<table>
<tr><th>Question Number</th><th>Scheme</th><th>Marks</th></tr>
<tr><td>4(a)</td><td>H_0: favourite flavours occur in the ratio 10 : 5 : 2 : 3</td><td rowspan="2">B1</td></tr>
<tr><td></td><td>H_1: favourite flavours do not occur in the ratio 10 : 5 : 2 : 3</td></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>Chocolate</td><td>Vanilla</td><td>Strawberry</td><td>Other</td></tr>
<tr><td>observed</td><td>188</td><td>95</td><td>40</td><td>77</td></tr>
<tr><td>expected</td><td>200</td><td>100</td><td>40</td><td>60</td></tr>
<tr><td>$\frac{(O_i-E_i)^2}{E_i}$</td><td>$\frac{(188-"200")^2}{"200"}$
(= 0.72)</td><td>$\frac{(95-"100")^2}{"100"}$
(= 0.25)</td><td>$\frac{(40-"40")^2}{"40"}$
(= 0)</td><td>$\frac{(77-"60")^2}{"60"}$
(= 4.816…)</td></tr>
<tr><td>$\frac{O_i^2}{E_i}$</td><td>$\frac{188^2}{"200"}$
(=176.72)</td><td>$\frac{95^2}{"100"}$
(=90.25)</td><td>$\frac{40^2}{"40"}$
(=40)</td><td>$\frac{77^2}{"60"}$
(=98.816…)</td></tr>
</table>
</td><td>M1
M1</td></tr>
<tr><td></td><td>$\sum \frac{(O_i-E_i)^2}{E_i} = 5.786\ldots$ <u>or</u> $\sum \frac{O_I^2}{E_I} - 400 = 405.7867 - 400$ (awrt 5.79)</td><td>A1</td></tr>
<tr><td></td><td>$\nu = 3$</td><td>B1</td></tr>
<tr><td></td><td>CV is 7.815</td><td>B1ft</td></tr>
<tr><td></td><td>[5.79 < 7.815] so insufficient evidence to reject H_0 <u>or</u> not significant</td><td>M1</td></tr>
<tr><td></td><td>There is no evidence to suggest that people's favourite flavours of ice-cream do not occur in the given ratio. oe</td><td>A1ft</td></tr>
<tr><td></td><td></td><td>(8)</td></tr>
<tr><td>(b)(i)(ii)</td><td>$\frac{188\times130}{400}$ or $\frac{112\times95}{400}$</td><td>M1</td></tr>
<tr><td></td><td>61.1 and 26.6</td><td>A1</td></tr>
<tr><td></td><td></td><td>(2)</td></tr>
<tr><td>(c)</td><td>6</td><td>B1</td></tr>
<tr><td></td><td></td><td>(1)</td></tr>
<tr><td></td><td>Notes</td><td>Total 11</td></tr>
<tr><td>(a)</td><td colspan="2">B1 Both hypotheses correct. Must state the ratio or refer to the "given ratio" oe. Does not need to state the actual flavours.
Accept statements e.g. H_0 : the proportion of people who like different ice creams is 10:5:2:3 Accept H_0 : the ratio 10:5:2:3 is correct. Do not accept e.g. H_0 : the manager's belief is correct (without reference to the ratio)</td></tr>
<tr><td></td><td colspan="2">M1 At least 2 expected values correct. Check if each cell has been calculated separately and the totals add up to 200, 100, 40 and 60 (seen)</td></tr>
<tr><td></td><td colspan="2">M1 Correct method seen or may be implied by values for at least 2 flavours. Implied by awrt 5.79</td></tr>
<tr><td></td><td colspan="2">A1 awrt 5.79</td></tr>
<tr><td></td><td colspan="2">B1 correct degrees of freedom stated or implied by any awrt 0.072 0.115 0.216 0.352 0.584 6.251 7.815 9.348 11.345 12.838</td></tr>
<tr><td></td><td colspan="2">B1ft awrt 7.815 follow through on 6 degrees only = 12.592</td></tr>
<tr><td></td><td colspan="2">M1 Independent of hypotheses, ft their χ^2 value and their CV. A correct comment. Allow</td></tr>
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	"Accept H_0" or e.g. "do not reject H_0" Do not award if contradicting non contextual comments given. If their χ^2 value < their CV e.g. "do not reject H_0" If their χ^2 value > their CV e.g. "reject H_0" (May be implied by a correct ft contextual comment)
	A1ft **dependent on all the previous method marks**. A correct contextual comment for their χ^2 value and their CV that mentions **flavour** and **ratio** oe (does not need to state the actual ratio) Accept sufficient evidence to support the manager's belief oe condone "the manager is correct"
(b)	M1 A correct method to find one of the values. Implied by one correct value
	A1 Both answers correct.
(c)	B1 cao