

## N297 Surds

**Q1.**

(a) Express  $5\sqrt{27}$  in the form  $n\sqrt{3}$ , where  $n$  is a positive integer.

.....  
(2)

(b) Rationalise the denominator of  $\frac{21}{\sqrt{3}}$

.....  
(2)

**(Total for Question is 4 marks)**

**Q2.**

Show that  $\frac{(4 - \sqrt{3})(4 + \sqrt{3})}{\sqrt{13}}$  simplifies to  $\sqrt{13}$

**(Total for question = 2 marks)**

**Q3.**

Simplify fully  $(\sqrt{a} + \sqrt{4b})(\sqrt{a} - 2\sqrt{b})$

.....  
**(Total for question = 3 marks)**

**Q4.**

$(a + \sqrt{8})^2$  can be written in the form  $c + d\sqrt{2}$ , where  $a$ ,  $c$  and  $d$  are integers.

Find, in terms of  $a$ , an expression for  **$c$**  and an expression for  $d$ .

$c =$  .....

$d =$  .....

**(Total for question = 3 marks)**

**Q5.**

Show that  $\frac{3+\sqrt{2}}{5+\sqrt{8}}$  can be written as  $\frac{11-\sqrt{2}}{17}$

**(Total for question = 3 marks)**

**Q6.**

Show that  $\frac{6-\sqrt{8}}{\sqrt{2}-1}$  can be written in the form  $a+b\sqrt{2}$  where  $a$  and  $b$  are integers.

**(Total for question = 3 marks)**

**Q7.**

$$\frac{\sqrt{3}}{5} + \frac{2}{\sqrt{3}} = a\sqrt{3}, \text{ where } a \text{ is a fraction}$$

Find the value of  $a$ .

.....  
**(Total for question = 3 marks)**

**Q8.**

Show that  $\frac{4}{\frac{1}{\sqrt{3}} + \sqrt{3}}$  can be written as  $\sqrt{3}$

**(Total for question = 3 marks)**

**Q9.**

Show that  $\frac{1}{1 + \frac{1}{\sqrt{2}}}$  can be written as  $2 - \sqrt{2}$

**(Total for question = 3 marks)**

**Q10.**

$ABD$  is a right angled triangle.

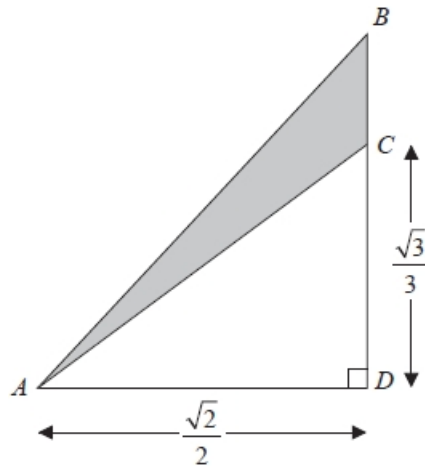


Diagram NOT  
accurately drawn

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  $\text{cm}^2$ , of the shaded region.

.....  $\text{cm}^2$

**(Total for question = 3 marks)**

**Q11.**

Here is a trapezium.

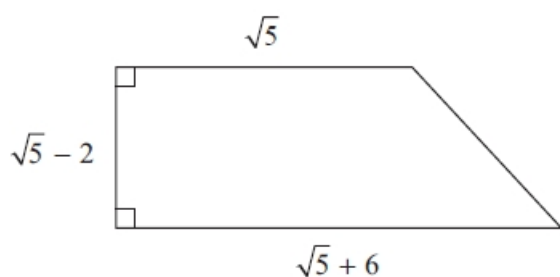


Diagram **NOT**  
accurately drawn

All measurements shown are in centimetres.

Work out the area of the trapezium.

Give your answer in  $\text{cm}^2$  in the form  $a\sqrt{5} + b$  where  $a$  and  $b$  are integers.

..... $\text{cm}^2$

**(Total for question = 3 marks)**

**Q12.**

\* The diagram shows the triangle  $PQR$ .

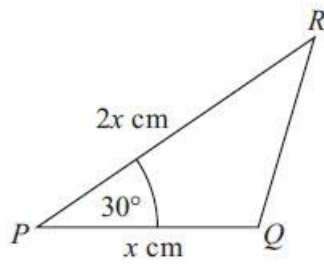


Diagram **NOT**  
accurately drawn

$$PQ = x \text{ cm}$$

$$PR = 2x \text{ cm}$$

$$\text{Angle } QPR = 30^\circ$$

The area of triangle  $PQR = A \text{ cm}^2$

Show that  $x = \sqrt{2A}$

**(Total for Question is 3 marks)**



**Q13.**

$a = \sqrt{7} + \sqrt{c}$  and  $b = \sqrt{63} + \sqrt{d}$  where  $c$  and  $d$  are positive integers.

Given that  $c : d = 1 : 9$

find, in its simplest form, the ratio  $a : b$

.....  
**(Total for question = 3 marks)**

**Q14.**

S is a geometric sequence.

(a) Given that  $(\sqrt{x} - 1)$ , 1 and  $(\sqrt{x} + 1)$  are the first three terms of S, find the value of x.

You must show all your working.

.....  
(3)

(b) Show that the 5th term of S is  $7 + 5\sqrt{2}$

(2)

**(Total for question = 5 marks)**

**Q15.**

\* The diagram shows a triangle  $DEF$  inside a rectangle  $ABCD$ .

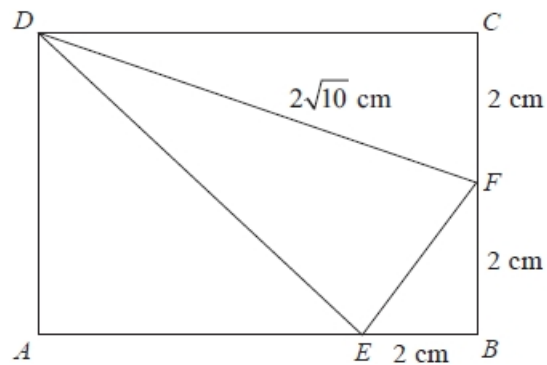


Diagram **NOT**  
accurately drawn

Show that the area of triangle  $DEF$  is  $8 \text{ cm}^2$ .  
You must show all your working.

**(Total for question = 4 marks)**