Paper Reference(s)

7361/01

London Examinations GCE

Mathematics Syllabus B
Ordinary Level
Paper 1

Tuesday 12 January 2010 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Nil	Nil

Candidates are expected to have an electronic calculator when answering this paper.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
Full marks may be obtained for answers to ALL questions.
There are 29 questions in this question paper. The total mark for this paper is 100.
There are 20 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Write your answers neatly and legibly.

Turn over

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1. Evaluate $3a^2 - \dfrac{a}{b} + b^2$ when $a = -4$ and $b = 5$

....

(Total 2 marks)

2. Write down the range of the function $f: x \mapsto x^2 - 1$ with domain $\{0, 1, 2, 3\}$.

{.............................}

(Total 2 marks)

3.

$$\mathbf{A} = \begin{pmatrix} 2 & x \\ 3 & 4 \end{pmatrix}$$

Find the value of x when the determinant of $\mathbf{A}$ is 17

$x = $ ....

(Total 2 marks)

4. A number is to be chosen at random from

51,   52,   53,   55,   57,   61,   63,   65,   67,   70

Write down the probability that the number will be a multiple of three.

....

(Total 2 marks)

5. Simplify the ratio $1\,\text{km} : 800\,\text{m} : 50\,\text{cm}$, giving your answer in the form $a : b : 1$.

....

(Total 2 marks)

6.

$$\mathbf{a} = \begin{pmatrix} -8 \\ 6 \end{pmatrix}$$

Calculate the modulus of the vector **a**.

....
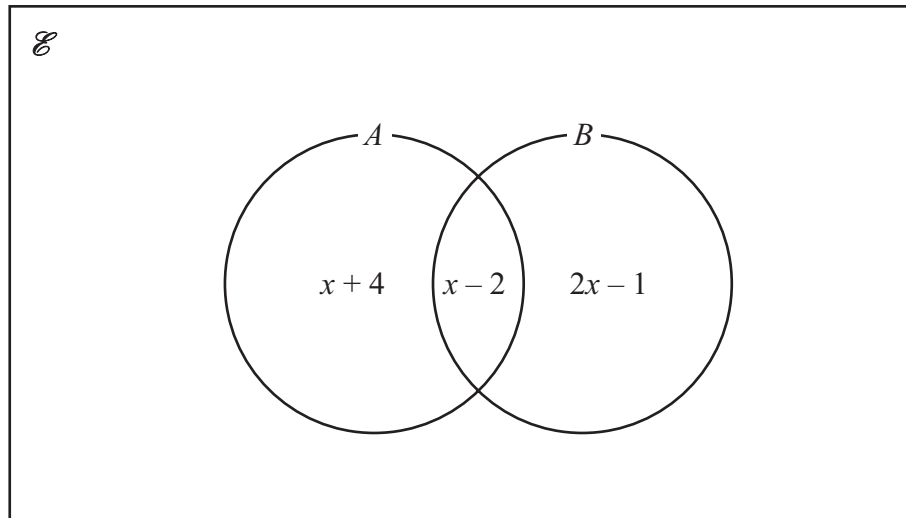
(Total 2 marks)

N 3 5 3 7 3 A 0 3 2 0

Turn over

7.

The Venn diagram gives information about the number of elements in the set A and in the set B.

Given that $n(A) = n(B)$, find the value of x.

$x = $ ....

(Total 2 marks)

8. Calculate $2 \times 10^{-4} + 5 \times 10^{-6}$.
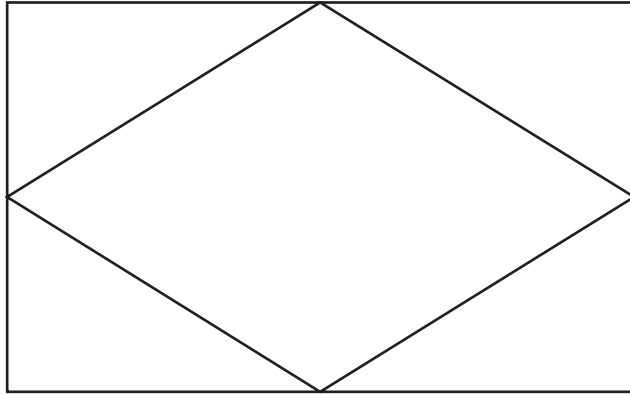
Give your answer in standard form.

