Topic 25 Indices and surds (Post-TT) [44]

N.B. All questions are non-calculator except questions 8 and 10.

1.

(a) Evaluate $49^{0.5} \times 3^{-2}$

Give your answer as a fraction.

(3)

(b) Work out $27^{\frac{2}{3}}$

(2)

(Total 5 marks)

2.

Without using a calculator, show clearly that $64^{\frac{2}{3}}$ is equal to 16. **[2]**

3.

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

(Total 2 marks)

4.

(a) Work out $8^{\frac{2}{3}}$

(2)

(b) Work out $64^{-\frac{1}{3}}$

Give your answer as a fraction.

(2)

(Total 4 marks)

5.

(a) Work out the exact value of $(\sqrt{3})^4$

(1)

(b) Write $\sqrt{32}$ in the form 2^p

(2)

(c) Find the value of $(0.25)^{-1}$

(1)

(d) Find the value of $81^{-\frac{3}{4}}$

Leave your answer as a fraction.

(2)

(Total 6 marks)

6. Rationalise the denominator in this surd $\frac{2+4\sqrt{5}}{3-\sqrt{5}}$. Simplify your answer where possible.

(Total 6 marks)

7.

(a) Work out $125^{\frac{1}{2}}$

(1)

(b) Write 162 in the form 2×3^b

(2)

(c) Express $32^{-\frac{3}{5}}$ as a fraction.

(2)

(Total 5 marks)

8.

James assumes that the population of birds on an island follows this exponential growth model.

$$P = 120r^t$$

P is the population t years after 1st June 2014.

On 1st June 2014 there were 120 birds.
On 1st June 2015 there were 138 birds.

(a) Show that $r = 1.15$. **[2]**

(b) Calculate the population on 1st June 2025.

(c) James estimates that the population will be about 6000 by 1st June 2042.

Explain why he might be wrong.

(Total 5 marks)

9.

(a) Calculate the value of $64^{-\frac{1}{2}}$, giving your answer as a fraction in its simplest form.

(2)

(b) Write 32 in the form 4^b

(2)

(Total 4 marks)

10.

(a) The growth of a population of bacteria is given by the formula

$$P = 30\,000 \times 2.3^t$$

where P is the population t hours after 10am.

Calculate the population at 4pm on the same day.

(b) Another population of bacteria grows by k% each day.
After 3 days, the population has doubled.

Find the value of k.

(Total 5 marks)