4.2 Indices: 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

Index Laws Checklist

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Multiplying powers of the same base: add the indices, a^m * a^n = a^(m+n). Dividing powers of the same base: subtract the indices, a^m / a^n = a^(m-n). Raising a power to a power: multiply the indices, (a^m)^n = a^(m*n). Any non-zero number to the power 0 is 1: a^0 = 1. A negative index gives a reciprocal: a^-n = 1/a^n. A fractional index gives a root: a^(1/n) = nth root of a, and more generally a^(m/n) = (nth root of a)^m. Work through the fluency questions first to build speed with these rules, then use the exam-style questions to practise applying them in longer, marked problems.

1 Work out 4^3 and give the answer in standard form if needed.

(Total for Question 1 is 3 marks)

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2 Simplify $3k^2n^4 \times 2k^5n$

(Total for Question 2 is 2 marks)

---

3 Simplify $4m^4n^5 \times 5m^6n$

(Total for Question 3 is 2 marks)

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4 Find the value of n.

$3^n \times 3^3 = 3^7$

(Total for Question 4 is 2 marks)

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5 Work out the value of 10^0.

(Total for Question 5 is 1 mark)

---

6 Simplify $p^5 * p^3$.

(Total for Question 6 is 1 mark)

---

7 Simplify q^9 / q^4.

(Total for Question 7 is 1 mark)

---

8 Work out $3^2 * 3^{-1}$.

(Total for Question 8 is 1 mark)

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9 Simplify $4x^5 * 3x^2$.

(Total for Question 9 is 2 marks)

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10 Simplify $20y^9 / 5y^3$.

(Total for Question 10 is 2 marks)

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11 Work out the value of 5^{-1}. Give your answer as a fraction.

(Total for Question 11 is 1 mark)

---

12 Work out the value of 2^{-4}.

(Total for Question 12 is 1 mark)

---

13 Simplify $(r^3)^4$.

(Total for Question 13 is 1 mark)

---

14 Simplify $x^3 * x^{-5}$.

(Total for Question 14 is 2 marks)

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15 Simplify $(3d^2)^3$.

(Total for Question 15 is 2 marks)

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16 Simplify fully $(3x^4y)^2 / (9x^5y^2)$.

(Total for Question 16 is 3 marks)

---

17 Show that $2^3 / 2^5 = 1/4$

(Total for Question 17 is 2 marks)

---

18 Work out the value of $16^{1/2}$.

(Total for Question 18 is 1 mark)

---

19 Work out the value of $125^{1/3}$.

(Total for Question 19 is 1 mark)

---

20 Show that $2^n * 5^n = 10^n$ for any integer n.

(Total for Question 20 is 1 mark)

---

21 Evaluate $27^{2/3}$.

(Total for Question 21 is 2 marks)

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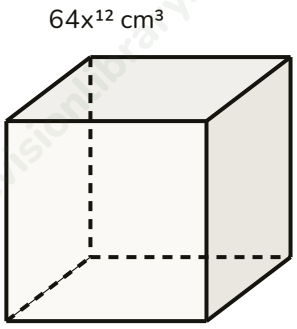
22 Work out the value of $49^{-1/2}$.

(Total for Question 22 is 2 marks)

---

23 The volume of a cube is $64x^{12}$ cm³. Find an expression, in terms of x, for the length of one edge of the cube. Give your answer in its simplest form.

Diagram NOT accurately drawn



(Total for Question 23 is 3 marks)

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24 Answer each of the following.

(a) Write $(5^3)^2 * 5^{-4}$ as a single power of 5. **(2)**

(b) Hence work out the value of $(5^3)^2 * 5^{-4}$. **(2)**

(Total for Question 24 is 4 marks)

25 Solve $4^{x-1} = 8$. Give your answer as a fraction or mixed number if needed.

(Total for Question 25 is 3 marks)

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Mark scheme · 4.2 Indices: 1-hour Pack

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

Question 1

calculate 4^3 = 4 x 4 x 4 or show method	**M1**
64 cao	**A1**
if standard form required: 6.4 x 10^1 cao (award if student gives this form)	**B1**

Answer: 64

Question 2

correct coefficient	**B1**
correct power(s) of the letter(s)	**B1**

Answer: $6k^7n^5$

Question 3

correct coefficient	**B1**
correct power(s) of the letter(s)	**B1**

Answer: $20m^{10}n^6$

Question 4

applies the index law or writes both sides as powers of the same base	**M1**
n = 4	**A1**

Answer: n = 4

Question 5

1 cao (any non-zero number to the power 0 is 1)	**B1**

Answer: 1

Question 6

p^8 cao	**B1**

Answer: p^8

Question 7

q^5 cao	**B1**

Answer: q^5

Question 8

3 cao	**B1**

Answer:3
($3^2 * 3^{-1} = 3^{2-1} = 3^1 = 3$)

Question 9

coefficient 12 or index x^7 seen	**M1**
$12x^7$ cao	**A1**

Answer: $12x^7$

Question 10

coefficient 4 or index y^6 seen	**M1**
$4y^6$ cao	**A1**

Answer: $4y^6$

Question 11

1/5 oe	**B1**

Answer: 1/5

Question 12

1/16 oe	**B1**

Answer: 1/16

Question 13

r^{12} cao	**B1**

Answer: r^{12}

Question 14

subtract exponents: 3 - 5 = -2	**M1**
x^{-2} cao	**A1**

Answer: x^{-2}

Question 15

3^3 = 27 seen, or index d^6 seen	**M1**
$27d^6$ cao	**A1**

Answer: $27d^6$

Question 16

$(3x^4y)^2 = 9x^8y^2$ oe seen	**M1**
dividing coefficients and subtracting indices correctly, e.g. 9/9 = 1, x^{8-5}, y^{2-2}	**M1**
x^3 oe cao	**A1**

Answer: x^3

Question 17

$2^3 / 2^5 = 2^{-2}$ oe seen	**M1**
= 1/4 cso	**A1**

Answer: 1/4 (shown)

Question 18

4 cao	**B1**

Answer: 4

Question 19

5 cao	**B1**

Answer: 5

Question 20

$2^n * 5^n = (2*5)^n = 10^n$ cso	**C1**

Answer:10^n
(Because $2^n * 5^n = (2*5)^n = 10^n$.)

Question 21

interpret $27^{2/3}$ = (cube root of 27)^2 or $(27^2)^{1/3}$	**M1**
9 cao	**A1**

Answer:9
(since cube root of 27 is 3, $3^2 = 9$)

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Question 22

$49^{1/2} = 7$ seen, or $1/49^{1/2}$ oe	**M1**
1/7 oe cao	**A1**

Answer: 1/7

Question 23

cube root of 64 = 4 seen	**M1**
cube root of $x^{12} = x^4$ seen (12 / 3)	**M1**
$4x^4$ oe cao	**A1**

Answer: $4x^4$ cm

Question 24

(a) $(5^3)^2 = 5^6$ seen	**M1**
(a) 5^2 cao (from $5^6 * 5^{-4} = 5^{6-4}$)	**A1**

(a) Answer: 5^2

(b) ft, uses the result from part (a), 5^2, or fully recalculates	**M1**
(b) 25 cao	**A1**

(b) Answer: 25

Question 25

write 4 and 8 as powers of 2: $4^{x-1} = (2^2)^{x-1} = 2^{2x-2}$, $8 = 2^3$	**M1**
equate exponents: 2x - 2 = 3	**M1**
x = 5/2 cao	**A1**

Answer: 5/2

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