

STEP II, 2021, Q3 MS

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- (i) From the 1st eqn: $\{x\} = 4$ and $\{y\} = 0.9$ B1
 From the 2nd eqn: $\{x\} = 0.6$ and $\{y\} = -2$ B1
 Clear use of $x = \{x\} + \{y\}$ etc. M1
 Solution is $x = 4.6$, $y = -1.1$ A1

NB for candidates scoring *none* of the above marks, allow a **B1** for adding both eqns. to obtain $x + y = 3.5$

- (ii) ② + ③ - ① M1
 $\Rightarrow y + \{y\} - \{y\} + z + \{z\} - \{z\} = 6.4$
 $\Rightarrow 2\{y\} + 2\{z\} = 6.4$ M1
 $\Rightarrow \{y\} + \{z\} = 3.2$ **AG** or $\{x\} + \{y\} = 2.1$ or $\{x\} + \{z\} = 1.8$ A1
 Similar attempts at ① + ② - ③ $\Rightarrow \{x\} + \{y\} = 2.1$ M1
 and ① + ③ - ② $\Rightarrow \{x\} + \{z\} = 1.8$
 The remaining two 2-variable eqns. correct A1
 $\Rightarrow \{y\} = 0.2$ and $\{z\} = 3$ B1
 Also (respectively) $\{x\} = 0.1$ and $\{y\} = 2$ B1
 and $\{x\} = 1$ and $\{z\} = 0.8$ B1
 Solution is $x = 1.1$, $y = 2.2$, $z = 3.8$ A1

- (iii) From ② + ③ - ①, we now get $2\{y\} + \{z\} = 3.2$ B1
 From ① + ③ - ②, we still get $\{x\} + \{z\} = 1.8$ B1
 From ① + ② - ③, we now get $\{x\} + 2\{y\} = 2.1$ B1

First solution follows immediately from (ii): namely,
 $x = 1.1$, $y = 1.1$, $z = 3.8$ B1

For clear evidence that the second possibility exists M1
 namely: $2\{y\} + \{z\} = 3.2 \Rightarrow \{y\} = 0.6$ and $\{z\} = 2$ A1
 and $\{x\} + 2\{y\} = 2.1 \Rightarrow \{x\} = 0.1$ and $\{y\} = 1$ A1
NB $\{x\} = 1$ and $\{z\} = 0.8$ follows as before

Second solution is $x = 1.1$, $y = 1.6$, $z = 2.8$ A1



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