Cambridge Assessment International Education

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9653701697

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/52**

Paper 5 Investigation (Core) **October/November 2023**

1 hour 10 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a graphic display calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly, including sketches, to gain full marks for correct methods.
- In this paper you will be awarded marks for providing full reasons, examples and steps in your working to communicate your mathematics clearly and precisely.

INFORMATION

- The total mark for this paper is 36.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **8** pages. Any blank pages are indicated.

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Answer **all** the questions.

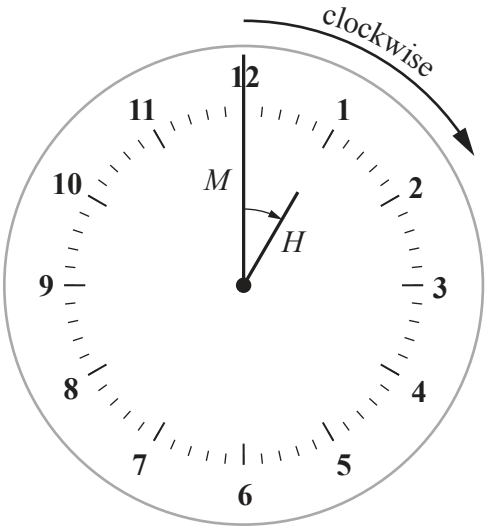
INVESTIGATION **CLOCK HANDS**

This investigation looks at the angle between the hands of a clock at different times of day.

You should **not** measure angles from the clock diagrams.

In this investigation:

- the hour hand is labelled *H*
- the minute hand is labelled *M*
- the hands of the clock rotate clockwise in the direction shown
- the *clockwise angle* between the two hands is shown on the clock.



1 **(a)** The clock shows the time 1.00 am.

(i) Write down the mathematical name for the type of angle shown.

..... [1]

(ii) Explain why hand *H* rotates through 360° in 12 hours.

..... [1]

(iii) Write down the calculation to show that the clockwise angle from hand *M* to hand *H* is 30°.

[1]

(iv) Write down a calculation to show that the **anticlockwise** angle from hand *M* to hand *H* is 330°.

[1]

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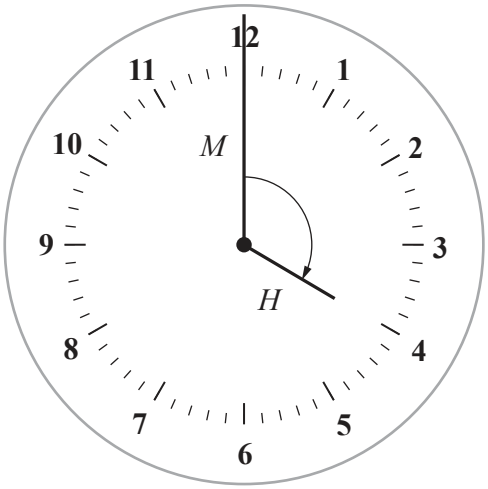
(b) This clock shows the time 4.00 am.

(i) Work out the clockwise angle from hand *M* to hand *H*.



..... [2]

(ii) Work out the anticlockwise angle from hand *M* to hand *H*.

..... [2]

(c) Write down the clockwise angle from hand *M* to hand *H* at 6.00 am.

..... [1]

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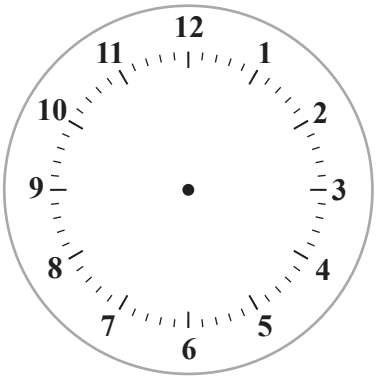
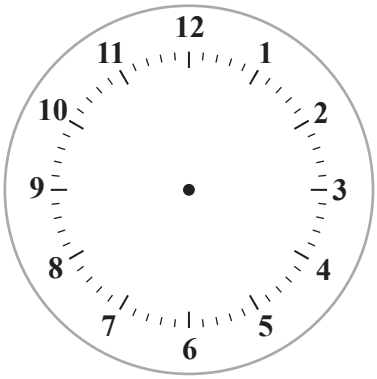
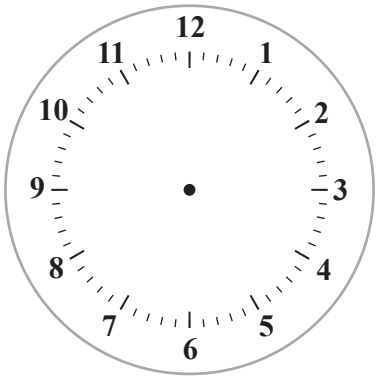
(d) Complete the table using **part (b)** and **part (c)**.

