WJEC 2014 Online Exam Review

GCE Mathematics S2 0984-01

All Candidates' performance across questions

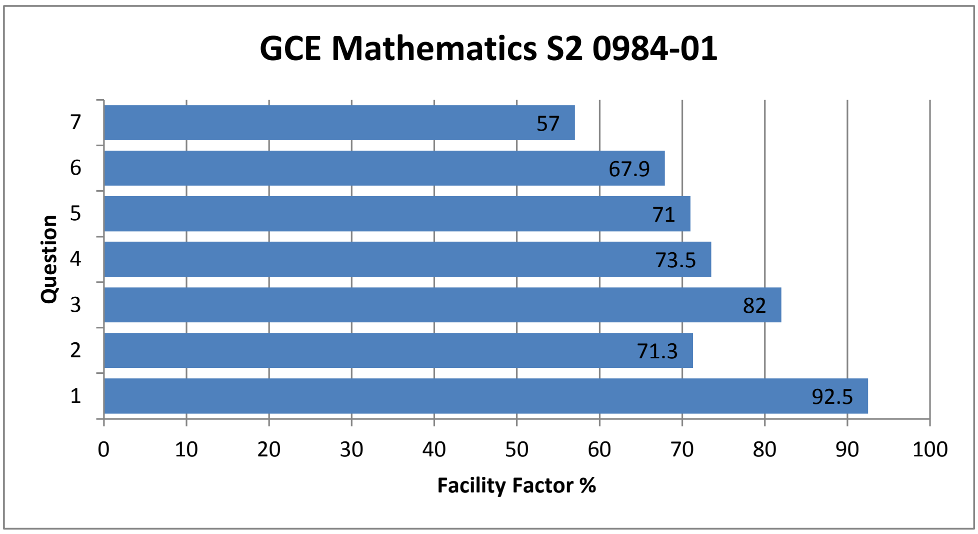
Question Title	*N*	*Mean*	*S D*	*Max Mark*	*F F*	*Attempt %*
1	907	5.5	1.2	6	92.5	99.7
2	908	10	4.4	14	71.3	99.8
3	904	8.2	2.4	10	82	99.3
4	905	10.3	4.4	14	73.5	99.5
5	906	5.7	2.9	8	71	99.6
6	894	8.8	3.7	13	67.9	98.2
7	897	5.7	4.2	10	57	98.6

2a and b

3b

4

7b and c



2. The weights of the oranges sold on a market stall are normally distributed with mean 248 grams and standard deviation 8 grams. The weights of the lemons sold on the market stall are normally distributed with mean 85 grams and standard deviation 1·5 grams.

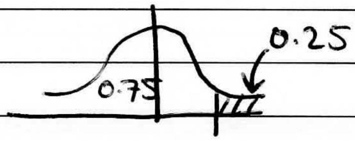
(a) Find the upper quartile of the weights of the lemons. [2]

(b) Ann buys 8 oranges. Calculate the probability that the total weight of her oranges is less than 2000 grams. [5]

② Let $O \sim$ weight of oranges
Let $L \sim$ weight of lemons.

$O \sim N(248, 8^2)$ $\qquad$ $L \sim N(85, 1.5^2)$

a) $P(x \geq x) = 0.25$



$$1.96 = \frac{L - 85}{\sqrt{1.5^2}}$$

$$L = 1.96\sqrt{1.5^2} + 85$$
$$L = 87.94g.$$

orange (not zero)

b) $8O \sim N(8(248), 8^2(8^2))$

$8O \sim N(1984, 4096)$

$= P(8O < 2000)$
$= P\left(Z < \frac{2000-1984}{\sqrt{4096}}\right)$

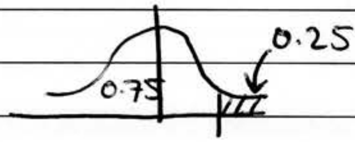
$= P(Z < 0.25)$
$= 1 - P(Z \geq 0.25)$
$= 1 - 0.4013$
$= 0.5987$

6

② let $O \sim$ weight of oranges
let $L \sim$ weight of lemons.

$$O \sim N(248, 8^2) \qquad L \sim N(85, 1.5^2)$$

a) $P(x \geq \alpha) = 0.25$



$$1.96 = \frac{L - 85}{\sqrt{1.5^2}}$$ M1

Q2(b) $L = 1.96\sqrt{1.5^2} + 85$

$L = 87.94g.$

orange (not zero)

b) $8O \sim N(8(248), 8^2(8^2))$ B1 B1

$8O \sim N(1984, 4096)$ B0 B0

M1

$= P(8O < 2000)$ A0

$= P\left(Z < \dfrac{2000 - 1984}{\sqrt{4096}}\right)$ M1

$= P(Z < 0.25)$ A0

$= 1 - P(Z \geq 0.25)$

$= 1 - 0.4013$

$= 0.5987$

3. A new species of animal has been found on an uninhabited island. A zoologist wishes to investigate whether or not there is a difference in the mean weights of males and females of the species. She traps some of the animals and weighs them with the following results.

Males (kg)	5·3, 4·6, 5·2, 4·5, 4·3, 5·5, 5·0, 4·8
Females (kg)	4·9, 5·0, 4·1, 4·6, 4·3, 5·3, 4·2, 4·5, 4·8, 4·9

You may assume that these are random samples from normal populations with a common standard deviation of 0·5 kg.

