GCSE MATHEMATICS

Indices 1

AQA These questions have been taken or modified from previous AQA GCSE Mathematics Papers.

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer **all** questions.
- You must answer the questions in the spaces provided.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information
- The marks for questions are shown in brackets.
- The quality of your written communication is specifically assessed in questions that are indicated with an asterisk (*).

Advice
- Read each question carefully before you start to answer it.
- In all calculations, show clearly how you work out your answer.
- Use the number of marks for the question as a guide to the amount of time you need to spend.
- Look at previous parts of the question, e.g. a), b), c) i) as there may be information there you need to answer later parts.
- Check your answer is realistic and appropriate.
- For calculator decimal numbers always write your full calculator display in the working out area and then, if you need to, round the answer on the answer line.

1 Simplify $(2x^5y)^3$

Answer $8x^{15}y^3$ **[2 marks]**

2 x is a number between 0 and 1.

Write the following in numerical order, starting with the smallest.

$\sqrt{x}$ x^2 x^0 $\frac{1}{x}$ x

Answer $x^2, x, \sqrt{x}, x^0, \frac{1}{x}$ **[2 marks]**

3 x is a number greater than 1.

Write the following in numerical order starting with the smallest.

$\frac{1}{x}$ x^{-2} $x^{\frac{1}{2}}$ x^3

Answer $x^{-2}, \frac{1}{x}, x^{\frac{1}{2}}, x^3$ **[2 marks]**

4 Find **two** sets of values for c and d such that

$16^c = 2^d$

$c = 2, d = 8$

$c = 0, d = 0$

+ more

Examples

$c =$ 1/2 and $d =$ 2

or $c =$ 1/4 and $d =$ 1 **[3 marks]**

5 (a) Work out the value of $9^{-\frac{3}{2}}$

Answer 1/27 **[2 marks]**

5 (b) Work out **all** solutions of the equation

$8^m = 2^{m^2}$

$(2^3)^m = 2^{m^2}$

$2^{3m} = 2^{m^2}$

$\therefore m^2 = 3m$

$m^2 - 3m = 0$

$m(m-3) = 0$

Answer $m = 0$ or $m = 3$ **[3 marks]**

6 A microscope slide has 2^8 bacteria on it.
The number of bacteria doubles every hour.

After how many hours are there 8^4 bacteria on the slide? **[3 marks]**

$8^4 = (2^3)^4 = 2^{12}$

$2^8 \times 2^x = 2^{12}$

$x = 4$

Answer 4 hours

7 $16^{-\frac{1}{4}} = n^{\frac{1}{3}}$

Work out the value of n. **[2 marks]**

$(16^{-1})^{1/4} = \left(\frac{1}{16}\right)^{1/4} = 1/2$

$n^{1/3} = 1/2$

$n = (1/2)^3$

Answer 1/8

8 $8^{\frac{2}{3}} \times 2^{-2} = 4^x$

Work out the value of x.
You **must** show your working.

[4 marks]

$8^{2/3} = 4$

$2^{-2} = 1/4$

$4 \times 1/4 = 4^x$

$1 = 4^x$

$x = 0$

Answer $x = 0$

9 (a) Complete this table.

3^0	3^1	3^2	3^3	3^4	3^5	3^6	3^7
1	3	9	27	81	243	729	2187

(2 marks)

9 (b) $729 \times 2187 = 1\,594\,323$

and $1\,594\,323 = 3^x$

Use the table to work out the value of x.

$3^6 \times 3^7$ Add the powers

$x =$ 3^{13} *(1 mark)*

9 (c) Use the table, or otherwise, to work out $\frac{2187}{9}$

Give your answer as a power of 3.

$\frac{3^7}{3^2}$ Subtract the powers

Answer 3^5 *(1 mark)*