1.15 Roots, Powers and Exact Values: 2-hour Pack

Calculators not allowed · about 120 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write $\sqrt{54}$ in the form $a\sqrt{6}$, where a is a whole number.

(2)

2 Which is greater, 4^5 or 12^3? You must show your working.

(2)

3 Which is greater, 5^4 or 9^2? You must show your working.

(2)

4 Simplify $\sqrt{18}$ and give your answer in simplest exact form.

(2)

5 Work out 9^2 - (the cube root of 27) x 3.

(3)

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6 Work out $(\sqrt{3})^2 \times 9$.

(2)

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7 Which is greater, 4^4 or 6^2? You must show your working.

(2)

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8 Work out $\sqrt{5} \times \sqrt{20}$. Give your answer as a whole number.

(2)

---

9 $\sqrt{66}$ lies between two consecutive whole numbers. Write down the two numbers.

(2)

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10 Write $\sqrt{112}$ in the form $a\sqrt{7}$, where a is a whole number.

(2)

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11 Work out $8^4 - 6^2$.

(2)

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12 Solve $x^2 - 5 = -1$.

(3)

---

13 Simplify $\sqrt{8}$ in exact form.

(2)

---

14 $\sqrt{31}$ lies between two consecutive whole numbers. Write down the two numbers.

(2)

---

15 $\sqrt{96}$ lies between two consecutive whole numbers. Write down the two numbers.

(2)

---

16 Work out $\sqrt{6} \times \sqrt{150}$. Give your answer as a whole number.

(2)

---

17 Which is greater, 4^3 or 6^2? You must show your working.

(2)

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18 Work out $(\sqrt{6})^2$ x 16.

(2)

19 Work out 12^2 - (the cube root of 216) x 6.

(3)

20 $\sqrt{191}$ lies between two consecutive whole numbers. Write down the two numbers.

(2)

21 Solve $x^2 - 13 = 12$.

(3)

22 Write $\sqrt{147}$ in the form $a\sqrt{3}$, where a is a whole number.

(2)

23 Which is greater, 3^6 or 7^2? You must show your working.

(2)

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24 Which is greater, 4^4 or 9^2? You must show your working.

(2)

---

25 Write $\sqrt{160}$ in the form $a\sqrt{10}$, where a is a whole number.

(2)

---

26 Work out $7^3 - 3^2$.

(2)

---

27 Which is greater, 4^4 or 8^3? You must show your working.

(2)

---

28 Solve $x^2 - 18 = 178$.

(3)

---

29 Work out $2^3 \times 2^3$.

(2)

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30 Write $\sqrt{50}$ in the form $a\sqrt{2}$, where a is a whole number.

(2)

---

31 Solve $x^2 = 100$.

(2)

---

32 $\sqrt{92}$ lies between two consecutive whole numbers. Write down the two numbers.

(2)

---

33 Work out $(\sqrt{2})^2 \times 4$.

(2)

---

34 Work out 3^2 - (the cube root of 27) x 3.

(3)

---

35 Work out $\sqrt{196}$ + the cube root of 64.

(2)

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36 Work out $\sqrt{6} \times \sqrt{54}$. Give your answer as a whole number.

(2)

---

37 Find each cube root exactly.

(a) cube root of 343 **(1)**

.....

(b) cube root of 512 **(1)**

.....

---

38 Simplify and combine: $\sqrt{28} + \sqrt{63}$. Give the exact form.

(2)

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39 A square rug has an area of 45 m². Work out the exact length of one side of the rug, giving your answer in the form $a\sqrt{b}$ m.

Diagram NOT accurately drawn



45 m²

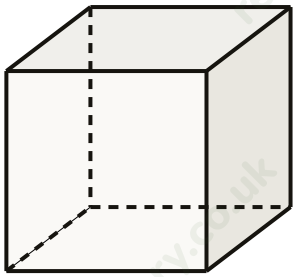
(3)

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40 A cube-shaped storage box has a volume of 729 cm³. Work out the exact length of one edge of the box.

Diagram NOT accurately drawn

729 cm³



(3)

---

41 Evaluate the cube root of 216.

(1)

---

42 Find 2^6.

(1)

---

43 Evaluate $(\sqrt{8})^2$.

(1)

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44 Simplify $\sqrt{75}$ in exact form.

(2)

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Mark scheme · 1.15 Roots, Powers and Exact Values: 2-hour Pack

