OCR

Oxford Cambridge and RSA

Monday 11 November 2024 – Morning

GCSE (9–1) Mathematics

J560/06 Paper 6 (Higher Tier)

Time allowed: 1 hour 30 minutes

H

You must have:
- the Formulae Sheet for Higher Tier (inside this document)

You can use:
- a scientific or graphical calculator
- geometrical instruments
- tracing paper

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number [ ][ ][ ][ ][ ]   Candidate number [ ][ ][ ][ ]

First name(s) _____

Last name _____

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 answer 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 something different.

INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- This document has **24** pages.

ADVICE
- Read each question carefully before you start your answer.

1 Sasha has these two sets of number cards.

Set A: | 1 | 2 | 3 | 4 | Set B: | 8 | 9 | 10 |

One card is taken at random from each set.
Sasha adds the numbers on the two cards to get a total.

(a) Complete the table to show all the possible totals.

Set A

	Total	1	2	3	4
	8		10	11	12
Set B	9		11		13
	10	11	12		

[2]

(b) Find the probability that the total is a prime number.
Give your answer as a fraction.

(b) .... **[2]**

2 The price of a holiday increases from £320 to £340.

Work out the percentage increase in the price of the holiday.

.... % **[3]**

3 A bag contains only blue, green and red counters in the ratio 7 : 3 : 2.
There are 76 more blue counters than green counters in the bag.

Work out the **total** number of counters in the bag.

.... **[4]**

Turn over

4   A farmer has 60 pear trees.
     The table shows the heights, *h* metres, of the pear trees.

Height (*h* metres)	Frequency		
$1 < h \leqslant 2$	5		
$2 < h \leqslant 3$	8		
$3 < h \leqslant 4$	32		
$4 < h \leqslant 5$	15		

(a) Calculate an estimate of the mean height of the 60 pear trees.

(a) .... m **[4]**

(b) Explain why it is not possible to use the information from this table to calculate the **exact**
     value of the mean height.

     ....

     .... **[1]**

5 Rearrange this formula to make *f* the subject.

$$e = \frac{k}{f}$$

.... **[2]**

6 $\overrightarrow{AB} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ and $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 6 \end{pmatrix}$.

(a) On the grid below, draw $\overrightarrow{AB}$.

[2]

(b) Work out $\overrightarrow{AC}$.

$\begin{pmatrix} \\ \end{pmatrix}$ **[2]**

(c) Write down $\overrightarrow{BA}$.

$\begin{pmatrix} \\ \end{pmatrix}$ **[1]**

Turn over
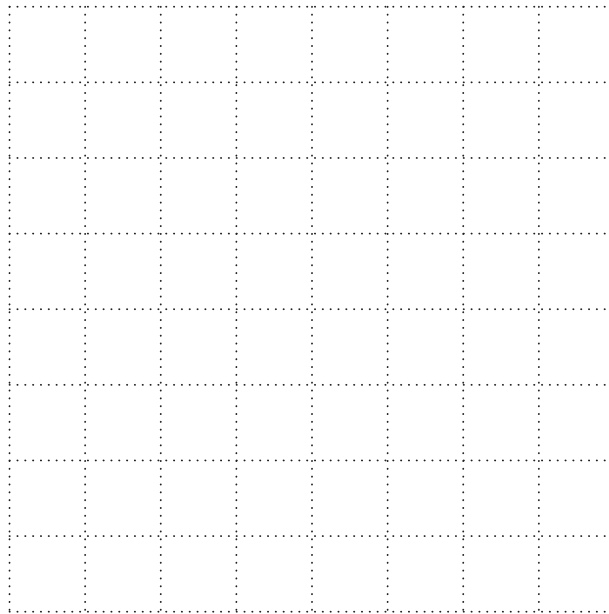
7 The diagram represents a rectangular field.
A and B are two trees.

A straight path goes across the field.
The path is always the same distance from A and B.

Construct the route followed by the path.
Show all your construction lines.

[2]

8 **(a)** 198 and 495 are written below as the product of their prime factors.

$$198 = 2 \times 3^2 \times 11 \qquad 495 = 3^2 \times 5 \times 11$$

Work out the highest common factor (HCF) of 198 and 495.

(a) .... **[2]**

(b) A five-digit passcode is created using the lowest common multiple (LCM) followed by the highest common factor (HCF) of two numbers.
The two numbers chosen are 198 and 495.

