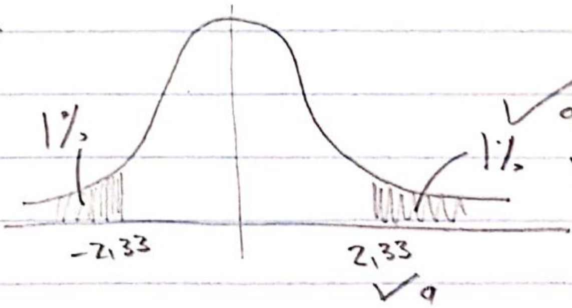
$-\frac{1}{16}m^2 + \frac{4m}{8} - 0,5 = 0$

$m = 6,828$ ✓ n.A $\qquad m = 1,17157$ ✓

5

8.1) $\mu = 8 \qquad \sigma = 1,2$

$H_0: \mu = 8$
$H_1: \mu \neq 8$ } ✓a



✓a ✓two tailed ✓a

$z = \frac{8,3 - 8}{\frac{1,2}{\sqrt{120}}}$ ✓

$= 2,739$ ✓a

∴ reject Ho, ✓ there is sufficient evidence to reject Ho at 2% ✓ Strong evidence to reject Ho.

∴ ~~[illegible]~~ fair to claim that the mean will be different.

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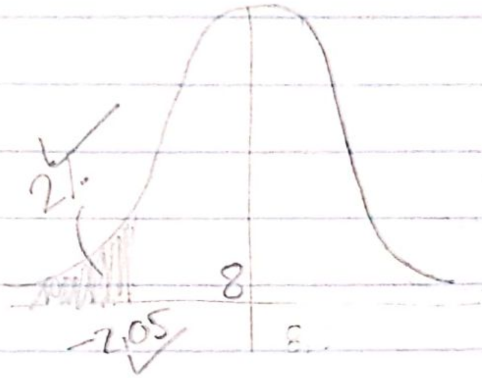
8.2)



$H_0: \mu = 8$

$H_1: \mu < 8$

$$Z = \frac{7{,}1 - 8}{\frac{.5}{\sqrt{100}}}$$

$$= -1{,}8$$

∴ fail to ~~reject~~ accept Ho at a 2% significance level

Therefore ~~the claim that the mean bulbs will be less than 8 is justifiable~~.

we dont have enough evidence to say that the mean will be smaller than 8.