# Surds Past Paper Answers Edexcel Maths IGCSE Higher- Calculator

## 1.

| | | | |
|---|---|---|---|
| $(\sqrt{3} + 3\sqrt{3})/\sqrt{2}$<br>$4\sqrt{3}/\sqrt{2}$<br>$2\sqrt{6}$ or $(\sqrt{48}/\sqrt{2})$ | 24 | 3 | M1 Must see $\sqrt{27}$ reduce to $3\sqrt{3}$ alternative $\frac{\sqrt{6}+\sqrt{54}}{2}$ (or better)<br>M1 dep on 1st M1<br>A1cao dep on M2 Accept $\sqrt{24}$ if M2 awarded. |
| | | | **Total 3 marks** |

## 2.

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| | $3+\sqrt{x}+3\sqrt{x}+\left(\sqrt{x}\right)^2$ oe | | 3 | M1 |
| | | $(x=)$ 5 | | A1 |
| | | $(y=)$ 8 | | A1 |
| | | | | **Total 3 marks** |

## 3.

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| | $5^2-5\sqrt{x}-5\sqrt{x}+(\sqrt{x})^2$ oe | | 3 | M1 for correct expansion |
| | | $(x=)$ 8 | | A1 cao |
| | | $(y=)$ 33 | | A1 cao |
| | | | | **Total 3 marks** |

## 4.

| | | | |
|---|---|---|---|
| $\frac{7\sqrt{p}-p^2}{p\sqrt{p}}$ **or** $\frac{7\sqrt{p}-p^2}{\sqrt{p^3}}\times\frac{\sqrt{p^3}}{\sqrt{p^3}}$ oe | $\frac{7-p\sqrt{p}}{p}$ | 3 | M1 e.g. $\frac{7p^{\frac{1}{2}}-p^2}{p^{\frac{3}{2}}}$ |
| $\frac{7\sqrt{p}-p^2}{p\sqrt{p}}\times\frac{\sqrt{p}}{\sqrt{p}}$ **or** $\frac{7\sqrt{p}-p\sqrt{p}\sqrt{p}}{p\sqrt{p}}$ $\frac{7\sqrt{p}\sqrt{p^3}-p^2\sqrt{p^3}}{p^3}$ oe | | | M1 e.g. $\frac{7p^2-p^{\frac{7}{2}}}{p^3}$ oe |
| | | | A1 for $\frac{7-p\sqrt{p}}{p}$ **or** $\frac{7}{p}-\sqrt{p}$ oe **or** $\frac{7-p^{\frac{3}{2}}}{p}$ oe |
| | | | **Total 3 marks** |

## 5.

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| (a) | $\sqrt{25\times2}+\sqrt{64\times2}-\sqrt{100\times2}$ **or** $5\sqrt{2}+8\sqrt{2}-10\sqrt{2}$ **or** $3\sqrt{2}$ | 3 | 2 | M1 for at least 2 out of 3 correct products from those shown **or** for $3\sqrt{2}$<br>A1 |
| (b) | E.g. $\frac{5\sqrt{a}+a}{10\sqrt{a}}\times\frac{\sqrt{a}}{\sqrt{a}}$ **or** $\frac{5\sqrt{a}}{10\sqrt{a}}+\frac{a}{10\sqrt{a}}$ **or** $\frac{\sqrt{a}(5+\sqrt{a})}{10\sqrt{a}}$ | $\frac{1}{2}+\frac{1}{10}\sqrt{a}$ | 2 | M1 $\sqrt{a}$ for multiplying numerator and denominator by $\sqrt{a}$ (or a multiple of $\sqrt{a}$) **or** splitting fraction into 2 parts **or** taking out $\sqrt{a}$ as a common factor<br>A1 from correct working<br>NB. individual fractions need not be in their simplest form |

## 6.

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| | $\frac{\sqrt{8}}{\sqrt{8}-2}\times\frac{\sqrt{8}+2}{\sqrt{8}+2}$ | Shown | 3 | M1 or $\frac{2\sqrt{2}}{2\sqrt{2}-2}$ or $\frac{\sqrt{2}}{\sqrt{2}-1}$ |
| | $\frac{\sqrt{8}(\sqrt{8}+2)}{8-4}=\frac{8+2\sqrt{8}}{4}=\frac{8+4\sqrt{2}}{4}$ | | | M1 or $\frac{\sqrt{2}}{\sqrt{2}-1}\times\frac{\sqrt{2}+1}{\sqrt{2}+1}$ |
| | $=2+\sqrt{2}$ | | | A1 (dep on M2) Conclusion - need not state the value of $n$ |

