Surds

1. Simplify

(a) $\sqrt{24} + \sqrt{600}$ (b) $4\sqrt{3} - \sqrt{27}$ (c) $\sqrt{32} + 2\sqrt{8}$

(d) $3\sqrt{5} + \sqrt{20} - 2\sqrt{18}$ (e) $\sqrt{300} - 5\sqrt{12} + 2\sqrt{27}$ (f) $\sqrt{28} - \sqrt{1000} + 3\sqrt{63}$

(g) $2\sqrt{12} + \sqrt{40} + 3\sqrt{90}$ (h) $\sqrt{500} - 2\sqrt{45} + \sqrt{63}$ (i) $\sqrt{700} - 5\sqrt{28}$

2. $f(x) = 4\sqrt{x}$.

(a) Evaluate f(45).
(b) Given f(a) = 24, find a.

3. $f(x) = 3\sqrt{x}$

(a) Find f(18)
(b) Given f(x) = 2, find x.

4. Expand the brackets and simplify

(a) $\sqrt{2}(\sqrt{6} + \sqrt{2})$ (b) $\sqrt{3}(2\sqrt{3} - 5)$ (c) $\sqrt{6}(4 - \sqrt{3})$

(d) $\sqrt{5}\left(2\sqrt{5} - 3\right)$ (e) $\sqrt{6}\left(3\sqrt{10} - 2\sqrt{6}\right)$ (f) $2\sqrt{2}\left(\sqrt{14} + 5\sqrt{2}\right)$

(g) $\sqrt{x}(\sqrt{x} - 3)$ (h) $\sqrt{u}(2\sqrt{u} + 5)$ (i) $3\sqrt{2}(2\sqrt{2} - 4\sqrt{10})$

(j) $2\sqrt{3}(3\sqrt{3} + \sqrt{8})$ (k) $(\sqrt{3} + \sqrt{2})^2$ (l) $(\sqrt{5} - 2)^2$

(m) $(\sqrt{7} - 2)(\sqrt{7} + 2)$ (n) $(\sqrt{3} + \sqrt{2})(\sqrt{3} - \sqrt{2})$ (o) $(2\sqrt{5} - 1)(2\sqrt{5} + 1)$

5. Express with a rational denominator in its simplest form

(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{2}{\sqrt{5}}$ (c) $\frac{6}{\sqrt{2}}$ (d) $\frac{21}{\sqrt{7}}$ (e) $\frac{10}{3\sqrt{5}}$

(f) $\frac{14}{5\sqrt{2}}$ (g) $\frac{\sqrt{2}}{\sqrt{14}}$ (h) $\frac{\sqrt{3}}{\sqrt{24}}$ (i) $\frac{\sqrt{2}}{\sqrt{40}}$ (j) $\frac{\sqrt{5}}{2\sqrt{30}}$

6. $f(x) = \frac{2}{\sqrt{x}}$

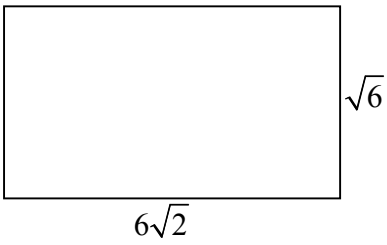
(a) Express f(3) with a rational denominator.
(b) Given f(x) = 4, find x.

7. $f(x) = \dfrac{10}{3\sqrt{x}}$

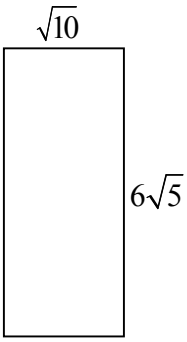
(a) Express f(5) with a rational denominator in its simplest form.
(b) Given f(a) = 2, find a.