(i) To try and find the passcode, a computer hacker multiplies the highest common factor (HCF) of 198 and 495 by 5 and uses this as the lowest common multiple (LCM) in the passcode.
The computer hacker's passcode is incorrect.

Write down the omission in the computer hacker's method.

....

.... **[1]**

(ii) Work out the correct five-digit passcode.

(ii) .... **[2]**

Turn over

9 The next term in a Fibonacci sequence is found by adding together the previous two terms.

In a particular Fibonacci sequence:
- the first term is 3
- the second term is x.

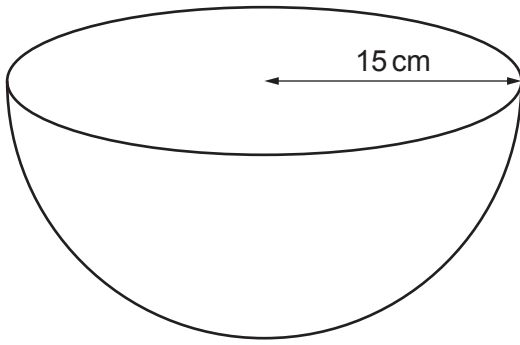**(a)** Show that the fifth term in the sequence is $6 + 3x$. **[2]**

(b) The sixth term in the sequence is 74.

Find the value of x.

(b) $x =$ .... **[4]**

10 A bowl in the shape of a hemisphere with radius 15 cm is used to collect raindrops.

15 cm

Assume each raindrop has the volume of a sphere of radius 3×10^{-4} cm.

Calculate how many raindrops it takes to completely fill the bowl.
Give your answer in standard form.
You must show your working.

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

.... **[6]**

Turn over

11 (a) Here is a function.

Input ⟶ +3 ⟶ ×2 ⟶ Output

Complete the diagram below to show the **inverse** of the function.

Input ⟶ .... ⟶ .... ⟶ Output

[2]

(b) Here is another function.

Input ⟶ ×*m* ⟶ +*p* ⟶ Output

When the input is 5, the output is 8.5.
When the input is 10, the output is 11.

Find the value of *m* and the value of *p*.

(b) *m* = ...

p = ... **[5]**

12 (a) Find all the possible integer values of x that satisfy the inequality $10 < 3x - 2 \leqslant 21$.

(a) .... **[3]**

(b) An inequality is shown on the number line below.
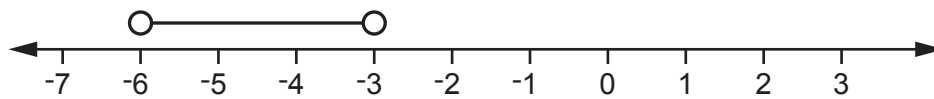
Taylor says,

You can write this inequality as $\{x: -3 < x < -6\}$.

Explain why Taylor is **not** correct.

....

