1.15 Roots, Powers and Exact Values: Test Pack

Calculators not allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Evaluate each exact root value.

(a) $\sqrt{81}$ **(1)**

(b) cube root of 27 **(1)**

(c) $\sqrt{49}$ **(1)**

2 Multiply the surds and simplify: $\sqrt{3} \times \sqrt{12}$.

(2)

3 Without using a calculator, state whether $\sqrt{50}$ is greater than, equal to or less than 7. Give a brief reason.

(1)

4 A square garden has area 50 m². Find the exact length of one side in simplest surd form.

(2)

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5 Stretch: Express $\sqrt{12} + \sqrt{27}$ in the form $k\sqrt{3}$. Find k and show the steps.

(2)

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6 Write down the value of $\sqrt{49}$.

(1)

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7 $\sqrt{108}$ lies between two consecutive whole numbers. Write down the two numbers.

(2)

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8 Solve $x^2 - 17 = 19$.

(3)

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9 Solve $x^2 = 169$.

(2)

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10 $\sqrt{89}$ lies between two consecutive whole numbers. Write down the two numbers.

(2)

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11 Work out $9^4 - 2^4$.

(2)

12 Solve $x^2 = 49$.

(2)

13 Solve $x^2 = 196$.

(2)

14 Work out $\sqrt{2} \times \sqrt{8}$. Give your answer as a whole number.

(2)

15 Write $\sqrt{150}$ in the form $a\sqrt{6}$, where a is a whole number.

(2)

16 Write $\sqrt{98}$ in the form $a\sqrt{b}$ with b simplified.

(2)

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17 Express $\sqrt{80} + \sqrt{45}$ in the form $k\sqrt{5}$. Find the value of k, showing your working.

(3)

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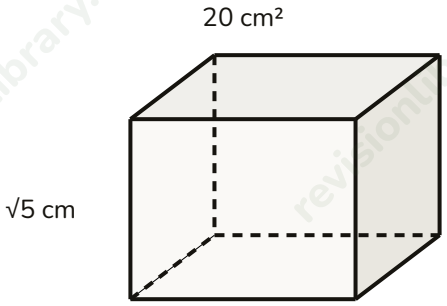
18 Mia says that $\sqrt{9} + \sqrt{16}$ is equal to $\sqrt{25}$. Use exact values to show whether Mia is correct, and state the correct value of $\sqrt{9} + \sqrt{16}$.

(3)

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19 A cuboid-shaped tank has a square base with area 20 cm². The height of the tank is $\sqrt{5}$ cm. Find the exact volume of the tank in simplest surd form, stating the units.

Diagram NOT accurately drawn



(3)

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20 Find 9^2.

(1)

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21 Give the positive square root of 169.

(1)

22 Simplify $\sqrt{48}$, giving your answer in the form $a\sqrt{b}$ with b simplified.

(2)

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Mark scheme · 1.15 Roots, Powers and Exact Values: Test Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

(a) 9 cao — **B1**

(a) Answer: **9**

(b) 3 cao — **B1**

(b) Answer: **3**

(c) 7 cao — **B1**

(c) Answer: **7**

Question 2

use $\sqrt{3} \times \sqrt{12} = \sqrt{36}$ or simplify $\sqrt{12}$ to $2\sqrt{3}$ — **M1**

6 cao — **A1**

Answer: **6**

Question 3

answer: greater than 7 with reason such as $50 > 49$ so $\sqrt{50} > \sqrt{49} = 7$ — **B1**

Answer: **Greater than 7**

Question 4

use side = $\sqrt{\text{area}}$ or write side = $\sqrt{50}$ — **M1**

$5\sqrt{2}$ m cao — **A1**

Answer: **$5\sqrt{2}$ m**

Question 5

simplify each surd: $\sqrt{12} = 2\sqrt{3}$, $\sqrt{27} = 3\sqrt{3}$ or equivalent — **M1**

$5\sqrt{3}$ cao so k = 5 — **A1**

Answer: **$5\sqrt{3}$**

Question 6

7 cao — **B1**

Answer: **7**

Question 7

$10^2 = 100$ or $11^2 = 121$ seen — **M1**

10 and 11 cao — **A1**

Answer: **10 and 11**

Question 8

$x^2 = 36$ (adds 17 to both sides) — **M1**

$\sqrt{36} = 6$ — **M1**

$x = 6$ or $x = -6$ cao — **A1**

Answer: **$x = 6$ or $x = -6$**

Question 9

$\sqrt{169} = 13$ or one correct solution — **M1**

$x = 13$ or $x = -13$ cao — **A1**

Answer: **$x = 13$ or $x = -13$**

Question 10

$9^2 = 81$ or $10^2 = 100$ seen — **M1**

9 and 10 cao — **A1**

Answer: **9 and 10**

Question 11

$9^4 = 6561$ or $2^4 = 16$ found — **M1**

6545 cao — **A1**

Answer: **6545**

Question 12

$\sqrt{49} = 7$ or one correct solution — **M1**

$x = 7$ or $x = -7$ cao — **A1**

Answer: **$x = 7$ or $x = -7$**

Question 13

$\sqrt{196} = 14$ or one correct solution — **M1**

$x = 14$ or $x = -14$ cao — **A1**

Answer: **$x = 14$ or $x = -14$**

Question 14

$\sqrt{16}$ or 2×2 seen — **M1**

4 cao — **A1**

Answer: **4**

Question 15

$150 = 25 \times 6$ or $\sqrt{25} = 5$ seen — **M1**

$5\sqrt{6}$ cao — **A1**

Answer: **$5\sqrt{6}$**

Question 16

factor 98 as 49×2 or identify 49 as largest square factor — **M1**

$7\sqrt{2}$ cao — **A1**

Answer: **$7\sqrt{2}$**

Question 17

simplify $\sqrt{80}$ to $4\sqrt{5}$ — **M1**

simplify $\sqrt{45}$ to $3\sqrt{5}$ — **M1**

$7\sqrt{5}$ cao, so k = 7 — **A1**

Answer: **$7\sqrt{5}$, so k = 7**

Question 18

evaluate $\sqrt{9} = 3$ and $\sqrt{16} = 4$, giving sum 7 — **M1**

evaluate $\sqrt{25} = 5$ and compare with 7 — **M1**

conclusion that Mia is incorrect since $7 \neq 5$; correct value is 7 — **A1**

Answer: **Mia is incorrect. $\sqrt{9} + \sqrt{16} = 3 + 4 = 7$, but $\sqrt{25} = 5$.**

Question 19

use volume = base area x height — **M1**

substitute $20 \times \sqrt{5}$ — **M1**

$20\sqrt{5}$ cm^3 cao — **A1**

Answer: **$20\sqrt{5}$ cm^3**

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Question 20

81 cao **B1**

Answer: **81**

Question 21

13 cao **B1**

Answer: **13**

Question 22

factor 48 as 16 x 3 or identify 16 as largest square factor **M1**

$4\sqrt{3}$ cao **A1**

Answer: **$4\sqrt{3}$**

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