

**Discrete Random Variables Exam Questions MS (from Legacy MEI S1)**

**Q1 (Jun 2016, Q4) [Modified]**

<b>(i)</b>	$k/2 + k/6 + k/12 + k/20 + k/30 = 1$ $(30 + 10 + 5 + 3 + 2)k/60 = 1$ $50k = 60$ $k = 1.2$					M1 A1          B1 <b>[3]</b>	For correct equation including = 1 Need one further intermediate step after equation NB <b>Answer Given</b>          Complete correct table in fraction or decimal form NOT in terms of $k$	Allow substitution of $k = 1.2$ to show probabilities add to 1 with convincing working which must be more than just $1.2/2 + 1.2/6 + 1.2/12 + 1.2/20 + 1.2/30 = 1$ This latter gets M1A0          Must tabulate probabilities, though may be seen in part(ii) If fractions any denominator is ok provided numerators are integers								
	<table border="1" style="width: 100%; text-align: center;"> <tr> <td><math>r</math></td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td><math>P(X=r)</math></td> <td>0.6 <math>= \frac{3}{5}</math></td> <td>0.2 <math>= \frac{1}{5}</math></td> <td>0.1 <math>= \frac{1}{10}</math></td> <td>0.06 <math>= \frac{3}{50}</math></td> <td>0.04 <math>= \frac{1}{25}</math></td> </tr> </table>								$r$	2	3	4	5	6	$P(X=r)$	0.6 $= \frac{3}{5}$
$r$	2	3	4	5	6											
$P(X=r)$	0.6 $= \frac{3}{5}$	0.2 $= \frac{1}{5}$	0.1 $= \frac{1}{10}$	0.06 $= \frac{3}{50}$	0.04 $= \frac{1}{25}$											

**Q2 (Jun 2014, Q5) [Modified]**

<b>(i)</b>	$k + 0.01 + k + 0.04 + k + 0.09 + k + 0.16 + k + 0.25 = 1$ $5k + 0.55 = 1$  $k = 0.09$					M1          A1          B1          <b>[3]</b>	For equation in $k$          NB <b>Answer Given</b>          Complete correct table	Allow substitution of $k = 0.09$ to show probabilities add to 1 with convincing working          Must tabulate probabilities, though may be seen in part(ii)								
	<table border="1" style="width: 100%; text-align: center;"> <tr> <td><math>r</math></td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td><math>P(X=r)</math></td> <td>0.1</td> <td>0.13</td> <td>0.18</td> <td>0.25</td> <td>0.34</td> </tr> </table>								$r$	1	2	3	4	5	$P(X=r)$	0.1
$r$	1	2	3	4	5											
$P(X=r)$	0.1	0.13	0.18	0.25	0.34											

**Q3 (Jan 2013, Q2) [Modified]**

<table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <tr> <td style="padding: 2px 10px;"><math>r</math></td> <td style="padding: 2px 10px;">2</td> <td style="padding: 2px 10px;">3</td> <td style="padding: 2px 10px;">4</td> <td style="padding: 2px 10px;">5</td> </tr> <tr> <td style="padding: 2px 10px;"><math>P(X=r)</math></td> <td style="padding: 2px 10px;"><math>3k</math></td> <td style="padding: 2px 10px;"><math>8k</math></td> <td style="padding: 2px 10px;"><math>15k</math></td> <td style="padding: 2px 10px;"><math>24k</math></td> </tr> </table> <p style="margin-top: 5px;"><math>3k + 8k + 15k + 24k = 1</math></p> <p style="margin-top: 5px;"><math>k = 0.02</math></p>	$r$	2	3	4	5	$P(X=r)$	$3k$	$8k$	$15k$	$24k$	<p>B1</p> <p>M1</p> <p>A1</p> <p><b>[3]</b></p>	<p>For correct table (ito <math>k</math> or correct probabilities 0.06, 0.16, 0.30, 0.48)</p> <p>or <math>k = 1/50</math> (with or without working)</p>	<p>For their four multiples of <math>k</math> added and =1. Allow M1A1 even if done in part (ii) – link part (ii) to part (i)</p>
$r$	2	3	4	5									
$P(X=r)$	$3k$	$8k$	$15k$	$24k$									