(a) State suitable hypotheses for this investigation. [1]

(b) Determine the *p*-value of these results and state your conclusion in context. [9]

Question number *Rhif y Cwestiwn*		Leave Blank *Gadewch yn wag*
3.	$= 1 - 0.84375$	
	$= 0.15625$	
	p-value $= 0.3125$	
	$\therefore$ $p > 0.1$, hence no evidence to believe	
	that their weights are different.	

Question number *Rhif y Cwestiwn*		Leave Blank *Gadewch yn wag*
3.	$= 1 - 0.84375$	A
	$= 0.15625$ A1	B1
	p-value $= 0.3125$ B1	
	$\therefore$ $p > 0.1$, hence no evidence to believe that their weights are different. B0	B0
		9

4. Gwilym buys a new computer game. He claims that he wins, on average, 60% of games played. His friend Huw believes that Gwilym wins less than 60% of games played.

(a) To investigate these conflicting claims, Gwilym plays the game 20 times and wins 7 of them.

(i) State suitable hypotheses for testing these claims.

(ii) Determine the *p*-value of the above result and state your conclusion in context. [7]

(b) During the following week, Gwilym plays the game 80 times and wins 37 of them. Use a suitable approximation to determine the *p*-value and state your conclusion in context. [7]

Question number

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4.

a)

(i) $H_0: p = 0.6$

$H_1: p < 0.6$

If H_0 is true $X \sim B(20, 0.6)$

(ii) pvalue $p(X < 7)$ 60% of 20 games $= 12 = E(X)$

since $p > 0.5$ $X' \sim B(20, 0.4)$

$p(X' \geq 13)$

$= 0.9867$

0	1	2	3	4	5	6	7	8	19	20
20	19	18	17	16	15	14	13			

since $p > 0.05$, there is insufficient evidence for rejecting H_0 $\therefore$ we conclude that ~~the claim is true~~ Gwilym's claim is true.

b) 80 times $X \sim B(80, 0.6) \xrightarrow{\text{approx}} X \sim N(48, 19.2)$

pvalue $p(X < 37)$

$p\left(Z < \frac{37-48}{\sqrt{19.2}}\right)$

$= p(Z \leq -2.51)$

$= p(Z \geq 2.51)$

$= 0.00604$

since $p < 0.01$, there is very strong evidence for rejecting H_0 $\therefore$ we conclude that Huw's claim is correct, and that Gwilym wins less that 60% of the games.

Question number

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4. QUES 4

a)

(i) $H_0 : p = 0.6$

$H_1 : p < 0.6$ B1

If H_0 is true $X \sim B(20, 0.6)$ B1

(ii) pvalue $p(X < 7)$ 60% of 20 games: $12 = E(X)$

$= \cancel{p(X \geq 8)}$

since $p > 0.5$ $X' \sim B(20, 0.4)$ B1

$p(X' \geq 13)$ M1

$= 0.9867$ A1

0	1	2	3	4	5	6	7	8 .... 19 20
20	19	18	17	16	15	14	13	

A0

since $p > 0.05$, ~~we~~ there is insufficient evidence for rejecting H_0 ∴ we conclude that ~~the claim is true~~ Gwilym's claim is true. No FT on this p B0

(b)

b) 80 times $X \sim B(80, 0.6) \xrightarrow{\text{approx}} X \sim N(48, 19.2)$ B1

~~p~~ pvalue $p(X < 37)$ B1

$p\left(Z < \frac{37 - 48}{\sqrt{19.2}}\right)$ M1

$= p(Z \leq -2.51)$ A0

$= p(Z \geq 2.51)$ A1

$= 0.00604$ A1

No c/c

since $p < 0.01$, there is very strong evidence for rejecting H_0 ∴ we conclude that Huw's claim is correct, and that ~~Gt~~ Gwilym wins less that 60% of the games. B1

11

2

7. The sides of a square are of length L cm and its area is A cm^2. Given that A is uniformly distributed on the interval [15, 20], find

(a) $P(L \leqslant 4)$, [3]

(b) $E(L)$, [4]

(c) $\text{Var}(L)$. [3]

END OF PAPER

7. (b) ~~$E(L) = E$~~

$L^2 = A$

$E(L) \times E(L) = E(A)$

$(E(L))^2 = E(A)$

$(E(L))^2 = \frac{1}{2}(15+20)$

$(E(L))^2 = 17.5$

$\underline{E(L) = 4.18}$

c) $Var(L) = E(L^2) - (E(L))^2$

$= E(A) - (E(L))^2$

$= \frac{1}{2}(15+20) - 4.18^2$

$= 0.0276$

number
Rhif y
Cwestiwn

QUES 7

7. (b) $\cancel{E(L) = E}$

$L^2 = A$

$E(L)\cancel{\times}E(L) = E(A)$

$(E(L))^2 = E(A)$

Mo

$(E(L))^2 = \frac{1}{2}(15+20)$

$(E(L))^2 = 17.5$

No.

$\underline{E(L) = 4.18}$

c) $Var(L) = E(L^2) - (E(L))^2$

$= E(A) - (E(L))^2$

$= \frac{1}{2}(15+20) - 4.18^2$

3

$= 0.0276$ ✓

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