

Surds

Q1: Simplify each of the following surds into the form $a\sqrt{b}$.

a $\sqrt{18}$

b $\sqrt{24}$

c $\sqrt{12}$

d $\sqrt{50}$

m $\sqrt{1000}$

n $\sqrt{250}$

o $\sqrt{98}$

p $\sqrt{243}$

Q2: Simplify each of these write your answer into the simplest form.

a $2\sqrt{18} \times 3\sqrt{2}$

b $4\sqrt{24} \times 2\sqrt{5}$

c $3\sqrt{12} \times 3\sqrt{3}$

d $2\sqrt{8} \times 2\sqrt{8}$

i $2\sqrt{32} \times 4\sqrt{2}$

j $\sqrt{1000} \times \sqrt{10}$

k $\sqrt{250} \times \sqrt{10}$

l $2\sqrt{98} \times 2\sqrt{2}$

Q3: Simplify each of these and write your answer in the simplest form.

a $4\sqrt{2} \times 5\sqrt{3}$

b $2\sqrt{5} \times 3\sqrt{3}$

c $4\sqrt{2} \times 3\sqrt{2}$

d $2\sqrt{2} \times 2\sqrt{8}$

i $2\sqrt{2} \times 3\sqrt{7}$

j $2\sqrt{2} \times 3\sqrt{18}$

k $2\sqrt{6} \times 2\sqrt{6}$

l $4\sqrt{5} \times 3\sqrt{6}$

Q4. Simplify each of these and write your answer in the simplest form.

a $6\sqrt{12} \div 2\sqrt{3}$

b $3\sqrt{15} \div \sqrt{3}$

c $6\sqrt{12} \div \sqrt{2}$

d $4\sqrt{24} \div 2\sqrt{8}$

i $9\sqrt{28} \div 3\sqrt{7}$

j $12\sqrt{56} \div 6\sqrt{8}$

k $25\sqrt{6} \div 5\sqrt{6}$

l $32\sqrt{54} \div 4\sqrt{6}$

Q5. Simplify each of these.

a $4\sqrt{2} \times \sqrt{3} \div 2\sqrt{2}$

b $4\sqrt{5} \times \sqrt{3} \div \sqrt{15}$

c $2\sqrt{32} \times 3\sqrt{2} \div 2\sqrt{8}$

j $8\sqrt{2} \times 2\sqrt{18} \div 4\sqrt{3}$

k $5\sqrt{6} \times 5\sqrt{6} \div 5\sqrt{3}$

l $2\sqrt{5} \times 3\sqrt{6} \div \sqrt{30}$

Q6. Simplify the following.

a. $\left(\frac{\sqrt{7}}{3}\right)^2 =$ _____

b. $\left(\frac{5}{\sqrt{3}}\right)^2 =$ _____

c. $\left(\frac{\sqrt{3}}{2}\right)^2 =$ _____

d. $\left(\frac{\sqrt{5}}{4}\right)^2 =$ _____

e. $\left(\frac{4}{\sqrt{6}}\right)^2 =$ _____

f. $\left(\frac{\sqrt{8}}{2}\right)^2 =$ _____

Q7. Simplify each of these expressions.

a $a\sqrt{b} \times c\sqrt{b}$

b $a\sqrt{b} \div c\sqrt{b}$

c $a\sqrt{b} \times c\sqrt{b} \div a\sqrt{b}$

Q8. Find the value of 'a' that makes each of these surds true.

a $\sqrt{5} \times \sqrt{a} = 10$

b $\sqrt{6} \times \sqrt{a} = 12$

c $\sqrt{10} \times 2\sqrt{a} = 20$

d $2\sqrt{6} \times 3\sqrt{a} = 72$

e $2\sqrt{a} \times \sqrt{a} = 6$

f $3\sqrt{a} \times 3\sqrt{a} = 54$

Q9. The following rules are *not* true. Try some numerical examples to show this.

