1.12 Indices and the Index Laws: Test Pack

Calculators not allowed · about 55 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write down the value of each power.

(a) 2^4 **(1)**

(b) 5^2 **(1)**

(c) 10^1 **(1)**

(d) 1^5 **(1)**

2 Rewrite each expression using index laws and then evaluate if possible.

(a) $x^0 \, x^5$ **(2)**

(b) $6^0 \times 2^3$ **(2)**

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3 A small electronic device uses power in units proportional to 2^n, where n is the version number. Version 0 uses 1 unit of power. Version 4 uses 16 units. A technician compares Version 4 to Version -1.

(a) State the power used by Version -1, showing your method using index laws. **(3)**

(b) How many times greater is the power of Version 4 compared to Version -1? Show your working. **(3)**

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4 Challenge problem. Simplify the expression fully and give the answer as a single number or single power.

(a) $(2^3 \times 2^{-2}) \times (4^2 / 2^3)$ **(5)**

5 Work out $10^{-2} + 3^0$.

(2)

6 Work out $4^{-1} + 7^0$.

(2)

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7 Write $(12^3)^8$ as a single power of 12.

(1)

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8 Find the value of n.

$7^n = 823543$

(1)

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9 Write $(3^3 \times 3^2) \div 3^3$ as a single power of 3.

(2)

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10 Write $2^9 \times 2^2$ as a single power of 2.

(1)

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11 Work out $(2^5)^2$.

(2)

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12 Find the value of x in $3^x \times 3^3 = 3^{10}$.

(2)

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13 Work out $6^0 + 4 \times 10^0$.

(2)

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14 Simplify $(6p^7)^3$.

(2)

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15 Calculate and write each answer as an exact number. Show the index law step.

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

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16 Work out $5^3 / 5^1$, giving your answer as an integer.

(2)

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17 A quantity doubles every hour. At time zero it is $2^0 = 1$ unit. Find the quantity after 5 hours, giving your answer as a power of 2 and as an integer.

(3)

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Mark scheme · 1.12 Indices and the Index Laws: Test Pack

Question 1

(a) 16 cao — B1

(a) Answer: **16**

(b) 25 cao — B1

(b) Answer: **25**

(c) 10 cao — B1

(c) Answer: **10**

(d) 1 cao — B1

(d) Answer: **1**

Question 2

(a) recognises $x^0 = 1$ and multiplies to get x^5 — M1

(a) x^5 cao — A1

(a) Answer: **x^5**

(b) use $6^0 = 1$ then evaluate 2^3 — M1

(b) 8 cao — A1

(b) Answer: **8**

Question 3

(a) uses index rule $2^{-1} = 1/2$ or writes $2^{-1} = 1/2$ — M1

(a) states the numerical value 1/2 — M1

(a) 1/2 unit cao — A1

(a) Answer: **1/2**

(b) uses division: $2^4 / 2^{-1} = 2^{4 - (-1)}$ or recognises 16 divided by 1/2 — M1

(b) evaluates 2^5 or 16 x 2 = 32 — M1

(b) 32 times greater cao — A1

(b) Answer: **32**

Question 4

(a) simplifies inside first bracket: $2^{3 + (-2)} = 2^1$ or shows 8 x 1/4 = 2 — M1

(a) rewrites 4^2 as $(2^2)^2 = 2^4$ and simplifies second bracket: $2^4 / 2^3 = 2^{4-3} = 2^1$ — M1

(a) multiplies results from brackets: 2 x 2 = 4 — M1

(a) shows numerical evaluation leading to final value — M1

(a) 4 cao — A1

(a) Answer: **4**

Question 5

$10^{-2} = 1/100$ or $3^0 = 1$ — M1

101/100 cao — A1

Answer: **101/100**

Question 6

$4^{-1}/4$ or $7^0 = 1$ — M1

5/4 cao — A1

Answer: **5/4**

Question 7

12^{24} cao — B1

Answer: **12^{24}**

Question 8

7 cao — B1

Answer: **7**

Question 9

uses the laws of indices correctly for one stage — M1

3^2 cao — A1

Answer: **3^2**

Question 10

2^{11} cao — B1

Answer: **2^{11}**

Question 11

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

1024 cao — A1

Answer: **1024**

Question 12

x + 3 = 10 or equivalent — M1

7 cao — A1

Answer: **7**

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: **$216p^{21}$**

Question 15

(a) uses power-of-a-power rule: $(2^3)^2 = 2^{3x2}$ — M1

(a) evaluates $2^6 = 64$ — M1

(a) 64 cao — A1

(a) Answer: **64**

Question 16

subtracts indices to get 5^2 — M1

25 cao — A1

Answer: **25**

Question 17

recognises the quantity after n hours is 2^n — M1

substitutes n = 5 to get 2^5 — M1

32 units cao — A1

Answer: **32**

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