

Multiplying and Dividing Surds - Worksheet

Skill

Group A - Multiplication and division

Simplify:

1) $\sqrt{2} \times \sqrt{4}$

2) $\sqrt{2} \times \sqrt{3}$

3) $\sqrt{2} \times \sqrt{2}$

4) $\sqrt{12} \div \sqrt{6}$

5) $\sqrt{12} \div \sqrt{2}$

6) $\sqrt{24} \div \sqrt{6}$

7) $\frac{\sqrt{12}}{\sqrt{6}}$

8) $\frac{3\sqrt{12}}{3\sqrt{6}}$

9) $\frac{4\sqrt{12}}{2\sqrt{2}}$

10) $\frac{(\sqrt{5})^2}{5}$

11) $\frac{(\sqrt{6})^2 \times \sqrt{3}}{\sqrt{4}}$

12) $\sqrt{3} + \sqrt{27}$

Group B - Simplify fractions and brackets

Simplify:

1) $\frac{(\sqrt{6})^2}{6}$

2) $\frac{\sqrt{6} \times \sqrt{20}}{\sqrt{12}}$

3) $\frac{\sqrt{6} \times \sqrt{20}}{\sqrt{3}}$

4) $\frac{\sqrt{27} - \sqrt{3}}{2}$

5) $\frac{\sqrt{27} - \sqrt{3}}{\sqrt{3}}$

6) $\frac{\sqrt{48} + \sqrt{27}}{\sqrt{108} + \sqrt{3}}$

7) $4(3 + \sqrt{2})$

8) $\sqrt{5}(3 + \sqrt{2})$

9) $\sqrt{2}(5 - \sqrt{8})$

10) $\frac{4(\sqrt{3})^2}{6}$

11) $\frac{2(\sqrt{14} + \sqrt{8})}{\sqrt{2}}$

12) $\frac{5(4\sqrt{20} + \sqrt{180})}{\sqrt{10}}$

Group C - Mostly single and double brackets

Simplify:

1) $3(\sqrt{2} - 1)$

2) $\sqrt{5}(\sqrt{2} - 1)$

3) $4\sqrt{5}(3\sqrt{2} - 1)$

4) $\frac{2(\sqrt{5})^2}{5}$

5) $\frac{3(\sqrt{12} + \sqrt{6})}{\sqrt{2}}$

6) $\frac{3(\sqrt{96} + 2\sqrt{24})}{4\sqrt{2}}$

7) $(\sqrt{2} + 1)(2 + \sqrt{3})$

8) $(\sqrt{2} + 1)(2 + \sqrt{2})$

9) $(\sqrt{2} - 1)(2 - \sqrt{2})$

10) $(\sqrt{45} + 3)(2 - \sqrt{5})$

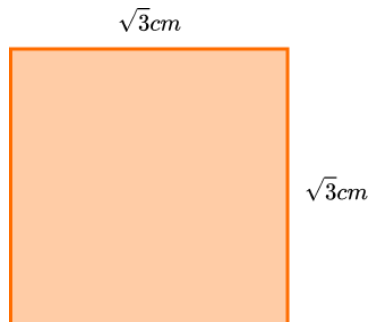
11) $(\sqrt{2} + 1)(2 + \sqrt{2})$

12) $(\sqrt{45} - \sqrt{5})^2$

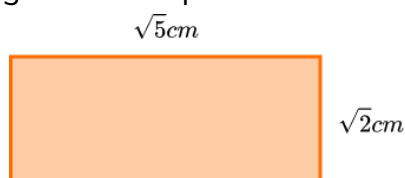
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Applied

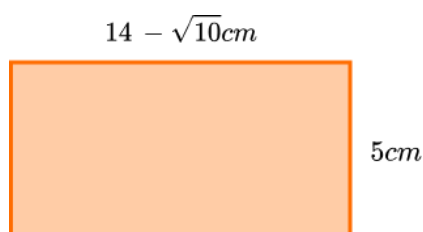
- 1) (a) Find the area of this square in its simplest form.



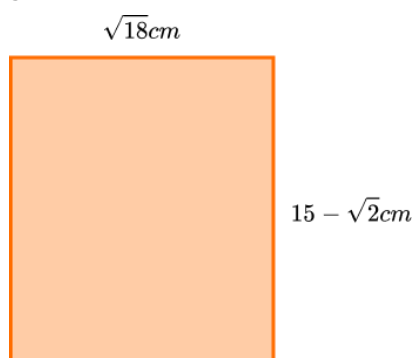
- (b) Find the area of this rectangle in its simplest form.



- 2) (a) Find the area of this rectangle in its simplest form.

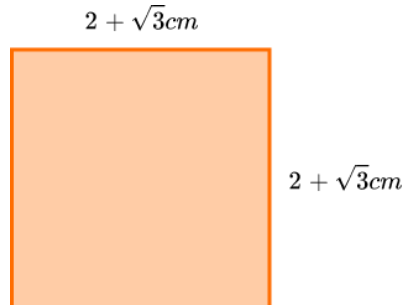


- (b) Find the area of this rectangle in its simplest form.