a $\sqrt{(a + b)} = \sqrt{a} + \sqrt{b}$

b $\sqrt{(a - b)} = \sqrt{a} - \sqrt{b}$

Q10. Show that:

a $(2 + \sqrt{3})(1 + \sqrt{3}) = 5 + 3\sqrt{3}$	b $(3 + \sqrt{2})(2 + \sqrt{5}) = 6 + 2\sqrt{2} + 3\sqrt{5} + \sqrt{10}$	c $(5 - \sqrt{2})(5 + \sqrt{2}) = 23$

Q11. Expand and simplify where possible.

a $\sqrt{8}(2 - \sqrt{8})$

b $\sqrt{5}(3 - 4\sqrt{5})$

c $\sqrt{5}(2\sqrt{5} + 4)$

d $3\sqrt{7}(4 - 2\sqrt{7})$

e $3\sqrt{2}(5 - 2\sqrt{8})$

f $\sqrt{3}(\sqrt{27} - 1)$

Q12. Expand and simplify where possible.

a $(5 + \sqrt{3})(3 - \sqrt{3})$

b $(3 + \sqrt{5})(3 - \sqrt{5})$

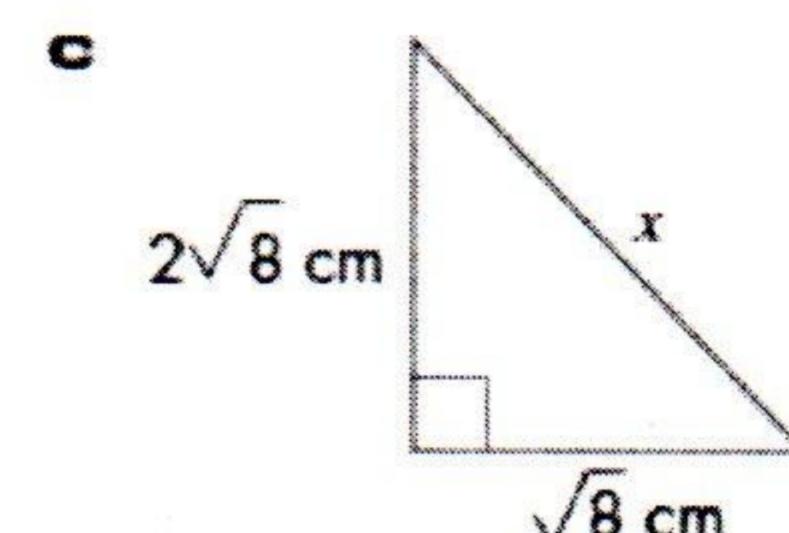
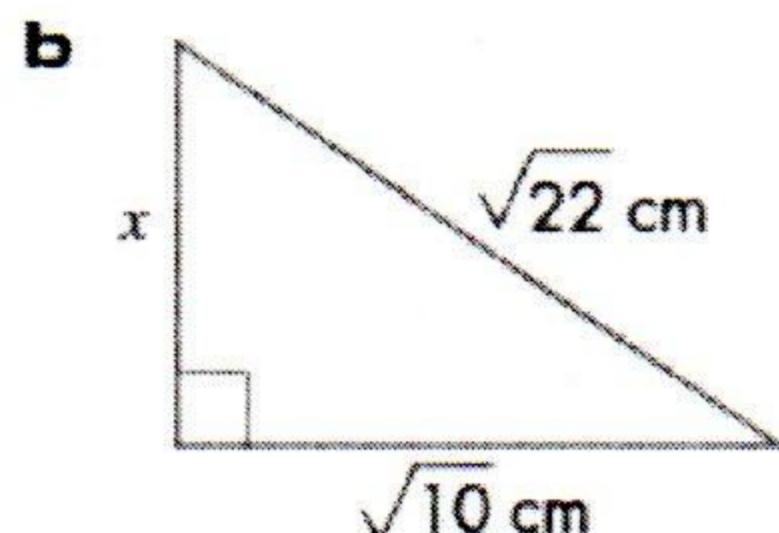
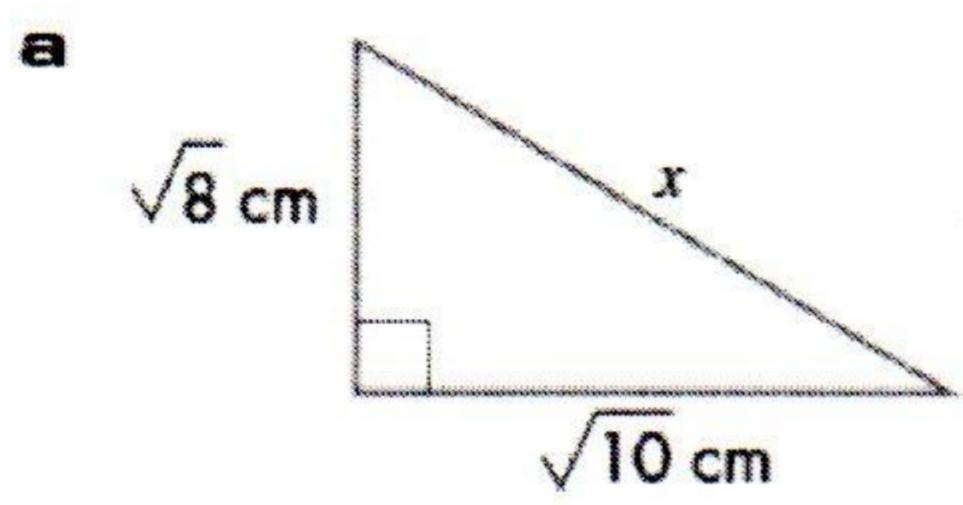
c $(1 - \sqrt{2})(6 + 2\sqrt{2})$

