Adding and Subtracting Surds - Worksheet

Skill

Group A - Adding and subtracting surds

Simplify:

1) $4\sqrt{2} + 3\sqrt{2}$

2) $4\sqrt{2} - 3\sqrt{2}$

3) $3\sqrt{2} - 4\sqrt{2}$

4) $6\sqrt{3} + 2\sqrt{3} - \sqrt{3}$

5) $3\sqrt{6} + 6\sqrt{3}$

6) $2\sqrt{3} - 5\sqrt{3} + 4\sqrt{7}$

7) $\sqrt{3} + \sqrt{12}$

8) $\sqrt{12} - 2\sqrt{3}$

9) $\sqrt{27} + 4\sqrt{3}$

10) $\sqrt{5} + \sqrt{20}$

11) $\sqrt{28} - \sqrt{7}$

12) $\sqrt{20} - 3\sqrt{5} + \sqrt{9}$

Group B - Adding and subtracting surds

Simplify:

1) $6\sqrt{2} + 7\sqrt{2} - 9\sqrt{2}$

2) $6\sqrt{2} - 12\sqrt{2}$

3) $6\sqrt{2} - 4 + 7\sqrt{2} + \sqrt{100}$

4) $\sqrt{3} + \sqrt{75}$

5) $\sqrt{48} - \sqrt{3}$

6) $\sqrt{180} + 3\sqrt{5}$

7) $\sqrt{8} + \sqrt{18}$

8) $\sqrt{12} + \sqrt{27}$

9) $\sqrt{8} + \sqrt{12}$

10) $\sqrt{80} - \sqrt{45}$

11) $\sqrt{125} - \sqrt{20}$

12) $\sqrt{80} - \sqrt{20}$

Group C - Adding and subtracting surds

Simplify:

1) $2\sqrt{20} + 3\sqrt{5}$

2) $\sqrt{48} - 2\sqrt{3}$

3) $6\sqrt{15} + 2\sqrt{3} + 2\sqrt{12}$

4) $\sqrt{18} - \sqrt{8}$

5) $\sqrt{45} - \sqrt{20}$

6) $\sqrt{99} - \sqrt{44}$

7) $\sqrt{32} + \sqrt{162}$

8) $\sqrt{98} - \sqrt{50}$

9) $\sqrt{32} + \sqrt{98} - 4\sqrt{50}$

10) $2\sqrt{80} + 4\sqrt{20}$

11) $2\sqrt{20} + 4\sqrt{60}$

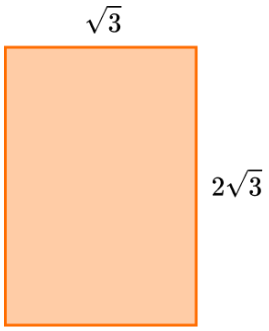
12) $3\sqrt{12} + 4 - \sqrt{81} + 2\sqrt{27}$

Adding and Subtracting Surds - Worksheet

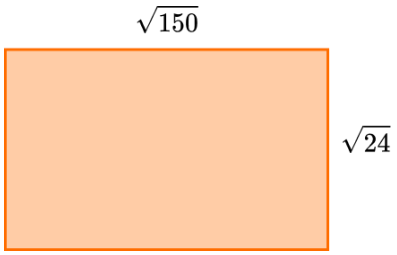
Applied

1) Find the perimeter of this rectangle, giving your answer as a surd in its simplest form.

(a)



(b)



2) **(a)** Ben writes: $\sqrt{2} + \sqrt{8} = \sqrt{10}$
He is wrong. What mistake has he made?

(b) What is the correct answer?

3) **(a)** Sarah writes: $\sqrt{45} + \sqrt{15} = 9\sqrt{5} + 3\sqrt{5} = 12\sqrt{5}$
She is wrong. What mistake has she made?

(b) What is the correct answer?

4) **(a)** What type of sequence is: $2,\ 8,\ 18,\ 32,\ 50$?
Find the nth term rule for this sequence.

(b) What type of sequence is: $\sqrt{2},\ \sqrt{8},\ \sqrt{18},\ \sqrt{32},\ \sqrt{50}$?
Find the nth term rule for this sequence.

(c) What is the algebraic link between the two sequences?

Adding and Subtracting Surds - Exam Questions

1) **(a)** Express $\sqrt{7} + \sqrt{63}$ in the form $a\sqrt{7}$ where a is an integer to be found.

..... **(2)**

(b) Express $6\sqrt{5} - \sqrt{20}$ in the form $a\sqrt{5}$ where a is an integer to be found.

