# Higher Check In – 3.01 Powers and roots

**Do not use a calculator.**

1. Estimate  to the nearest whole number.
2. Evaluate .
3. If , find *a*.
4. Evaluate .
5. Find the value of *x* which will satisfy the equation .
6. Max is trying to complete his maths homework, but can’t remember the rule to simplify  Lin says the rule is multiply the powers so the answer is ; Kush says the rule is add the powers so the answer is . Produce a step-by-step explanation to convince the three friends of the correct answer.
7. Using the laws of indices, show that any non-zero number raised to the power of zero equals one.
8. Marley says that . You tell her that  but she doesn’t believe you. By letting , prove that you are correct.
9. If , find *x*.
10. A cube has volume *V*The area of one of the faces is *A*. Find a formula for *A* in terms of *V*, giving your answer in the form *.*

**Extension**

If , evaluate  without a calculator, demonstrating your working clearly.

## Answers

1. 13
2. -9
3. 
4. 32
5. **
6. 



 so Lin is correct.

1.  and , so  oe
2. Let  

 (equating powers)



which gives  or , so this means .

1. , either by inspection i.e. spotting that , or by taking the inverse.
2. If you let the length of a side be *l*,  and  so .

**Extension**



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| **Assessment Objective** | **Qu.** | **Topic** | **R** | **A** | **G** |  | **Assessment Objective** | **Qu.** | **Topic** | **R** | **A** | **G** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| AO1 | 1 | Estimate a root to the nearest whole number |  |  |  |  | AO1 | 1 | Estimate a root to the nearest whole number |  |  |  |
| AO1 | 2 | Use a negative integer index to represent a reciprocal |  |  |  |  | AO1 | 2 | Use a negative integer index to represent a reciprocal |  |  |  |
| AO1 | 3 | Use a fractional index to represent a combination of powers and roots |  |  |  |  | AO1 | 3 | Use a fractional index to represent a combination of powers and roots |  |  |  |
| AO1 | 4 | Calculate fractional powers |  |  |  |  | AO1 | 4 | Calculate fractional powers |  |  |  |
| AO1 | 5 | Calculate with integer powers |  |  |  |  | AO1 | 5 | Calculate with integer powers |  |  |  |
| AO2 | 6 | Know and apply |  |  |  |  | AO2 | 6 | Know and apply |  |  |  |
| AO2 | 7 | Know and apply |  |  |  |  | AO2 | 7 | Know and apply |  |  |  |
| AO2 | 8 | Know and apply |  |  |  |  | AO2 | 8 | Know and apply |  |  |  |
| AO3 | 9 | Solve a problem involving a fractional index |  |  |  |  | AO3 | 9 | Solve a problem involving a fractional index |  |  |  |
| AO3 | 10 | Solve a contextual problem involving fractional indices |  |  |  |  | AO3 | 10 | Solve a contextual problem involving fractional indices |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
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| AO2 | 6 | Know and apply |  |  |  |  | AO2 | 6 | Know and apply |  |  |  |
| AO2 | 7 | Know and apply |  |  |  |  | AO2 | 7 | Know and apply |  |  |  |
| AO2 | 8 | Know and apply |  |  |  |  | AO2 | 8 | Know and apply |  |  |  |
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