HIGHER

6.2 Fractional and Negative Indices: 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

Key Index Laws to Recall

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Before you start: a^0 = 1 for any non-zero a. A negative index flips the base into a fraction: a^-n = 1/a^n. A fractional index is a root: a^(1/n) = nth root of a, and a^(m/n) = (nth root of a)^m. When multiplying powers of the same base, add the indices: a^m * a^n = a^(m+n). When dividing powers of the same base, subtract the indices: a^m / a^n = a^(m-n). When raising a power to a power, multiply the indices: (a^m)^n = a^(m*n). These rules still apply when m and n are fractions or negative numbers.

1 Work out the value of each expression.

(a) $25^{1/2}$ **(1)**

(b) $64^{1/3}$ **(1)**

(c) $32^{1/5}$ **(1)**

(Total for Question 1 is 3 marks)

2 Work out the value of $27^{4/3}$.

(Total for Question 2 is 2 marks)

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3 Work out the value of 2^{-4}. Give your answer as a fraction.

(Total for Question 3 is 2 marks)

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4 Work out the value of $(4/9)^{-2/2}$. Give your answer as a fraction or integer.

(Total for Question 4 is 3 marks)

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5 Work out the value of 6^{-1}. Give your answer as a fraction.

(Total for Question 5 is 2 marks)

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6 Solve $25^{x} = 1/125$.

(Total for Question 6 is 3 marks)

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

(Total for Question 7 is 2 marks)

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8 Work out the value of $4^{1/2}$.

(Total for Question 8 is 1 mark)

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9 Work out the value of $9^{-3/2}$. Give your answer as a fraction.

(Total for Question 9 is 3 marks)

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10 Work out the value of 4^{-4}. Give your answer as a fraction.

(Total for Question 10 is 2 marks)

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11 Solve $4^x = 1/16$.

(Total for Question 11 is 3 marks)

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12 Work out the value of $81^{2/2}$.

(Total for Question 12 is 2 marks)

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13 Work out the value of $81^{1/4}$.

(Total for Question 13 is 1 mark)

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14 Simplify $(25x^2)^{1/2}$.

(Total for Question 14 is 2 marks)

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15 Work out the value of $(16/81)^{-1/4}$. Give your answer as a fraction or integer.

(Total for Question 15 is 3 marks)

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16 Write $1/(x\sqrt{x})$ in the form x^n, where n is a fraction or integer.

(Total for Question 16 is 2 marks)

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17 Show that $27^{1/3} * 4^{-1/2} = 3/2$

(Total for Question 17 is 3 marks)

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18 Simplify $(x^{-2/3})^{-3}$. Give your answer as a single power of x.

(Total for Question 18 is 2 marks)

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19 Given that $2^a = 8$ and $2^b = 32$, find the value of 2^{a-b}. Give your answer as a fraction.

(Total for Question 19 is 3 marks)

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20 Simplify $(2^n)^{1/2} * 2^{1-n}$ fully. Give your answer in the form 2^k, where k is an expression in n.

(Total for Question 20 is 3 marks)

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Mark scheme · 6.2 Fractional and Negative Indices: 1-hour Pack

Question 1

(a) 5 cao **B1**

(a) Answer: 5

(b) 4 cao **B1**

(b) Answer: 4

(c) 2 cao **B1**

(c) Answer: 2

Question 2

$27^{1/3} = 3$ or 27^4 then root **M1**

81 cao **A1**

Answer: 81

Question 3

reciprocal used, e.g. $1/2^4$ or $(1/2)^4$ **M1**

1/16 cao **A1**

Answer: 1/16

Question 4

reciprocal for the negative power **M1**

takes the 2nd root **M1**

9/4 cao **A1**

Answer: 9/4

Question 5

reciprocal used, e.g. $1/6^1$ or $(1/6)^1$ **M1**

1/6 cao **A1**

Answer: 1/6

Question 6

writes both sides as powers of 5: $(5^2)^x = 5^{-3}$ **M1**

2x = -3 **M1**

x = -3/2 **A1**

Answer: x = -3/2

Question 7

$125^{1/3} = 5$ or 125^3 then root **M1**

125 cao **A1**

Answer: 125

Question 8

2 cao **B1**

Answer: 2

Question 9

reciprocal for the negative power **M1**

takes the 2nd root **M1**

1/27 cao **A1**

Answer: 1/27

Question 10

reciprocal used, e.g. $1/4^4$ or $(1/4)^4$ **M1**

1/256 cao **A1**

Answer: 1/256

Question 11

writes both sides as powers of 2: $(2^2)^x = 2^{-4}$ **M1**

2x = -4 **M1**

x = -2 **A1**

Answer: x = -2

Question 12

$81^{1/2} = 9$ or 81^2 then root **M1**

81 cao **A1**

Answer: 81

Question 13

3 cao **B1**

Answer: 3

Question 14

$(25)^{1/2} = 5$ or $(x^2)^{1/2} = x$ **M1**

5x oe **A1**

Answer: 5x

Question 15

reciprocal for the negative power **M1**

takes the 4th root **M1**

3/2 cao **A1**

Answer: 3/2

Question 16

correct use of a fractional or negative index **M1**

$x^{-3/2}$ oe **A1**

Answer: $x^{-3/2}$

Question 17

$27^{1/3} = 3$ shown **B1**

$4^{-1/2} = 1/2$ shown **B1**

3 * 1/2 = 3/2 shown, cso (dependent on both B marks) **A1**

Answer: 3/2 (shown)

Question 18

indices multiplied: (-2/3) x (-3) **M1**

x^2 cao **A1**

Answer: x^2

Question 19

a = 3 and b = 5 identified **M1**

a - b = -2 found **M1**

1/4 oe (accept 0.25) **A1**

Answer: 1/4

Question 20

$(2^n)^{1/2}$ written as $2^{n/2}$ **M1**

indices added: n/2 + (1-n) **M1**

$2^{1 - n/2}$ oe (accept $2^{(2-n)/2}$) **A1**

Answer: $2^{1 - n/2}$

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