..... **(2)**

(4 marks)

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2) Simplify fully $\sqrt{96} + \sqrt{24}$.

..... **(3 marks)**

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3) Simplify fully $\sqrt{75} - \sqrt{27}$.

..... **(3 marks)**

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4) Simplify fully:

..... **(3 marks)**

$$\sqrt{52} + \sqrt{\frac{13}{4}}$$

Write your answer in the form $\frac{a\sqrt{13}}{b}$, where a and b are integers to be found.

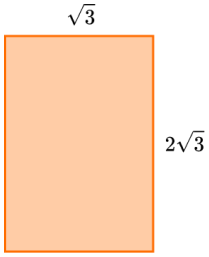
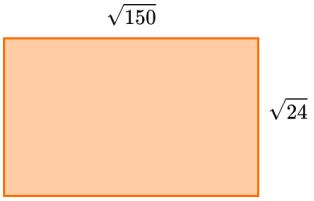
Adding and Subtracting Surds - Answers

	Question	Answer
	Skill Questions	
Group A	Simplify: **1)** $4\sqrt{2} + 3\sqrt{2}$ **2)** $4\sqrt{2} - 3\sqrt{2}$ **3)** $3\sqrt{2} - 4\sqrt{2}$ **4)** $6\sqrt{3} + 2\sqrt{3} - \sqrt{3}$ **5)** $3\sqrt{6} + 6\sqrt{3}$ **6)** $2\sqrt{3} - 5\sqrt{3} + 4\sqrt{7}$ **7)** $\sqrt{3} + \sqrt{12}$ **8)** $\sqrt{12} - 2\sqrt{3}$ **9)** $\sqrt{27} + 4\sqrt{3}$ **10)** $\sqrt{5} + \sqrt{20}$ **11)** $\sqrt{28} - \sqrt{7}$ **12)** $\sqrt{20} - 3\sqrt{5} + \sqrt{9}$	**1)** $7\sqrt{2}$ **2)** $\sqrt{2}$ **3)** $-\sqrt{2}$ **4)** $7\sqrt{3}$ **5)** $3\sqrt{6} + 6\sqrt{3}$ **6)** $4\sqrt{7} - 3\sqrt{3}$ **7)** $3\sqrt{3}$ **8)** 0 **9)** $7\sqrt{3}$ **10)** $3\sqrt{5}$ **11)** $\sqrt{7}$ **12)** $3 - \sqrt{5}$
Group B	Simplify: **1)** $6\sqrt{2} + 7\sqrt{2} - 9\sqrt{2}$ **2)** $6\sqrt{2} - 12\sqrt{2}$ **3)** $6\sqrt{2} - 4 + 7\sqrt{2} + \sqrt{100}$ **4)** $\sqrt{3} + \sqrt{75}$ **5)** $\sqrt{48} - \sqrt{3}$ **6)** $\sqrt{180} + 3\sqrt{5}$ **7)** $\sqrt{8} + \sqrt{18}$ **8)** $\sqrt{12} + \sqrt{27}$ **9)** $\sqrt{8} + \sqrt{12}$ **10)** $\sqrt{80} - \sqrt{45}$ **11)** $\sqrt{125} - \sqrt{20}$ **12)** $\sqrt{80} - \sqrt{20}$	**1)** $4\sqrt{2}$ **2)** $-6\sqrt{2}$ **3)** $6 + 13\sqrt{2}$ **4)** $6\sqrt{3}$ **5)** $3\sqrt{3}$ **6)** $9\sqrt{5}$ **7)** $5\sqrt{2}$ **8)** $5\sqrt{3}$ **9)** $2\sqrt{3} + 2\sqrt{2}$ **10)** $\sqrt{5}$ **11)** $3\sqrt{5}$ **12)** $2\sqrt{5}$