## 7.

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| (a) | Eg $\frac{a+\sqrt{4b}}{a-\sqrt{4b}}\times\frac{a+\sqrt{4b}}{a+\sqrt{4b}}$ **or** $\frac{a+2\sqrt{b}}{a-2\sqrt{b}}\times\frac{a+2\sqrt{b}}{a+2\sqrt{b}}$ **or** $\frac{(a+2\sqrt{b})^2}{(a+2\sqrt{b})(a-2\sqrt{b})}$ | | | M1 For multiplying the numerator and denominator by $a+\sqrt{4b}$ or $a+2\sqrt{b}$ |
| | Eg $\frac{(a+\sqrt{4b})(a+\sqrt{4b})}{a^2-4b}$ | | | M1 dep on M1 for correctly simplified denominator |
| | | $\frac{a^2+4a\sqrt{b}+4b}{a^2-4b}$ | 3 | A1 for $\frac{a^2+4a\sqrt{b}+4b}{a^2-4b}$ **or** $\frac{(a+2\sqrt{b})^2}{a^2-4b}$ |
| (b) | | 2.5 oe | 1 | B1 |

## 8.

| | | | |
|---|---|---|---|
| $(\sqrt{a})^2+(\sqrt{8a})^2+2\sqrt{a}\sqrt{8a}$<br>$a+8a+2a\sqrt{8}$<br>$9a+4a\sqrt{2}$ | $a=6$ $b=24$ | 3 | M1 for correct expansion of brackets<br>A1 for $9a+4a\sqrt{2}$<br>A1 |
| | | | **Total 3 marks** |

## 9.

| Question | Working | Answer | Mark | Notes | | |
|---|---|---|---|---|---|---|
| (a) | $25+15\sqrt{2}+15\sqrt{2}+9\times2$<br>or $25+15\sqrt{2}+15\sqrt{2}+18$<br>or $25+30\sqrt{2}+9\times2$<br>or $25+30\sqrt{2}+18$ | | 2 | M1 | Expand to give four terms – (must have surds not decimals), at least three correct,<br>or three terms with irrational term and one other correct.<br>Accept $\left(\sqrt{2}\right)^2$ for 2 | |
| | | $43+30\sqrt{2}$ | | A1 | dep on M1 awarded | |
| (b) | $\sqrt{8}=2\sqrt{2}$ or $(q=)\sqrt{8}\times"30\sqrt{2}"$ | | 3 | M1 | Award M marks independently for simplifying $\sqrt{8}$ and rationalising the denominator, seen at any points in the solution. | |
| | $\frac{1}{\sqrt{2}}=\frac{\sqrt{2}}{2}$ or $\frac{1}{\sqrt{8}}=\frac{\sqrt{8}}{8}$ or $(q=)30\sqrt{16}$ or<br>$(q=)\ 60\sqrt{4}$ or $(q=)\ 30\sqrt{2}$ x $2\sqrt{2}$ | | | M1 | | ft from (a) for $30\sqrt{16}$ |
| | | 120 | | A1 | ft 4 × "30" from (a) | |
| | | | | | | **Total 5 marks** |

## 10.

| | | | | |
|---|---|---|---|---|
| E.g.<br>$5\sqrt{2}\times3\sqrt{2}+5e\sqrt{2}-3e\sqrt{2}-e^2$ **or**<br>$30+2e\sqrt{2}-e^2$ | | | M1 | for rational terms correct $(5\sqrt{2}\times3\sqrt{2}-e^2)$<br>**or**<br>irrational terms correct $(5e\sqrt{2}-3e\sqrt{2})$<br><br>NB: $5\sqrt{2}\times3\sqrt{2}$ may be fully or partially simplified |
| $5\sqrt{2}\times3\sqrt{2}-e^2=-6$ oe **or**<br>rational terms correct **and** $e=6$ **or**<br><br>$5\sqrt{2}\ e-3\sqrt{2}\ e=\sqrt{2}f$ oe **or**<br>$5e-3e=f$ oe | | | M1 | dep on M1 |
| | $e=6$<br>$f=12$ | 3 | A1 | |
| | | | | **Total 3 marks** |