Rationalise the Denominator - Worksheet

Skill

Group A - Simple fractions with surds

Rationalise the denominator:

1) $\frac{1}{\sqrt{3}}$

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

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

4) $\frac{10}{\sqrt{5}}$

5) $\frac{20}{\sqrt{5}}$

6) $\frac{20}{\sqrt{10}}$

7) $\frac{16}{\sqrt{32}}$

8) $\frac{8}{\sqrt{32}}$

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

Group B - Fractions requiring some simplification

Rationalise the denominator:

1) $\frac{3\sqrt{2}}{\sqrt{5}}$

2) $\frac{4\sqrt{10}}{\sqrt{3}}$

3) $\frac{2\sqrt{6}}{\sqrt{3}}$

4) $\frac{30}{\sqrt{75}}$

5) $\frac{5\sqrt{8}}{\sqrt{5}}$

6) $\frac{5\sqrt{8}}{\sqrt{7}}$

7) $\frac{\sqrt{27}+\sqrt{3}}{\sqrt{2}}$

8) $\frac{\sqrt{27}-\sqrt{3}}{\sqrt{6}}$

9) $\frac{\sqrt{48}+\sqrt{27}}{\sqrt{5}}$

Group C -Simplification and using conjugates

Rationalise the denominator:

1) $\frac{\sqrt{96}+\sqrt{24}}{\sqrt{5}}$

2) $\frac{\sqrt{54}+\sqrt{24}}{\sqrt{5}}$

3) $\frac{\sqrt{96}-\sqrt{24}}{\sqrt{8}}$

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

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

6) $\frac{1}{3-\sqrt{2}}$

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

8) $\frac{4\sqrt{10}}{3\sqrt{5}-5}$

9) $-\frac{2}{1-\sqrt{3}}$

Rationalise the Denominator - Worksheet

Applied

1) **(a)** Rationalise the denominator: $\frac{2}{\sqrt{3}}$

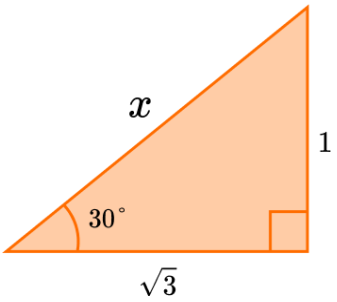
(b) Hence, or otherwise, simplify: $\frac{\sqrt{3}}{4} + \frac{2}{\sqrt{3}}$

2) **(a)** Rationalise the denominator: $\frac{2\sqrt{8}}{\sqrt{10}}$

(b) Hence, or otherwise, simplify $\frac{2\sqrt{8}}{\sqrt{10}} + \frac{3\sqrt{20}}{5}$.

Write your answer as a single surd in the form $a\sqrt{5}$.

3) **(a)** Using Pythagoras' Theorem, find the value of x.



(b) Hence, write down the exact value of tan 30°.

Rationalise the Denominator - Exam Questions

1) Rationalise the denominator: $\frac{3}{\sqrt{11}}$

..... **(1 mark)**

---

2) Rationalise the denominator: $\frac{6}{\sqrt{3}}$

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

---

3) Rationalise the denominator: $\frac{5\sqrt{2}}{\sqrt{7}}$

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

---

4) Simplify fully: $\frac{\sqrt{6}+12}{\sqrt{3}}$

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

---

5) Simplify fully $\frac{(3\sqrt{2}+4)(3\sqrt{2}-4)}{\sqrt{11}}$

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

---

6) Rationalise the denominator: $\frac{10}{\sqrt{7}-2}$

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

Rationalise the Denominator - Exam Questions

7) Show that $\frac{12+\sqrt{45}}{3\sqrt{5}-6}$ can be written as $13 + 6\sqrt{5}$.

.....

(3 marks)

---

8) Show that $\frac{3\sqrt{10}}{\sqrt{6}} - \frac{2\sqrt{5}}{\sqrt{12}}$ can be written in the form $\frac{a\sqrt{b}}{3}$, where a and b are integers to be found.

.....