....

(Total 2 marks)

9.

The diagram shows a rectangle and a rhombus. The vertices of the rhombus are the midpoints of the sides of the rectangle.

(a) Write down the number of lines of symmetry of the diagram.

....
(1)

(b) Write down the order of rotational symmetry of the diagram.

....
(1)

(Total 2 marks)

10.

$$A = \begin{pmatrix} 1 & -2 \\ -5 & 3 \end{pmatrix}, \quad B = \begin{pmatrix} -3 & 4 \\ -1 & 5 \end{pmatrix}.$$

Find

(a) $A - B$,

....
(1)

(b) BA.

....
(2)

(Total 3 marks)

11. A bag contains 3 blue marbles and 2 red marbles. A marble is to be taken at random from the bag and then replaced. A second marble is then to be taken at random from the bag. Calculate the probability that the colours of the two marbles will be different.

....

(Total 3 marks)

12.

$$\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\},$$
$$A = \{2, 4, 7, 9\},$$
$$B = \{1, 2, 5, 6\}.$$

List the elements of

(a) $(A \cup B)'$,

....
(1)

(b) $A \cap B'$,

....
(1)

(c) $A' \cap B$.

....
(1)

(Total 3 marks)

13. Find the value of $\dfrac{64^{-\frac{1}{2}} + 64^{\frac{1}{2}}}{64^{\frac{1}{3}}}$, giving your answer in the form $\dfrac{m}{n}$, where m and n are positive integers.

....

(Total 3 marks)

14. The point A has the coordinates $(5, -1)$.

Given that $\mathbf{y} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$ and $\mathbf{y} = \dfrac{1}{2}\ \overrightarrow{AB}$,

(a) find the coordinates of B.

....
(2)

(b) Write down an equation of the straight line that passes through A and B.

....
(1) Q14

(Total 3 marks)

15. Find the largest positive integer, x, for which $5x + 6 < 32 - x$.

....
(Total 3 marks) Q15

16. Given that $\sin\theta = \dfrac{1}{3}$, find the value of $(\tan\theta)^2 + (\cos\theta)^2$.

Give your answer in the form $\dfrac{m}{n}$, where m and n are positive integers.

....
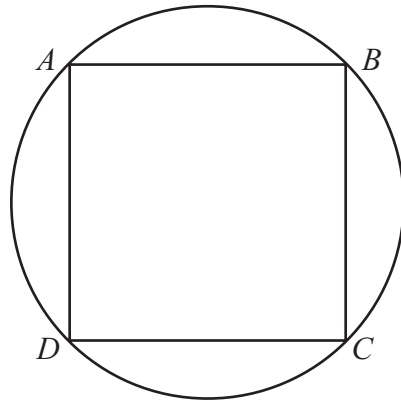
(Total 3 marks) Q16

17.

Diagram **NOT** accurately drawn

In the diagram, *A*, *B*, *C* and *D* are points on a circle such that *ABCD* is a square. Given that the radius of the circle is 4 cm, calculate the length, in cm to 3 significant figures, of a side of the square *ABCD*.

.... cm

Q17

(Total 3 marks)

18. Simplify fully $\dfrac{3m+n}{12} - \dfrac{m-n}{4}$.

....

Q18

(Total 3 marks)

19. Given that $G = \dfrac{a}{b}$, find the percentage decrease in the value of G when a decreases by

10% and b increases by 20%.

.... %

(Total 4 marks)

Turn over

20. The volume of a solid varies directly as the cube of the length of its longest side.
When the length of the longest side is d cm, the volume is V cm^3.
When the length of the longest side is D cm, the volume is $3V$ cm^3.
Find an expression for D in terms of d.

