1.12 Indices and the Index Laws: 2-hour Pack

Calculators not allowed · about 120 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write $9^5 \div 9^4$ as a single power of 9.

(1)

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2 Find the value of y in $3^y \div 3^2 = 3^{10}$.

(2)

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3 Work out $3^{-3} + 5^0$.

(2)

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4 Simplify $3q^2 \times 6q^3$.

(2)

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5 Work out $8^0 + 4 \times 5^0$.

(2)

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6 Use the power-of-a-power rule to simplify. Give your answer as a single power.

(a) $(x^3)^4$ **(2)**

7 Simplify $54a^3 \div 6a^2$.

(2)

8 Work out $5^{-3} + 9^0$.

(2)

9 Work out $5^4 \div 5^2$.

(2)

10 Find the value of n.

$2^n = 256$

(1)

11 Write $3^6 \div 3^3$ as a single power of 3.

(1)

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12 Write $(2^3)^2$ as a single power of 2.

(1)

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13 Work out $4^0 + 4 \times 2^0$.

(2)

---

14 Simplify $4z^6 \times 6z^3$.

(2)

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15 Simplify fully. Expand brackets where needed and give a final single-term answer.

(a) $(2x^2)^3$ **(3)**

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16 Find the value of n.

$7^n = 16807$

(1)

---

17 Find the value of x in $3^x \times 3^4 = 3^{12}$.

(2)

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18 Write $7^6 \div 7^3$ as a single power of 7.

(1)

---

19 Simplify $(5x^7)^3$.

(2)

---

20 Write $10^6 \div 10^2$ as a single power of 10.

(1)

---

21 Work out $5^4 \div 5^3$.

(2)

---

22 Work out $2^6 \div 2^5$.

(2)

---

23 Write $10^3 \times 10^3$ as a single power of 10.

(1)

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24 Simplify each expression. Give answers as single powers or numbers.

(a) $(3x^2)^2$ **(2)**

25 Simplify $2a^3 \times 2a^2$.

(2)

26 Write $10^8 \times 10^8$ as a single power of 10.

(1)

27 Simplify $(3c^3)^3$.

(2)

28 Find the value of x in $7^x \times 7^5 = 7^9$.

(2)

29 Write 2^{-1} as a fraction.

(1)

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30 Work out $2^5 \times 2^1$.

(2)

31 Simplify $(4a^4)^3$.

(2)

32 Write 10^{-1} as a fraction.

(1)

33 Simplify $(5x^5)^3$.

(2)

34 Simplify $16a^6 \div 4a^4$.

(2)

35 Work out $10^2 \times 10^3$.

(2)

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36 Work out $2^2 \times 2^4$, giving your answer as an integer.

(2)

---

37 Simplify $(2y)^3$, giving your answer in the form ky^n.

(2)

---

38 Simplify $p^0 \times p^6$.

(2)

---

39 Simplify k^9 / k^9.

(2)

---

40 Simplify $(3x^2)^3$, giving your answer in the form kx^n.

(3)

---

41 Work out the value of $(2^3 \times 2^2) / 2^4$, giving your answer as an integer.

(3)

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42 Simplify $(a^4\ b^3) \times (a^2\ b^5)$, giving your answer as a single term.

(3)

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43 Work out $(4^3) / (2^4)$, giving your answer as an integer. Use index laws to help.

(3)

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44 Write down the value of 6^2.

(1)

---

45 Simplify $(5x^3)^2 / x^4$, giving your answer in the form kx^n.

(3)

---

46 Write down the value of 10^4.

(1)

---

47 Write down the value of 5^0.

(1)

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48 Write down the value of 2^{-3}.

(1)

49 Write down the value of 4^{-1}.

(1)

50 Simplify $y^5 \times y^2$, giving your answer as a single power.

(2)

51 Simplify $7^6 / 7^4$, giving your answer as a single power or a number.

(2)

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Mark scheme · 1.12 Indices and the Index Laws: 2-hour Pack

Question 1

9^1 cao — B1

Answer: 9^1

Question 2

y - 2 = 10 or equivalent — M1

12 cao — A1

Answer: **12**

Question 3

$3^{-3} = 1/27$ or $5^0 = 1$ — M1

28/27 cao — A1

Answer: **28/27**

Question 4

correct coefficient — B1

correct power — B1

Answer: $18q^5$

Question 5

any number to the power 0 is 1 — M1

5 cao — A1

Answer: **5**

Question 6

(a) multiplies powers: 3 x 4 = 12 — M1

(a) x^{12} cao — A1

(a) Answer: x^{12}

Question 7

correct coefficient — B1

correct power — B1

Answer: $9a^1$

Question 8

$5^{-3} = 1/125$ or $9^0 = 1$ — M1

126/125 cao — A1

Answer: **126/125**

Question 9

uses the laws of indices to write as a single power or evaluates each power correctly — M1

