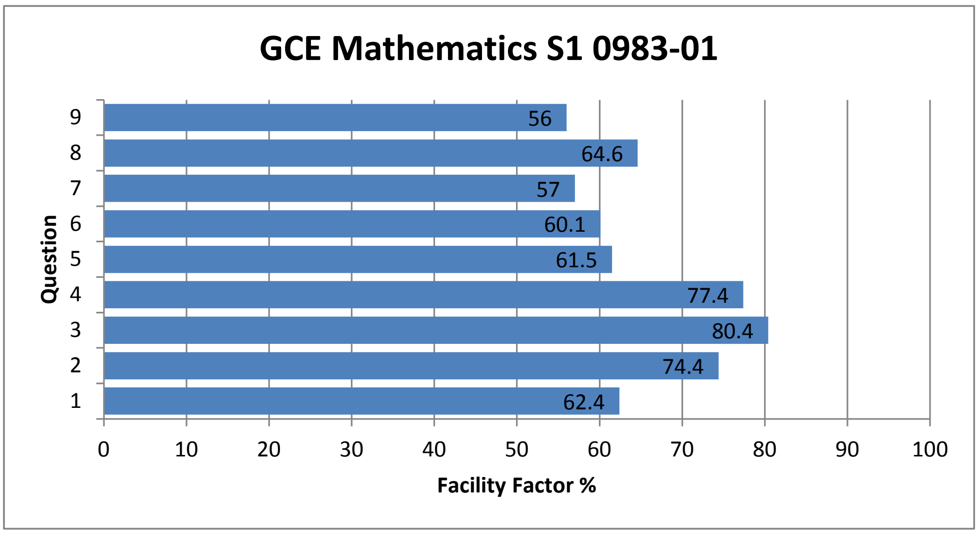
WJEC 2014 Online Exam Review

GCE Mathematics S1 0983-01

All Candidates' performance across questions

Question Title	*N*	*Mean*	*S D*	*Max Mark*	*F F*	*Attempt %*	
1	3116	3.7	1.9	6	62.4	99.1	
2	3017	3.7	1.9	5	74.4	96	
3	3124	5.6	2.1	7	80.4	99.4	3
4	3061	4.6	1.8	6	77.4	97.4	
5	3067	6.8	3.5	11	61.5	97.5	5
6	3093	5.4	2.8	9	60.1	98.4	6
7	3078	6.8	3.8	12	57	97.9	
8	3041	4.5	2.3	7	64.6	96.7	
9	2943	6.7	4.2	12	56	93.6	9b



3. A bag contains 9 coloured balls, of which 3 are red, 3 are blue and 3 are yellow. Huw selects 3 of these balls at random, without replacement. Calculate the probability that he selects

(a) 1 ball of each colour, [3]

(b) 2 balls of the same colour and 1 ball of a different colour. [4]

Question number *Rhif y Cwestiwn*		Leave Blank *Gadewch yn wag*
3.	$3 = r$	
	$3 = b$	
	$3 = y$	
	a) ~~3anx3xnMB~~ $\frac{3}{9} \times \frac{3}{8} \times \frac{3}{7} = \frac{3}{56}$	
	b) $P(rrr') = \frac{3}{9} \times \frac{2}{8} \times \frac{6}{7} = \frac{1}{14}$	
	$P(bbb') = \frac{3}{9} \times \frac{2}{8} \times \frac{6}{7} = \frac{1}{14}$	
	$P(yyy') = \frac{3}{9} \times \frac{2}{8} \times \frac{6}{7} = \frac{1}{14}$	
	$= \frac{3}{14}$	

Question number
Rhif y Cwestiwn

Leave Blank
Gadewch yn wag

QUES 3

3. $3 = r$

$3 = b$

$3 = y$

a) ~~3a^3^^~~ $\frac{3}{9} \times \frac{3}{8} \times \frac{3}{7} = \frac{3}{56}$

M1
A0

b) $P(rrr') = \frac{3}{9} \times \frac{2}{8} \times \frac{6}{7} = \frac{1}{14}$

$P(bbb') = \frac{3}{9} \times \frac{2}{8} \times \frac{6}{7} = \frac{1}{14}$

$P(yyy') = \frac{3}{9} \times \frac{2}{8} \times \frac{6}{7} = \frac{1}{14}$

$= \frac{3}{14}$ ✓

then?

