

Topic test 14**Surds**

- Time allowed: 45 minutes
- Part A: 20 multiple-choice questions (40 marks)
- Part B: 5 free response questions (60 marks)

Name: _____

Part A

20 multiple-choice questions

2 marks each: 40 marks

Circle the correct answer.

- 1 Simplify $\sqrt{7} \times \sqrt{10}$.
A $\sqrt{17}$ B $\sqrt{70}$
C 17 D 70
- 2 Simplify $\sqrt{6} + 3\sqrt{6}$.
A $4\sqrt{6}$ B $3\sqrt{12}$
C 18 D 108
- 3 Simplify $\sqrt{6} \times 3\sqrt{6}$.
A $4\sqrt{6}$ B $3\sqrt{12}$
C 18 D 3
- 4 Which one of these numbers is rational?
A 0.30712... B 2π
C $\sqrt{40}$ D $0.\dot{1}4$
- 5 Simplify $(5\sqrt{3})^2$.
A 15 B $25\sqrt{3}$
C 75 D $\sqrt{15}$
- 6 Simplify $\sqrt{120}$.
A $2\sqrt{30}$ B $2\sqrt{60}$
C $3\sqrt{40}$ D $6\sqrt{20}$
- 7 Simplify $2\sqrt{2} \times 8\sqrt{8}$.
A 16 B 64
C $10\sqrt{10}$ D $\sqrt{32}$
- 8 Simplify $3\sqrt{3} + 6\sqrt{7} - 2\sqrt{7} + 2\sqrt{3}$.
A -13 B $18\sqrt{21}$
C $\sqrt{3} + 4\sqrt{7}$ D $5\sqrt{3} + 4\sqrt{7}$
- 9 Simplify $\sqrt{45} - 2\sqrt{5}$.
A $\sqrt{5}$ B $\sqrt{35}$
C $7\sqrt{5}$ D $4\sqrt{10}$
- 10 Simplify $(\sqrt{5})^3$.
A $5\sqrt{5}$ B 15
C $\sqrt{15}$ D $\sqrt{125}$
- 11 Simplify $\sqrt{15} \times \sqrt{5}$.
A $2\sqrt{10}$ B $25\sqrt{3}$
C $5\sqrt{3}$ D 75
- 12 Simplify $\frac{4\sqrt{10}}{16\sqrt{2}}$.
A $\frac{\sqrt{5}}{2}$ B $\frac{\sqrt{5}}{4}$
C $4\sqrt{5}$ D $\frac{5}{4}$
- 13 Expand $\sqrt{6}(2\sqrt{2} - 6)$.
A $-2\sqrt{6}$ B $-4\sqrt{6}$
C $4\sqrt{2} - 6\sqrt{6}$ D $4\sqrt{3} - 6\sqrt{6}$
- 14 Expand $\sqrt{3}(\sqrt{8} + 3\sqrt{3})$.
A $2\sqrt{6} + 6$ B $2\sqrt{6} + 9$
C $12\sqrt{2} + 9$ D $12\sqrt{2} + 27$
- 15 Simplify $\frac{4\sqrt{2} \times 5\sqrt{10}}{2\sqrt{5}}$.
A 20 B 40
C $\frac{9\sqrt{5}}{2}$ D $\frac{20\sqrt{3}}{5}$
- 16 Expand $(2 + \sqrt{7})(1 - \sqrt{7})$.
A $9 - \sqrt{7}$ B $-9 - \sqrt{7}$
C $-5 - \sqrt{7}$ D $5 + 3\sqrt{7}$
- 17 Expand $(4 - \sqrt{5})(4 + \sqrt{5})$.
A -9 B 11
C $21 + 2\sqrt{5}$ D $21 - 2\sqrt{5}$
- 18 Expand $(4 + \sqrt{10})^2$.
A $26 + 4\sqrt{10}$ B $26 + 8\sqrt{10}$
C $116 + 4\sqrt{10}$ D $116 + 8\sqrt{10}$

Topic test 14: Surds continued

- 19 Expand $(3 - \sqrt{2})(3 + \sqrt{2})$
 A $11 - 3\sqrt{2}$ B $11 - 6\sqrt{2}$
 C 5 D 7

- 20 Rationalise the denominator of $\frac{3}{\sqrt{6}}$.
 A $\frac{1}{2}$ B $\frac{3\sqrt{6}}{2}$
 C $\frac{\sqrt{6}}{2}$ D $\frac{3}{2}$

Part B

5 free-response questions
 60 marks

Show working where appropriate.

- 21 (20 marks) Simplify each of these expressions.

