

IGCSE Higher Answers Week 10

1a, $2\sqrt{2}$ b, $3\sqrt{3}$ c, $12\sqrt{2}$ d, $9\sqrt{5}$ e, $3\sqrt{3}$ f, $6\sqrt{19}$
 g, $9\sqrt{3} + 9\sqrt{7}$ h, 3 i, 5 j, 6 k, 15 l, 3 m, 30
 n, 12 o, 63 p, $2\sqrt{2}$ q, $60\sqrt{2}$ r, 5 s, 3 t, $\sqrt{6}$
 u, $\sqrt{55}$ v, 9 w, 4

2a, $2\sqrt{3}$ b, $2\sqrt{5}$ c, $4\sqrt{3}$ d, $4\sqrt{2}$ e, $3\sqrt{5}$ f, $5\sqrt{3}$
 g, $3\sqrt{3}$ h, $5\sqrt{5}$ i, $9\sqrt{2}$ j, $\frac{1}{3}$ k, $\frac{2}{5}$ l, $\frac{7}{10}$
 m, $5\sqrt{5}$ n, $6\sqrt{5}$

3, Area $\Rightarrow \sqrt{3} \times \sqrt{12} = \sqrt{36} = 6 \text{ cm}^2$
 Perimeter $\Rightarrow 2\sqrt{3} + 2\sqrt{12} = 2\sqrt{3} + 4\sqrt{3} = 6\sqrt{3} \text{ cm}$
 Diagonal $\Rightarrow (\sqrt{3})^2 + (\sqrt{12})^2 = \text{diagonal}^2$
 $3 + 12 = 15$ diagonal $= \sqrt{15} \text{ cm}$

4, a, $1 + \sqrt{2} + \sqrt{2} + 2 = 3 + 2\sqrt{2}$ b, $6 + 2\sqrt{5}$ c, $7 + 4\sqrt{3}$ d, $4 - 2\sqrt{3}$
 e, $13 + 4\sqrt{3}$ f, $22 + 12\sqrt{2}$ g, $16 - 8\sqrt{3}$ h, $10 + 2\sqrt{21}$
 i, $\frac{3}{2} - 1$ j, 1 k, 44 l, $15 - 6\sqrt{7} + 10\sqrt{2} - 4\sqrt{14}$
 m, $20 - 10\sqrt{5} + 12\sqrt{3} - 6\sqrt{15}$

5, Perimeter $2(\sqrt{5} + 1) + 2(\sqrt{5} - 1) \Rightarrow 4\sqrt{5} \text{ cm}$
 Area $(\sqrt{5} + 1)(\sqrt{5} - 1) = 4 \text{ cm}^2$
 Diagonal $(\sqrt{5} + 1)^2 + (\sqrt{5} - 1)^2 = 6 + 2\sqrt{5} + 5 - 2\sqrt{5} = 11$
 Diagonal $= \sqrt{11} \text{ cm}$

6 CONT
 $\frac{2\sqrt{6} + \sqrt{18}}{2}$
 $\Rightarrow \frac{2\sqrt{6} + 3\sqrt{2}}{2}$
 Area $= \frac{\sqrt{6}(2 + \sqrt{3})}{2}$

6, $a^2 = (1 + 2\sqrt{3})^2 - (2 + \sqrt{3})^2 \Rightarrow 13 + 4\sqrt{3} - (7 + 4\sqrt{3}) = 6$ $a = \sqrt{6}$ Area $= \frac{\sqrt{6}(2 + \sqrt{3})}{2}$

7, a, $\frac{\sqrt{2}}{2}$ b, $\frac{\sqrt{5}}{5}$ c, $\frac{\sqrt{11}}{11}$ d, $\sqrt{3}$ e, $\sqrt{2}$ f, $\frac{3\sqrt{2}}{2}$ g, $\frac{4\sqrt{6}}{3}$
 h, $\frac{\sqrt{3} + 3}{3}$ i, $\frac{\sqrt{5} - 5}{5}$ j, $2\sqrt{2} - 1$ k, $\frac{\sqrt{3}}{3}$ l, $\frac{2\sqrt{2}}{2\sqrt{5} \times \sqrt{5}} \Rightarrow \frac{2\sqrt{10}}{10} \Rightarrow \frac{\sqrt{10}}{5}$

m, $2 + \sqrt{3}$ n, $\frac{1 \times (1 - \sqrt{3})}{1 + \sqrt{3}(1 - \sqrt{3})} = \frac{1 - \sqrt{3}}{-2} = \frac{\sqrt{3} - 1}{2}$ o, $\frac{1 \times (1 - \sqrt{5})}{1 + \sqrt{5}(1 - \sqrt{5})} = \frac{1 - \sqrt{5}}{-4} = \frac{\sqrt{5} - 1}{4}$