g $(5 - 3\sqrt{5})(5 + 3\sqrt{5})$

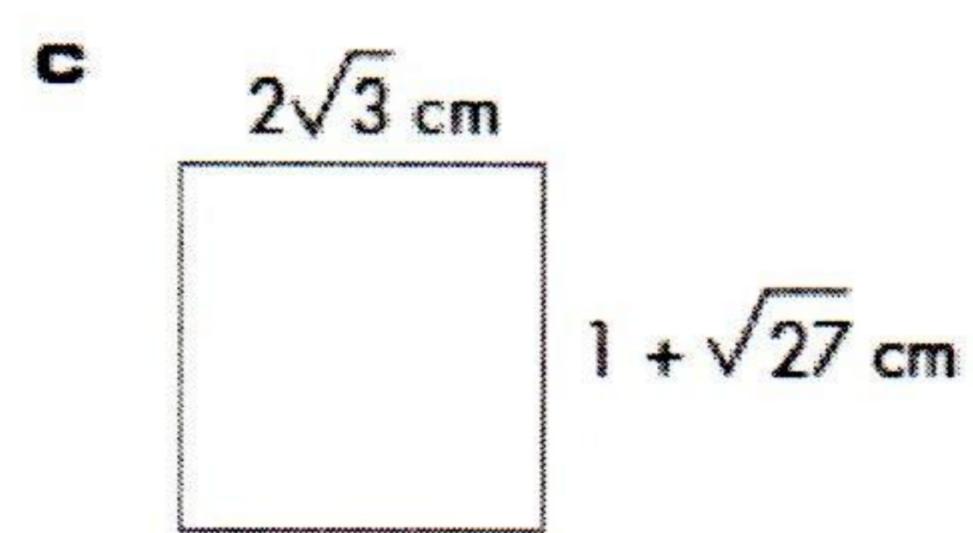
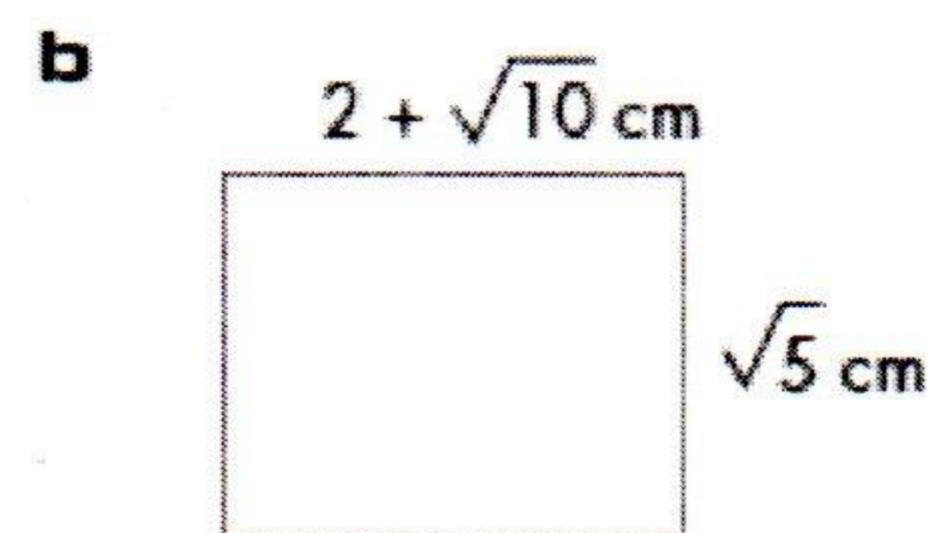
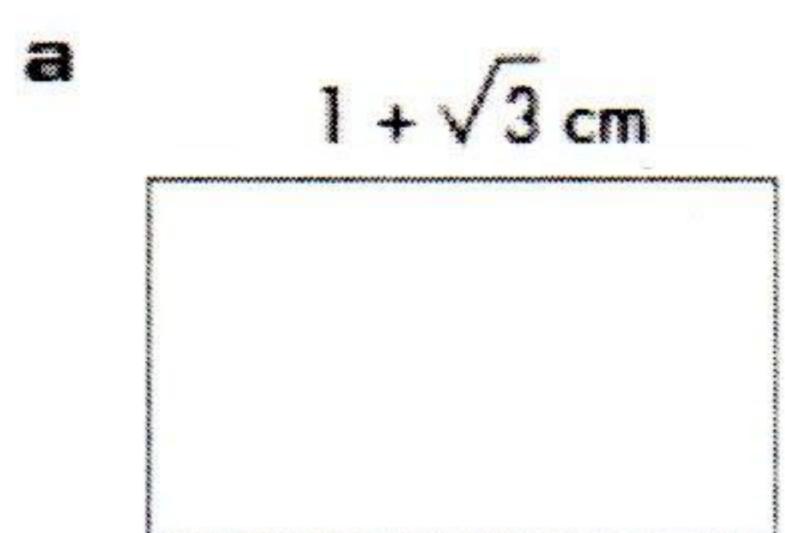
h $(3 - \sqrt{2})^2$