A $(\sqrt{a})^2$

B $\sqrt{x} \times \sqrt{y}$

C $(5\sqrt{2})^2$

D $\sqrt{72}$

E $\sqrt{27}$

F $3\sqrt{32}$

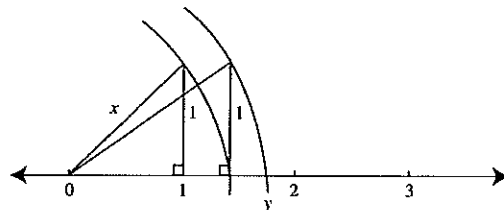
G $2\sqrt{75}$

H $5\sqrt{40}$

I $6\sqrt{3} + 5\sqrt{3} - \sqrt{3}$

J $\sqrt{32} + \sqrt{98}$

- 22 (6 marks) Judy approximated the value of some surds on the number line using the following construction.



- a Find the value of x as a surd, showing working.

- b Hence, find the value of y :
 i as a surd

- ii as a decimal rounded to three decimal places.

- 23 (10 marks) Simplify each of these expressions.

a $\sqrt{12} \times 2\sqrt{3}$

b $4\sqrt{5} \times 2\sqrt{6}$

c $\frac{\sqrt{45}}{3}$

d $\frac{6\sqrt{60}}{2\sqrt{5}}$

e $\sqrt{2}(4\sqrt{7} - \sqrt{2})$

Topic test 14

Surds

98% V. Good!

Name: Emily Chen

- Time allowed: 45 minutes
- Part A: 20 multiple-choice questions (40 marks)
- Part B: 5 free response questions (60 marks)

Part A

20 multiple-choice questions

2 marks each: 40 marks

Circle the correct answer.

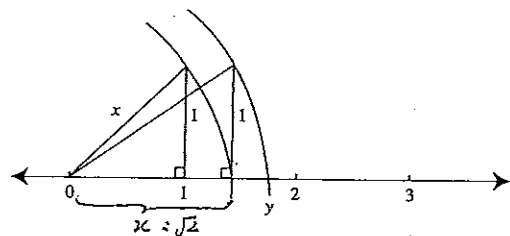
- 1 Simplify $\sqrt{7} \times \sqrt{10}$.
 A $\sqrt{17}$ B $\sqrt{70}$
 C 17 D 70
- 2 Simplify $\sqrt{6} + 3\sqrt{6}$.
 A $4\sqrt{6}$ B $3\sqrt{12}$
 C 18 D 108
- 3 Simplify $\sqrt{6} \times 3\sqrt{6}$.
 A $4\sqrt{6}$ B $3\sqrt{12}$
 C 18 D 3
- 4 Which one of these numbers is rational?
 A 0.30712... B 2π
 C $\sqrt{40}$ D 0.i4
- 5 Simplify $(5\sqrt{3})^2$.
 A 15 ~~X~~ B $25\sqrt{3}$
 C 75 D $\sqrt{15}$
- 6 Simplify $\sqrt{120}$.
 A $2\sqrt{30}$ B $2\sqrt{60}$ $\sqrt{4} \times \sqrt{30}$
 C $3\sqrt{40}$ D $6\sqrt{20}$ $2\sqrt{30}$
- 7 Simplify $2\sqrt{2} \times 8\sqrt{8}$.
 A 16 B 64 $16\sqrt{16}$
 C $10\sqrt{10}$ D $\sqrt{32}$ 16×4
- 8 Simplify $3\sqrt{3} + 6\sqrt{7} - 2\sqrt{7} + 2\sqrt{3}$.
 A -13 B $18\sqrt{21}$ $5\sqrt{3} + 4\sqrt{7}$
 C $\sqrt{3} + 4\sqrt{7}$ D $5\sqrt{3} + 4\sqrt{7}$
- 9 Simplify $\sqrt{45} - 2\sqrt{5}$.
 A $\sqrt{5}$ B $\sqrt{35}$ $\sqrt{9} \times \sqrt{5} - 2\sqrt{5}$
 C $7\sqrt{5}$ D $4\sqrt{10}$ $3\sqrt{5} - 2\sqrt{5}$
- 10 Simplify $(\sqrt{5})^3$.
 A $5\sqrt{5}$ B 15
 C $\sqrt{15}$ D $\sqrt{125}$ $\sqrt{5} \times \sqrt{5} \times \sqrt{5}$
- 11 Simplify $\sqrt{15} \times \sqrt{5}$.
 A $2\sqrt{10}$ B $25\sqrt{3}$
 C $5\sqrt{3}$ D 75
- 12 Simplify $\frac{\sqrt[4]{105}}{16\sqrt{2}}$.
 A $\frac{\sqrt{5}}{2}$ B $\frac{\sqrt{5}}{4}$ $\frac{\sqrt{10}}{4\sqrt{2}}$ $\frac{\sqrt{5}}{\sqrt{2}}$
 C $4\sqrt{5}$ D $\frac{5}{4}$
- 13 Expand $\sqrt{6}(2\sqrt{2} - 6)$.
 A $-2\sqrt{6}$ B $-4\sqrt{6}$ $2\sqrt{12} - 6\sqrt{6}$
 C $4\sqrt{2} - 6\sqrt{6}$ D $4\sqrt{3} - 6\sqrt{6}$ $2 \times \sqrt{4} \times \sqrt{3} - 6\sqrt{6}$ $4\sqrt{3} - 6\sqrt{6}$
- 14 Expand $\sqrt{3}(\sqrt{8} + 3\sqrt{3})$.
 A $2\sqrt{6} + 6$ B $2\sqrt{6} + 9$ $\sqrt{24} + 3 \times 3$
 C $12\sqrt{2} + 9$ D $12\sqrt{2} + 27$ $2\sqrt{6} + 9$
- 15 Simplify $\frac{4\sqrt{2} \times 5\sqrt{10}}{2\sqrt{5}}$.
 A 20 B 40 $\frac{10}{2\sqrt{5}}$
 C $\frac{9\sqrt{5}}{2}$ D $\frac{20\sqrt{3}}{5}$
- 16 Expand $(2 + \sqrt{7})(1 - \sqrt{7})$.
 A $9 - \sqrt{7}$ B $-9 - \sqrt{7}$ $2 - 2\sqrt{7} + \sqrt{7} - 7$
 C $-5 - \sqrt{7}$ D $5 + 3\sqrt{7}$ $\sqrt{7} - 5$
- 17 Expand $(4 - \sqrt{5})(4 + \sqrt{5})$.
 A -9 B 11 $16 - 5$
 C $21 + 2\sqrt{5}$ D $21 - 2\sqrt{5}$
- 18 Expand $(4 + \sqrt{10})^2$.
 A $26 + 4\sqrt{10}$ B $26 + 8\sqrt{10}$ $16 + 8\sqrt{10} + 10$
 C $116 + 4\sqrt{10}$ D $116 + 8\sqrt{10}$