.... **[1]**

Turn over

13 Triangle **A** and triangle **B** are shown on the coordinate grid.
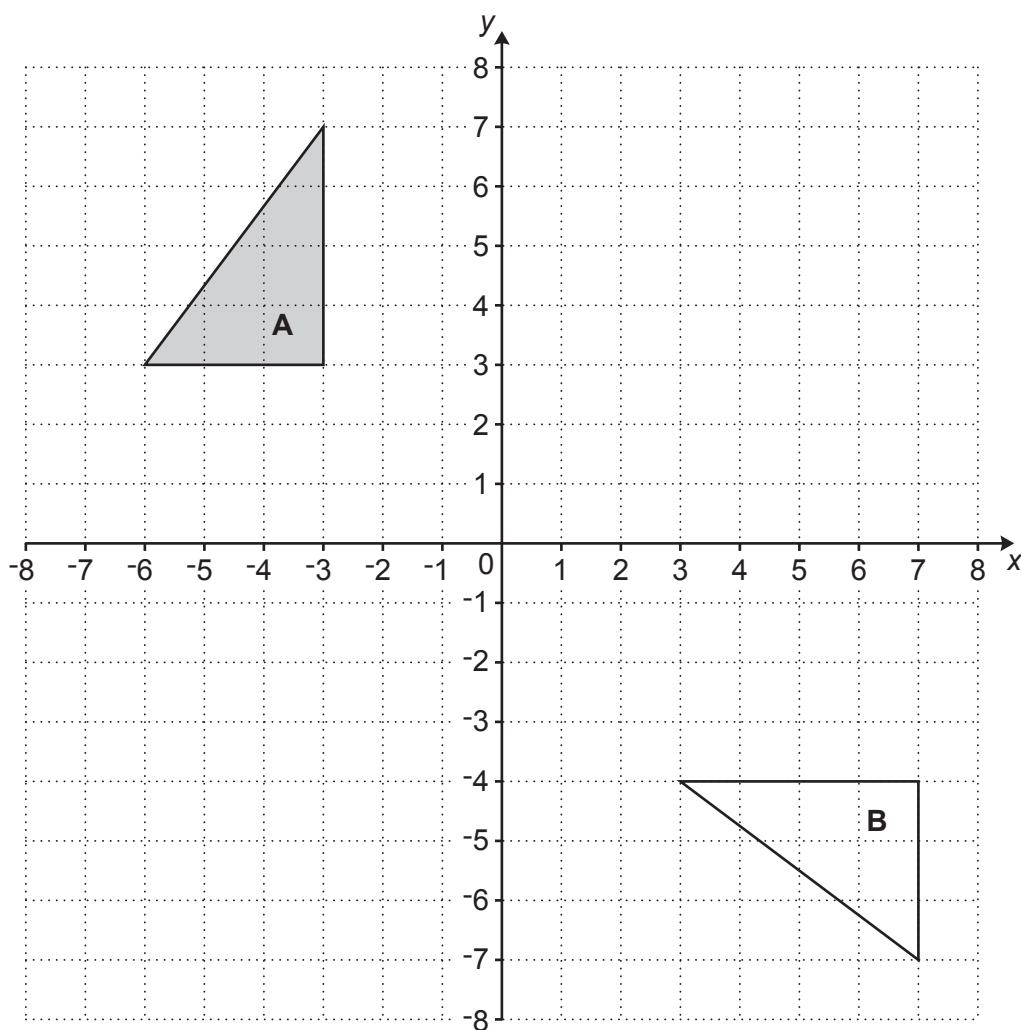
Triangle **A** is mapped onto triangle **B** using a combination of two transformations:

* a transformation T, followed by
* a translation of $\begin{pmatrix} 8 \\ -5 \end{pmatrix}$.

Describe fully transformation T.

....

.... **[4]**

14 $N = 4a^6$.

Write the following in the form ka^m.

(a) N^{-1} = ... a .... **[2]**

(b) $N^{\frac{3}{2}}$ = ... a .... **[2]**

15 Prove that $1.8\dot{6}$ converts to the fraction $\dfrac{28}{15}$.
You must show your working. **[3]**

Turn over

16 Work out the exact value of *x* in this triangle.

Not to scale

x cm   7 cm

30°

$6\sqrt{3}$ cm
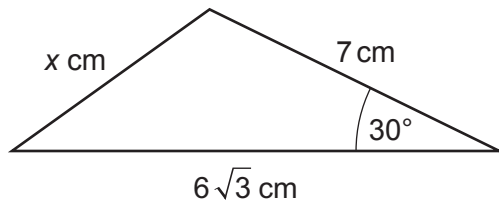
x = ... **[4]**

17 An online company is tracking the timing and condition of its deliveries.

The probability that a parcel arrives on time is 0.6.
When the parcel arrives on time, the probability that it is damaged is 0.1.
When the parcel arrives late, the probability that it is damaged is 0.3.

(a) Use the information to complete the tree diagram.

Timing   **Condition**

0.1 — Damaged

On time

0.6

.... (Not damaged)