i $(\sqrt{3} + \sqrt{2})^2$

Q13. Work out the missing lengths in each of these triangles, giving the answer in as simple a form as possible.



Q14. Calculate the area of each of these rectangles, simplifying your answers where possible.



Q15. Expand and simplify the following.

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

b) $(1 - \sqrt{5})(1 + \sqrt{5})$

c) $(\sqrt{3} - 1)(\sqrt{3} + 1)$

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

e) $(2 - 4\sqrt{3})(2 + 4\sqrt{3})$

f) $(\sqrt{3} - 1)(\sqrt{3} + 1)$

Q16. Rationalise the denominators of these expressions.

a) $\frac{2}{\sqrt{13}} =$

b) $\frac{3}{\sqrt{5}} =$

g) $\frac{6}{\sqrt{8}} =$

h) $\frac{2\sqrt{3}}{\sqrt{21}} =$

i) $\frac{6 - \sqrt{3}}{\sqrt{3}} =$

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

Q17. Rationalise the denominators of the following.

Q.18 $\frac{9}{\sqrt{11} - \sqrt{2}}$

Q.19 $\frac{5}{\sqrt{9} - \sqrt{4}}$

Q.20 $\frac{a}{\sqrt{b} - \sqrt{c}}$

Q.21 $\frac{9}{\sqrt{3} + 1}$

Q.22 $\frac{2}{\sqrt{5} + 2}$

Q.23 $\frac{\sqrt{3} + 1}{\sqrt{3} - 1}$

Q.24 $\frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$

Q.25 $\frac{\sqrt{7}}{\sqrt{5} + 3}$