Topic test 14: Surds continued

- 19 Expand $(3 - \sqrt{2})(3 + \sqrt{2})$ 9-2
 A $11 - 3\sqrt{2}$ B $11 - 6\sqrt{2}$
 C 5 D 7

- 20 Rationalise the denominator of $\frac{3 \times \sqrt{6}}{\sqrt{6} \times \sqrt{6}}$
 A $\frac{1}{2}$ B $\frac{3\sqrt{6}}{2}$
 C $\frac{\sqrt{6}}{2}$ D $\frac{3}{2}$

- 22 (6 marks) Judy approximated the value of some surds on the number line using the following construction.



- a Find the value of x as a surd, showing working.

$$x^2 = 1^2 + 1^2$$

$$x = 2$$

$$x = \sqrt{2}$$

- b Hence, find the value of y as a surd

$$y^2 = (\sqrt{2})^2 + 1^2$$

$$= 2 + 1$$

$$= 3$$

$$y = \sqrt{3}$$

- ii as a decimal rounded to three decimal places.

$$y = \sqrt{3}$$

$$= 1.73205...$$

$$= 1.732$$

Part B

5 free-response questions
60 marks

Show working where appropriate.

- 21 (20 marks) Simplify each of these expressions.

A $(\sqrt{a})^2 = a$ ✓

B $\sqrt{x} \times \sqrt{y} = \sqrt{xy}$ ✓

C $(5\sqrt{2})^2 = 25 \times 2 = 50$ ✓

D $\frac{\sqrt{72}}{\sqrt{36} \times \sqrt{2}} = \frac{6\sqrt{2}}{6\sqrt{2}} = 1$ ✓

E $\frac{\sqrt{27}}{\sqrt{9} \times \sqrt{3}} = \frac{3\sqrt{3}}{3\sqrt{3}} = 1$ ✓

F $3\sqrt{32} = 3 \times \sqrt{16} \times \sqrt{2} = 3 \times 4 \times \sqrt{2} = 12\sqrt{2}$ ✓

G $2\sqrt{75} = 2 \times \sqrt{25} \times \sqrt{3} = 2 \times 5 \times \sqrt{3} = 10\sqrt{3}$ ✓

H $5\sqrt{40} = 5 \times \sqrt{10} \times \sqrt{4} = 5 \times \sqrt{10} \times 2 = 10\sqrt{10}$ ✓

I $6\sqrt{3} + 5\sqrt{3} - \sqrt{3} = 10\sqrt{3}$ ✓

J $\sqrt{32} + \sqrt{98} = 4\sqrt{2} + 7\sqrt{2} = 11\sqrt{2}$ ✓

- 23 (10 marks) Simplify each of these expressions.

a $\sqrt{12} \times 2\sqrt{3} = 2\sqrt{36} = 2 \times 6 = 12$ ✓

b $4\sqrt{5} \times 2\sqrt{6} = 8\sqrt{30}$ ✓

c $\frac{\sqrt{45}}{3} = \frac{3\sqrt{5}}{3} = \sqrt{5}$ ✓

d $\frac{\sqrt[3]{60}}{\sqrt[3]{5}} = \frac{3 \times 2\sqrt[3]{15}}{\sqrt[3]{5}} = \frac{6\sqrt[3]{15}}{\sqrt[3]{5}} = 6\sqrt[3]{3}$ ✓

e $\sqrt{2}(4\sqrt{7} - \sqrt{2}) = 4\sqrt{14} - 2$ ✓