8. Calculate the area of each rectangle below. Give your answer as a surd in its simplest form.

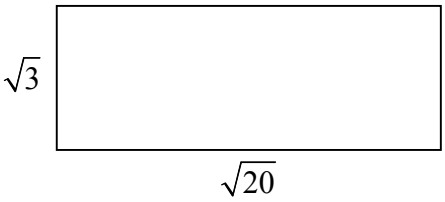
(a)



(b)

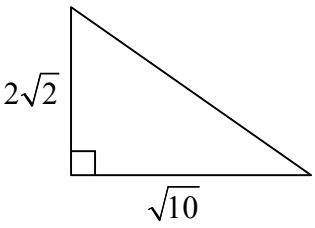


(c)

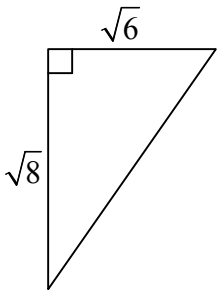


9. Calculate the area of each right-angled triangle below. Give your answer as a surd in its simplest form.

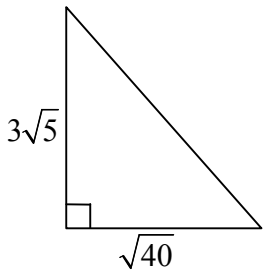
(a)



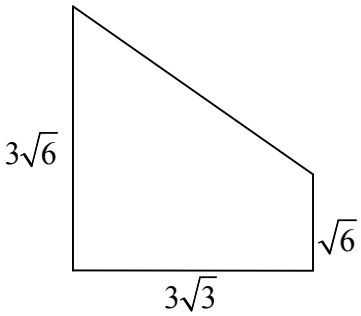
(b)



(c)

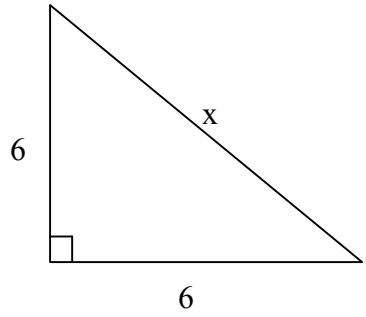


10. The shape below consists of a rectangle and a right-angled triangle.
Calculate the area of this shape. Give your answer as a surd in its simplest form.

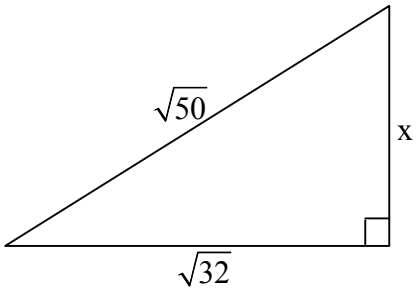


11. Calculate x in each of the following. Give your answer as a surd in its simplest form.

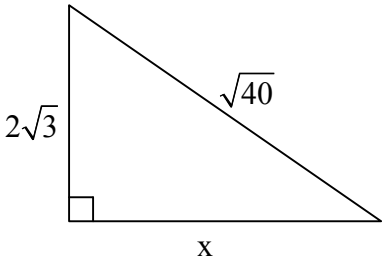
(a)



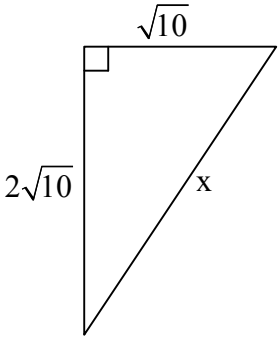
(b)



(c)

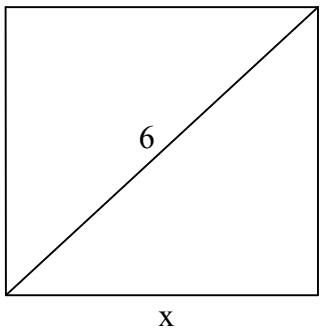


(d)

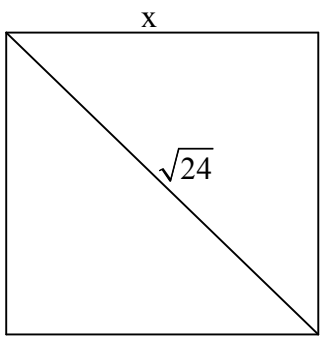


12. Each shape below is a square. Calculate x giving your answer as a surd in its simplest form.

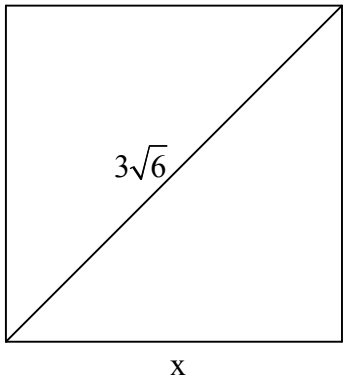
(a)



(b)



(c)

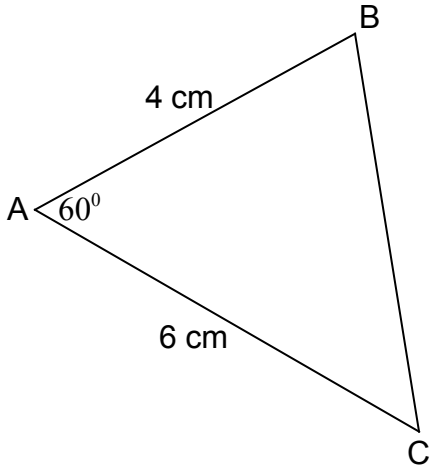


Use the table opposite to help answer the questions below.