p, $\frac{7 \times (7 + \sqrt{7})}{7 - \sqrt{7} \times (7 + \sqrt{7})} = \frac{49 + 7\sqrt{7}}{49 - 7} = \frac{7 + \sqrt{7}}{6}$ q, $\frac{1 - \sqrt{3} \times (1 - \sqrt{3})}{1 + \sqrt{3} \times (1 - \sqrt{3})} = \frac{1 - 2\sqrt{3} + 3}{1 - 3} = \frac{4 - 2\sqrt{3}}{-2} = -2 + \sqrt{3}$

$$8 \quad (3-\sqrt{3})(3-\sqrt{3}) = 9 - 3\sqrt{3} - 3\sqrt{3} + 3 \Rightarrow 12 - 6\sqrt{3} \quad \begin{matrix} a=12 \\ b=-6 \end{matrix}$$

$$9 \quad (3+\sqrt{2})(1-\sqrt{2}) = 3 - 3\sqrt{2} + \sqrt{2} - 2 \Rightarrow 1 - 2\sqrt{2} \quad \begin{matrix} a=1 \\ b=-2 \end{matrix}$$

$$10 \quad \sqrt{48} \Rightarrow 2\sqrt{12} \Rightarrow 4\sqrt{3} \quad \cdot \quad \sqrt{108} \Rightarrow 3\sqrt{12} \Rightarrow 6\sqrt{3}$$

$$\underbrace{4\sqrt{3} \cdot 6\sqrt{3}}_{= 10\sqrt{3}} \quad R=10$$

$$11 \quad \frac{\sqrt{2}(\sqrt{3} + \sqrt{27})}{2} \xrightarrow{\sqrt{27} \Rightarrow 3\sqrt{3}} \Rightarrow \frac{\sqrt{6} + \cancel{3\sqrt{6}}}{2} \Rightarrow \frac{4\sqrt{6}}{2} = 2\sqrt{6} = \sqrt{24} \quad \begin{matrix} \xrightarrow{\sqrt{4 \times 6}} \\ R=24 \end{matrix}$$

$$12 \quad (6-\sqrt{8})(6-\sqrt{8}) \Rightarrow 36 - 6\sqrt{8} - 6\sqrt{8} + 8 \Rightarrow 44 - 12\sqrt{8} \quad \sqrt{8} = 2\sqrt{2}$$

$$\boxed{44 - 24\sqrt{2}}$$

$$13 \quad a, \frac{\sqrt{a}}{a} \quad b, \sqrt{c} \quad c, \frac{2\sqrt{p}}{p} \quad d, \frac{5\sqrt{5a}}{5a} \Rightarrow \frac{\sqrt{5a}}{a}$$

$$14 \quad a^2 - b \quad b, m^2 - 2m\sqrt{n} + n \quad c, p^2 + 4p\sqrt{r} + 4r^2$$

$$15 \quad (2+\sqrt{a})(3+\sqrt{a}) \Rightarrow 11 + k\sqrt{a}$$

$$\boxed{6} + \boxed{5\sqrt{a}} + \boxed{a} \Rightarrow \boxed{11} + \boxed{k\sqrt{a}} \quad \begin{matrix} \boxed{6+a=11} \therefore a=5 \\ \therefore k=5 \end{matrix}$$

$$11 + 5\sqrt{5} = 11 + k\sqrt{5}$$

$$16 \quad \frac{\sqrt{a}(5a-\sqrt{a})}{a} = \frac{5a\sqrt{a} - a}{a} = 5\sqrt{a} - 1$$

$$17 \quad (5-\sqrt{8})(7+\sqrt{2}) \quad \sqrt{8} = 2\sqrt{2} \quad (5-2\sqrt{2})(7+\sqrt{2})$$

$$35 + 5\sqrt{2} - 14\sqrt{2} - 4$$

$$\Rightarrow 31 - 9\sqrt{2}$$

$$18 \quad \begin{matrix} h \\ \triangle \\ 2 \\ 1 \end{matrix} \quad h = \sqrt{2^2 - 1^2} = \sqrt{3} = \text{height}$$

$$\begin{matrix} \sqrt{3} \\ \triangle \\ 2 \\ 1 \end{matrix} \quad \begin{matrix} \cos 60 = \frac{1}{2} \\ \sin 60 = \frac{\sqrt{3}}{2} \end{matrix} \quad \begin{matrix} C^A \\ S^A \end{matrix}$$

$$19 \quad \frac{14}{7\sqrt{5}} \Rightarrow \frac{2}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$$

$$\boxed{245 \div 5 = 49} \\ \boxed{\sqrt{49} = 7} \therefore \sqrt{245} = 7\sqrt{5}$$