

50 multiple-choice questions

**Question 1** (Level 1) — *Adding fractions with same denominator*

Evaluate  $\frac{2}{7} + \frac{3}{7}$ .

- (A)  $\frac{5}{7}$
- (B)  $\frac{5}{14}$
- (C)  $\frac{6}{7}$
- (D)  $\frac{1}{7}$

**Question 2** (Level 1) — *Multiplying decimals*

Calculate  $0.3 \times 0.4$ .

- (A) 0.12
- (B) 1.2
- (C) 0.7
- (D) 0.012

**Question 3** (Level 1) — *Converting percentage to fraction*

Write 25% as a fraction in simplest form.

- (A)  $\frac{1}{4}$
- (B)  $\frac{1}{5}$
- (C)  $\frac{25}{10}$
- (D)  $\frac{5}{20}$

**Question 4** (Level 1) — *Order of operations*

Evaluate  $3 + 4 \times 2$ .

- (A) 14
- (B) 11
- (C) 10
- (D) 9

**Question 5** (Level 1) — *Rounding to one decimal place*

Round 3.47 to one decimal place.

- (A) 3.5
- (B) 3.4
- (C) 3.0
- (D) 4.0

**Question 6** (Level 1) — *Integer subtraction*

Evaluate  $(-3) - (-8)$ .

- (A) 5
- (B)  $-11$
- (C)  $-5$
- (D) 11

**Question 7** (Level 1) — *Finding a percentage of a number*

Find 10% of 250.

- (A) 25
- (B) 2.5
- (C) 250
- (D) 50

**Question 8** (Level 1) — *Converting fraction to decimal*

Write  $\frac{3}{4}$  as a decimal.

- (A) 0.75
- (B) 0.34
- (C) 1.33
- (D) 0.25

**Question 9** (Level 1) — *Squaring a number*

Evaluate  $7^2$ .

- (A) 49
- (B) 14
- (C) 42

(D) 56

**Question 10** (Level 1) — *Simplifying a fraction*

Simplify  $\frac{12}{18}$ .

(A)  $\frac{2}{3}$

(B)  $\frac{3}{4}$

(C)  $\frac{6}{9}$

(D)  $\frac{4}{6}$

**Question 11** (Level 2) — *Adding fractions with different denominators*

Evaluate  $\frac{1}{3} + \frac{1}{4}$ .

(A)  $\frac{7}{12}$

(B)  $\frac{2}{7}$

(C)  $\frac{1}{7}$

(D)  $\frac{7}{7}$

**Question 12** (Level 2) — *Percentage increase*

A \$40 item is increased by 15%. What is the new price?

(A) \$46

(B) \$55

(C) \$44

(D) \$6

**Question 13** (Level 2) — *Index law — power of zero*

Evaluate  $5^0$ .

(A) 0

(B) 1

(C) 5

(D) Undefined

**Question 14** (Level 2) — *Dividing fractions*

Evaluate  $\frac{3}{5} \div \frac{2}{3}$ .

- (A)  $\frac{9}{10}$
- (B)  $\frac{6}{15}$
- (C)  $\frac{2}{5}$
- (D)  $\frac{10}{9}$

**Question 15** (Level 2) — *Negative indices*

Evaluate  $2^{-3}$ .

- (A)  $\frac{1}{8}$
- (B)  $-8$
- (C)  $-6$
- (D)  $\frac{1}{6}$

**Question 16** (Level 2) — *Mixed number to improper fraction*

Convert  $2\frac{3}{5}$  to an improper fraction.

- (A)  $\frac{13}{5}$
- (B)  $\frac{11}{5}$
- (C)  $\frac{23}{5}$
- (D)  $\frac{8}{5}$

**Question 17** (Level 2) — *Square root*

Evaluate  $\sqrt{144}$ .

- (A) 12
- (B) 14
- (C) 72
- (D) 11

**Question 18** (Level 2) — *Scientific notation*

Write 0.00035 in scientific notation.