**Q4 (Jan 2011, Q4) [Modified]**

<p><math>2k + 6k + 12k + 20k + 30k = 1, 70k = 1</math></p> <p><math>k = \frac{1}{70}</math></p>	<p>M1</p> <p>A1 NB ANSWER GIVEN</p>	<p><b>2</b></p>	<p>For five multiples of <math>k</math> (at least four correct multiples) Do not need to sum or =1 for M1 Condone omission of either <math>70k = 1</math> or <math>k = 1/70</math> but not both Condone omission of <math>k: 2+6+12+20+30=70</math> Allow substitution of <math>k = 1/70</math> into formula and getting at least four of <math>2/70, 6/70, 12/70, 20/70, 30/70</math> for M1 and <math>2/70+6/70+12/70+20/70+30/70 = 1</math> for A1</p>
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**Q5, (Edexcel 6683, Jan 2007, Q3)**

(a)	N.B. Part (a) doesn't have to be in a table, could be a list $P(X = 1) = \dots$ etc	B1, B1, B1														
	<table border="1"> <tr> <td>x</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td><math>P(X=x)</math></td> <td><math>\frac{1}{36}</math></td> <td><math>\frac{3}{36}</math></td> <td><math>\frac{5}{36}</math></td> <td><math>\frac{7}{36}</math></td> <td><math>\frac{9}{36}</math></td> <td><math>\frac{11}{36}</math></td> </tr> </table>	x	1	2	3	4	5	6	$P(X=x)$	$\frac{1}{36}$	$\frac{3}{36}$	$\frac{5}{36}$	$\frac{7}{36}$	$\frac{9}{36}$	$\frac{11}{36}$	
x	1	2	3	4	5	6										
$P(X=x)$	$\frac{1}{36}$	$\frac{3}{36}$	$\frac{5}{36}$	$\frac{7}{36}$	$\frac{9}{36}$	$\frac{11}{36}$										
	0.0278, 0.0833, 0.139, 0.194, 0.25, 0.306 (Accept awrt 3 s.f)	(3)														
(b)	$P(3) + P(4) + P(5) = \frac{21}{36}$ or $\frac{7}{12}$ <u>or awrt 0.583</u>	M1, A1 (2)														

**Q6, (Edexcel 6683, Jan 2008, Q7)**

(a)	$P(R=3 \cap B=0) = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$	M1, A1																																				
(b)	<table border="1"> <tr> <td></td> <td>3</td> <td>0</td> <td>3</td> <td>6</td> <td>9</td> </tr> <tr> <td></td> <td>2</td> <td>0</td> <td>2</td> <td>4</td> <td>6</td> </tr> <tr> <td></td> <td>1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td></td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>B</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>R</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td></td> </tr> </table>		3	0	3	6	9		2	0	2	4	6		1	0	1	2	3		0	0	0	0	0	B						R	0	1	2	3		All 0s All 1,2,3s All 4,6,9s B1 B1 B1 (3)
	3	0	3	6	9																																	
	2	0	2	4	6																																	
	1	0	1	2	3																																	
	0	0	0	0	0																																	
B																																						
R	0	1	2	3																																		
(c)	$a = \frac{7}{16}, b = c = d = \frac{1}{16}$	B1, B1 B1 (3)																																				

**Q7, (Edexcel 6683, Jan 2011, Q6a,e-g)**

(a)	$k + 2k + 3k + 4k = 1$ or $10k = 1$ $k = 0.1$ (*) [allow verification with a comment e.g. "so $k = 0.1$ "]	B1cso (1)																
(e)	$P(1,3) + P(2,2) = 2 \times 0.1 \times 0.3 + 0.2 \times 0.2 = 0.1$ (*)	M1 A1cso (2)																
(f)	<table border="1"> <tr> <td><math>X_1 + X_2</math></td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> </tr> <tr> <td>p</td> <td>0.01</td> <td>0.04</td> <td>0.1</td> <td><b>0.2</b></td> <td>0.25</td> <td>0.24</td> <td><b>0.16</b></td> </tr> </table>	$X_1 + X_2$	2	3	4	5	6	7	8	p	0.01	0.04	0.1	<b>0.2</b>	0.25	0.24	<b>0.16</b>	B1 B1 (2)
$X_1 + X_2$	2	3	4	5	6	7	8											
p	0.01	0.04	0.1	<b>0.2</b>	0.25	0.24	<b>0.16</b>											
(g)	$P(2) + P(3) = 0.05$	M1A1 (2)																