Geometric Problems with Surds

Q1. The perimeter of a square is $\sqrt{120}$ cm.
Work out the area of the square.
Give your answer in its simplest form.

…… cm^2
(Total 3 marks)

Q2. Here is a trapezium.

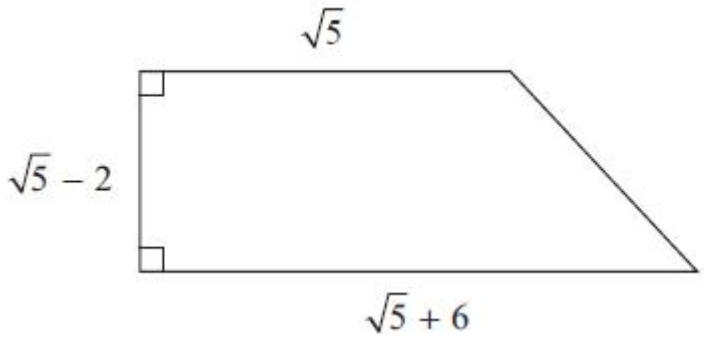

Diagram **NOT** accurately drawn

All measurements shown are in centimetres.
Work out the area of the trapezium.
Give your answer in cm^2 in the form $a\sqrt{5} + b$ where a and b are integers.

…… cm^2
(Total 3 marks)

Q3. ABD is a right-angled triangle.

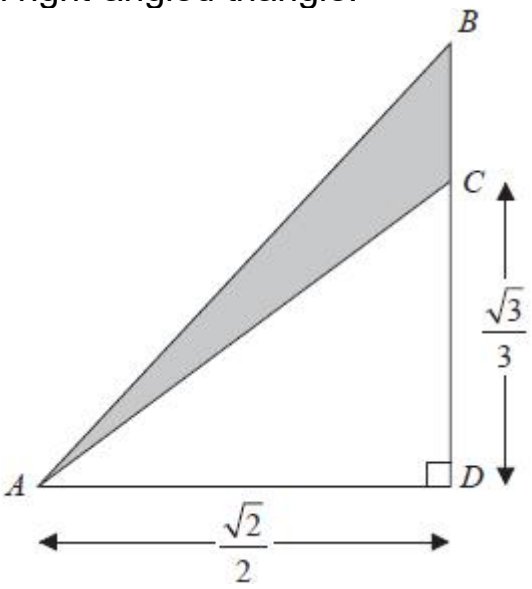

Diagram **NOT** accurately drawn

All measurements are given in centimetres.

C is the point on BD such that $CD = \frac{\sqrt{3}}{3}$

$AD = BD = \frac{\sqrt{2}}{2}$

Work out the exact area, in cm^2, of the shaded region.

…… cm^2

(Total 3 marks)

Q4. The diagram shows a right-angled triangle.

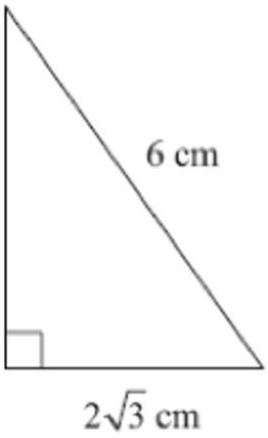

Diagram **NOT** accurately drawn

The length of the base of the triangle is $2\sqrt{3}$ cm.
The length of the hypotenuse of the triangle is 6 cm.
The area of the triangle is A cm^2. Show that $A = k\sqrt{2}$ giving the value of k .

$k =$ .....

(Total 5 marks)

Q5. All measurements on the triangle are in centimetres.

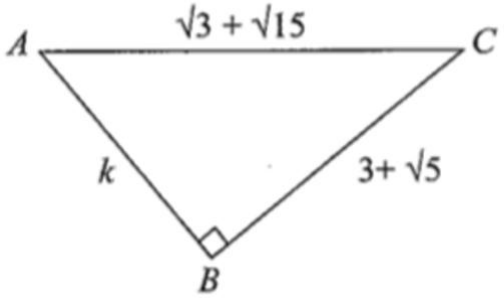

Diagram **NOT** accurately drawn

ABC is a right-angled triangle.
k is a positive integer. Find the value of k .

$k =$ .....

(Total 4 marks)

Geometric Problems with Surds – Answers!

Q1. The perimeter of a square is $\sqrt{120}$ cm.
Work out the area of the square.
Give your answer in its simplest form.

$\sqrt{120} = \sqrt{4} \times \sqrt{30} = 2\sqrt{30}$

Side of square $= \frac{1}{2}\sqrt{30}$

Area $= \left(\frac{1}{2}\sqrt{30}\right)^2 = \frac{15}{2}$ cm^2

$\frac{15}{2}$ or 7.5 ..... cm^2
(Total 3 marks)

Q2. Here is a trapezium.

