In the style of

AQA

General Certificate of Secondary Education
Higher Tier

Mathematics 43602H

Past Paper Type Questions by Topic

Surds and Indices

H

For this paper you must have:
- a calculator
- mathematical instruments.

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is.
- The quality of your written communication is specifically assessed in some questions. These questions are indicated with an asterisk (*)
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

1 (a) Write as single powers of a

1 (a) (i) $a^6 \times a^{-2}$

Answer .... *(1 mark)*

1 (a) (ii) $a^8 \div a^{-4}$

Answer .... *(1 mark)*

1 (b) Simplify the expression $(3a^2b)^3$

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Answer .... *(2 marks)*

2 Expand and simplify fully $(\sqrt{10} + \sqrt{2})(\sqrt{15} - \sqrt{3})$

Give your answer in the form $a\sqrt{b}$, where a and b are integers.

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Answer .... *(4 marks)*

3 (a)   Simplify $a^3b^2 \times 4ab^5$

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                Answer   ....   *(2 marks)*

3 (b)   Factorise fully $a^2 - 8\ ab$

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                Answer   ....   *(2 marks)*

3 (c)   Make x the subject of $w = y + \frac{x}{r}$

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                Answer   ....   *(2 marks)*

3 (d)   Work out the least common multiple (LCM) of $6xy^2$ and $3x^2y$

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                Answer   ....   *(2 marks)*

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

Answer .... *(3 marks)*

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

$$8^n = 2^{n^2}$$

Answer .... *(3 marks)*

5 (a) Write the number 5.28×10^{-3} as an ordinary decimal number.

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Answer .... *(1 mark)*

5 (b) Work out $(7 \times 10^3)^2$
Give your answer in standard form.

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Answer .... *(2 marks)*

6 These statistics are about the United States.

- There are 2.5×10^8 passenger vehicles in the United States.
- On average 2×10^7 barrels of fuel are used by these vehicles each day.
- One barrel contains 42 gallons.
- On average each passenger vehicle travels 18 miles on one gallon of fuel.

6 (a) Work out how many gallons of fuel are used each day?

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Answer ....gallons   *(2 marks)*

6 (b) What is the average distance each passenger vehicle travels each day.

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Answer ....miles   *(2 marks)*

7 (a) Simplify $x^4 \times x^7$

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Answer .... *(1 mark)*

7 (b) Simplify $y^{12} \div y^4$

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Answer .... *(1 mark)*

7 (c) Rearrange $y = 3a + 2$ to make a the subject.

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Answer .... *(2 marks)*
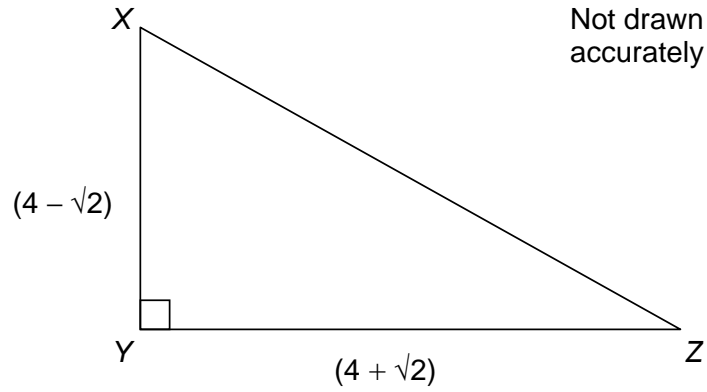
8 Here is a formula $r = \sqrt{(x^2 - y^2)}$

Work out the value of r when $x = 9\sqrt{2}$ and $y = 5\sqrt{6}$

Give your answer in the form $a\sqrt{b}$ where a and b are integers greater than 1.

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Answer .... *(3 marks)*

9 *XYZ* is a right-angled triangle.

$XY = (4 - \sqrt{2})$ cm, $YZ = (4 + \sqrt{2})$ cm

Not drawn
accurately

X

$(4 - \sqrt{2})$

Y

$(4 + \sqrt{2})$

Z

Show that the perimeter of the triangle is 14 cm.

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(5 marks)

10   Lauren is using the quadratic formula to solve a quadratic equation. After correctly substituting the values, she writes

$$x = \frac{7 \pm \sqrt{49 - 72}}{4}$$

10 (a)   What is the quadratic equation Lauren is trying to solve?

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Answer .... *(3 marks)*

10 (b)   Explain why Lauren will **not** be able to find any solutions to the equation.

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(1 mark)

11 (a) Simplify $n^3 \times n^5$

Answer .... *(1 mark)*

11 (b) Simplify $\dfrac{n^4}{n^6}$

Answer .... *(1 mark)*

11 (c) Simplify fully $\sqrt{\dfrac{\pi b^3}{4\pi b}}$

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Answer .... *(2 marks)*

12 (a) Write $\sqrt{28} + \sqrt{63}$ in the form $p\sqrt{7}$, where p is an integer.

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Answer .... *(2 marks)*

12 (b) Simplify $\dfrac{30}{\sqrt{5}}$ by rationalising the denominator.

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Answer .... *(2 marks)*