1.9 Powers and Roots: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write down the value of each power.

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

.....

(b) 10^2 **(1)**

.....

(c) 5^2 **(1)**

.....

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

.....

(Total for Question 1 is 4 marks)

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2 Circle the correct value of 6^2.

- ☐ A) 12
- ☐ B) 36
- ☐ C) 18
- ☐ D) 8

(Total for Question 2 is 1 mark)

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3 Work out 4^3.

(Total for Question 3 is 1 mark)

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4 Write 6^3 as a repeated multiplication (in the form 6 x 6 x ...).

(Total for Question 4 is 1 mark)

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5 Use estimation to answer each part.

(a) $\sqrt{30}$ lies between which two consecutive whole numbers? **(1)**

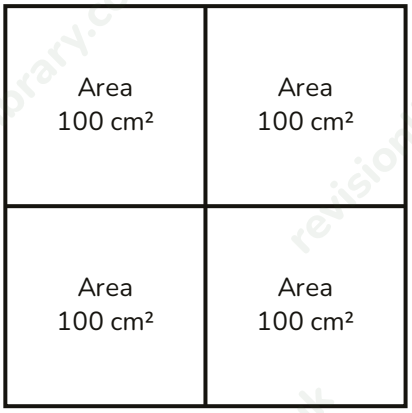
(b) $\sqrt{90}$ lies between which two consecutive whole numbers? **(1)**

(Total for Question 5 is 2 marks)

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6 Four identical square tiles, each with area 100 cm², are arranged edge-to-edge (2 tiles by 2 tiles) to form one larger square. Work out the area of the larger square.

Diagram NOT accurately drawn



(Total for Question 6 is 3 marks)

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7 A square has a perimeter of 52 cm. Work out the area of the square.

(Total for Question 7 is 3 marks)

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8 Write down the value of $\sqrt{36}$.

(Total for Question 8 is 1 mark)

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9 Work out $3^4 \times 5^3$

(Total for Question 9 is 2 marks)

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10 Which two consecutive integers does $\sqrt{7}$ lie between?

(Total for Question 10 is 1 mark)

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11 $\sqrt{50}$ is not a whole number. Round $\sqrt{50}$ to the nearest whole number.

(Total for Question 11 is 1 mark)

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12 Simplify each expression, leaving your answer as a single power.

(a) $a^4 \times a^3$ **(1)**

(b) $y^5 \times y$ **(1)**

(Total for Question 12 is 2 marks)

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13 Use a pattern of powers, or the laws of indices, to help you answer this question.

(a) Work out 8^0 **(1)**

(b) Work out 15^0 **(1)**

(c) Explain why any non-zero number raised to the power 0 is equal to 1. **(2)**

(Total for Question 13 is 4 marks)

14 Tom says: "$\sqrt{16} + \sqrt{9} = \sqrt{25}$". Explain why Tom is wrong.

(Total for Question 14 is 2 marks)

15 Solve $2^x = 32$. Give the value of x.

(Total for Question 15 is 2 marks)

16 Simplify $3^2 \times 3^3$.

(Total for Question 16 is 2 marks)

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17 The table shows some values of 2^n.

n	-2	-1	0	1	2	3
2^n	?	1/2	1	2	?	8

Complete the table by working out the two missing values of 2^n.

(Total for Question 17 is 2 marks)

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18 A square patio in a garden in Leeds has an area of 75 m². Find the exact side length of the patio. Give your answer in the form $k*\sqrt{n}$, where n is as small as possible.

(Total for Question 18 is 2 marks)

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19 Write 3.5×10^{-3} as an ordinary number.

(Total for Question 19 is 2 marks)

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20 Show that $\sqrt{3^5} = 3^{5/2}$.

(Total for Question 20 is 2 marks)

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21 Express cube root(54) in simplest form.

(Total for Question 21 is 2 marks)

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22 A student's working to simplify $4^3 \times 4^2$ is shown below.

$4^3 \times 4^2 = 4^6 = 4096$

Identify the error in the student's working, and write down the correct answer.

(Total for Question 22 is 2 marks)

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Mark scheme · 1.9 Powers and Roots: Test Pack

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

Question 1

(a) 4 cao **B1**

(a) Answer: 4

(b) 100 cao **B1**

(b) Answer: 100

(c) 25 cao **B1**

(c) Answer: 25

(d) 1 cao **B1**

(d) Answer: 1

Question 2

B (36) cao **B1**

Answer: B) 36

Question 3

64 cao **B1**

Answer:64

(4 x 4 x 4 = 64).