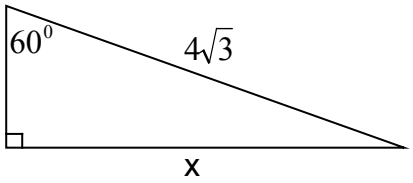
	30^0	45^0	60^0
sin	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$
cos	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$
tan	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$

13. The diagram opposite shows a triangle ABC.

Calculate the length of BC.
Give your answer as a surd in its simplest form.

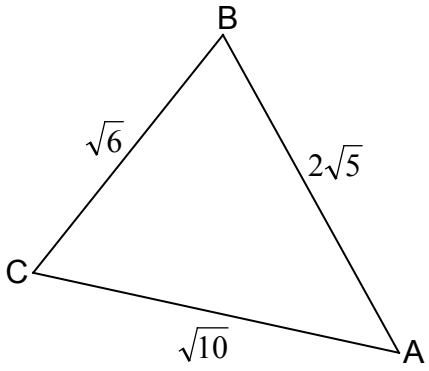


14. Calculate x in the triangle opposite.

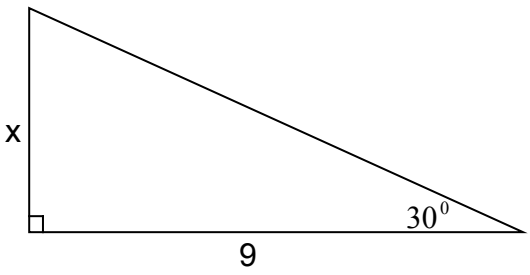


15. The diagram shows triangle ABC.

Show that $\cos BAC = \frac{3\sqrt{2}}{5}$

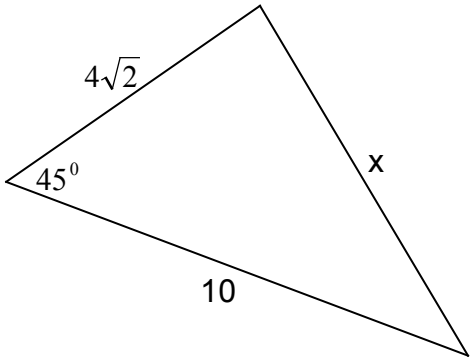


16. Calculate the length of x in the triangle opposite.
Give your answer as a surd expressed with a rational denominator.

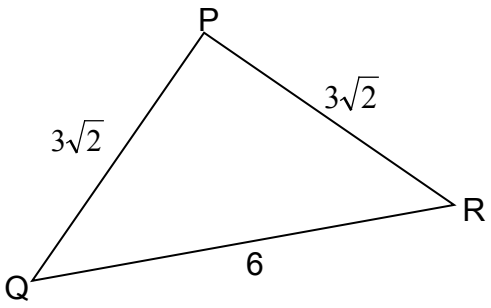


17. In the triangle shown, prove that

$x = 2\sqrt{13}$



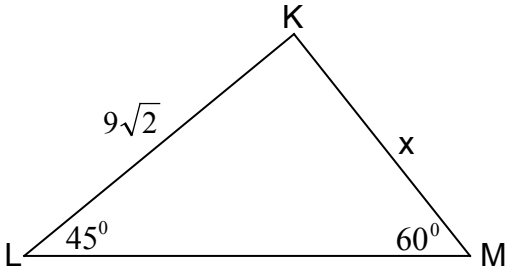
18. Show that the triangle opposite is right-angled at the point P.



19. The diagram opposite shows triangle KLM.

Show that

$x = 6\sqrt{3}$



20. The diagram opposite shows a parallelogram ABCD.
Given the information in the diagram calculate the area of this parallelogram.
Give your answer as a surd in its simplest form.