(4 marks)

Rationalise the Denominator - Answers

	Question	Answer
	Skill Questions	
Group A	Rationalise the denominator: **1)** $\frac{1}{\sqrt{3}}$ **2)** $\frac{2}{\sqrt{3}}$ **3)** $\frac{3}{\sqrt{2}}$ **4)** $\frac{10}{\sqrt{5}}$ **5)** $\frac{20}{\sqrt{5}}$ **6)** $\frac{20}{\sqrt{10}}$ **7)** $\frac{16}{\sqrt{32}}$ **8)** $\frac{8}{\sqrt{32}}$ **9)** $-\frac{4}{\sqrt{12}}$	**1)** $\frac{\sqrt{3}}{3}$ **2)** $\frac{2\sqrt{3}}{3}$ **3)** $\frac{3\sqrt{2}}{2}$ **4)** $2\sqrt{5}$ **5)** $4\sqrt{5}$ **6)** $2\sqrt{10}$ **7)** $2\sqrt{2}$ **8)** $\sqrt{2}$ **9)** $-\frac{2\sqrt{3}}{3}$

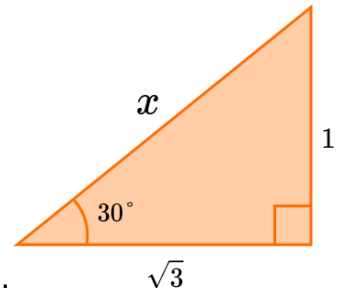
Rationalise the Denominator - Answers

	Question	Answer
	Skill Questions	
Group B	Rationalise the denominator: **1)** $\frac{3\sqrt{2}}{\sqrt{5}}$ **2)** $\frac{4\sqrt{10}}{\sqrt{3}}$ **3)** $\frac{2\sqrt{6}}{\sqrt{3}}$ **4)** $\frac{30}{\sqrt{75}}$ **5)** $\frac{5\sqrt{8}}{\sqrt{5}}$ **6)** $\frac{5\sqrt{8}}{\sqrt{7}}$ **7)** $\frac{\sqrt{27}+\sqrt{3}}{\sqrt{2}}$ **8)** $\frac{\sqrt{27}-\sqrt{3}}{\sqrt{6}}$ **9)** $\frac{\sqrt{48}+\sqrt{27}}{\sqrt{5}}$	**1)** $\frac{3\sqrt{10}}{5}$ **2)** $\frac{4\sqrt{30}}{3}$ **3)** $2\sqrt{2}$ **4)** $2\sqrt{3}$ **5)** $2\sqrt{10}$ **6)** $\frac{10\sqrt{14}}{7}$ **7)** $2\sqrt{6}$ **8)** $\sqrt{2}$ **9)** $\frac{7\sqrt{15}}{5}$

Rationalise the Denominator - Answers

	Question	Answer
	Skill Questions	
Group C	Rationalise the denominator: **1)** $\frac{\sqrt{96}+\sqrt{24}}{\sqrt{5}}$ **2)** $\frac{\sqrt{54}+\sqrt{24}}{\sqrt{5}}$ **3)** $\frac{\sqrt{96}-\sqrt{24}}{\sqrt{8}}$ **4)** $\frac{1}{2+\sqrt{2}}$ **5)** $\frac{1}{3+\sqrt{2}}$ **6)** $\frac{1}{3-\sqrt{2}}$ **7)** $\frac{5}{4+2\sqrt{3}}$ **8)** $\frac{4\sqrt{10}}{3\sqrt{5}-5}$ **9)** $-\frac{2}{1-\sqrt{3}}$	**1)** $\frac{6\sqrt{30}}{5}$ **2)** $\sqrt{30}$ **3)** $\sqrt{3}$ **4)** $\frac{2-\sqrt{2}}{2}$ **5)** $\frac{3-\sqrt{2}}{7}$ **6)** $\frac{3+\sqrt{2}}{7}$ **7)** $\frac{10-5\sqrt{3}}{2}$ **8)** $\sqrt{10}+3\sqrt{2}$ **9)** $1+\sqrt{3}$

