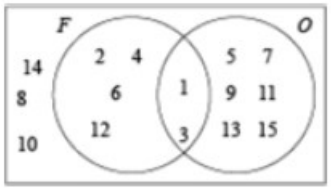
Topical Worksheets for Cambridge O LEVEL Mathematics D (4024)

Probability (II)

Mark Scheme

1st edition, for examination until 2025

Question	Answer	Marks	AO Element	Notes	Guidance
1(a)	0.22 oe	**2**		**M1** for 0.15 + 0.2 + ? + 0.43 = 1 or better	
1(b)	40	**1**			
2(a)		**2**		**B1** for 2 or 3 correctly completed regions	
2(b)	One of 5, 7, 9, 11, 13, 15	**1**		**FT** *their* Venn diagram	
2(c)	12	**1**		**FT** *their* Venn diagram	
2(d)	$\frac{8}{15}$ oe	**1**		**FT** *their* Venn diagram	
3(a)(i)	$1.5 < h \leqslant 1.6$	**1**			
3(a)(ii)	1.62 or 1.623… nfww	**4**		**M1** for 1.35, 1.45, 1.55, 1.65, 1.75 1.85 soi **M1** for Σfx **M1 dep** for *their* $\Sigma fx \div 120$	

Question	Answer	Marks	AO Element	Notes	Guidance
3(b)(i)	$\frac{14}{120}$ oe	**1**			
3(b)(ii)	$\frac{21}{20060}$ oe	**4**		**M3** for $3\left(\frac{14}{120}\times\frac{7}{119}\times\frac{6}{118}\right)$ or **M2** for $\frac{14}{120}\times\frac{7}{119}\times\frac{6}{118}$ isw or **M1** for $\frac{14}{120}$, $\frac{7}{119}$, $\frac{6}{118}$ After 0 scored, **SC1** for answer $\frac{343}{864000}$ or $\frac{343}{288000}$ oe	
3(c)(i)	55, 79, 106, 120	**2**		**B1** for 2 or 3 correct	

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3(c)(ii)	Correct diagram	**3**		**B1** for correct horizontal plots **B1FT** for correct vertical plots **B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 6 points If 0 scored **SC1** for 5 out of 6 points correctly plotted	
3(d)(i)	1.62 to 1.63	**1**			
3(d)(ii)	1.57 to 1.58	**2**		**B1** for 48 soi	
4(a)	E cao	**1**			
4(b)	H cao	**1**			
5(a)	Arrow at $\frac{1}{2}$	**1**			
5(b)	Arrow at $\frac{11}{16}$	**1**			

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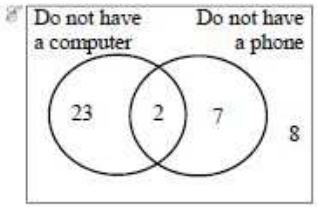
6	$\frac{147}{160}$ oe	**3**		**M2** for $\frac{1}{10} \times \frac{3}{4} + \frac{9}{10} \times \frac{15}{16}$ or **M1** for $\frac{1}{10} \times \frac{3}{4}$ or $\frac{9}{10} \times \frac{15}{16}$	
7	72	**2**		**M1** for $\frac{9}{25} \times 200$ oe	
8	0.41	**2**		**M1** for $1 - (0.35 + 0.04 + 0.2)$	
9(a)	$\frac{11}{30}$ oe	**1**			
9(b)	$\frac{25}{30}$ oe	**1**			
9(c)	0	**1**			
10(a)	[0].62 oe	**1**			
10(b)	0	**1**			
11	0.73 oe	**1**			
12	48	**1**			

Question	Answer	Marks	AO Element	Notes	Guidance
13	0	**1**			
14	$\frac{2}{20}$ oe	**2**		**M1** for $\frac{2}{5} \times \frac{1}{4}$ oe	
15(a)	$\frac{8}{15}$ oe	**1**			
15(b)		**2**		**B1** for 2 or 3 correct out of 4 regions	
16(a)	$\frac{9}{16}$ oe	**2**		**B1** for $\frac{9}{k}$ or $\frac{k}{16}$ provided fraction is less than 1	
16(b)	46	**1**			
17(a)	4	**1**			

Question	Answer	Marks	AO Element	Notes	Guidance
17(b)	3 correct bars drawn on bar chart	**4**		**B1** for Mr Smith bar drawn height 15 **M2** for *their* $(80 - (18 + 14 + 15)) \div 3[\times 2]$ or **M1** for $80 - (18 + 14 + 15)$ oe	
17(c)	Mrs Brown	**1**		**FT** *their* bar chart provided 5 bars drawn	
17(d)(i)	$\frac{14}{80}$ oe	**1**			
17(d)(ii)	$\frac{48}{80}$ oe	**2**		**FT** *their* bar chart **M1** for $80 - (18 + 14)$ or $\frac{18 + 14}{80}$ oe OR **M1FT** for adding heights of bars for (Mr Jones, Mrs Brown and Mr Smith)	
17(e)	81	**2**		**M1** for $\frac{360}{80}$ $[\times 18]$ or $\frac{18}{80}$ $[\times 360]$	