Multiplying and Dividing Surds - Worksheet

- (c) Find the area of this square in its simplest form.



- 3) (a) $(2 + \sqrt{3})(a - \sqrt{b}) = 1$. Find the values of a and b .
- (b) Hence, simplify $(2 + \sqrt{3})^2(2 - \sqrt{3})$.

Multiplying and Dividing Surds - Exam Questions

1) (a) Simplify fully: $\sqrt{8} \times \sqrt{5}$
(2)

(b) Simplify fully: $\frac{\sqrt{20}}{\sqrt{5}}$
(2)
(4 marks)

2) Work out the value of $(\sqrt{5})^2 \times (\sqrt{3})^2$
(2 marks)

3) Expand and simplify
 $(6 - 3\sqrt{2})(5 + 2\sqrt{2})$. (3 marks)

4) $\sqrt{3}(\sqrt{6} + \sqrt{24})$ can be written in the form
 $a\sqrt{2}$. Find the value of a . (3 marks)

5) Show that $(10 - \sqrt{5})(2 + 4\sqrt{5})$ can be
written in the form $a\sqrt{5}$, where a is an integer (3 marks)
to be found.

6) Show that $(2\sqrt{8} + \sqrt{50})^2$ simplifies to an
integer. (3 marks)

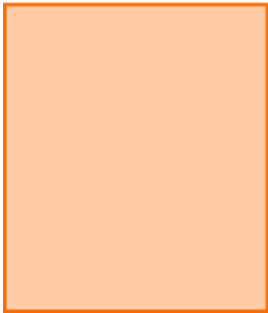
Multiplying and Dividing Surds - Answers

	Question	Answer
	Skill Questions	
Group A	Simplify: 1) $\sqrt{2} \times \sqrt{4}$ 2) $\sqrt{2} \times \sqrt{3}$ 3) $\sqrt{2} \times \sqrt{2}$ 4) $\sqrt{12} \div \sqrt{6}$ 5) $\sqrt{12} \div \sqrt{2}$ 6) $\sqrt{24} \div \sqrt{6}$ 7) $\frac{\sqrt{12}}{\sqrt{6}}$ 8) $\frac{3\sqrt{12}}{3\sqrt{6}}$ 9) $\frac{4\sqrt{12}}{2\sqrt{2}}$ 10) $\frac{(\sqrt{5})^2}{5}$ 11) $\frac{(\sqrt{6})^2 \times \sqrt{3}}{\sqrt{4}}$ 12) $\frac{\sqrt{3} + \sqrt{27}}{2}$	1) $2\sqrt{2}$ 2) $\sqrt{6}$ 3) 2 4) $\sqrt{2}$ 5) $\sqrt{6}$ 6) $\sqrt{4} = 2$ 7) $\sqrt{2}$ 8) $\sqrt{2}$ 9) $2\sqrt{6}$ 10) 1 11) $3\sqrt{3}$ 12) $2\sqrt{3}$
Group B	Simplify: 1) $\frac{(\sqrt{6})^2}{6}$ 2) $\frac{\sqrt{6} \times \sqrt{20}}{\sqrt{12}}$ 3) $\frac{\sqrt{6} \times \sqrt{20}}{\sqrt{3}}$ 4) $\frac{\sqrt{27} - \sqrt{3}}{2}$ 5) $\frac{\sqrt{27} - \sqrt{3}}{\sqrt{3}}$	1) 1 2) $\sqrt{10}$ 3) $2\sqrt{10}$ 4) $\sqrt{3}$ 5) 2

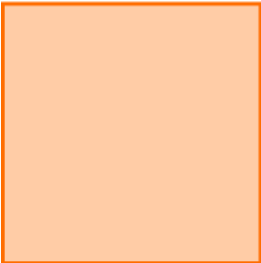
Multiplying and Dividing Surds - Answers