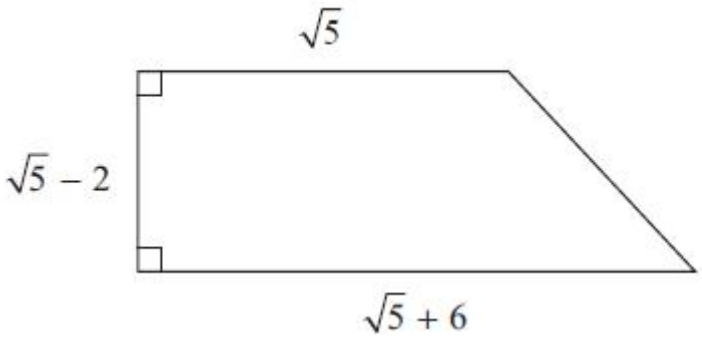

Diagram **NOT** accurately drawn

All measurements shown are in centimetres.
Work out the area of the trapezium.
Give your answer in cm^2 in the form $a\sqrt{5} + b$ where a and b are integers.

$\frac{1}{2}(\sqrt{5}+\sqrt{5}+6)(\sqrt{5}-2)$

$= (\sqrt{5}+3)(\sqrt{5}-2)$

$= \sqrt{5} - 1$

$\therefore a = 1, b = -1$

	$\sqrt{5}$	-2
$\sqrt{5}$	5	$-2\sqrt{5}$
$+3$	$+3\sqrt{5}$	-6

$\sqrt{5} - 1$ ..... cm^2
(Total 3 marks)

Q3. ABD is a right-angled triangle.

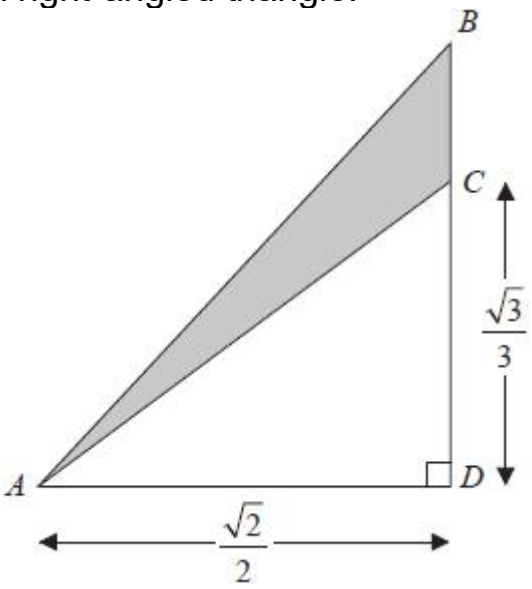

Diagram **NOT** accurately drawn

All measurements are given in centimetres.

C is the point on BD such that $CD = \frac{\sqrt{3}}{3}$

$AD = BD = \frac{\sqrt{2}}{2}$

Work out the exact area, in cm^2, of the shaded region.

Area ABD $= \left(\frac{\sqrt{2}}{2}\right)^2 \times \frac{1}{2} = \frac{2}{8}$ cm^2

Area ACD $= \frac{\sqrt{2}}{2} \times \frac{\sqrt{3}}{2} \times \frac{1}{2} = \frac{\sqrt{6}}{8}$

Area ABC $= \frac{2}{8} - \frac{\sqrt{6}}{8} = \frac{2-\sqrt{6}}{8}$ cm^2

$\frac{2-\sqrt{6}}{8}$ ..... cm^2

(Total 3 marks)

Q4. The diagram shows a right-angled triangle.

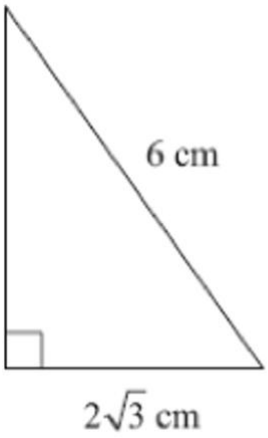

Diagram **NOT** accurately drawn

The length of the base of the triangle is $2\sqrt{3}$ cm.
The length of the hypotenuse of the triangle is 6 cm.
The area of the triangle is A cm^2. Show that $A = k\sqrt{2}$ giving the value of k .

Height $= \sqrt{6^2 - (2\sqrt{3})^2} = \sqrt{36 - 12} = \sqrt{24} = 2\sqrt{6}$ cm

Area $= \frac{1}{2} \times 2\sqrt{3} \times 2\sqrt{6} = 2\sqrt{18} = 6\sqrt{2}$ cm^2

$k =$ 6

(Total 5 marks)

Q5. All measurements on the triangle are in centimetres.

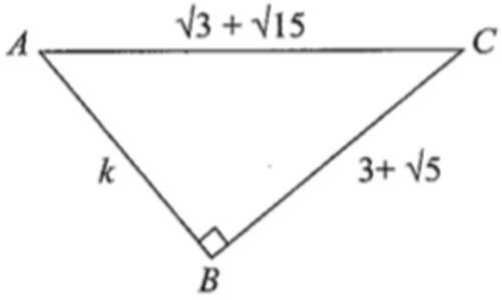

Diagram **NOT** accurately drawn

ABC is a right-angled triangle.
k is a positive integer. Find the value of k .

Pythagoras' Theorem:

$$k^2 + (3+\sqrt{5})^2 = (\sqrt{3}+\sqrt{15})^2$$

$$k^2 + 9 + 6\sqrt{5} + 5 = 3 + 2\sqrt{45} + 15$$

$$k^2 = 4$$

$$k = 2 \text{ or } -2$$

Since $k > 0$, $k = 2$

$k =$ ..... 2 .....

(Total 4 marks)