Question	Answer	Marks	AO Element	Notes	Guidance
18(a)	Correct bar	**3**		**M1** for 5, 12, 17 or 34 **M1** for 40 – *their* 34	
18(b)	5	**1**			
18(c)	Adult	**1**		**FT**	
18(d)	$\frac{12}{40}$ oe	**1**			
19(a)(i)	Correct frequencies 8 5 3 5 2 1	**2**		**B1** for 1 frequency incorrect or 2 incorrect but total still 24 or 8 5 3 5 2 1 in tally column If 0 scored, **B1** for completely correct tallies	
19(a)(ii)	1	**1**			
19(a)(iii)	5	**1**			
19(a)(iv)	2	**1**			

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19(a)(v)	2.625	**3**		**M1** for Σfx $1 \times 8 + 2 \times 5 + 3 \times 3 + 4 \times 5 + 5 \times 2 + 6 \times 1$ **M1** dep for *their* $\Sigma fx \div 24$	
19(a)(vi)	$\frac{5}{24}$ oe	**1**		**FT** *their* table	
19(b)	Correct bar chart	**2**		**B1** for 2 or 3 correct bars or for all 4 heights correct	
19(c)	Correct generalised comparison	**1**			
20(a)	$1 - r$	**1**			
20(b)(i)	$(1 - r)(1.3 - r)\ [= 0.4]$	**1**		**FT** *their* **(a)** dep on **(a)** being an expression in r	

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20(b)(ii)	**M1** for $1.3 - 1.3r - r + r^2$ or better nfww **M1** for $0.9 - 2.3r + r^2$ [= 0] OR $13 - 13r - 10r + 10r^2 = 4$ oe **A1** for $10r^2 - 23r + 9 = 0$	**3**		**FT** *their* **(b)(i)** **Strict FT** *their* expansion to a quadratic then equating to 0.4 and then collecting to 3 terms on 'one side' OR **Strict FT** *their* expansion to a quadratic = 0.4 all multiplied by 10 no errors or omissions seen	

Question	Answer	Marks	AO Element	Notes	Guidance
20(b)(iii)	**B2** for $(5r - 9)(2r - 1)\ [= 0]$ **B1** for $[r =] \frac{9}{5}$ oe $\quad [r =] \frac{1}{2}$ oe	**3**		or **B2** for e.g. $5r(2r-1) - 9(2r-1)$ **and then** $5r - 9 = 0$ **and** $2r - 1 = 0$ or **B1** for $5r(2r-1) - 9(2r-1)[= 0]$ or $2r(5r-9) - 1(5r-9)[= 0]$ or $(5r + a)(2r + b)\ [= 0]$ where a, b are integers and $ab = +9$ or $2a + 5b = -23$ If 0 scored, **SC1** for $5r - 9$ **and** $2r - 1$ seen but not in factorised form	
20(b)(iv)	0.8 or $\frac{4}{5}$ oe	**1**			
21(a)	**B1** for range = 7 **B1** for mode = 21 **B2** for median = 22.5 **B2** for mean = 22.7 or 22.71…	**6**		**M1** for evidence of middle value **M1** for use of $\Sigma x \div 14$	
21(b)	$\frac{3}{14}$ oe	**1**			

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22	$\frac{1}{6}$ oe	**4**		**M3** for $\frac{5}{9} \times \frac{4}{8} \times \frac{3}{7} + \frac{4}{9} \times \frac{3}{8} \times \frac{2}{7}$ or **M2** for $\frac{5}{9} \times \frac{4}{8} \times \frac{3}{7}$ or $\frac{4}{9} \times \frac{3}{8} \times \frac{2}{7}$ or **M1** for $\frac{5}{9}$, $\frac{4}{8}$, $\frac{3}{7}$ seen or $\frac{4}{9}$, $\frac{3}{8}$, $\frac{2}{7}$ seen If 0 scored, **SC1** for $\frac{5^3 + 4^3}{729}$ oe	
23(a)	$\frac{x-1}{x+2}$	**2**		**B1** for either numerator or denominator correct	

Question	Answer	Marks	AO Element	Notes	Guidance
23(b)(i)	**B1** for $\frac{x}{x+3} \times \frac{x-1}{x+2} = \frac{7}{15}$ **M1** for $15x(x-1) = 7(x+3)(x+2)$ **M1** for $15x^2 - 15x = 7x^2 + 21x + 14x + 42$ **A1** for $[8x^2 - 50x - 42 = 0]$ $4x^2 - 25x - 21 = 0$	**4**		**FT** *their* **(a)(i)** = $\frac{7}{15}$ Removes all algebraic fractions **FT** *their* equation if in comparable form Correctly expands all brackets **FT** *their* equation if in comparable form With no errors or omissions seen and one further stage seen after final M1	
23(b)(ii)	**M2** for $(4x+3)(x-7)[=0]$ **B1** for 7 and $-\frac{3}{4}$	**3**		**M1** for $4x(x-7) + 3(x-7)$ or $x(4x-3) - 7(4x-3)$ or for $(4x+a)(x+b)$ where either $ab = -21$ or $4b + a = -25$ If 0 scored, **SC1** for $4x + 3$ **and** $x - 7$ seen but not in factorised form	