Adding and Subtracting Surds - Answers

Group C	Simplify: **1)** $2\sqrt{20} + 3\sqrt{5}$ **2)** $\sqrt{48} - 2\sqrt{3}$ **3)** $6\sqrt{15} + 2\sqrt{3} + 2\sqrt{12}$ **4)** $\sqrt{18} - \sqrt{8}$ **5)** $\sqrt{45} - \sqrt{20}$ **6)** $\sqrt{99} - \sqrt{44}$ **7)** $\sqrt{32} + \sqrt{162}$ **8)** $\sqrt{98} - \sqrt{50}$ **9)** $\sqrt{32} + \sqrt{98} - 4\sqrt{50}$ **10)** $2\sqrt{80} + 4\sqrt{20}$ **11)** $2\sqrt{20} + 4\sqrt{60}$ **12)** $3\sqrt{12} + 4 - \sqrt{81} + 2\sqrt{27}$	**1)** $7\sqrt{5}$ **2)** $2\sqrt{3}$ **3)** $6\sqrt{15} + 6\sqrt{3}$ **4)** $\sqrt{2}$ **5)** $\sqrt{5}$ **6)** $\sqrt{11}$ **7)** $13\sqrt{2}$ **8)** $2\sqrt{2}$ **9)** $-9\sqrt{2}$ **10)** $16\sqrt{5}$ **11)** $8\sqrt{15} + 4\sqrt{5}$ **12)** $12\sqrt{3} - 5$

Adding and Subtracting Surds - Answers

	Question	Answer
	Applied Questions	
1)	Find the perimeter of this rectangle, giving your answer as a surd in its simplest form. **(a)**  **(b)**  	**(a)** $6\sqrt{3}$ **(b)** $14\sqrt{6}$
2)	**(a)** Ben writes: $\sqrt{2} + \sqrt{8} = \sqrt{10}$ He is wrong. What mistake has he made? **(b)** What is the correct answer?	**(a)** He has just added the numbers underneath the root signs. He can't do this because they are not like surds. **(b)** $\sqrt{2} + \sqrt{8} = \sqrt{2} + 2\sqrt{2} = 3\sqrt{2}$
3)	**(a)** Sarah writes: $\sqrt{45} + \sqrt{15} = 9\sqrt{5} + 3\sqrt{5} = 12\sqrt{5}$ She is wrong. What mistake has she made? **(b)** What is the correct answer?	**(a)** She has tried to make like surds of $\sqrt{5}$. She hasn't square rooted the square factor of 9 in $\sqrt{45}$. It's also incorrect to remove 3 as a factor of 15, because 3 isn't a square number. **(b)** $\sqrt{45} + \sqrt{15} = 3\sqrt{5} + \sqrt{15}$ which will not simplify further.

Adding and Subtracting Surds - Answers

4)	**(a)**	What type of sequence is: $2,\ 8,\ 18,\ 32,\ 50$? Find the nth term rule for this sequence.	**(a)** Quadratic, nth term $2n^2$
	(b)	What type of sequence is: $\sqrt{2},\ \sqrt{8},\ \sqrt{18},\ \sqrt{32},\ \sqrt{50}$? Find the nth term rule for this sequence.	**(b)** Arithmetic, nth term $\sqrt{2}n$
	(c)	What is the algebraic link between the two sequences?	**(c)** Link $\sqrt{2n^2} = \sqrt{2}n$

Adding and Subtracting Surds - Mark Scheme

	Question	Answer	
	Exam Questions		
1) (a)	Express $\sqrt{7} + \sqrt{63}$ in the form $a\sqrt{7}$ where a is an integer to be found.	(a) $\sqrt{63} = 3\sqrt{7}$ $\sqrt{7} + 3\sqrt{7} = 4\sqrt{7}, a = 4$	(2)
(b)	Express $6\sqrt{5} - \sqrt{20}$ in the form $a\sqrt{5}$ where a is an integer to be found.	(b) $\sqrt{20} = 2\sqrt{5}$ $6\sqrt{5} - 2\sqrt{5} = 4\sqrt{5}, a = 4$	(2)
2)	Simplify fully $\sqrt{96} + \sqrt{24}$.	$\sqrt{96} = 4\sqrt{6}$ $\sqrt{24} = 2\sqrt{6}$ $4\sqrt{6} + 2\sqrt{6} = 6\sqrt{6}$	(3)
3)	Simplify fully $\sqrt{75} - \sqrt{27}$.	$\sqrt{75} = 5\sqrt{3}$ $\sqrt{27} = 3\sqrt{3}$ $5\sqrt{3} - 3\sqrt{3} = 2\sqrt{3}$	(3)
4)	Simplify fully: $\sqrt{52} + \sqrt{\frac{13}{4}}$ Write your answer in the form $\frac{a\sqrt{13}}{b}$, where a and b are integers to be found.	$\sqrt{52} = 2\sqrt{13}$ $\sqrt{\frac{13}{4}} = \frac{\sqrt{13}}{2}$ $2\sqrt{13} + \frac{\sqrt{13}}{2} = \frac{5\sqrt{13}}{2}$	(3)