- (A)  $3.5 \times 10^{-4}$
- (B)  $35 \times 10^{-5}$
- (C)  $3.5 \times 10^{-3}$
- (D)  $0.35 \times 10^{-3}$

**Question 19** (Level 2) — *Recurring decimal*

Write  $\frac{1}{3}$  as a decimal.

- (A)  $0.\overline{3}$
- (B) 0.3
- (C) 0.33
- (D) 0.13

**Question 20** (Level 2) — *Percentage of an amount*

What is 35% of \$200?

- (A) \$70
- (B) \$35
- (C) \$7
- (D) \$170

**Question 21** (Level 3) — *Simplifying surds*

Simplify  $\sqrt{50}$ .

- (A)  $5\sqrt{2}$
- (B)  $2\sqrt{5}$
- (C)  $25\sqrt{2}$
- (D)  $\sqrt{25}$

**Question 22** (Level 3) — *Index law — power of a power*

Simplify  $(x^3)^4$ .

- (A)  $x^{12}$
- (B)  $x^7$
- (C)  $x^{34}$

(D)  $4x^3$

**Question 23** (Level 3) — *Rationalising the denominator*

Simplify  $\frac{6}{\sqrt{3}}$ .

(A)  $2\sqrt{3}$

(B)  $\frac{6\sqrt{3}}{3}$

(C)  $6\sqrt{3}$

(D)  $3\sqrt{2}$

**Question 24** (Level 3) — *Percentage change*

A price drops from \$80 to \$68. What is the percentage decrease?

(A) 15%

(B) 12%

(C) 85%

(D) 17.6%

**Question 25** (Level 3) — *Adding surds*

Simplify  $3\sqrt{2} + 5\sqrt{2}$ .

(A)  $8\sqrt{2}$

(B)  $8\sqrt{4}$

(C)  $15\sqrt{2}$

(D)  $\sqrt{128}$

**Question 26** (Level 3) — *Fractional indices*

Evaluate  $8^{\frac{2}{3}}$ .

(A) 4

(B) 6

(C)  $\frac{16}{3}$

(D) 2

**Question 27** (Level 3) — *Compound interest — one period*

Find the amount after 1 year if \$500 is invested at 6% p.a. compounded annually.

(A) \$530

- (B) \$560
- (C) \$506
- (D) \$503

**Question 28** (Level 3) — *Multiplying surds*

Simplify  $\sqrt{6} \times \sqrt{10}$ .

- (A)  $2\sqrt{15}$
- (B)  $\sqrt{60}$
- (C)  $4\sqrt{15}$
- (D)  $\sqrt{16}$

**Question 29** (Level 3) — *Converting recurring decimal to fraction*

Write  $0.\bar{6}$  as a fraction.

- (A)  $\frac{2}{3}$
- (B)  $\frac{3}{5}$
- (C)  $\frac{6}{10}$
- (D)  $\frac{1}{6}$

**Question 30** (Level 3) — *Reverse percentage*

After a 20% discount, an item costs \$56. What was the original price?

- (A) \$70
- (B) \$67.20
- (C) \$76
- (D) \$44.80

**Question 31** (Level 4) — *Rationalising a binomial denominator*

Simplify  $\frac{1}{\sqrt{5} - 2}$ .

- (A)  $\sqrt{5} + 2$
- (B)  $\sqrt{5} - 2$
- (C)  $\frac{\sqrt{5} + 2}{3}$

(D)  $\frac{1}{\sqrt{5} + 2}$

**Question 32** (Level 4) — *Compound interest — multiple periods*

Find the value of \$1000 after 3 years at 5% p.a. compounded annually. Give your answer to the nearest cent.

(A) \$1157.63

(B) \$1150.00

(C) \$1150.63

(D) \$1331.00

**Question 33** (Level 4) — *Negative fractional index*

Evaluate  $27^{-\frac{1}{3}}$ .

(A)  $\frac{1}{3}$

(B)  $-3$

(C)  $3$

(D)  $-\frac{1}{3}$

**Question 34** (Level 4) — *Simplifying a complex surd expression*

Expand and simplify  $(\sqrt{3} + \sqrt{2})^2$ .

