"Use and manipulate surds, including rationalising the denominator." (Standard)

Question 1

Write $\sqrt{80}$ in the form $c\sqrt{5}$, where c is a positive constant.

(1 mark)

Question 2

Simplify $\left(2\sqrt{5}\right)^2$

(1 mark)

Question 3

Express

$$\left(5 - \sqrt{8}\right)\left(1 + \sqrt{2}\right)$$

in the form $a + b\sqrt{2}$, where a and b are integers.

(3 marks)

Question 4

Express $\left(2 - \sqrt{3}\right)^2$ in the form $b + c\sqrt{3}$, where b and c are integers to be found.

Question 5

Simplify $\sqrt{50} - \sqrt{18}$, giving your answer in the form $a\sqrt{2}$, where a is an integer.

(2 marks)

Question 6

Find $\frac{15}{\sqrt{3}} - \sqrt{27}$ in the form $k\sqrt{3}$, where k is an integer.

(4 marks)

Question 7

Express $\frac{26}{4+\sqrt{3}}$ in the form $a + b\sqrt{3}$, where a and b are integers.

Question 8

By first simplifying $\sqrt{32} + \sqrt{18}$, simplify

$$\frac{\sqrt{32}+\sqrt{18}}{3+\sqrt{2}}$$

giving your answer in the form $b\sqrt{2} + c$, where b and c are integers.

(4 marks)

Mark scheme

Question 1

$4\sqrt{5}$

(a) $80 = 5 \times 16$ $\sqrt{80} = 4\sqrt{5}$		B1

Question 2

20

20	Sight of 20. (4×5 is not sufficient)	B1

Question 3

$1 + 3\sqrt{2}$

(i)	$\left(5 - \sqrt{8}\right)\left(1 + \sqrt{2}\right)$ $= 5 + 5\sqrt{2} - \sqrt{8} - 4$ $= 5 + 5\sqrt{2} - 2\sqrt{2} - 4$ $= 1 + 3\sqrt{2}$		M1
		$\sqrt{8} = 2\sqrt{2}$, seen or implied at any point.	B1
		$1 + 3\sqrt{2}$ or $a = 1$ and $b = 3$.	A1

Question 4

$7 - 4\sqrt{3}$

Question 5

$2\sqrt{2}$

$\sqrt{50} - \sqrt{18} = 5\sqrt{2} - 3\sqrt{2}$	$\sqrt{50} = 5\sqrt{2}$ or $\sqrt{18} = 3\sqrt{2}$ **and** the other term in the form $k\sqrt{2}$. This mark may be implied by the correct answer $2\sqrt{2}$	M1
$= 2\sqrt{2}$	Or $a = 2$	A1

Question 6

$2\sqrt{3}$

$\dfrac{15}{\sqrt{3}} = \dfrac{15}{\sqrt{3}} \times \dfrac{\sqrt{3}}{\sqrt{3}} = 5\sqrt{3}$	M1: Attempts to multiply numerator and denominator by √3. This may be implied by a correct answer.	M1A1
	A1: $5\sqrt{3}$	
$\sqrt{27} = 3\sqrt{3}$		B1
$\dfrac{15}{\sqrt{3}} - \sqrt{27} = 2\sqrt{3}$		A1

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Question 7

$8 - 2\sqrt{3}$

Question 8

$3\sqrt{2} - 2$

(b)	$\times\dfrac{3-\sqrt{2}}{3-\sqrt{2}}$ $\underline{or}$ $\times\dfrac{-3+\sqrt{2}}{-3+\sqrt{2}}$ seen	M1
	$\left[\dfrac{\sqrt{32}+\sqrt{18}}{3+\sqrt{2}}\times\dfrac{3-\sqrt{2}}{3-\sqrt{2}}=\right]\dfrac{a\sqrt{2}\left(3-\sqrt{2}\right)}{[9-2]}\ \rightarrow\ \dfrac{3a\sqrt{2}-2a}{[9-2]}$ (or better)	dM1
	$= \underline{3\sqrt{2}, -2}$	A1, A1 (4)