	6) $\frac{\sqrt{48}+\sqrt{27}}{\sqrt{108}+\sqrt{3}}$ 7) $4(3 + \sqrt{2})$ 8) $\sqrt{5}(3 + \sqrt{2})$ 9) $\sqrt{2}(5 - \sqrt{8})$ 10) $\frac{4(\sqrt{3})^2}{6}$ 11) $\frac{2(\sqrt{14}+\sqrt{8})}{\sqrt{2}}$ 12) $\frac{5(4\sqrt{20}+\sqrt{180})}{\sqrt{10}}$	6) 1 7) $12 + 4\sqrt{2}$ 8) $3\sqrt{5} + \sqrt{10}$ 9) $5\sqrt{2} - 4$ 10) 2 11) $4 + 2\sqrt{7}$ 12) $35\sqrt{2}$
Group C	Simplify: 1) $3(\sqrt{2} - 1)$ 2) $\sqrt{5}(\sqrt{2} - 1)$ 3) $4\sqrt{5}(3\sqrt{2} - 1)$ 4) $\frac{2(\sqrt{5})^2}{5}$ 5) $\frac{3(\sqrt{12}+\sqrt{6})}{\sqrt{2}}$ 6) $\frac{3(\sqrt{96}+2\sqrt{24})}{4\sqrt{2}}$ 7) $(\sqrt{2} + 1)(2 + \sqrt{3})$ 8) $(\sqrt{2} + 1)(2 + \sqrt{2})$ 9) $(\sqrt{2} - 1)(2 - \sqrt{2})$ 10) $(\sqrt{45} + 3)(2 - \sqrt{5})$ 11) $(2 + \sqrt{5})(2 - \sqrt{5})$ 12) $(\sqrt{45} - \sqrt{5})^2$	1) $3\sqrt{2} - 3$ 2) $\sqrt{10} - \sqrt{5}$ 3) $12\sqrt{10} - 4\sqrt{5}$ 4) 2 5) $3\sqrt{6} + 3\sqrt{3}$ 6) $6\sqrt{3}$ 7) $2\sqrt{2} + 2 + \sqrt{6} + \sqrt{3}$ 8) $4 + 3\sqrt{2}$ 9) $3\sqrt{2} - 4$ 10) $3\sqrt{5} - 9$ 11) - 1 12) 20

Multiplying and Dividing Surds - Answers

	Question	Answer
	Applied Questions	
1)	(a) Find the area of this square in its simplest form.  (b) Find the area of this rectangle in its simplest form. 	(a) 3cm^2 (b) $\sqrt{10}\text{cm}^2$
2)	(a) Find the area of this rectangle in its simplest form.  (b) Find the area of this rectangle in its simplest form. 	(a) $70 - 5\sqrt{10}\text{m}^2$ (b) $45\sqrt{2} - 6\text{cm}^2$

Multiplying and Dividing Surds - Answers

	(c) Find the area of this square in its simplest form. $2 + \sqrt{3}cm$  $2 + \sqrt{3}cm$	(c) $7 + 4\sqrt{3}m^2$
3)	(a) $(2 + \sqrt{3})(a - \sqrt{b}) = 1$. Find the values of a and b.	(a) $a = 2, b = 3$ (Difference of two squares)
	(b) Hence, simplify $(2 + \sqrt{3})^2(2 - \sqrt{3})$.	(b) $2 + \sqrt{3}$

Multiplying and Dividing Surds - Mark Scheme

	Question	Answer	
	Exam Questions		
1) (a)	Simplify fully: $\sqrt{8} \times \sqrt{5}$	(a) $\sqrt{8} \times \sqrt{5} = \sqrt{40}$ $\sqrt{40} = 2\sqrt{10}$ or $\sqrt{8} = 2\sqrt{2}$ $2\sqrt{2} \times \sqrt{5} = 2\sqrt{10}$	(2)
(b)	Simplify fully: $\frac{\sqrt{20}}{\sqrt{5}}$	(b) $\sqrt{20} \div \sqrt{5} = \sqrt{4}$ $\sqrt{4} = 2$ or $\sqrt{20} = 2\sqrt{5}$ $2\sqrt{5} \div \sqrt{5} = 2$	(2)
2)	Work out the value of $(\sqrt{5})^2 \times (\sqrt{3})^2$	Either $(\sqrt{5})^2 = 5$ or $(\sqrt{3})^2 = 3$ 15	(2)
3)	Expand and simplify $(6 - 3\sqrt{2})(5 + 2\sqrt{2})$	$30 - 15\sqrt{2} + 12\sqrt{2} - 12$ Any two correct terms All four correct terms Simplified to $18 - 3\sqrt{2}$	(3)
4)	$\sqrt{3}(\sqrt{6} + \sqrt{24})$ can be written in the form $a\sqrt{2}$. Find the value of a .	$\sqrt{24} = 2\sqrt{6}$ $\sqrt{3} \times 3\sqrt{6} = 3\sqrt{18}$ $3\sqrt{18} = 9\sqrt{2}$ so $a = 9$	(3)

Multiplying and Dividing Surds - Mark Scheme

5)	Show that $(10 - \sqrt{5})(2 + 4\sqrt{5})$ can be written in the form $a\sqrt{5}$, where a is an integer to be found.	$20 - 2\sqrt{5} + 40\sqrt{5} - 20$ Any two correct terms All four correct terms Simplified to $38\sqrt{5}$ so $a = 38$	(3)
6)	Show that $(2\sqrt{8} + \sqrt{50})^2$ simplifies to an integer.	Either of $\sqrt{50} = 5\sqrt{2}$, $\sqrt{8} = 2\sqrt{2}$ $4\sqrt{2} + 5\sqrt{2} = 9\sqrt{2}$ $(9\sqrt{2})^2 = 162$ or $32 + 2\sqrt{400} + 2\sqrt{400} + 50$ Any two correct terms All four correct terms $4\sqrt{400} = 4 \times 20 = 80$ so $32 + 80 + 50 = 162$	(3)

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