....

(Total 4 marks)

Q20

21. The table shows information about the numbers of train journeys made by 40 people in a week.

Number of train journeys	0	1	2	3	4	5
Frequency	3	4	6	6	10	11

(a) Find the median number of train journeys.

....

(1)

(b) Calculate the mean number of train journeys made per person.

....

(3)
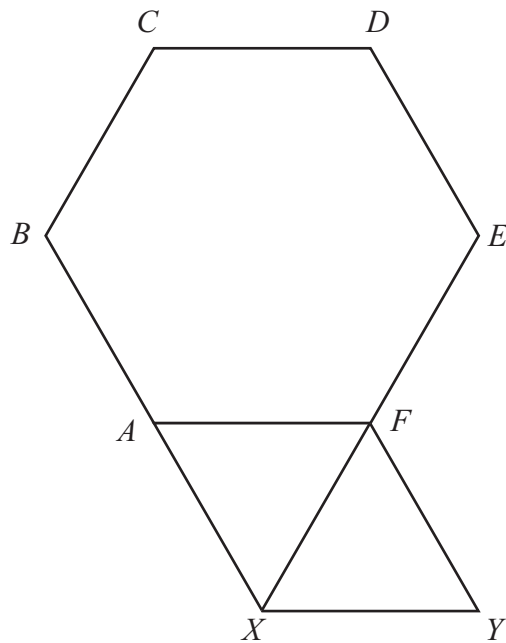
Q21

(Total 4 marks)

22.

Diagram **NOT**
accurately drawn

In the diagram, *ABCDEF* is a regular hexagon and *AFYX* is a rhombus such that *BAX* is a straight line and *EFX* is a straight line.
Find, giving your reasons, the size in degrees of ∠*EYF*.

.... °

Q22

(Total 4 marks)

23. Mariam and Farzad buy a house for £150 000.
Their bank lends them 85% of the £150 000.

(a) Calculate the amount, in £, that the bank lends Mariam and Farzad.

£ ....
(2)

The amount that the bank lends Mariam and Farzad is 2.5 times their combined annual earnings.
Farzad earns £30 000 in a year.

(b) Calculate how much, in £, Mariam earns per year.

£ ....
(2)

(Total 4 marks)

Q23

24.

A ——————————— B

(a) On the diagram, draw the locus of points which are equidistant from *A* and *B*.

(2)

The point *C* lies on this locus and is such that the distance of *C* from *B* is 5 cm.

(b) On the diagram, plot and label a possible position for the point *C*.

(1)

(c) Shade the region in Δ*ABC* containing the points which are more than 3 cm from *B*.

(2)

(Total 5 marks)

