Edexcel AS Mathematics Surds and indices

Topic assessment

1. Write the following in terms of the simplest possible surd.
   (i) $\sqrt{27}$ (ii) $\sqrt{288}$ (iii) $\sqrt{96}$ [6]

2. Simplify
   (i) $\sqrt{98} - \sqrt{32}$
   (ii) $\sqrt{75} \times \sqrt{10} \times \sqrt{24}$
   (iii) $\left(1+\sqrt{2}\right)\left(3-2\sqrt{2}\right)$ [9]

3. Rationalise the denominators of the following and simplify as far as possible

   (i) $\dfrac{12}{\sqrt{6}}$ (ii) $\dfrac{2-\sqrt{3}}{\sqrt{3}}$ [4]

   (iii) $\dfrac{1}{\sqrt{3}-2}$ (iv) $\dfrac{1+\sqrt{2}}{3-\sqrt{2}}$ [6]

4. Find the values of
   (i) $64^{1/3}$ (ii) 2^{-5} (iii) $\left(\tfrac{1}{3}\right)^{0}$ [3]
   (iv) $25^{-1/2}$ (v) $9^{3/2}$ [4]

5. Simplify

   (i) $x^3 \times x^8 \div x^5$ (ii) $\dfrac{\left(a^3\right)^5}{\left(a^2\right)^{5/2}}$ [6]

   (iii) $3a^2b \times \left(2ab^2\right)^2$ (iv) $\dfrac{2x}{yz} \times \dfrac{y^2x}{6z} \times \dfrac{4z^2}{y}$ [6]

6. Simplify
   (a) $32^{3/2} \times 8^5 \times 2^{-5/2}$
   (b) $10^{-1/3} \times 25^{2/3} \div 2^{5/3}$ [6]

Total 50 marks

Edexcel AS Maths Surds and indices Assessment solutions
Solutions to Topic assessment

1. (i) $\sqrt{27} = \sqrt{9 \times 3} = 3\sqrt{3}$

    [2]

    (ii) $\sqrt{288} = \sqrt{144 \times 2} = 12\sqrt{2}$

    [2]

    (iii) $\sqrt{96} = \sqrt{16 \times 6} = 4\sqrt{6}$

    [2]

2. (i) $\sqrt{98} - \sqrt{32} = \sqrt{49 \times 2} - \sqrt{16 \times 2}$
    $$= 7\sqrt{2} - 4\sqrt{2}$$
    $$= 3\sqrt{2}$$

    [3]

    (ii) $\sqrt{75} \times \sqrt{10} \times \sqrt{24} = \sqrt{25 \times 3} \times \sqrt{2 \times 5} \times \sqrt{4 \times 3 \times 2}$
    $$= 5\sqrt{3} \times \sqrt{2}\sqrt{5} \times 2\sqrt{3}\sqrt{2}$$
    $$= 5 \times 3 \times 2 \times 2 \times \sqrt{5}$$
    $$= 60\sqrt{5}$$

    [3]

    (iii) $\left(1 + \sqrt{2}\right)\left(3 - 2\sqrt{2}\right) = 3 - 2\sqrt{2} + 3\sqrt{2} - 2\sqrt{2}\sqrt{2}$
    $$= 3 + \sqrt{2} - 4$$
    $$= \sqrt{2} - 1$$

    [3]

3. (i) $\dfrac{12}{\sqrt{6}} \times \dfrac{\sqrt{6}}{\sqrt{6}} = \dfrac{12\sqrt{6}}{6} = 2\sqrt{6}$

    [2]

    (ii) $\dfrac{2 - \sqrt{3}}{\sqrt{3}} \times \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{\left(2 - \sqrt{3}\right)\sqrt{3}}{3} = \dfrac{2\sqrt{3} - 3}{3}$

    [2]

    (iii) $\dfrac{1}{\sqrt{3} - 2} \times \dfrac{\sqrt{3} + 2}{\sqrt{3} + 2} = \dfrac{\sqrt{3} + 2}{\left(\sqrt{3} - 2\right)\left(\sqrt{3} + 2\right)}$
    $$= \dfrac{\sqrt{3} + 2}{3 - 4}$$
    $$= -\sqrt{3} - 2$$

    [3]

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(iv) $\dfrac{1+\sqrt{2}}{3-\sqrt{2}} \times \dfrac{3+\sqrt{2}}{3+\sqrt{2}} = \dfrac{\left(1+\sqrt{2}\right)\left(3+\sqrt{2}\right)}{\left(3-\sqrt{2}\right)\left(3+\sqrt{2}\right)}$

$\qquad\qquad = \dfrac{3+\sqrt{2}+3\sqrt{2}+2}{9-2}$

$\qquad\qquad = \dfrac{5+4\sqrt{2}}{7}$

[3]

4. (i) $64^{1/3} = \sqrt[3]{64} = 4$ [1]

(ii) $2^{-5} = \dfrac{1}{2^5} = \dfrac{1}{32}$ [1]

(iii) $\left(\tfrac{1}{3}\right)^0 = 1$ [1]

(iv) $25^{-1/2} = \dfrac{1}{\sqrt{25}} = \dfrac{1}{5}$ [2]

(v) $9^{3/2} = \left(\sqrt{9}\right)^3 = 3^3 = 27$ [2]

5. (i) $x^3 \times x^8 \div x^5 = x^{3+8-5} = x^6$

[3]

(ii) $\dfrac{\left(a^3\right)^5}{\left(a^2\right)^{5/2}} = \dfrac{a^{15}}{a^5} = a^{15-5} = a^{10}$

[3]

(iii) $3a^2 b \times \left(2ab^2\right)^2 = 3a^2 b \times 4a^2 b^4 = 12a^4 b^5$

[3]

(iv) $\dfrac{2x}{yz} \times \dfrac{y^2 x}{6z} \times \dfrac{4z^2}{y} = \dfrac{48 x^2 y^2 z^2}{36 y^2 z^2} = \dfrac{4x^2}{3}$

[3]

6. (i) $32^{3/2} \times 8^5 \times 2^{-5/2} = \left(2^5\right)^{3/2} \times \left(2^3\right)^5 \times 2^{-5/2}$

$\qquad\qquad = 2^{15/2} \times 2^{15} \times 2^{-5/2}$

$\qquad\qquad = 2^{\frac{15}{2}+15-\frac{5}{2}}$

$\qquad\qquad = 2^{20}$

[3]

(ii) $10^{-1/3} \times 25^{2/3} \div 2^{5/3} = 2^{-1/3} \times 5^{-1/3} \times \left(5^2\right)^{2/3} \times 2^{-5/3}$

$\qquad\qquad = 2^{-1/3} \times 5^{-1/3} \times 5^{4/3} \times 2^{-5/3}$

$\qquad\qquad = 2^{-\frac{1}{3}-\frac{5}{3}} \times 5^{-\frac{1}{3}+\frac{4}{3}}$

$\qquad\qquad = 2^{-2} \times 5^1$

$\qquad\qquad = \dfrac{5}{4}$

[3]