Late .... Damaged

.... Not damaged
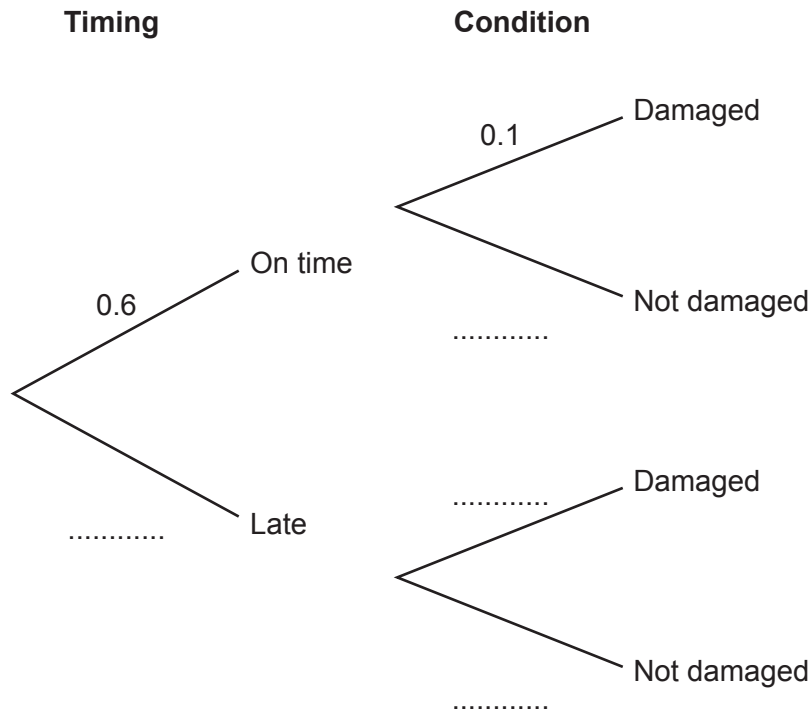
[3]

(b) Given that a parcel arrives damaged, find the probability that it also arrived on time.

(b) .... **[4]**

18 y is inversely proportional to x^2.

Find the percentage decrease in y when x is increased by 25%.

.... % **[4]**

18 y is inversely proportional to x^2.

19 This graph shows the depth of the water, in centimetres, at a particular point in a river over a period of 10 hours.
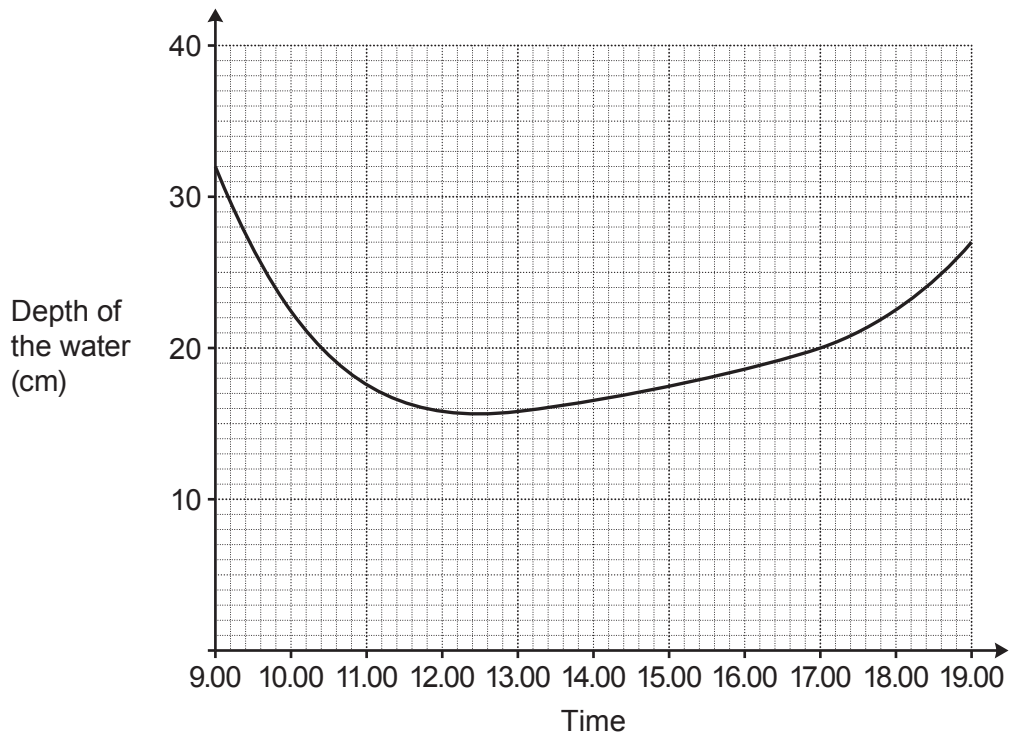
(a) Work out the average rate of change in the depth of the water over the 10 hours.

(a) .... cm per hour **[2]**

(b) Use the graph to estimate the rate of change in the depth of the water at 17.00.
You must show working to support your estimate.

(b) .... cm per hour **[4]**

Turn over

20 $(4x + a)(4x - a)(x^2 + 2) = 16x^4 + bx^2 - 50$

Find the **two** possible pairs of values for a and b.
You must show your working.

Pair 1: a = ... and b = ...

