# 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**



We’d like to know your view on the resources we produce. By clicking on ‘Like’ or ‘Dislike’ you can help us to ensure that our resources work for you. When the email template pops up please add additional comments if you wish and then just click ‘Send’. Thank you.

If you do not currently offer this OCR qualification but would like to do so, please complete the Expression of Interest Form which can be found here: [www.ocr.org.uk/expression-of-interest](http://www.ocr.org.uk/expression-of-interest)

**OCR Resources**: *the small print*OCR’s **resources** are provided to support the teaching of OCR specifications, but in no way constitute an endorsed teaching method that is required by the Board, and the decision to use them lies with the individual teacher. Whilst every effort is made to ensure the accuracy of the content, OCR cannot be held responsible for any errors or omissions within these resources.
© OCR 2016 - This resource may be freely copied and distributed, as long as the OCR logo and this message remain intact and OCR is acknowledged as the originator of this work.

OCR acknowledges the use of the following content: n/a

Please get in touch if you want to discuss the accessibility of resources we offer to support delivery of our qualifications: resources.feedback@ocr.org.uk

To give us feedback on, or ideas about the OCR resources you have used, email resourcesfeedback@ocr.org.uk

To give us feedback on, or ideas about the OCR resources you have used, email resourcesfeedback@ocr.org.uk

To give us feedback on, or ideas about the OCR resources you have used, email resourcesfeedback@ocr.org.uk

To give us feedback on, or ideas about the OCR resources you have used, email resourcesfeedback@ocr.org.uk

To give us feedback on, or ideas about the OCR resources you have used, email resourcesfeedback@ocr.org.uk

To give us feedback on, or ideas about the OCR resources you have used, email resourcesfeedback@ocr.org.uk

**OCR Resources**: *the small print*OCR’s resources are provided to support the teaching of OCR specifications, but in no way constitute an endorsed teaching method that is required by the Board, and the decision to use them lies with the individual teacher. Whilst every effort is made to ensure the accuracy of the content, OCR cannot be held responsible for any errors or omissions within these resources.
© OCR 2014 - This resource may be freely copied and distributed, as long as the OCR logo and this message remain intact and OCR is acknowledged as the originator of this work.

**OCR Resources**: *the small print*OCR’s resources are provided to support the teaching of OCR specifications, but in no way constitute an endorsed teaching method that is required by the Board, and the decision to use them lies with the individual teacher. Whilst every effort is made to ensure the accuracy of the content, OCR cannot be held responsible for any errors or omissions within these resources.
© OCR 2014 - This resource may be freely copied and distributed, as long as the OCR logo and this message remain intact and OCR is acknowledged as the originator of this work.

OCR acknowledges the use of the following content::
⚫ Garden: Elen Eliseeva/Shutterstock.com ⚫ Flag: Pixel Europe/Shutterstock.com

To give us feedback on, or ideas about the OCR resources you have used, email resourcesfeedback@ocr.org.uk

| **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 |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **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 |  |  |  |