25 cao — A1

Answer: **25**

Question 10

8 cao — B1

Answer: **8**

Question 11

3^3 cao — B1

Answer: 3^3

Question 12

2^6 cao — B1

Answer: 2^6

Question 13

any number to the power 0 is 1 — M1

5 cao — A1

Answer: **5**

Question 14

correct coefficient — B1

correct power — B1

Answer: $24z^9$

Question 15

(a) cube 2 to get 8 or shows 2^3 and multiplies powers for x — M1

(a) multiply the index on x: 2 x 3 = 6 — M1

(a) $8x^6$ cao — A1

(a) Answer: $8x^6$

Question 16

5 cao — B1

Answer: **5**

Question 17

x + 4 = 12 or equivalent — M1

8 cao — A1

Answer: **8**

Question 18

7^3 cao — B1

Answer: 7^3

Question 19

correct coefficient — B1

correct power — B1

Answer: $125x^{21}$

Question 20

10^4 cao — B1

Answer: 10^4

Question 21

uses the laws of indices to write as a single power or evaluates each power correctly — M1

5 cao — A1

Answer: **5**

Question 22

uses the laws of indices to write as a single power or evaluates each power correctly — M1

2 cao — A1

Answer: **2**

Question 23

10^6 cao — B1

Answer: 10^6

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Question 24

(a) square 3 to get 9 and multiply index of x: 2 x 2 = 4 **M1**

(a) $9x^4$ cao **A1**

(a) Answer: **$9x^4$**

Question 25

correct coefficient **B1**

correct power **B1**

Answer: **$4a^5$**

Question 26

10^{16} cao **B1**

Answer: **10^{16}**

Question 27

correct coefficient **B1**

correct power **B1**

Answer: **$27c^9$**

Question 28

x + 5 = 9 or equivalent **M1**

4 cao **A1**

Answer: **4**

Question 29

1/2 cao **B1**

Answer: **1/2**

Question 30

uses the laws of indices to write as a single power or evaluates each power correctly **M1**

64 cao **A1**

Answer: **64**

Question 31

correct coefficient **B1**

correct power **B1**

Answer: **$64a^{12}$**

Question 32

1/10 cao **B1**

Answer: **1/10**

Question 33

correct coefficient **B1**

correct power **B1**

Answer: **$125x^{15}$**

Question 34

correct coefficient **B1**

correct power **B1**

Answer: **$4a^2$**

Question 35

uses the laws of indices to write as a single power or evaluates each power correctly **M1**

100000 cao **A1**

Answer: **100000**

Question 36

adds indices to get 2^6 **M1**

64 cao **A1**

Answer: **64**

Question 37

cubes the 2 to get 8 and multiplies the index on y: 1 x 3 = 3 **M1**

$8y^3$ cao **A1**

Answer: **$8y^3$**

Question 38

recognises $p^0 = 1$ **M1**

p^6 cao **A1**

Answer: **p^6**

Question 39

subtracts indices to get k^0 **M1**

1 cao **A1**

Answer: **1**

Question 40

cubes the 3 to get 27 **M1**

multiplies the index on x: 2 x 3 = 6 **M1**

$27x^6$ cao **A1**

Answer: **$27x^6$**

Question 41

adds the indices in the numerator: 3 + 2 = 5 **M1**

subtracts the denominator's index: 5 - 4 = 1 **M1**

2 cao **A1**

Answer: **2**

Question 42

adds the indices of a: 4 + 2 = 6 **M1**

adds the indices of b: 3 + 5 = 8 **M1**

$a^6 b^8$ cao **A1**

Answer: **$a^6 b^8$**

Question 43

recognises $4 = 2^2$ so $4^3 = 2^6$ **M1**

subtracts indices: 6 - 4 = 2 **M1**

4 cao **A1**

Answer: **4**

Question 44

36 cao **B1**

Answer: **36**

Question 45

squares the 5 to get 25 and multiplies the index on x: 3 x 2 = 6, giving $25x^6$ **M1**

subtracts the index in the denominator: 6 - 4 = 2 **M1**

$25x^2$ cao **A1**

Answer: **$25x^2$**

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Question 46

10000 cao **B1**

Answer: **10000**

Question 47

1 cao **B1**

Answer: **1**

Question 48

1/8 or 0.125 cao **B1**

Answer: **1/8**

Question 49

1/4 or 0.25 cao **B1**

Answer: **1/4**

Question 50

adds indices: 5 + 2 = 7 **M1**

y^7 cao **A1**

Answer: $\mathbf{y^7}$

Question 51

subtracts indices: 6 - 4 = 2 **M1**

7^2 or 49 cao **A1**

Answer: $\mathbf{7^2}$

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