Q24

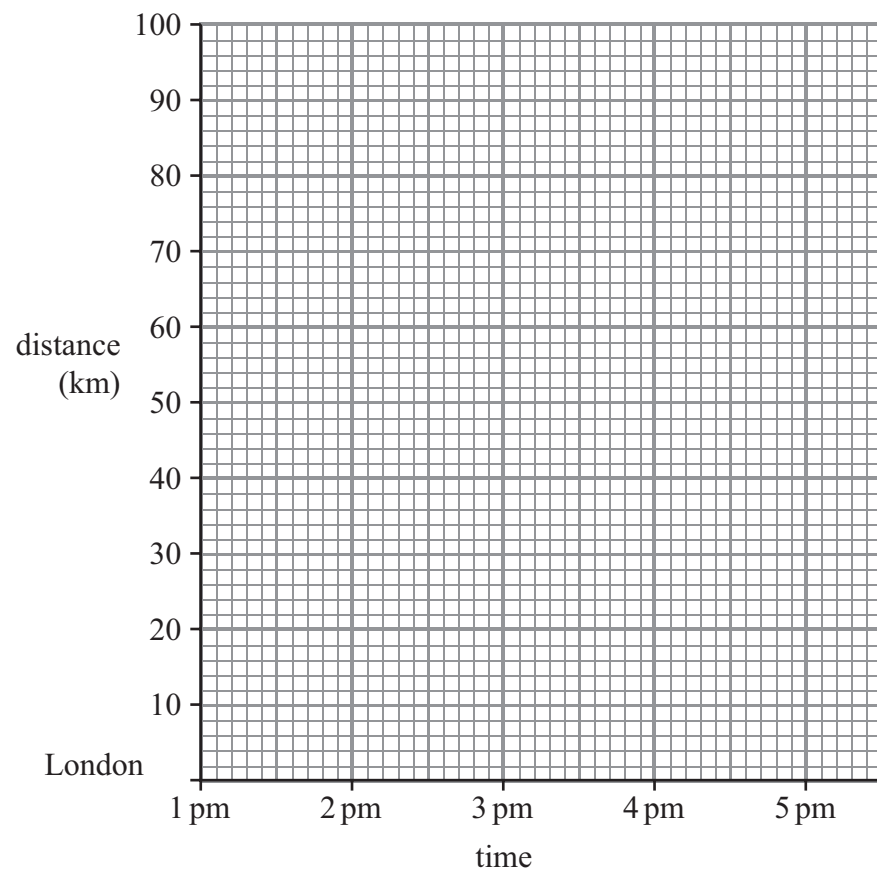**25.**

The distance between London and Brighton is 84 km. James leaves London at 1 pm and takes 1 hour and 18 minutes to travel to Brighton.

(a) Show this information on the distance-time graph above.

(1)

He then stays in Brighton for 1 hour.

(b) Show this information on your distance-time graph.

(1)

James then travels back to London from Brighton at an average speed of 54 km/hour.

(c) Calculate the time, in hours to one decimal place, taken to travel back to London from Brighton.

.... hrs

(2)

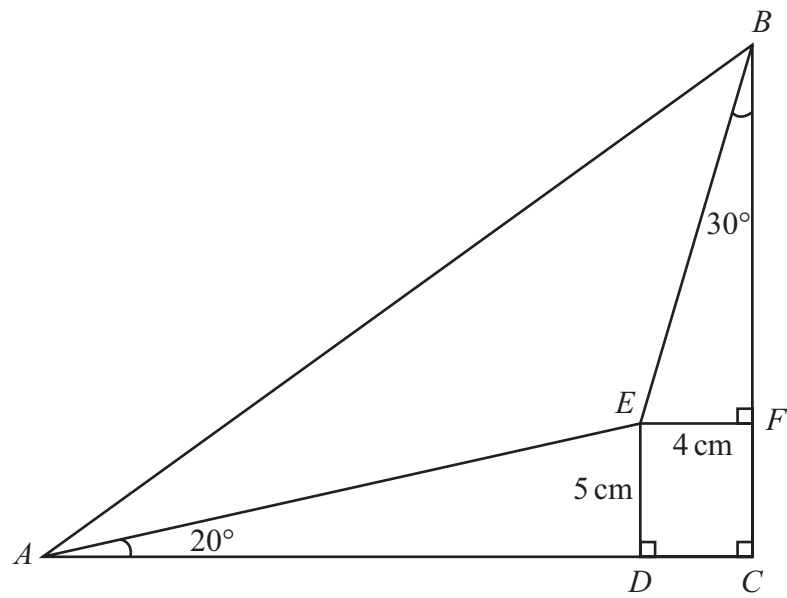(d) Complete your distance-time graph.

(1)

(Total 5 marks)

Q25

26.

Diagram **NOT** accurately drawn

In the diagram, *ADC* is a straight line and *BFC* is a straight line.
CDEF is a rectangle.
EF = 4 cm and *ED* = 5 cm.
∠*DAE* = 20º and ∠*EBF* = 30º .

Calculate the length, in cm to 3 significant figures, of

(a) *BF*,

.... cm

(2)

(b) *AB*.