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

Question 1

$54 = 9 \times 6$ or $\sqrt{9} = 3$ seen	M1
$3\sqrt{6}$ cao	A1

Answer: **$3\sqrt{6}$**

Question 2

$4^5 = 1024$ and $12^3 = 1728$	M1
12^3 cao	A1

Answer: **12^3**

Question 3

$5^4 = 625$ and $9^2 = 81$	M1
5^4 cao	A1

Answer: **5^4**

Question 4

factor 18 as 9 x 2 or identify 9 as largest square factor	M1
$3\sqrt{2}$ cao	A1

Answer: **$3\sqrt{2}$**

Question 5

81 found	M1
3 x 3 = 9 found	M1
72 cao	A1

Answer: **72**

Question 6

$(\sqrt{3})^2 = 3$	M1
27 cao	A1

Answer: **27**

Question 7

$4^4 = 256$ and $6^2 = 36$	M1
4^4 cao	A1

Answer: **4^4**

Question 8

$\sqrt{100}$ or 5 x 2 seen	M1
10 cao	A1

Answer: **10**

Question 9

$8^2 = 64$ or $9^2 = 81$ seen	M1
8 and 9 cao	A1

Answer: **8 and 9**

Question 10

$112 = 16 \times 7$ or $\sqrt{16} = 4$ seen	M1
$4\sqrt{7}$ cao	A1

Answer: **$4\sqrt{7}$**

Question 11

$8^4 = 4096$ or $6^2 = 36$ found	M1
4060 cao	A1

Answer: **4060**

Question 12

$x^2 = 4$ (adds 5 to both sides)	M1
$\sqrt{4} = 2$	M1
x = 2 or x = -2 cao	A1

Answer: **x = 2 or x = -2**

Question 13

factor 8 as 4 x 2 or identify 4 as largest square factor	M1
$2\sqrt{2}$ cao	A1

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

Question 14

$5^2 = 25$ or $6^2 = 36$ seen	M1
5 and 6 cao	A1

Answer: **5 and 6**

Question 15

$9^2 = 81$ or $10^2 = 100$ seen	M1
9 and 10 cao	A1

Answer: **9 and 10**

Question 16

$\sqrt{900}$ or 6 x 5 seen	M1
30 cao	A1

Answer: **30**

Question 17

$4^3 = 64$ and $6^2 = 36$	M1
4^3 cao	A1

Answer: **4^3**

Question 18

$(\sqrt{6})^2 = 6$	M1
96 cao	A1

Answer: **96**

Question 19

144 found	M1
6 x 6 = 36 found	M1
108 cao	A1

Answer: **108**

Question 20

$13^2 = 169$ or $14^2 = 196$ seen	M1
13 and 14 cao	A1

Answer: **13 and 14**

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Question 21

$x^2 = 25$ (adds 13 to both sides) **M1**

$\sqrt{25} = 5$ **M1**

x = 5 or x = -5 cao **A1**

Answer: **x = 5 or x = -5**

Question 22

$147 = 49 \times 3$ or $\sqrt{49} = 7$ seen **M1**

$7\sqrt{3}$ cao **A1**

Answer: **$7\sqrt{3}$**

Question 23

$3^6 = 729$ and $7^2 = 49$ **M1**

3^6 cao **A1**

Answer: **3^6**

Question 24

$4^4 = 256$ and $9^2 = 81$ **M1**

4^4 cao **A1**

Answer: **4^4**

Question 25

$160 = 16 \times 10$ or $\sqrt{16} = 4$ seen **M1**

$4\sqrt{10}$ cao **A1**

Answer: **$4\sqrt{10}$**

Question 26

$7^3 = 343$ or $3^2 = 9$ found **M1**

334 cao **A1**

Answer: **334**

Question 27

$4^4 = 256$ and $8^3 = 512$ **M1**

8^3 cao **A1**

Answer: **8^3**

Question 28

$x^2 = 196$ (adds 18 to both sides) **M1**

$\sqrt{196} = 14$ **M1**

x = 14 or x = -14 cao **A1**

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

Question 29

$2^3 = 8$ or $2^3 = 8$ found **M1**

64 cao **A1**

Answer: **64**

Question 30

$50 = 25 \times 2$ or $\sqrt{25} = 5$ seen **M1**

$5\sqrt{2}$ cao **A1**

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

Question 31

$\sqrt{100} = 10$ or one correct solution **M1**

x = 10 or x = -10 cao **A1**

Answer: **x = 10 or x = -10**

Question 32

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

9 and 10 cao **A1**

Answer: **9 and 10**

Question 33

$(\sqrt{2})^2$ **M1**

8 cao **A1**

Answer: **8**

Question 34

9 found **M1**

3 x 3 = 9 found **M1**

0 cao **A1**

Answer: **0**

Question 35

14 or 4 found **M1**

18 cao **A1**

Answer: **18**

Question 36

$\sqrt{324}$ or 6 x 3 seen **M1**

18 cao **A1**

Answer: **18**

Question 37

(a) 7 cao **B1**

(a) Answer: **7**

(b) 8 cao **B1**

(b) Answer: **8**

Question 38

simplify $\sqrt{28}$ to $2\sqrt{7}$ or $\sqrt{63}$ to $3\sqrt{7}$, or show common surd factor **M1**

$5\sqrt{7}$ cao **A1**

Answer: **$5\sqrt{7}$**

Question 39

use side = $\sqrt{\text{area}}$, i.e. side = $\sqrt{45}$ **M1**

factor 45 as 9 x 5 or identify 9 as largest square factor **M1**

$3\sqrt{5}$ m cao **A1**

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

Question 40

use edge = cube root of volume **M1**

recognise 729 = 9 x 9 x 9 (trial or systematic check) **M1**

9 cm cao **A1**

Answer: **9 cm**

Question 41

6 cao **B1**

Answer: **6**

Question 42

64 cao **B1**

Answer: **64**

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Question 43

8 cao	**B1**

Answer: **8**

Question 44

factor 75 as 25 x 3 or identify 25 as largest square factor	**M1**
$5\sqrt{3}$ cao	**A1**

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

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