

Q1. Expand and simplify

$$(2 + \sqrt{3})(7 - \sqrt{3})$$

Give your answer in the form $a + b\sqrt{3}$, where a and b are integers.

.....

(Total 3 marks)

Q2. (a) Rationalise the denominator of $\frac{1}{\sqrt{3}}$

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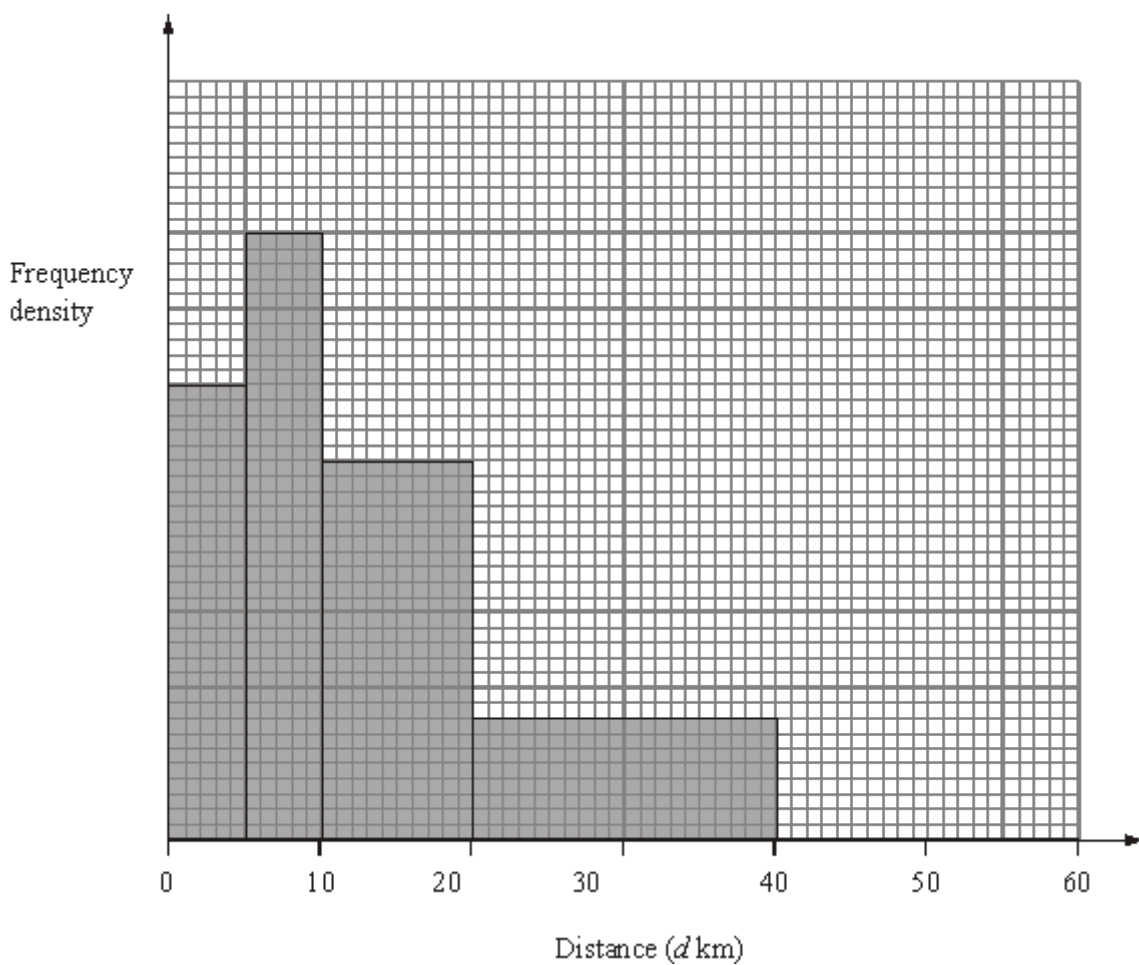
(1)

(b) Expand $(2 + \sqrt{3})(1 + \sqrt{3})$

Give your answer in the form $a + b\sqrt{3}$ where a and b are integers.

.....
 (2)
 (Total 3 marks)

Q3. The incomplete histogram and table give some information about the distances some teachers travel to school.



(a) Use the information in the histogram to complete the frequency table.

Distance (d km)	Frequency
$0 < d \leq 5$	15

$5 < d \leq 10$	20
$10 < d \leq 20$	
$20 < d \leq 40$	
$40 < d \leq 60$	10

(2)

(b) Use the information in the table to complete the histogram.

