Indices and surds (answers at the end)

# Mixed practice 2

1. Express $(n+\sqrt{5})^2$ in the form $a+b\sqrt{5}$.

2. If $z=xy^2$ and $y=3x$ express $z$ in terms of $x$ only.

3. Show that $\dfrac{10}{\sqrt{28}-\sqrt{8}}$ can be written in the form $\sqrt{a}+\sqrt{b}$.

4. If $y=\dfrac{2}{\sqrt{x}}$, write $y^{-4}$ in the form $kx^a$.

5. If $3x\sqrt{8}=x\sqrt{2}+\sqrt{32}$, find $x$.

6. Simplify

   **i** $(\sqrt[3]{x})^6$,

   **ii** $\dfrac{3y^4\times(10y)^3}{2y^5}$.



7. Express each of the following in the form $3^n$:

   **i** $\frac{1}{9}$,

   **ii** $\sqrt[3]{3}$,

   **iii** $3^{10}\times 9^{135}$.



8. Simplify $\left(x^4+7x^3\times\frac{x}{9}\right)^{-\frac{1}{2}}$.

9. Rationalise the denominator of $\dfrac{\sqrt{n}+1}{\sqrt{n}-1}$.

10. **a** Find and simplify an expression for $(a+b\sqrt{5})^2$.

    **b** By considering $(2-\sqrt{5})^4$ show that $\sqrt{5}<\frac{161}{72}$.

    **c** By considering $(2-\sqrt{5})^3$ show that $\sqrt{5}>\frac{38}{17}$.

    **d** **i** Explain why considering $(3-\sqrt{5})^3$ gives a worse upper bound on $\sqrt{5}$ than found in part **b**.

    **ii** Explain why considering $(4-\sqrt{5})^4$ would not give as good an upper bound on $\sqrt{5}$ as found in part **b**.

1 $n^2+5+2n\sqrt{5}$

2 $z=9x^3$

3 $\sqrt{2}+\sqrt{7}$

4 $\frac{1}{16}x^2$

5 $x=0.8$

6 a $x^2$ b $1500y^2$

7 a $3^{-2}$ b $3^{\frac{1}{3}}$ c $3^{280}$

8 $\frac{3}{4x^2}$

9 $\frac{1+n+2\sqrt{n}}{n-1}$

10 a $a^2+b^2+2ab\sqrt{5}$

b Proof

c Proof

d i Upper bound because $3-\sqrt{5}>0$ so an odd power is also bigger than zero; worse because $\sqrt{5}$ is closer to 2 than to 3

ii Because $4-\sqrt{5}>1$, large powers get further away from zero or one