(A)  $5 + 2\sqrt{6}$

(B)  $5 + \sqrt{6}$

(C)  $5$

(D)  $7 + 2\sqrt{6}$

**Question 35** (Level 4) — *Laws of logarithms*

Simplify  $\log_2 8 + \log_2 4$ .

(A)  $5$

(B)  $6$

(C)  $12$

(D)  $32$

**Question 36** (Level 4) — *Index equation*

Solve  $4^x = \frac{1}{8}$  by writing both sides as powers of 2.

- (A)  $x = -\frac{3}{2}$
- (B)  $x = -2$
- (C)  $x = \frac{3}{2}$
- (D)  $x = -3$

**Question 37** (Level 4) — *Simplifying index expressions*

Simplify  $\frac{6x^3y^{-2}}{3x^{-1}y^4}$ .

- (A)  $\frac{2x^4}{y^6}$
- (B)  $2x^2y^{-6}$
- (C)  $\frac{2x^4}{y^2}$
- (D)  $2x^4y^6$

**Question 38** (Level 4) — *Solving a logarithmic equation*

Solve  $\log_{10} x = 3$ .

- (A)  $x = 1000$
- (B)  $x = 30$
- (C)  $x = 100$
- (D)  $x = 10^{1/3}$

**Question 39** (Level 4) — *Surds in equations*

Solve  $\sqrt{x+3} = x-3$ .

- (A)  $x = 6$
- (B)  $x = 1$  or  $x = 6$
- (C)  $x = 1$
- (D) No solution

**Question 40** (Level 4) — *Recurring decimal — two digits*

Express  $0.\overline{36}$  as a fraction in lowest terms.

- (A)  $\frac{4}{11}$
- (B)  $\frac{36}{99}$

(C)  $\frac{12}{33}$

(D)  $\frac{9}{25}$

**Question 41** (Level 5) — *Change of base*Evaluate  $\log_4 32$ .

(A)  $\frac{5}{2}$

(B) 8

(C) 3

(D)  $\frac{3}{2}$

**Question 42** (Level 5) — *Rationalising a complex denominator*Simplify  $\frac{3 + \sqrt{2}}{3 - \sqrt{2}}$ .

(A)  $\frac{11 + 6\sqrt{2}}{7}$

(B)  $\frac{11 + 6\sqrt{2}}{9}$

(C)  $\frac{9 + \sqrt{2}}{7}$

(D)  $11 + 6\sqrt{2}$

**Question 43** (Level 5) — *Solving a logarithmic equation*Solve  $\log_2(x + 3) + \log_2(x - 1) = 3$ .

(A)  $x = -1 + 2\sqrt{3}$

(B)  $x = 1 + 2\sqrt{3}$

(C)  $x = -1 \pm 2\sqrt{3}$

(D)  $x = 3$

**Question 44** (Level 5) — *Index laws — complex simplification*Simplify  $\frac{(2^n)^3 \cdot 4^{n+1}}{8^n}$ .

(A)  $2^{2n+2}$

(B)  $2^{2n}$

(C)  $2^{5n+2}$

(D)  $4^n$

**Question 45** (Level 5) — *Surd equation with two radicals*

Solve  $\sqrt{x+7} - \sqrt{x} = 1$ .

(A)  $x = 9$

(B)  $x = 3$

(C)  $x = 16$

(D)  $x = 4$

**Question 46** (Level 5) — *Logarithm properties*

If  $\log_{10} 2 = a$  and  $\log_{10} 3 = b$ , express  $\log_{10} 0.12$  in terms of  $a$  and  $b$ .

(A)  $2a + b - 2$

(B)  $a + b - 2$

(C)  $2a + b$

(D)  $a + 2b - 2$

**Question 47** (Level 5) — *Nested surds*

Simplify  $\sqrt{6 + 2\sqrt{5}}$ .