(1)

(Total 3 marks)

Q4. $\sqrt{3} = 3^k$

(a) Write down the value of k

.....

(1)

(b) Expand and simplify $(2 + \sqrt{3})(1 + \sqrt{3})$

Give your answer in the form $a + b\sqrt{3}$

where a and b are integers

.....

(2)
(Total 3 marks)

M1.

Working	Answer	Mark	Additional Guidance
$2 \times 7 - 2 \times \sqrt{3} + 7 \times \sqrt{3} - \sqrt{3} \times \sqrt{3} =$ $14 + 5\sqrt{3} - 3$	$11 + 5\sqrt{3}$	3	<p>M1 for exactly 3 or exactly 4 terms correct including correct signs or all 4 terms correct with wrong signs.</p> <p>M1(dep) for either collecting their two or three terms in $\sqrt{3}$ or for $\sqrt{3} \times \sqrt{3} = 3$</p> <p>A1 cao</p>
Total for Question: 3 marks			

M2.

	Working	Answer	Mark	Additional Guidance
(a)	$\frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$	$\frac{\sqrt{3}}{3}$	1	<p>B1 for $\frac{\sqrt{3}}{3}$ or $\frac{k\sqrt{3}}{3k}$ or $\frac{\sqrt{3k^2}}{3k}$, where k is an integer not equal to 0</p> <p>$\frac{1\sqrt{3}}{3}, \frac{\sqrt{1}\sqrt{3}}{3}$ or $\frac{3^{0.5}}{3}$</p> <p>(accept $\frac{1\sqrt{3}}{3}, \frac{\sqrt{1}\sqrt{3}}{3}$ or $\frac{3^{0.5}}{3}$)</p>
(b)	$2 \times 1 + 2 \times \sqrt{3} + 1$ $\times \sqrt{3} + \sqrt{3} \times \sqrt{3}$	$5 + 3\sqrt{3}$	2	<p>M1 for $2 \times 1 + 2 \times \sqrt{3} + 1 \times \sqrt{3} + 3 \times \sqrt{3}$ or three of 2, $2\sqrt{3}$, $\sqrt{3}$, $\sqrt{9}$ (or 3 or $\sqrt{3^2}$ or $(\sqrt{3})^2$)</p> <p>A1 for $5 + 3\sqrt{3}$ cao</p> <p>(SC: B1 for $a + 3\sqrt{3}$ or $5 + b\sqrt{3}$ if M0 scored, where a and b are integers not equal to 0)</p>
Total for Question: 3 marks				

M3.

	Answer	Mark	Additional Guidance
(a)	7	1	B1 for 7 (accept -7 or ± 7)
(b)	$3\sqrt{5}$	1	B1 cao
Total for Question: 2 marks			

M4.

	Working	Answer	Mark	Additional Guidance
(a)		$\frac{1}{2}$	1	B1
(b)	$(2 + \sqrt{3}) \times (1 + \sqrt{3})$ $= 2 + 2\sqrt{3} + \sqrt{3} + \sqrt{9}$	$5 + 3\sqrt{3}$	2	M1 4 term expansion with 3, 4 terms correct and sight of 3 or $\sqrt{9}$ A1 cao
Total for Question: 3 marks				

- E1.** There were a refreshing number of correct or nearly correct answers to this question. Many candidates could expand the brackets more or less correctly and then go on to collect terms. Common errors were to evaluate $\sqrt{3} \times -\sqrt{3}$ as zero and to make sign errors on the expansion.

There were frequent examples of poor notation for example: where $7\sqrt{3}$ was written as the 7th root of 3, $\sqrt[7]{3}$, or $-2\sqrt{3}$ was written as $2-\sqrt{3}$ and there were many cases of $7\sqrt{3} = \sqrt{21}$.

- E2.** Many candidates were able to score at least 1 mark in this question. In part (a), only the best candidates realized that they had to multiply both the numerator and the denominator by $\sqrt{3}$. Common incorrect answers here were $1/3$ and $1/9$. A large number of candidates attempted to expand the brackets in part (b), and most were able to score a mark for three correct terms. Common errors here were $(2 + \sqrt{3})(1 + \sqrt{3}) = 2 + \sqrt{6} + \sqrt{3} + \sqrt{9}$ or $3 + 2\sqrt{3} + \sqrt{3} + \sqrt{9}$ or $2 + 2\sqrt{3} + \sqrt{3} + \sqrt{3}$

- E3.** A great many candidates showed no understanding of fractional powers in part (a) and answers of 49.5 and 24.5 were very common indeed. In part (b) $9\sqrt{5}$ was the most common answer from candidates showing some knowledge of surds.