Write your name here

Surname	Other names

In the style of:
Pearson Edexcel
Level 1/Level 2 GCSE (9 - 1)

Centre Number | Candidate Number

Mathematics

Surds and Indices

Higher Tier

GCSE style questions arranged by topic

Paper Reference
1MA1/1H

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may not be used.**
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out**.

Information

- The total mark for this paper is
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

1 Work out $(2 + \sqrt{5})(2 - \sqrt{5})$

Give your answer in its simplest form.

.....

(1)

(Total for Question 1 is 1 mark)

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2 (a) Write down the value of $64^{\frac{1}{2}}$

.....

(1)

(b) Write $\sqrt{45}$ in the form $k\sqrt{5}$, where k is an integer.

.....

(2)

(Total for Question 2 is 3 marks)

3 Find the value of

(i) 8^0

.....

(1)

(ii) $64^{\frac{1}{2}}$

.....

(1)

(iii) $\left(\frac{27}{8}\right)^{\frac{2}{3}}$

.....

(2)

(Total for Question 3 is 4 marks)

4 (a) Simplify $4x \times 5y$

.....

(1)

(b) Simplify $x \times x \times x \times x$

.....

(1)

(c) Expand $4(3n - 7)$

.....

(2)

(d) Expand and simplify $2(2x + 3) + 3(x + 1)$

.....

(2)

(e) Simplify $n^2 \times n$

.....

(1)

(f) Simplify $p^5 \div p^3$

.....

(1)

(Total for Question 4 is 8 marks)

5 (a) Simplify $q^5 \times q^4$

.....

(1)

(b) Simplify $r^5 \div r^2$

.....

(1)

(c) Simplify $12tv^6 \div 6tv^5$

.....

(2)

(d) Simplify $(9w^2y^6)^{\frac{1}{2}}$

.....

(2)

(e) For $y > 1$, write the following expressions in order of size.
Start with the expression with the least value.

$y^0 \quad y^2 \quad y \quad y^{-2} \quad y^{\frac{1}{2}}$

.....

(2)

(Total for Question 5 is 8 marks)

6 (a) Simplify $n^3 \times n^4$

.....

(1)

(b) Simplify $q^7 \div q^3$

.....

(1)

(c) Simplify $a^2b^3 \times 3ab^2$

.....

(2)

(Total for Question 6 is 4 marks)

---

7 (a) Expand and simplify $3(a + 4) + 5(2a + 1)$

.....

(2)

(b) Simplify $x^4 \times x^6$

.....

(1)

(c) Simplify $y^8 \div y^5$

.....

(1)

(d) Simplify $(z^4)^3$

.....

(1)

(Total for Question 7 is 5 marks)

8 (a) Simplify $v^6 \times v^2$

.....

(1)

(b) Simplify $\dfrac{m^8}{m^3}$

.....

(1)

(c) Simplify $(2y)^3$

.....

(2)

(d) Simplify $3a^2h \times 4a^5h^4$

.....

(2)

(Total for Question 8 is 6 marks)

9 Work out the value of $(9 \times 10^{-4}) \times (3 \times 10^{7})$
Give your answer in standard form.

.....

(Total for Question 9 is 2 marks)

---

10 (a) Write down the value of $64^{\frac{1}{2}}$

.....

(1)

(b) Find the value of $\left(\frac{8}{125}\right)^{-\frac{2}{3}}$

.....

(2)

(Total for Question 10 is 3 marks)

11 One uranium atom has a mass of 3.95×10^{-22} grams.

(a) Work out an estimate for the number of uranium atoms in 1 kg of uranium.

.....

(3)

(b) Is your answer to (a) an underestimate or an overestimate?
Give a reason for your answer.

.....

.....

(1)

(Total for Question 11 is 4 marks)

---

12 Write 0.000068 in standard form.

.....

(Total for Question 12 is 1 mark)

13 $a \times 10^4 + a \times 10^2 = 24\ 240$ where a is a number.

Work out $a \times 10^4 - a \times 10^2$

Give your answer in standard form.

.....

(2)

(Total for Question 13 is 2 marks)

---

14 Rationalise the denominator and simplify $\dfrac{10}{3\sqrt{5}}$

.....

(2)

(Total for Question 14 is 2 marks)

15 **(a)** Show that $\sqrt{396}$ can be written as $6\sqrt{11}$.

(2)

(b) **Without** using a calculator, show that $\dfrac{4 + 2\sqrt{2}}{2 - \sqrt{2}}$ can be simplified to $6 + 4\sqrt{2}$

(6)

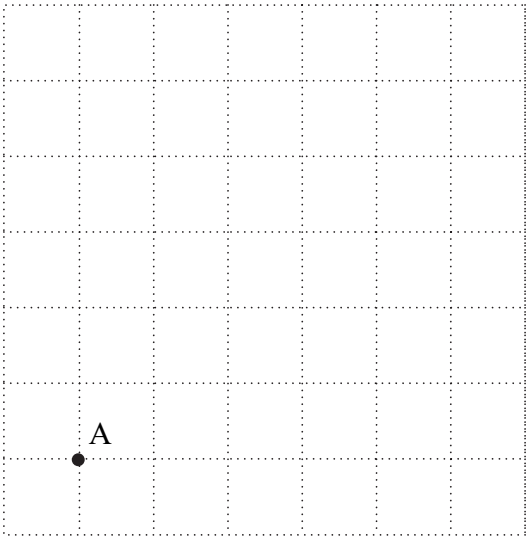
(Total for Question 15 is 8 marks)

16 **(a)** Without using a calculator, show that $\sqrt{20} = 2\sqrt{5}$

(2)

(b) The point A is shown on the unit grid below.
The point B is $2\sqrt{5}$ units from A and lies on the intersection of two grid lines.

Mark **one** possible position for B.



(3)

(Total for Question 16 is 5 marks)

17 The volume of Earth is 1.08×10^{12} km^3

The volume of Jupiter is 1.43×10^{15} km^3.

How many times larger is the radius of Jupiter than the radius of Earth?

Assume that Jupiter and Earth are both spheres.

Volume of sphere $= \frac{4}{3}\pi r^3$

.....

(4)

(Total for Question 17 is 4 marks)

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