.... cm

(4)

(Total 6 marks)

Q26

27. A small department store sells only household goods, furniture and clothing. In a pie chart showing the sales, in £, of these for Monday, the angle for household goods is 120° and the angle for furniture is 100°.
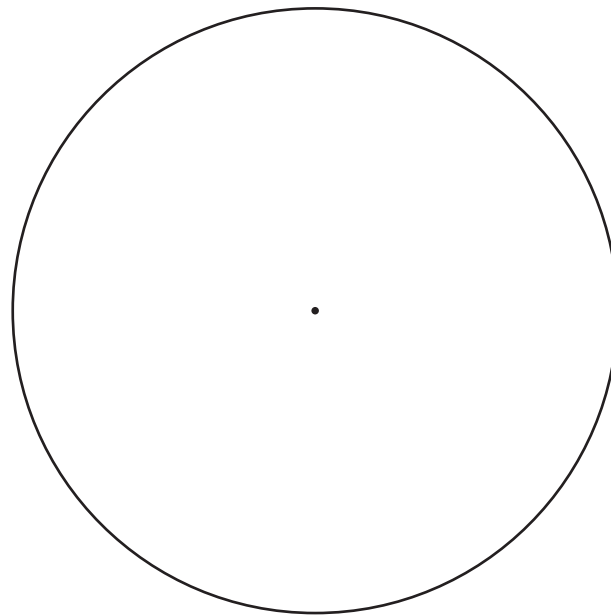
Given that the store sold £480 of household goods on Monday,

(a) calculate the sales, in £, of furniture on Monday,

....
(2)

(b) calculate the sales, in £, of clothing on Monday.

....
(2)

(c) Using the circle, draw an accurate pie chart illustrating this information. State clearly the size of the angle of each sector and label each sector.

(2) Q27

(Total 6 marks)

28. $p*q = \dfrac{p}{q} - q$

$r \otimes s = \dfrac{r+s}{s}$

(a) Calculate $3*(2 \otimes 1)$.

....
(2)

(b) Solve for x

$$6 \otimes (x*5) = -4$$

$x = $ ....
(4)

(Total 6 marks)

29.
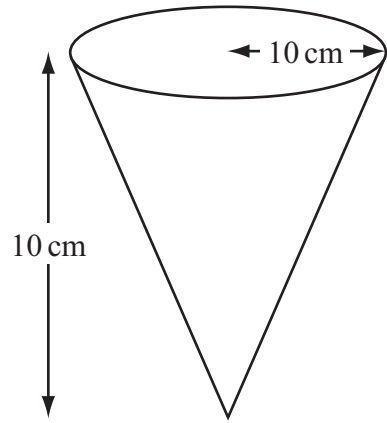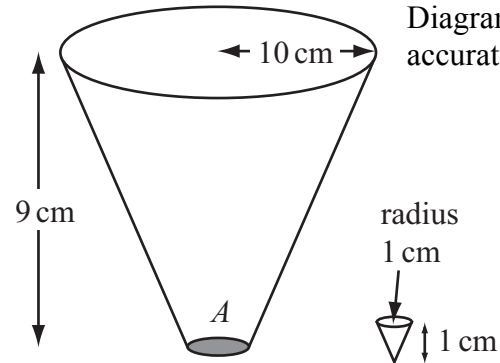
Diagram **NOT** accurately drawn

Figure 1   **Figure 2**

Figure 1 shows an inverted right circular cone of height 10 cm and base radius 10 cm. A right circular cone of height 1 cm and base radius 1 cm is removed from the cone to leave a frustrum as shown in Figure 2.

(a) Calculate the volume, in cm^3 to 4 significant figures, of the frustrum.

....

(2)

The frustrum is completely filled with sand which flows out at a constant speed of x cm/sec from the shaded outlet A at the bottom of the frustrum. It takes 3 minutes to empty the frustrum.

(b) Calculate the value of x to 3 significant figures.

(5)

Q29

(Total 7 marks)

TOTAL FOR PAPER: 100 MARKS

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