Q1. Phil has 20 sweets in a bag.

5 of the sweets are orange.
7 of the sweets are red.
8 of the sweets are yellow.

Phil takes at random **two** sweets from the bag.

Work out the probability that the sweets will **not** be the same colour.

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(Total 4 marks)

Q2. Sue wants to find out if a 6-sided dice is biased.
She rolls the dice six times.

The table shows her results.

Score	1	2	3	4	5	6
Frequency	0	1	1	1	1	2

Sue says

"My experiment shows this dice is biased".

Sue is wrong.
Explain why.

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.....

(Total 1 mark)

M1.

Working	Answer	Mark
$\frac{5}{20}\times\frac{7}{19}+\frac{5}{20}\times\frac{8}{19}+\frac{7}{20}\times\frac{5}{19}+\frac{7}{20}\times\frac{8}{20}+\frac{8}{20}\times\frac{5}{19}+\frac{8}{20}\times\frac{7}{19}$ **or** $\left(\frac{5}{20}\times\frac{15}{19}+\frac{7}{20}\times\frac{13}{19}+\frac{8}{20}\times\frac{12}{19}\right)$ **or** $1-\left(\frac{5}{20}\times\frac{4}{19}+\frac{7}{20}\times\frac{6}{19}+\frac{8}{20}\times\frac{7}{19}\right)$	$\frac{131}{190}$	4
		Total for Question: 4 marks

Additional Guidance

M1 for at least one product of the form $\frac{a}{20}\times\frac{b}{19}$
M1 for identifying all products
(condone 2 errors in 6 products, 1 error in 3 products)
Either
$\left(\frac{5}{20}\times\frac{7}{19},\frac{5}{20}\times\frac{8}{19},\frac{7}{20}\times\frac{5}{19},\frac{7}{20}\times\frac{8}{19},\frac{8}{20}\times\frac{5}{19},\frac{8}{20}\times\frac{7}{19}\right)$

or
$\left(\frac{5}{20}\times\frac{15}{19},\frac{7}{20}\times\frac{13}{19},\frac{8}{20}\times\frac{12}{19}\right)$ **or**
$\left(\frac{5}{20}\times\frac{4}{19},\frac{7}{20}\times\frac{6}{19},\frac{8}{20}\times\frac{7}{19}\right)$

M1 (dep) for

$\left(,\frac{5}{20}\times\frac{7}{19}+\frac{5}{20}\times\frac{8}{19}+\frac{7}{20}\times\frac{5}{19}+\frac{7}{20}\times\frac{8}{19}+\frac{8}{20}\times\frac{5}{19}+\frac{8}{20}\times\frac{7}{19},\right)$ oe

or $\left(,\frac{5}{20}\times\frac{15}{19}+\frac{7}{20}\times\frac{13}{19}+\frac{8}{20}\times\frac{12}{19},\right)$ oe

or 1 – $\left(,\frac{5}{20}\times\frac{4}{19}+\frac{7}{20}\times\frac{6}{19}+\frac{8}{20}\times\frac{7}{19},\right)$ oe

A1 for $\frac{131}{190}$ oe or 0.68947… correct to at least 2 decimal places or answer that rounds to 0.69

NB : If decimals used for products then must be correct to at least 2 decimal places

With replacement
M0
M1 for identifying all products
(condone 2 errors in 6 products, 1 error in 3 products)
either
$\left(\frac{5}{20}\times\frac{7}{20},\frac{5}{20}\times\frac{8}{20},\frac{7}{20}\times\frac{5}{20},\frac{7}{20}\times\frac{8}{20},\frac{8}{20}\times\frac{5}{20},\frac{8}{20}\times\frac{7}{20}\right)$ **or**
$\left(\frac{5}{20}\times\frac{5}{20},\frac{7}{20}\times\frac{7}{20},\frac{8}{20}\times\frac{8}{20}\right)$ **or**
$\left(\frac{5}{20}\times\frac{15}{20},\frac{7}{20}\times\frac{13}{20},\frac{8}{20}\times\frac{12}{20}\right)$

M1 (dep) for

$\left(,\frac{5}{20}\times\frac{7}{20}+\frac{5}{20}\times\frac{8}{20}+\frac{7}{20}\times\frac{5}{20}+\frac{7}{20}\times\frac{8}{20}+\frac{8}{20}\times\frac{5}{20}+\frac{8}{20}\times\frac{7}{20},\right)$

or $\left(,\frac{5}{20}\times\frac{15}{20}+\frac{7}{20}\times\frac{13}{20}+\frac{8}{20}\times\frac{12}{20},\right)$

or 1 – $\left(,\frac{5}{20}\times\frac{5}{20}+\frac{7}{20}\times\frac{7}{20}+\frac{8}{20}\times\frac{8}{20},\right)$

A0 for $\frac{262}{400}$ oe or 0.655 (NB: $\frac{262}{400}$ oe or 0.655 implies M2)

Partial replacement

SC: **B2** for $\frac{141}{200}$ oe or 0.705 **or** $\frac{121}{190}$ oe or 0.6368… correct to at least 2 decimal places

M2.

Answer	Mark	Additional Guidance
Reason	1	**B1** for indication of not enough trials
		Total for Question: 1 mark

E1. A large number of candidates drew tree diagrams, which in most cases were helpful: however some candidates drew them so big that their calculations were then squashed around the edges with very little logical flow. Most candidates seemed to have assumed that there was replacement and so limited themselves to 2 out of the four marks. It was common to consider only three scenarios instead of 6, for example red then orange but not orange then red. It was more common to see 6 fractions added rather than 1 – the complement.

E2. This question was not answered well. Only about a third of the candidates realized that they had to comment on the frequency of the trials of the experiment. Common unacceptable answers here were, e.g. “the dice has an equal chance of landing on the numbers” and “if she kept rolling the dice it would land on a 1”.