

1:06 | Surds

Exercise 1:06

1 Indicate whether each of the following is *rational* or *irrational*.

- | | | | |
|------------------|---------|---------------|---------------|
| a $6\frac{3}{5}$ | b 1.31 | c $\sqrt{3}$ | d 5.162 |
| e $\sqrt[3]{2}$ | f π | g $0.\dot{7}$ | h $\sqrt{49}$ |

2 Evaluate each of the following to one decimal place.

- | | | | |
|--------------|-------------------------|-------------------|------------------------|
| a $\sqrt{7}$ | b $\sqrt{5} + \sqrt{2}$ | c $\sqrt{11} - 3$ | d $\frac{\sqrt{3}}{2}$ |
|--------------|-------------------------|-------------------|------------------------|

3 Simplify:

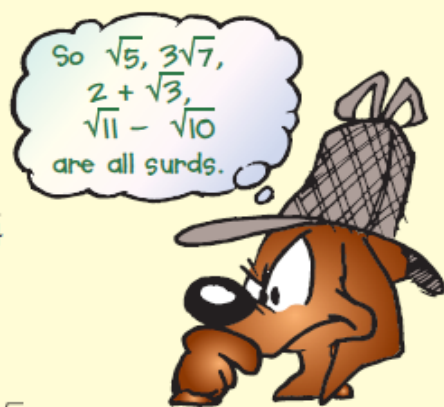
- | | | | |
|--------------------------------|--------------------------------|------------------------------|-----------------------------|
| a $5 \times \sqrt{2}$ | b $\sqrt{5} \times \sqrt{7}$ | c $\sqrt{3} \times \sqrt{2}$ | d $\sqrt{3} \times 6$ |
| e $\frac{\sqrt{20}}{\sqrt{2}}$ | f $\frac{\sqrt{42}}{\sqrt{6}}$ | g $\sqrt{130} \div \sqrt{5}$ | h $\sqrt{\frac{49}{81}}$ |
| i $(\sqrt{7})^2$ | j $\sqrt{2} \times 3\sqrt{2}$ | k $(5\sqrt{3})^2$ | l $8\sqrt{6} \div \sqrt{2}$ |

4 Simplify:

- | | | |
|---------------------------|----------------------------|----------------------------|
| a $\sqrt{75}$ | b $3\sqrt{8}$ | c $\sqrt{180}$ |
| d $4\sqrt{3} - 7\sqrt{3}$ | e $6\sqrt{5} - \sqrt{5}$ | f $\sqrt{2} + \sqrt{2}$ |
| g $\sqrt{8} + \sqrt{18}$ | h $5\sqrt{32} - \sqrt{50}$ | i $\sqrt{24} - 2\sqrt{54}$ |

5 Simplify:

- | | | |
|-----------------------------------|--|------------------------------------|
| a $3\sqrt{2} \times 5\sqrt{2}$ | b $4\sqrt{7} \times 9\sqrt{5}$ | c $\sqrt{96} \div \sqrt{12}$ |
| d $(7\sqrt{5})^2 \times \sqrt{2}$ | e $\frac{4\sqrt{3} \times \sqrt{18}}{\sqrt{12}}$ | f $\sqrt{3}(2\sqrt{3} - \sqrt{5})$ |



6 Expand and simplify:

- | | |
|-----------------------------------|--|
| a $(\sqrt{2} + 1)(\sqrt{2} + 5)$ | b $(\sqrt{5} - 3)(\sqrt{5} - 2)$ |
| c $(2 + \sqrt{3})(5 - \sqrt{3})$ | d $(\sqrt{5} + \sqrt{3})(\sqrt{5} + \sqrt{2})$ |
| e $(2\sqrt{3} - 1)(\sqrt{3} + 7)$ | f $(5\sqrt{2} - 2\sqrt{3})(3\sqrt{2} + 5\sqrt{3})$ |
| g $(\sqrt{3} + 2)^2$ | h $(\sqrt{5} - 3)^2$ |
| i $(2\sqrt{3} + 3\sqrt{2})^2$ | j $(\sqrt{5} - 2)(\sqrt{5} + 2)$ |
| k $(7 + \sqrt{3})(7 - \sqrt{3})$ | l $(5\sqrt{3} - 2\sqrt{2})(5\sqrt{3} + 2\sqrt{2})$ |

7 Rewrite each fraction with a rational denominator.

- | | | |
|-------------------------|-------------------------|------------------------------------|
| a $\frac{1}{\sqrt{3}}$ | b $\frac{5}{\sqrt{5}}$ | c $\frac{6}{\sqrt{2}}$ |
| d $\frac{1}{3\sqrt{2}}$ | e $\frac{3}{2\sqrt{6}}$ | f $\frac{2 + \sqrt{5}}{2\sqrt{5}}$ |

Answers:

- 1 a rational b rational c irrational d rational e irrational f irrational g rational h rational
- 2 a 2.6 b 3.7 c 0.3 d 0.9
- 3 a $5\sqrt{2}$ b $\sqrt{35}$ c $\sqrt{6}$ d $6\sqrt{3}$ e $\sqrt{10}$ f $\sqrt{7}$ g $\sqrt{26}$ h $\frac{7}{9}$ i 7 j 6 k 75 l $8\sqrt{3}$
- 4 a $5\sqrt{3}$ b $6\sqrt{2}$ c $6\sqrt{5}$ d $-3\sqrt{3}$ e $5\sqrt{5}$ f $2\sqrt{2}$ g $5\sqrt{2}$ h $15\sqrt{2}$ i $-4\sqrt{6}$
- 5 a 30 b $36\sqrt{35}$ c $2\sqrt{2}$ d $245\sqrt{2}$ e $6\sqrt{2}$ f $6 - \sqrt{15}$
- 6 a $6\sqrt{2} + 7$ b $11 - 5\sqrt{5}$ c $7 + 3\sqrt{3}$ d $5 + \sqrt{10} + \sqrt{15} + \sqrt{6}$ e $-1 + 13\sqrt{3}$
- f $19\sqrt{6}$ g $7 + 4\sqrt{3}$ h $14 - 6\sqrt{5}$ i $30 + 12\sqrt{6}$ j 1 k 46 l 67
- 7 a $\frac{\sqrt{3}}{3}$ b $\sqrt{5}$ c $3\sqrt{2}$ d $\frac{\sqrt{2}}{6}$ e $\frac{\sqrt{6}}{4}$ f $\frac{2\sqrt{5} + 5}{10}$