1 Given that y is a prime number,

(b) express $\dfrac{3}{2-\sqrt{y}}$ in the form $\dfrac{a+b\sqrt{y}}{c-y}$ where a, b and c are integers.

.....

(2)

(Total for Question 1 is 2 marks)

2 (a) Show that $\left(6 + 2\sqrt{12}\right)^2 = 12\left(7 + 4\sqrt{3}\right)$

Show each stage of your working.

(3)

(Total for Question 2 is 3 marks)

3 The area of a rectangle is $18\,\text{cm}^2$

The length of the rectangle is $\left(\sqrt{7}+1\right)$ cm.

Without using a calculator and showing each stage of your working,

find the width of the rectangle.
Give your answer in the form $a\sqrt{b}+c$ where a, b and c are integers.

..... cm

(Total for Question 3 is 3 marks)

4 (b) Show that $\frac{2}{6-3\sqrt{2}}$ can be written in the form $\frac{a+\sqrt{a}}{b}$

where a and b are integers.

Show your working clearly.

(3)

(Total for Question 4 is 3 marks)

5 Given that $(8 - \sqrt{x})(5 + \sqrt{x}) = y\sqrt{x} + 21$ where x is a prime number and y is an integer,

find the value of x and the value of y.
Show each stage of your working clearly.

$x =$ .....

$y =$ .....

(Total for Question 5 is 3 marks)

6 Express $\dfrac{3+\sqrt{8}}{\left(\sqrt{2}-1\right)^2}$ in the form $p+\sqrt{q}$ where p and q are integers.

Show each stage of your working clearly.

.....

(Total for Question 6 is 4 marks)

7 Without using a calculator, show that $\frac{12}{\sqrt{2}-1} - \left(\sqrt{2}\right)^5 = 2\sqrt{32} + 12$

Show your working clearly.

(Total for Question 7 is 3 marks)

8 $a = \sqrt{8} + 4$

$b = \sqrt{8} - 4$

$(a - b)(a + b)$ can be written in the form $y\sqrt{4y}$

Find the value of y
Show your working clearly.

$y =$ .....

(Total for Question 8 is 3 marks)

9 The diagram shows the prism *ABCDEFGHJK* with horizontal base *AEFG*

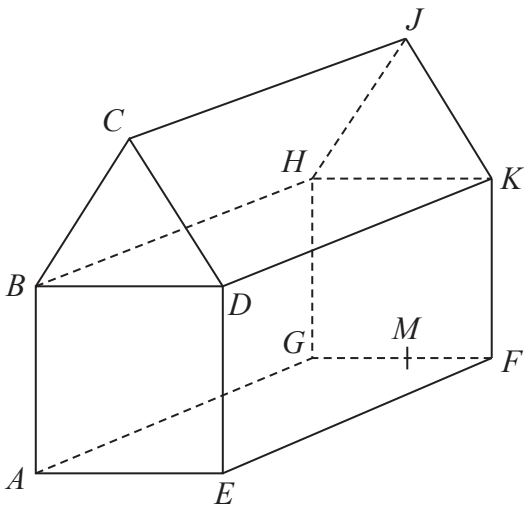


Diagram **NOT** accurately drawn

ABCDE is a cross section of the prism where
ABDE is a square
BCD is an equilateral triangle

$EF = 2 \times AE$
M is the midpoint of *GF* so that *JM* is vertical.

Angle $MAJ = y°$

Given that $\tan y° = T$

find the value of *T*, giving your answer in the form $\frac{\sqrt{p} + \sqrt{q}}{17}$ where *p* and *q* are integers.

$T =$ .....

(Total for Question 9 is 5 marks)

10 Show that $\dfrac{\sqrt{12}}{\sqrt{3}+2}$

can be written in the form $a + \sqrt{b}$ where a and b are integers.

(Total for Question 10 is 3 marks)

11 Solve $\sqrt{3}(x - 2\sqrt{3}) = x + 2\sqrt{3}$

Give your answer in the form $a + b\sqrt{3}$ where a and b are integers.
Show your working clearly.

$x =$ .....

(Total for Question 11 is 4 marks)

12 Given that $8\sqrt{m} + \sqrt{49m} - \sqrt{9m} = k\sqrt{m}$

where k is an integer and m is a prime number,

(a) work out the value of k

$k =$ .....

(1)

(b) Show that $\dfrac{5 - \sqrt{18}}{1 - \sqrt{2}}$ can be written in the form $a + b\sqrt{2}$

where a and b are integers.
Show each stage of your working clearly.

(3)

(Total for Question 12 is 4 marks)

13 Show that $\frac{2\sqrt{3}}{\sqrt{3}-1}$ can be written in the form $a + \sqrt{a}$ where a is an integer.

Show your working clearly.

(Total for Question 13 is 3 marks)

14 The diagram shows a cuboid with a square cross section.

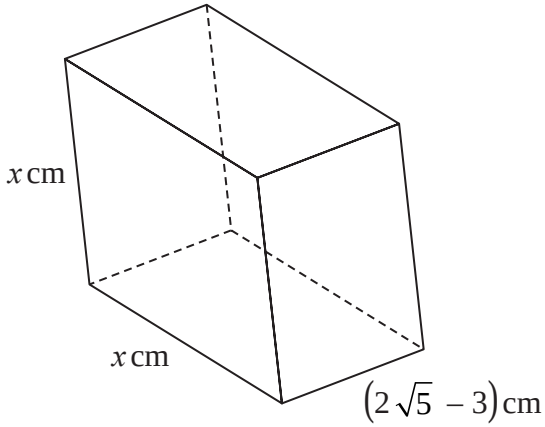


Diagram **NOT** accurately drawn

The volume of the cuboid is $(13 + 6\sqrt{5})\text{cm}^3$

Without using a calculator, find the value of x
Give your answer in the form $a + \sqrt{b}$ where a and b are integers.
Show your working clearly.

$x =$ .....

(Total for Question 14 is 4 marks)