Question Number	Scheme	Marks
2. (a)	**Number** all employees [1-800]	B1
	Use a **random** number to select the **first employee** oe	B1
	Then select every **10th** employee from the list of employees	B1
		(3)
(b)	**Number** all employees **by city/for each city**	B1
	Use **random** numbers to select	B1
	54 employees from London, **31** employees from Edinburgh and **15** employees from Cardiff	B1
		(3)
(c)	e.g Stratified sample reflects the population structure	B1
		(1)
		[7]

Question Number	Scheme	Marks
5. (a)	Label beginners 1 – 452, intermediates 1 – 251, professionals 1 – 97	M1
	Use random numbers to select a ...	M1
	Simple random sample of 28 beginners, 16 intermediates and 6 professionals.	A1
		[3]
(b)	**Any one of**	
	• Enables estimation of statistics/sampling errors for each strata.	B1
	• Reduces variability.	
	• More representative of the population/reflects population structure	**[1]**
(c)	$H_0 : m_I - m_B = 3 \quad H_1 : m_I - m_B > 3$	B1; B1
	s.e. $= \sqrt{\frac{38.1}{60} + \frac{57.3}{80}}$ $\{= 1.162432794...\}$	M1
	$z = \frac{36.9 - 31.7 - 3}{"1.1624..."}$; $= 1.89258...$	dM1;
	awrt 1.89	A1
	One tailed c.v. $Z = 1.6449$ or CR : $Z \geqslant 1.6449$ or p-value = awrt $0.029 < 0.05$	B1
	[in the CR/significant/Reject H_0/"0.029" < 0.05]	
	Conclude either that the	
	• mean score of intermediates is more than 3 greater than the mean score of beginners. (oe)	A1
	• manager's belief is correct.	
		[7]
		11
	Alternative method for "2nd M1, 1st A1, 3rd B1" marks: Let $D = \bar{x}_I - \bar{x}_B$	
	$1.6449 = \frac{D - 3}{1.1624...}$ **dependent upon the 1st M1 for** $\frac{D - 3}{\text{their "1.1624..."}} = 1.6449 / 1.645 / 1.64 / 1.65$	dM1:
	So, $D = 4.912...$ $D =$ awrt 4.91 and $D_{obs} = 5.2$	A1
	$D_{obs} = 36.9 - 31.7 = 5.2$ [1.64, 1.65]	B1

3. (a)	Any two reasons from • sample will be taken from the same office **or** other offices not considered. • same day **or** other days not considered. • around the same time of arrival **or** first 50 employees • These employees may have the same views (e.g. positive attitude to work).	B1, B1 **[2]**
(b)	Generate a numbered list(oe) of all employees sorted by office location.	B1
	Use random numbers to select/take a (simple) random sample of ...	B1
	51 employees from Bristol, 26 employees from Dudley, 73 employees from Glasgow.	B1cao **[3]**
(c)	Any one of advantage of stratified sampling, e.g. • A stratified sample is not biased as the members are chosen randomly. • You can estimate the sampling errors for a stratified sample • A stratified sample gives more accurate estimates as it is a random process.	B1 **[1]** **6**

Question Number	Scheme	Marks
1(a)	Select a random number as the starting point	B1
	Take every 50th employee	B1
		(2)
(b)	e.g. The alphabetical list may not be **random** or May be **biased** as list not truly random or Some **combinations** of names are **not possible**	B1
		(1)
(c)	0	B1
		(1)
	Notes	Total 4