(A)  $\sqrt{5} + 1$

(B)  $\sqrt{5} - 1$

(C)  $\sqrt{6} + \sqrt{5}$

(D)  $2 + \sqrt{5}$

**Question 48** (Level 5) — *Exponential inequality*

Solve  $3^{2x-1} > 27$ .

(A)  $x > 2$

(B)  $x > 3$

(C)  $x > \frac{3}{2}$

(D)  $x \geq 2$

**Question 49** (Level 5) — *Product of logarithms*

Evaluate  $\log_2 9 \times \log_3 4$ .

(A) 4

(B) 6

(C) 36

(D) 2

**Question 50** (Level 5) — *Proof with indices*

If  $2^a = 3$  and  $3^b = 5$ , find  $2^{ab}$ .

(A) 5

(B) 15

(C) 6

(D) 8

## Solutions

**Q1:** (A)

$$\frac{2}{7} + \frac{3}{7} = \frac{5}{7}.$$

**Q2:** (A)

$$0.3 \times 0.4 = 0.12.$$

**Q3:** (A)

$$25\% = \frac{25}{100} = \frac{1}{4}.$$

**Q4:** (B)

$$3 + 4 \times 2 = 3 + 8 = 11.$$

**Q5:** (A)

$$3.47 \approx 3.5.$$

**Q6:** (A)

$$(-3) - (-8) = -3 + 8 = 5.$$

**Q7:** (A)

$$10\% \times 250 = 25.$$

**Q8:** (A)

$$\frac{3}{4} = 0.75.$$

**Q9:** (A)

$$7^2 = 49.$$

**Q10:** (A)

$$\frac{12}{18} = \frac{2}{3}.$$

**Q11:** (A)

$$\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12}.$$

**Q12:** (A)

$$40 \times 1.15 = \$46.$$

**Q13:** (B)

$$5^0 = 1.$$

**Q14:** (A)

$$\frac{3}{5} \div \frac{2}{3} = \frac{3}{5} \times \frac{3}{2} = \frac{9}{10}.$$

**Q15:** (A)

$$2^{-3} = \frac{1}{2^3} = \frac{1}{8}.$$

**Q16:** (A)

$$2\frac{3}{5} = \frac{13}{5}.$$

**Q17:** (A)

$$\sqrt{144} = 12.$$

**Q18:** (A)

$$0.00035 = 3.5 \times 10^{-4}.$$

**Q19:** (A)

$$\frac{1}{3} = 0.\bar{3} = 0.333\dots$$

**Q20:** (A)

$$0.35 \times 200 = \$70.$$

**Q21:** (A)

$$\sqrt{50} = \sqrt{25 \times 2} = 5\sqrt{2}.$$

**Q22:** (A)

$$(x^3)^4 = x^{12}.$$

**Q23:** (A)

$$\frac{6}{\sqrt{3}} = \frac{6\sqrt{3}}{3} = 2\sqrt{3}.$$

**Q24:** (A)

$$\text{Change} = 80 - 68 = 12. \text{ Percentage} = \frac{12}{80} \times 100 = 15\%.$$

**Q25:** (A)

$$3\sqrt{2} + 5\sqrt{2} = 8\sqrt{2}.$$

**Q26:** (A)

$$8^{\frac{2}{3}} = (\sqrt[3]{8})^2 = 2^2 = 4.$$

**Q27:** (A)

$$A = 500 \times 1.06 = \$530.$$

**Q28:** (A)

$$\sqrt{6} \times \sqrt{10} = \sqrt{60} = \sqrt{4 \times 15} = 2\sqrt{15}.$$

**Q29:** (A)

$$10x - x = 6 \Rightarrow 9x = 6 \Rightarrow x = \frac{6}{9} = \frac{2}{3}.$$

**Q30:** (A)

$$\text{Original} = \frac{56}{0.8} = \$70.$$

**Q31:** (A)

$$\frac{\sqrt{5} + 2}{(\sqrt{5})^2 - 4} = \frac{\sqrt{5} + 2}{5 - 4} = \sqrt{5} + 2.$$