Pair 2: a = ... and b = ... **[6]**

21 The diagram shows a cuboid ABCDEFGH.
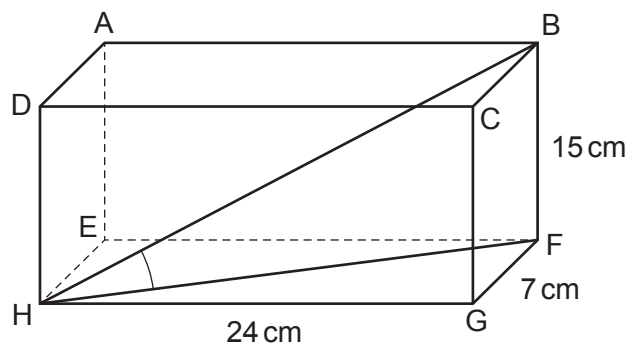
Not to scale

FB = 15 cm, GF = 7 cm and HG = 24 cm.

Calculate the angle BHF.
You must show your working.

Angle BHF = ...° **[5]**

Turn over

22 (a) For each graph below, select its possible equation from this list.

$$y = \sqrt{x-4} \qquad y = 4^x \qquad y = x^4 \qquad y = \frac{4}{x}$$

$$y = \left(\frac{1}{4}\right)^x \qquad y = -4x^2 \qquad y = 4\cos x \qquad y = \sqrt{4^2 - x^2}$$

(i)

Not to scale

(a)(i) .... **[1]**

(ii)

Not to scale
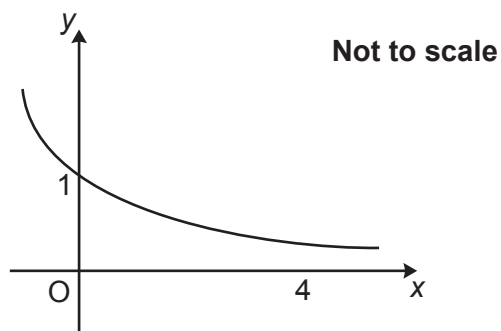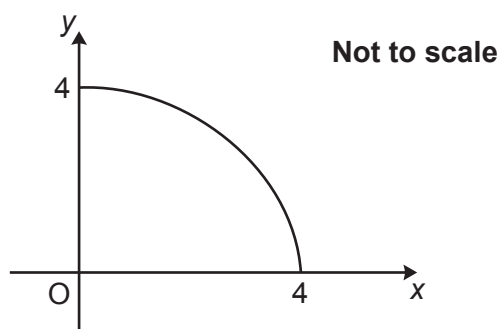
(ii) .... **[1]**

(b) A graph is drawn on the axes below.
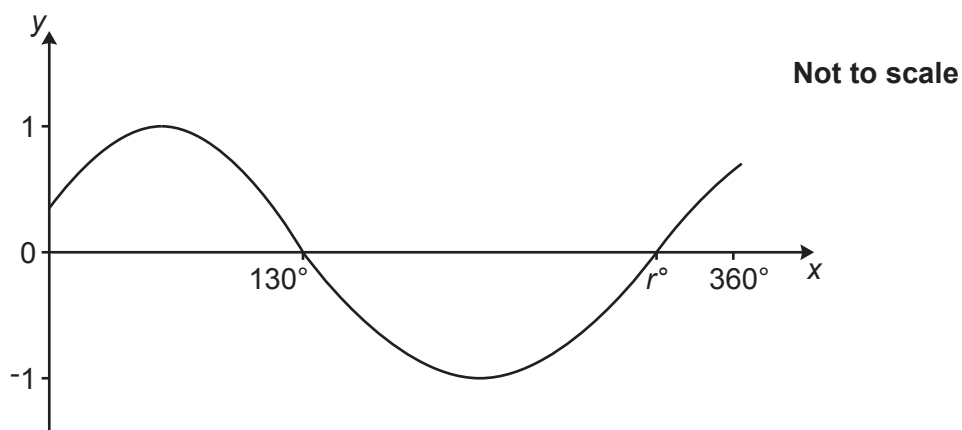
The equation of the graph is $y = \sin(x + p)$, where $0° \leqslant x \leqslant 360°$.
The *x*-intercepts are 130° and $r°$.

Write down the value of *p* and the value of *r*.

p = ...

r = ... **[2]**

END OF QUESTION PAPER

22

EXTRA ANSWER SPACE

If you need extra space use these lined pages. You must write the question numbers clearly in the margin.

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