Question 4

6 x 6 x 6 oe cao **B1**

Answer: 6 x 6 x 6

Question 5

(a) 5 and 6 (both required), oe with correct reasoning e.g. 25 < 30 < 36 **B1**

(a) Answer: 5 and 6

(b) 9 and 10 (both required), oe with correct reasoning e.g. 81 < 90 < 100 **B1**

(b) Answer: 9 and 10

Question 6

$\sqrt{100}$ = 10 cm, the side length of one small tile **M1**

20 cm (2 x 10) identified as the side length of the larger square **M1**

400 cm² cao (units required) **A1**

Answer: 400 cm^2

Question 7

52 / 4 or 13 seen **M1**

13 x 13 **M1**

169 cm² cao **A1**

Answer: 169 cm^2

Question 8

6 cao **B1**

Answer: 6

Question 9

81 or 125 seen **M1**

10125 cao **A1**

Answer: 10125

Question 10

2 and 3 cao **B1**

Answer:Between 2 and 3

(since $2^2 = 4$ and $3^2 = 9$, and $4 < 7 < 9$).

Question 11

7 cao **B1**

Answer: 7

Question 12

(a) a^7 oe **B1**

(a) Answer: a^7

(b) y^6 oe **B1**

(b) Answer: y^6

Question 13

(a) 1 cao **B1**

(a) Answer: 1

(b) 1 cao **B1**

(b) Answer: 1

(c) correct reference to a pattern or index law, e.g. 2^3=8, 2^2=4, 2^1=2, 2^0=1 (dividing by the base each time), or $b^n / b^n = b^0$ and any number divided by itself = 1 **B1**

(c) correct conclusion linking the pattern/law to the value 1, oe **B1**

(c) Answer: Any non-zero number to the power 0 equals 1, e.g. because $b^n / b^n = b^{n-n} = b^0$, and any number divided by itself is 1

Question 14

$\sqrt{16}$ = 4 and $\sqrt{9}$ = 3 (so LHS = 7), and $\sqrt{25}$ = 5 (RHS), both evaluated **M1**

correct conclusion that 7 is not equal to 5, so Tom is wrong, oe with correct supporting working **A1**

Answer: Tom is wrong because $\sqrt{16} + \sqrt{9} = 4 + 3 = 7$, but $\sqrt{25} = 5$, and 7 is not equal to 5

Question 15

recognise $32 = 2^5$ or use logs to show x = 5 **M1**

x = 5 cao **A1**

Answer:x = 5

($2^5 = 32$).

Question 16

use index law: add powers ($3^2 \times 3^3 = 3^{2+3}$) **M1**

243 cao **A1**

Answer:243

($3^{2+3} = 3^5 = 243$).

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Question 17

n = -2: 1/4 oe cao	**B1**
n = 2: 4 cao	**B1**

Answer: n = -2: 1/4 n = 2: 4

Question 18

factor 75 as 25 x 3 and take the square root of the square factor	**M1**
$5\sqrt{3}$ m cao	**A1**

Answer: $5\sqrt{3}$ m

Question 19

move the decimal point 3 places to write as an ordinary number	**M1**
0.0035 cao	**A1**

Answer: 0.0035

Question 20

rewrite sqrt as power 1/2: $\sqrt{3^5} = (3^5)^{1/2}$	**M1**
$3^{5/2}$ cso	**A1**

Answer:$3^{5/2}$
($(3^5)^{1/2} = 3^{5 \times 1/2} = 3^{5/2}$).

Question 21

factor 54 as 27 x 2 and take cube root of cube factor	**M1**
3 cube root(2) cao	**A1**

Answer:3 cube root(2)
(cube root(54) = cube root(27 x 2) = 3 cube root(2)).

Question 22

identifies that the powers should be added, not multiplied (3 + 2 = 5, not 3 x 2 = 6) oe	**B1**
correct answer $4^5 = 1024$ cao	**B1**

Answer: The student multiplied the powers (3 x 2 = 6) instead of adding them. The correct working is $4^3 \times 4^2 = 4^{3+2} = 4^5 = 1024$.

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