

OCR style

GCSE (9-1) Mathematics

Paper 4 (Higher Tier) Practice Paper

J560/04 · Higher Tier · Practice paper

Time allowed: 1 hour 30 minutes

Candidate name	
Centre number	
Candidate number	

Materials

- You must have: the Formulae Sheet for Higher Tier
- You can use: a scientific or graphical calculator, geometrical instruments, tracing paper
- You may use a calculator.

Instructions

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer all the questions.
- Where appropriate, your answers should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.

Information

- The total mark for this paper is 100.
- The marks for each question are shown in brackets [].
- Read each question carefully before you start your answer.
- Diagrams are not drawn to scale unless stated.

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Paper 4 (Higher Tier)

Answer all the questions. Time allowed: 1 hour 30 minutes.

1

(a) Calculate.

$$\sqrt{(38.2 - 3.7^2)} \div (1.6^3 + 0.45)$$

Write down all the figures on your calculator display.

[2]

(b) Write your answer to part (a) correct to 2 decimal places.

[1]

(c) A computer has 2.6×10^3 GB of free storage.

Each photo file uses 6.5×10^{-4} GB.

Work out the greatest number of photo files that can be stored.

Give your answer in standard form.

[2]

2 Orange juice is sold in two sizes of carton.

Carton A: 600 ml for £3.90

Carton B: 1 litre for £6.30

Which carton is the better value for money?

You must show your working.

[3]

3 The monthly rent for a flat is increased by 6%.
The new monthly rent is £477.

Work out the monthly rent before the increase.

[3]

4 In a garden centre, the ratio of roses to tulips is 3 : 4.
The ratio of tulips to daffodils is 6 : 5.

Write the ratio roses : tulips : daffodils in its simplest form.

[3]

5

(a) Solve.

$$5 - 2x < 3(x + 4)$$

[2]

(b) k is an integer.

$$-5 < 2k + 3 \leq 11$$

List all the possible values of k .

[3]

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6 Ella measured the lengths, l cm, of 50 leaves. The table summarises her results.

Length (l cm)	Frequency
$0 < l \leq 4$	6
$4 < l \leq 8$	14
$8 < l \leq 12$	19
$12 < l \leq 16$	11

(a) Work out an estimate of the mean length. **[4]**

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(b) Write down the class interval that contains the median length. **[1]**

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7 A ladder of length 6.5 m leans against a vertical wall.
The foot of the ladder is on horizontal ground, 1.8 m from the bottom of the wall.
[Diagram: right-angled triangle formed by the wall (vertical), the ground (horizontal) and the ladder (hypotenuse). Not to scale.]

(a) Work out how far up the wall the ladder reaches.
Give your answer correct to 2 decimal places. **[2]**

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(b) Work out the angle between the ladder and the ground. **[2]**

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8 A scientist is growing bacteria.

At the start there are 2500 bacteria.

The number of bacteria increases by 18% each hour.

(a) Work out the number of bacteria after 5 hours.

Give your answer to the nearest whole number.

[3]

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(b) After how many whole hours will the number of bacteria first be greater than 20 000?

[2]

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9 Solve these simultaneous equations algebraically.

$$5x + 2y = 14$$

$$3x - 4y = 24$$

[4]

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10 A sector of a circle has angle 80° .
The area of the sector is 40 cm^2 .

Work out the radius of the circle.

Give your answer correct to 2 decimal places.

[3]

11

(a) Expand and simplify.

$$(x + 3)(x - 2)(3x + 1)$$

[3]

(b) Make x the subject of this formula.

$$5(x - p) = q(2x + 3)$$

[4]

12 Two tins are mathematically similar.

The surface area of the smaller tin is 180 cm^2 .

The surface area of the larger tin is 405 cm^2 .

(a) The height of the smaller tin is 8 cm.

Work out the height of the larger tin.

[2]

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(b) The volume of the larger tin is 1350 cm^3 .

Work out the volume of the smaller tin.

[2]

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13 A bowl is in the shape of a hemisphere with internal radius 9 cm. The bowl is full of water.

All the water is poured into an empty cylindrical jug with internal radius 6 cm.

Work out the depth of the water in the jug.

[The volume V of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

(The jug is tall enough that no water overflows.)

[4]

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14 A cyclist travels 125 km, correct to the nearest 5 km.

The journey takes 8.5 hours, correct to 1 decimal place.

Work out the lower bound for the cyclist's average speed.

[3]

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15 A box contains 7 milk chocolates and 5 dark chocolates only.

Tom takes a chocolate at random and eats it. He then takes a second chocolate at random.

Work out the probability that both chocolates are the same type.

[4]

16 Solve.

$$5x^2 - 3x - 7 = 0$$

Give your answers correct to 2 decimal places.

[3]

17 T is directly proportional to the square root of L.

When $L = 1.44$, $T = 2.4$.

(a) Find a formula for T in terms of L.

[3]

(b) Work out the value of L when $T = 3$.

[2]

18 Kiran has £4000 to save for 3 years. She can choose one of two accounts.

Account A: 2.8% per year compound interest for all 3 years.

Account B: 3% interest in the first year, then 2.5% per year compound interest for the next 2 years.

Which account gives the greater total amount at the end of 3 years, and by how much?

[5]

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19 The table shows information about the times, t minutes, that some runners took to complete a fun run.

Time (t minutes)	Frequency density	Frequency
$0 < t \leq 10$	1.2	
$10 < t \leq 15$	4	
$15 < t \leq 30$	2.6	
$30 < t \leq 60$	0.5	

(a) Complete the frequency column of the table.

[2]

(b) Use the table to estimate the number of runners who took more than 20 minutes.

[2]

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20 In triangle ABC, $AB = 9.4$ cm, angle $BAC = 71^\circ$ and angle $ACB = 52^\circ$.

[Diagram: triangle ABC with angle 71° at A and angle 52° at C; side AB is opposite C. Not to scale.]

(a) Work out the length BC.

[3]

(b) Work out the area of triangle ABC.

[2]

21 $f(x) = 3x + 2$ and $g(x) = x^2 - 4$

(a) Work out $gf(-1)$.

[2]

(b) Find $fg(x)$.

Give your answer in its simplest form.

[2]

22 n is an integer.

Prove that the sum of the squares of any two consecutive integers is always odd.

[3]

23

- (a) Show that the equation $x^3 - 4x - 2 = 0$ has a solution between $x = 2$ and $x = 3$. [2]

- (b) Use the iterative formula

$$x_{n+1} = \sqrt[3]{4x_n + 2}$$

with $x_0 = 2$ to find x_1 , x_2 and x_3 .

Give each value correct to 3 decimal places. [3]

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- 24 A circle has centre O and equation $x^2 + y^2 = 45$.

The point P(3, -6) lies on the circle.

The tangent to the circle at P crosses the y-axis at Q.

Find the coordinates of Q. [4]

END OF QUESTIONS