You may use the clock diagrams and patterns to help you.

	Hour shown by hand H (x)	Angle between hand H and hand M in degrees	
		Clockwise angle	Anticlockwise angle
	1	30	330
	2		
	3		
part (b)	4		
	5		
part (c)	6		







[4]

(e) Find an expression for the clockwise angle at hour x.

..... [1]

(f) Write down the rule for continuing the sequence in the **anticlockwise angle** column.

..... [1]

(g) Find an expression for the anticlockwise angle at hour x.

..... [1]

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2 **(a)** In one hour, hand *H* rotates clockwise from one number to the next number.
For example, from 1.00 am to 2.00 am hand *H* rotates from 1 to 2.

Show that hand *H* rotates 0.5° in one minute.

[1]

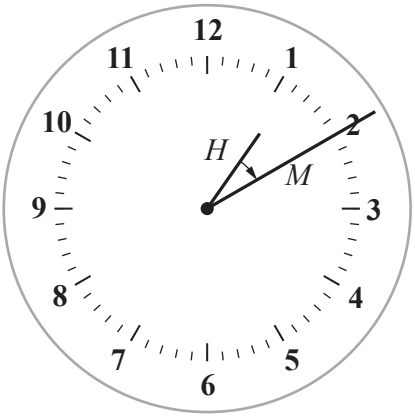
(b) In one hour, hand *M* rotates through a full circle.

Show that hand *M* rotates 6° in one minute.

[1]

3 **(a)** This clock shows the time 1.10 am.

(i) Use **Question 2(a)** to find the angle that hand *H* has rotated in the 10 minutes since 1.00 am.



..... [2]

(ii) Use **Question 2(b)** to find the angle that hand *M* has rotated in the 10 minutes since 1.00 am.

..... [2]

(iii) Show that the clockwise angle from hand *H* to hand *M* at 1.10 am is 25°.

[1]

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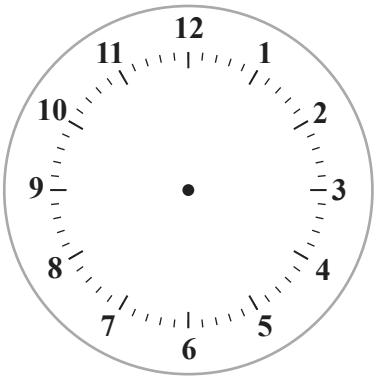
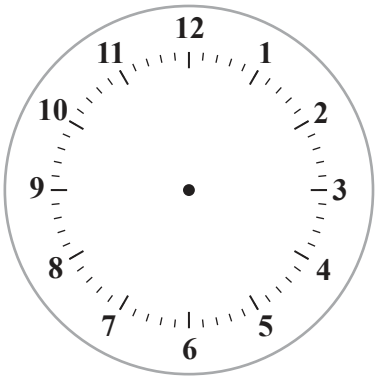
(b) Complete the table using your results from **part (a)(i)** and **part (a)(ii)**.

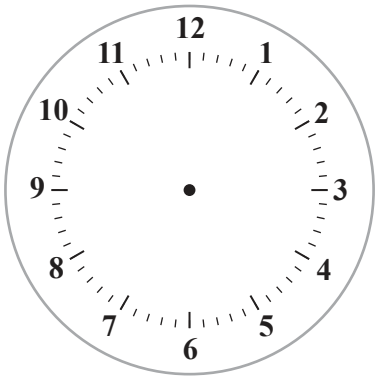
You may use the clock diagrams and patterns to help you.

Number of minutes since 1.00 am (m)	Angle rotated since 1.00 am in degrees		Clockwise angle between the hands in degrees
	Hand H angle	Hand M angle	
6			
7	3.5	42	8.5
8			
9			
10			25

part (a)(i)
part (a)(ii)







[6]

(c) Find an expression, in terms of m, for the clockwise angle between the hands.

..... [2]

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(d) Find how many minutes and seconds after 1.00 am the clockwise angle is 270°.
Give your answer correct to the nearest second.

..... minutes ..... seconds [5]

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