Question 1 **(25 marks)**

(a) A class consists of 12 boys and 8 girls.

(i) Two students are selected at random from the class. What is the probability that the two students selected will be a boy and a girl in any order?

(ii) Four students are selected, one at a time, at random from the class.
What is the probability that the **first three** students selected will be boys and the fourth will be a girl?

(b) An examination paper is made up of two sections, Section A consisting of 7 questions and Section B consisting of 8 questions. The paper contains the following instruction:
"*From section A you must answer question 1 and any three other questions.*
From Section B you must also answer any four questions."
Find how many different combinations of questions may be answered if a candidate follows this instruction.

Q1	Model Solution – 25 Marks	Marking Notes
(a) (i)	$\frac{12}{20}\times\frac{8}{19}+\frac{8}{20}\times\frac{12}{19}$ $=\frac{96}{380}+\frac{96}{380}$ or $2\left(\frac{96}{380}\right)$ $\frac{12}{20}\times\frac{8}{19}+\frac{8}{20}\times\frac{12}{19}=\frac{192}{380}$ or $\frac{48}{95}$ Or $\frac{\binom{12}{1}\binom{8}{1}}{\binom{20}{2}}=\frac{96}{190}$ or $\frac{48}{95}$ Or $1-\left[\frac{12}{20}\times\frac{11}{19}+\frac{8}{20}\times\frac{7}{19}\right]=1-\frac{188}{380}$ $=\frac{192}{380}$ or $\frac{48}{95}$	**Scale 10C (0, 4, 7, 10)** *Low Partial Credit:* 1 probability given e.g. $\frac{12}{20}$ or equivalent 1 combination indicated e.g. $\binom{12}{1}$ or $\binom{8}{1}$ or $\binom{20}{2}$ $\frac{12}{20}\times\frac{8}{19}$ or $\frac{8}{20}\times\frac{12}{19}$ or equivalent and stops $\frac{\binom{12}{1}}{\binom{20}{2}}$ or $\frac{\binom{8}{1}}{\binom{20}{2}}$ and stops $1-\frac{12}{20}\times\frac{11}{19}$ or $1-\frac{8}{20}\times\frac{7}{19}$ and stops *High Partial Credit:* $\frac{12}{20}\times\frac{8}{19}$ or $\frac{8}{20}\times\frac{12}{19}$ or equivalent and continues $\frac{\binom{12}{1}}{\binom{20}{2}}$ or $\frac{\binom{8}{1}}{\binom{20}{2}}$ and continues $1-\frac{12}{20}\times\frac{11}{19}$ or $1-\frac{8}{20}\times\frac{7}{19}$ and continues
(a) (ii)	$\frac{12}{20}\times\frac{11}{19}\times\frac{10}{18}\times\frac{8}{17}=\frac{10560}{116280}$ or $\frac{88}{969}$ **Or** $\frac{\binom{12}{1}}{\binom{20}{1}}\times\frac{\binom{11}{1}}{\binom{19}{1}}\times\frac{\binom{10}{1}}{\binom{18}{1}}\times\frac{\binom{8}{1}}{\binom{17}{1}}$ $=\frac{10560}{116280}$ or $\frac{88}{969}$	**Scale 10D (0, 4, 5, 8, 10)** *Low Partial Credit:* 1 probability given 1 combination indicated *Mid Partial Credit* 3 or 4 correct probabilities indicated *High Partial Credit:* 3 correct probabilities with multiplication completed 4 probabilities with correct operator

(b)	$\binom{6}{3} \times \binom{8}{4} = 1400$ or $\binom{1}{1} \times \binom{6}{3} \times \binom{8}{4} = 1400$	**Scale 5C (0, 2, 3, 5)** *Low Partial Credit:* $\binom{6}{3}$ or $\binom{8}{4}$ or $\binom{1}{1}$ *High Partial Credit:* $\binom{6}{3} \times \binom{8}{4}$ and stops