3

(4)

5. A zoologist is studying a certain breed of dog.

(a) He knows from past experience that the probability of a newly born puppy being female is 0·55. He selects a random sample of 20 newly born puppies. Calculate the probability that the number of females in the sample is

(i) exactly 12,

(ii) between 8 and 16 (both inclusive). [8]

(b) The probability of a newly born puppy being yellow is 0·05. Use an approximating distribution to find the probability that less than 5 out of a random sample of 60 newly born puppies are yellow. [3]

5)

a) Female = 0.55

Male = 0.45

20 selected

$B(\underset{n}{20}, \underset{p}{0.55})$ $q = 0.45$

~~i) X = 12 females ∴ X = 8 males at p = 0.45.~~

~~20 → X = 8, p = 0.45. = 0.4143 8 males = 12 females.~~

~~∴ probability of 12 females = 1 − 0.4143 = 0.5857~~

not replaced

ii) $(8 \leq X \leq 16)$.

16 − 7.

0.9997 − 0.2520 = 0.7477.

b) Yellow = 0.05

Puppies = 60

Poisson approximation = Po(60 x 0.05)

= Po(3).

P(X<5), look up 4. = 0.8153

5 a)

i) X = 12 females = X = 8 males

20 → X = 8, p = 0.45.

exactly 8 = 8 − 7.

= 0.4143 − 0.2520

= 0.1623

Question number
Rhif y Cwestiwn

Leave Blank
Gadewch yn wag

5)

a) Female = 0.55

Male = 0.45

20 selected

$B(\overset{n}{20}, \overset{p}{0.55})$ $q = 0.45$ ✓ M1

~~i) $X = 12$ females $\therefore$ $X = 8$ males at $p = 0.45$~~

~~$20 \to X = 8, p = 0.45$. $= 0.4143$ 8 males~~ [redacted]

~~$= 12$ females.~~ 0

~~$\therefore$ probability of 12 females $= 1 - 0.4143$~~

~~$= 0.5857$~~

not replaced

ii) $(8 \leq X \leq 16)$. ✗ A0

$16 - 7$.

$0.9997 - 0.2520 = \underline{\underline{0.7477}}$.

b) Yellow = 0.05

Puppies = 60

Poisson approximation = $Po(60 \times 0.05)$

$= Po(3)$.

$P(X<5)$, look up 4. $= \underline{\underline{0.8153}}$ ✓ 3

5 a)

i) $X = 12$ females = $X = 8$ males

$20 \to X = 8, p = 0.45$.

exactly 8 = $8 - 7$. 3

$= 0.4143 - 0.2520$

$= \underline{\underline{0.1623}}$ ✓ 7

6. A purse contains three fair coins and one double-headed coin. A coin is selected at random from the purse and tossed.

(a) Find the probability that a head is obtained. [3]

(b) Given that a head is obtained,

(i) determine the probability that the double-headed coin was selected,

(ii) find the probability that a head will be obtained if the selected coin is tossed a second time. [6]

END OF PAPER

Question number
Rhif y Cwestiwn

Leave Blank
Gadewch yn wag

6.) 1 purse 3 fair coins 1 double-head

a.) $P(\text{head obtained}) = \left(\frac{1}{4} \times \frac{1}{2}\right) + \left(\frac{1}{4} \times \frac{1}{2}\right) + \left(\frac{1}{4} \times \frac{1}{2}\right) + \left(\frac{1}{4} \times 1\right)$