**Q32:** (A)

$$A = 1000(1.05)^3 = 1000 \times 1.157625 = \$1157.63.$$

**Q33:** (A)

$$27^{-\frac{1}{3}} = \frac{1}{3}.$$

**Q34:** (A)

$$(\sqrt{3} + \sqrt{2})^2 = 3 + 2\sqrt{6} + 2 = 5 + 2\sqrt{6}.$$

**Q35:** (A)

$$\log_2 8 = 3 \text{ and } \log_2 4 = 2, \text{ so the sum is } 5. \text{ Alternatively, } \log_2 32 = 5.$$

**Q36:** (A)

$$2^{2x} = 2^{-3} \Rightarrow 2x = -3 \Rightarrow x = -\frac{3}{2}.$$

**Q37:** (A)

$$\frac{6}{3} \cdot x^{3-(-1)} \cdot y^{-2-4} = 2x^4y^{-6} = \frac{2x^4}{y^6}.$$

**Q38:** (A)

$$x = 10^3 = 1000.$$

**Q39:** (A)

$x + 3 = x^2 - 6x + 9 \Rightarrow x^2 - 7x + 6 = 0 \Rightarrow (x - 1)(x - 6) = 0$ . Check:  $x = 1$  gives  $\sqrt{4} = -2$  (false).  $x = 6$  gives  $\sqrt{9} = 3$  ✓. So  $x = 6$ .

**Q40:** (A)

$$100x - x = 36 \Rightarrow 99x = 36 \Rightarrow x = \frac{36}{99} = \frac{4}{11}.$$

**Q41:** (A)

$$\log_4 32 = \frac{\log_2 32}{\log_2 4} = \frac{5}{2}.$$

**Q42:** (A)

$$\frac{(3 + \sqrt{2})^2}{9 - 2} = \frac{9 + 6\sqrt{2} + 2}{7} = \frac{11 + 6\sqrt{2}}{7}.$$

**Q43:** (A)

$$(x+3)(x-1) = 8 \Rightarrow x^2 + 2x - 3 = 8 \Rightarrow x^2 + 2x - 11 = 0. \quad x = \frac{-2 \pm \sqrt{48}}{2} = -1 \pm 2\sqrt{3}.$$

Since  $x > 1$ ,  $x = -1 + 2\sqrt{3}$ .

**Q44:** (A)

$$\frac{2^{3n} \cdot 2^{2(n+1)}}{2^{3n}} = \frac{2^{3n} \cdot 2^{2n+2}}{2^{3n}} = 2^{2n+2} = 4 \cdot 4^{n-1} = 4^n \cdot 4. \quad \text{Actually: } = 2^{2n+2} = 4 \cdot 2^{2n}.$$

**Q45:** (A)

$\sqrt{x+7} = 1 + \sqrt{x}$ . Square:  $x+7 = 1 + 2\sqrt{x} + x \Rightarrow 6 = 2\sqrt{x} \Rightarrow \sqrt{x} = 3 \Rightarrow x = 9$ . Check:  $\sqrt{16} - \sqrt{9} = 4 - 3 = 1 \checkmark$ .

**Q46:** (A)

$$\log_{10} 0.12 = \log_{10} 12 - 2 = \log_{10}(4 \times 3) - 2 = 2\log_{10} 2 + \log_{10} 3 - 2 = 2a + b - 2.$$

**Q47:** (A)

$$6 + 2\sqrt{5} = 5 + 2\sqrt{5} + 1 = (\sqrt{5} + 1)^2. \quad \text{So } \sqrt{6 + 2\sqrt{5}} = \sqrt{5} + 1.$$

**Q48:** (A)

$$3^{2x-1} > 3^3 \Rightarrow 2x - 1 > 3 \Rightarrow x > 2.$$

**Q49:** (A)

$$\log_2 9 \times \log_3 4 = \frac{\ln 9}{\ln 2} \times \frac{\ln 4}{\ln 3} = \frac{2 \ln 3}{\ln 2} \times \frac{2 \ln 2}{\ln 3} = 4.$$

**Q50:** (A)

$$2^{ab} = (2^a)^b = 3^b = 5.$$