

WA7MNAA3

Algebraic techniques

Core + Challenge

# Squares, Cubes and Roots — Marking Key

I can find square numbers, cube numbers, square roots and cube roots, and estimate square roots.

*For tutors and parents. Award method marks for correct working even if the final answer is wrong.*

## Marks summary

Section A Fluency: 16 Section B Core: 22 Section C Reasoning: 9 Section D Challenge: 9 **Total: 56**

Fluency: 1 mark each; accept an equivalent unsimplified answer for half credit at tutor's discretion.

## A Fluency *answers and working*

/ 16 marks

| Q  | Answer   | Working                                    |
|----|----------|--------------------------------------------|
| 1  | 169      | $13 \times 13$                             |
| 2  | 225      | $15 \times 15$                             |
| 3  | 64       | $4 \times 4 \times 4$                      |
| 4  | 1000     | $10 \times 10 \times 10$                   |
| 5  | 11       | $11^2 = 121$                               |
| 6  | 14       | $14^2 = 196$                               |
| 7  | 3        | $3^3 = 27$                                 |
| 8  | 5        | $5^3 = 125$                                |
| 9  | 20       | $20^2 = 400$                               |
| 10 | 10       | $10^3 = 1000$                              |
| 11 | 12       | $\sqrt{144} = 12$                          |
| 12 | 17       | $8 + 9$                                    |
| 13 | 4        | $8 - 4$                                    |
| 14 | 7 and 8  | $49 < 50 < 64$                             |
| 15 | 9 and 10 | $81 < 90 < 100$                            |
| 16 | 5.8      | 34 is between 25 and 36, much closer to 36 |

**B**

**Core** *answers, working and marks*

/ 22 marks

| Q  | Answer                                     | Working / sample response                                                                                                                                                                                     | Marks |
|----|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1  | (a) 12 m (b) 48 m                          | $\sqrt{144} = 12$ ; $4 \times 12 = 48$<br><i>1 mark each</i>                                                                                                                                                  | 2     |
| 2  | 7 cm                                       | $\sqrt[3]{343} = 7$ because $7^3 = 343$<br><i>1 mark: working</i><br><i>1 mark: 7 cm</i>                                                                                                                      | 2     |
| 3  | $\approx 5.5$ m (5.477...)                 | $5^2 = 25$ , $6^2 = 36$ ; 30 is about halfway $\rightarrow 5.5$<br><i>1 mark: between 5 and 6</i><br><i>1 mark: 5.5</i>                                                                                       | 2     |
| 4  | 64, 81, 100, 121, 144                      | $8^2$ to $12^2$<br><i>2 marks: all five</i>                                                                                                                                                                   | 2     |
| 5  | 15                                         | $\sqrt{225} = 15$<br><i>1 mark: square root</i><br><i>1 mark: 15</i>                                                                                                                                          | 2     |
| 6  | 64                                         | $64 = 8^2 = 4^3$<br><i>1 mark: 64</i><br><i>1 mark: shows both</i>                                                                                                                                            | 2     |
| 7  | $\sqrt[3]{343}$ , $\sqrt{50}$ , 7.2, $2^3$ | $\sqrt[3]{343} = 7$ ; $\sqrt{50} \approx 7.07$ ; $2^3 = 8$<br><i>1 mark: <math>\sqrt[3]{343} = 7</math></i><br><i>1 mark: <math>\sqrt{50} \approx 7.07</math></i><br><i>1 mark: order</i>                     | 3     |
| 8  | $81 \text{ cm}^2$                          | Side = $36 \div 4 = 9$ ; $9^2 = 81$<br><i>1 mark: side 9</i><br><i>1 mark: <math>81 \text{ cm}^2</math></i>                                                                                                   | 2     |
| 9  | $125 \text{ cm}^3$                         | Each of 6 faces: $150 \div 6 = 25 \text{ cm}^2$<br>Edge $\sqrt{25} = 5$ ; $5^3 = 125$<br><i>1 mark: <math>25 \text{ cm}^2</math></i><br><i>1 mark: edge 5</i><br><i>1 mark: <math>125 \text{ cm}^3</math></i> | 3     |
| 10 | 1.41; 1.9881                               | $\sqrt{2}$ never ends; the rounded value squared is close to but not equal to 2.<br><i>1 mark: 1.41 and 1.9881</i><br><i>1 mark: explanation</i>                                                              | 2     |

C

**Reasoning** *sample answers and marking criteria*

/ 9 marks

| Q | Answer                     | Working / sample response                                                                                                                                                   | Marks |
|---|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1 | $9^2 = 81$                 | The square root finds the number that multiplies by itself to give 81: $9 \times 9 = 81$ .<br><i>2 marks</i>                                                                | 2     |
| 2 | $\sqrt{16} = 4$            | A square root is not halving. $4 \times 4 = 16$ , so $\sqrt{16} = 4$ ( $8 \times 8 = 64$ ).<br><i>1 mark: explanation</i><br><i>1 mark: 4</i>                               | 2     |
| 3 | 34 is closer to 36 than 25 | 34 is 2 away from 36 but 9 away from 25.<br><i>2 marks</i>                                                                                                                  | 2     |
| 4 | Yes                        | $3^2 = 9$ , $7^2 = 49$ , $15^2 = 225$<br>odd $\times$ odd = odd, because there is no factor of 2.<br><i>1 mark: yes</i><br><i>1 mark: examples</i><br><i>1 mark: reason</i> | 3     |

D

**Challenge** *solutions and marking criteria*

/ 9 marks

| Q | Answer    | Working / sample response                                                                                                                                | Marks |
|---|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1 | 12 and 13 | $(n + 1)^2 - n^2 = 2n + 1 = 25$ , so $n = 12$ . Check: $169 - 144 = 25$ .<br><i>1 mark: strategy</i><br><i>1 mark: 12 and 13</i><br><i>1 mark: check</i> | 3     |
| 2 | 32        | $31^2 = 961$ ; $32^2 = 1024$<br><i>1 mark: <math>31^2</math> and <math>32^2</math></i><br><i>1 mark: 32</i>                                              | 2     |
| 3 | 26        | $26 = 5^2 + 1 = 3^3 - 1$<br><i>1 mark: 26</i><br><i>1 mark: shows both</i>                                                                               | 2     |
| 4 | 70 and 77 | $64 < a < 81$ , multiples of 7: 70, 77<br><i>1 mark: <math>64 &lt; a &lt; 81</math></i><br><i>1 mark: 70 and 77</i>                                      | 2     |