Rationalise the Denominator - Answers

	Question	Answer
	Applied Questions	
1)	**(a)** Rationalise the denominator: $\frac{2}{\sqrt{3}}$ **(b)** Hence, or otherwise, simplify $\frac{\sqrt{3}}{4} + \frac{2}{\sqrt{3}}$	**(a)** $\frac{2\sqrt{3}}{3}$ **(b)** $\frac{11\sqrt{3}}{12}$
2)	**(a)** Rationalise the denominator: $\frac{2\sqrt{8}}{\sqrt{10}}$ **(b)** Hence, or otherwise, simplify $\frac{2\sqrt{8}}{\sqrt{10}} + \frac{3\sqrt{20}}{5}$. Write your answer as a single surd in the form $a\sqrt{5}$.	**(a)** $\frac{4\sqrt{5}}{5}$ **(b)** $2\sqrt{5}$
3)	**(a)** Using Pythagoras' Theorem, find the value of x.  **(b)** Hence, write down the exact value of tan 30°.	**(a)** $x = 2$ **(b)** $\tan 30° = \frac{\sqrt{3}}{3}$

Rationalise the Denominator - Mark Scheme

	Question	Answer	
	Exam Questions		
1)	Rationalise the denominator: $\frac{3}{\sqrt{11}}$	$\frac{3\sqrt{11}}{11}$	(1)
2)	Rationalise the denominator: $\frac{6}{\sqrt{3}}$	$\frac{6\sqrt{3}}{3}$ $2\sqrt{3}$	(2)
3)	Rationalise the denominator: $\frac{5\sqrt{2}}{\sqrt{7}}$	$\frac{5\sqrt{14}}{a}$ or $\frac{5\sqrt{a}}{7}$ Fully correct answer $\frac{5\sqrt{14}}{7}$	(2)
4)	Simplify fully: $\frac{\sqrt{6}+12}{\sqrt{3}}$	$\frac{(\sqrt{6}+12)\times\sqrt{3}}{\sqrt{3}\times\sqrt{3}}$ $\frac{\sqrt{18}+12\sqrt{3}}{3}$ $\frac{3\sqrt{2}+12\sqrt{3}}{3} = \sqrt{2} + 4\sqrt{3}$	(3)
5)	Simplify fully $\frac{(3\sqrt{2}+4)(3\sqrt{2}-4)}{\sqrt{11}}$	$(3\sqrt{2} + 4)(3\sqrt{2} - 4) = 18 + 12\sqrt{2} - 12\sqrt{2}$ Any two terms correct All four correct $\frac{2}{\sqrt{11}} = \frac{2\sqrt{11}}{11}$	(3)
6)	Rationalise the denominator: $\frac{10}{\sqrt{7}-2}$	$\frac{10\times(\sqrt{7}+2)}{(\sqrt{7}-2)(\sqrt{7}+2)}$ Fully correct denominator 3 $\frac{10\sqrt{7}+20}{3}$	(3)

Rationalise the Denominator - Mark Scheme

7)	Show that $\frac{12+\sqrt{45}}{3\sqrt{5}-6}$ can be written as $13 + 6\sqrt{5}$.	$\sqrt{45} = 3\sqrt{5}$ $\frac{(12+3\sqrt{5})(3\sqrt{5}+6)}{(3\sqrt{5}-6)(3\sqrt{5}+6)}$ $(=\frac{36\sqrt{5}+45+72+18\sqrt{5}}{9})$ $\frac{117+54\sqrt{5}}{9} = 13 + 6\sqrt{5}$ as required	**(3)**
8)	Show that $\frac{3\sqrt{10}}{\sqrt{6}} - \frac{2\sqrt{5}}{\sqrt{12}}$ can be written in the form $\frac{a\sqrt{b}}{3}$, where a and b are integers to be found.	Get a common denominator of $\sqrt{12}$ $\frac{3\sqrt{10}\times\sqrt{2}}{\sqrt{6}\times\sqrt{2}}=\frac{3\sqrt{20}}{\sqrt{12}}(=\frac{6\sqrt{5}}{\sqrt{12}})$ $\frac{6\sqrt{5}}{\sqrt{12}}-\frac{2\sqrt{5}}{\sqrt{12}}=\frac{4\sqrt{5}}{\sqrt{12}}(=\frac{4\sqrt{5}}{2\sqrt{3}})$ $\frac{4\sqrt{5}\times\sqrt{3}}{2\sqrt{3}\times\sqrt{3}}$ (or correct attempt at rationalising their denominator) Correct answer $\frac{2\sqrt{15}}{3}$ $a = 2, b = 15$	**(4)**