Simplifying Surds

We have now seen what a surd is. It is used in many aspects of mathematics, and we need to be able to simplify them. We can simplify if we look at the factors and if at least one is a square number then we can simplify.

Remember: Look to for these numbers as a factor

$\sqrt{4}\ \sqrt{9}\ \sqrt{16}\ \sqrt{25}\ \sqrt{36}\ \sqrt{49}\ \sqrt{64}\ \sqrt{81}\ \sqrt{100}$ Or any square number. This will allow us to simplify the problem by taking it outside of the square root sign.

Some numbers that may appear to be able to be simplified cannot. If you multiply two different surds together the resulting number is still a surd. For example

$\sqrt{6} = \sqrt{2}\sqrt{3}$ and so it cannot be simplified further. Similarly $\sqrt{15} = \sqrt{3}\sqrt{5}$

Example 3

$$\sqrt{12} = \sqrt{4 \times 3} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$$

Example 4

$$\sqrt{\frac{3}{49}} = \frac{\sqrt{3}}{\sqrt{49}} = \frac{\sqrt{3}}{7}$$

Exercise 2

1 Simplify all of the following

a) $\sqrt{18}$
b) $\sqrt{32}$
c) $\sqrt{27}$
d) $\sqrt{44}$
e) $\sqrt{63}$
f) $\sqrt{108}$
g) $\sqrt{60}$
h) $\sqrt{242}$
i) $\sqrt{84}$
j) $\sqrt{150}$
k) $\sqrt{300}$
l) $\sqrt{96}$
m) $\sqrt{112}$
n) $\sqrt{\frac{6}{25}}$
o) $\sqrt{\frac{11}{36}}$
p) $\sqrt{\frac{14}{64}}$
q) $\sqrt{\frac{56}{81}}$
r) $\sqrt{\frac{63}{64}}$
s) $\sqrt{\frac{18}{25}}$
t) $\sqrt{\frac{27}{49}}$
u) $\sqrt{\frac{18}{64}}$
v) $\sqrt{\frac{12}{100}}$
w) $\sqrt{\frac{44}{144}}$
x) $\sqrt{\frac{4\pi}{25}}$

Answers

1

a) $3\sqrt{2}$

b) $4\sqrt{2}$

c) $3\sqrt{3}$

d) $2\sqrt{11}$

e) $3\sqrt{7}$

f) $6\sqrt{3}$

g) $2\sqrt{15}$

h) $11\sqrt{2}$

i) $2\sqrt{21}$

j) $5\sqrt{6}$

k) $10\sqrt{3}$

l) $4\sqrt{6}$

m) $4\sqrt{7}$

n) $\frac{\sqrt{6}}{5}$

o) $\frac{\sqrt{11}}{6}$

p) $\frac{\sqrt{14}}{8}$

q) $\frac{4\sqrt{7}}{9}$

r) $\frac{3\sqrt{7}}{8}$

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

t) $\frac{3\sqrt{3}}{7}$

u) $\frac{3\sqrt{2}}{8}$

v) $\frac{\sqrt{3}}{4}$

w) $\frac{\sqrt{11}}{6}$

x) $\frac{2\sqrt{\pi}}{5}$