Question	Answer	Marks	AO Element	Notes	Guidance
23(b)(iii)	7	**1**		**FT** *their* positive solution	
24	[0].03 oe	**1**			
25	70	**2**		**M1** for $25\,000 \times 0.0028$ oe	
26(a)(i)	Swimming	**1**			
26(a)(ii)	$\frac{72}{360}$ oe	**1**			
26(a)(iii)	5 cao	**2**		**M1** for $\frac{30}{360}$ [×60] or $\frac{60}{360}$ [×30] or for $\frac{360}{60}$ soi by 6	
26(a)(iv)	$\frac{55}{60}$ oe	**1**		**FT** $\frac{60 - \textit{their}(\mathbf{a})(\mathbf{iii})}{60}$ oe	
26(a)(v)	Tennis, Judo	**1**			

Question	Answer	Marks	AO Element	Notes	Guidance
26(b)	2 sectors drawn: Running 60° Swimming 132°	**2**		**M1** for use of 12° implied by 60° or 132° seen or for 10 [boys] or 22 [boys] seen	
26(c)	A valid correct similarity and difference	**2**		**B1** for each	
27	$\frac{80}{153}$ oe	**3**		**M2** for $2 \times \frac{10}{18} \times \frac{8}{17}$ oe or **M1** for $\frac{10}{18} \times \frac{8}{17}$ oe If 0 scored, **SC1** for $\frac{160}{324}$ oe	

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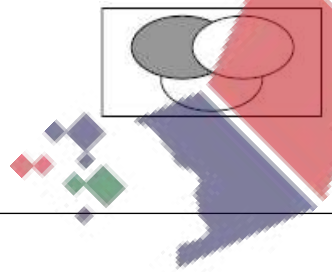
28	$\frac{11}{51}$ oe	**4**		**M3** for $\frac{10}{18} \times \frac{9}{17} \times \frac{8}{16} + \frac{8}{18} \times \frac{7}{17} \times \frac{6}{16}$ oe or **M2** for $\frac{10}{18} \times \frac{9}{17} \times \frac{8}{16}$ oe or $\frac{8}{18} \times \frac{7}{17} \times \frac{6}{16}$ oe or **M1** for $\frac{10}{18}, \frac{9}{17}, \frac{8}{16}$ or $\frac{8}{18}, \frac{7}{17}, \frac{6}{16}$ If 0 scored, **SC1** for $\frac{1512}{5832}$ oe	
29	$\frac{5}{9}$ oe	**1**			
30(a)	111.25	**4**		**M1** for midpoints soi (25, 75, 112.5, 137.5, 175) **M1** for $\sum fx$ with x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fx \div 20$	

Question	Answer	Marks	AO Element	Notes	Guidance
30(b)	2 7 11 17	**2**		**B1** for three correct	
30(c)	$\frac{3}{20}$ oe	**1**			
31(a)	Arrow at $\frac{3}{4}$	**1**		Clear indication	
31(b)	Arrow at 0	**1**		Clear indication	
32(a)	Arrow at 0.2	**1**			
32(b)	0.8 oe	**1**			
33	[0].36 oe	**1**			
34	0.27 oe	**2**		**M1** for $1 - (0.2 + 0.45 + 0.08)$ oe	
35(a)	$\frac{94}{200}$ oe	**2**		**M1** for $\frac{46}{200} + \frac{48}{200}$ oe	
35(b)	14.1 or 14.07…	**3**		**M2** for $2\left(\frac{50}{200} \times \frac{56}{199}\right)$ oe or **M1** for $\frac{50}{200} \times \frac{56}{199}$ oe	

Question	Answer	Marks	AO Element	Notes	Guidance
36	540	**2**		**M1** for $\frac{18}{50}$ [×1500] or $\frac{1500}{50}$ [×18]	
37(a)	**96** 144 240 129 **131** 260 225 275 500	**1**		both correct	
37(b)	50	**1**			
37(c)	$\frac{9}{20}$	**2**		**B1** for $\frac{225}{500}$ or $\frac{45}{100}$ or 0.45	
37(d)	12 : 13	**2**		**B1** for 240 : 260 oe If 0 scored, **SC1** for answer 13 : 12	
37(e)	$\frac{144}{500}$ oe	**1**			
38(a)	Negative	**1**			
38(b)	$\frac{10}{17}$ oe	**1**			

Question	Answer	Marks	AO Element	Notes	Guidance
38(c)	Correct ruled line of best fit	**1**			
38(d)	5 or 6	**1**		must be an integer	
39(a)	$\frac{4}{20}$ oe	**1**			
39(b)	0	**1**			
39(c)	$\frac{17}{20}$ oe	**1**			
40(a)	14	**1**			
40(b)	16	**1**			
40(c)	$\frac{20}{462}$ oe	**3**		**M2** for $\frac{5}{22} \times \frac{4}{21}$ or **M1** for $\frac{5}{22}$ seen	
40(d)	Correct shading 	**1**			

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					[Total: 174]