$= \frac{3}{8} + \frac{1}{4} = \underline{\underline{\frac{5}{8}}}$

bi) $P(\text{head / double head selected}) = \dfrac{\frac{1}{4} \times 1}{\frac{5}{8}} = \underline{\underline{\frac{2}{5}}}$

b.ii.) $P(\text{head if tossed again}) = \left(\left(\frac{1}{4} \times \frac{1}{2} \times \frac{1}{2}\right) \times 3\right) + \left(\frac{1}{4} \times 1 \times 1\right)$

$= \frac{3}{16} + \frac{1}{4} = \underline{\underline{\frac{7}{16}}}$

Question number
Rhif y Cwestiwn

Leave Blank
Gadewch yn wag

6.) 1 purse 3 fair coins 1 double-head

a.) P(head obtained) $= \left(\frac{1}{4} \times \frac{1}{2}\right) + \left(\frac{1}{4} \times \frac{1}{2}\right) + \left(\frac{1}{4} \times \frac{1}{2}\right) + \left(\frac{1}{4} \times 1\right)$

$= \frac{3}{8} + \frac{1}{4} = \frac{5}{8}$ ✓ 3

bi) P(head / double head selected) $= \dfrac{\frac{1}{4} \times 1}{\frac{5}{8}} = \frac{2}{5}$ ✓ 3

b.ii.) P(head if tossed again) $= \left(\left(\frac{1}{4} \times \frac{1}{2} \times \frac{1}{2}\right) \times 3\right) + \left(\frac{1}{4} \times 1 \times 1\right)$

$= \frac{3}{16} + \frac{1}{4} = \frac{7}{16}$ ✗ M0

6

9. The continuous random variable X has cumulative distribution function F given by

$$\begin{array}{ll} F(x) = 0 & \text{for } x < 0, \\ F(x) = 2x^3 - x^6 & \text{for } 0 \leqslant x \leqslant 1, \\ F(x) = 1 & \text{for } x > 1. \end{array}$$

(b) (i) Find an expression for $f(x)$, valid for $0 \leqslant x \leqslant 1$, where f denotes the probability density function of X.

(ii) Calculate $E(X^3)$. [6]

END OF PAPER

Question number
Rhif y Cwestiwn

Leave Blank
Gadewch yn wag

(b)(i) $F(x) \longrightarrow f(x)$ = DIFFERENTIATE

$$F(x) \int_0^1 2x^3 - x^6 \, dx$$

$$= \int_0^1 6x^2 - 6x^5$$

$$= 6x^2 - 6x^5 = f(x)$$

$$E(X^3) = \int x^3 f(x)\,dx$$

(ii) $E(X^3)$

$$= \int_0^1 X^3 \left(2x^3 - x^6\right) dx$$

$$= \int_0^1 2x^6 - x^9 \, dx$$

$$= \left[\frac{2x^7}{7} - \frac{x^{10}}{10}\right]_0^1$$

$$= \left(\frac{2(1)^7}{7} - \frac{(1)^{10}}{10}\right) - (0) = \frac{13}{70} - 0$$

$$= \frac{13}{70}$$

Question number
Rhif y Cwestiwn

Leave Blank
Gadewch yn wag

(b)(i) $F(x) \longrightarrow f(x)$ = DIFFERENTIATE

$F(x) \int_0^1 2x^3 - x^6 \, dx$

$= \int_0^1 6x^2 - 6x^5$

$= 6x^2 - 6x^5 = f(x)$

2

$E(X^3) = \int x^3 f(x) \, dx$

(ii) $E(X^3)$

$= \int_0^1 X^3 \left(2x^3 - x^6\right) dx$

MC

$= \int_0^1 2x^6 - x^9 \, dx$

$= \left[\frac{2x^7}{7} - \frac{x^{10}}{10} \right]_0^1$

$= \left(\frac{2(1)^7}{7} - \frac{(1)^{10}}{10} \right) - (0) = \frac{13}{70} - 0$

$= \frac{13}{70}$

(F

4