

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 0.3×0.4 .

(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) 3.5×10^{-4}
- (B) 35×10^{-5}
- (C) 3.5×10^{-3}
- (D) 0.35×10^{-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 $0.\overline{6}$ 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)

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

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)

$\log_2 8 = 3$ and $\log_2 4 = 2$, so the sum is 5. 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 $\sqrt{9} = 3 \checkmark$. 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)

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

Since $x > 1$, $x = -1 + 2\sqrt{3}$.**Q44:** (A)

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

Q45: (A)

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

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)

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

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)

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