CCEA GCSE MATHEMATICS (MODULAR)

MATHS



EXAM QUESTION PACK

MODULE N4 PAPER 1 (NON-CALCULATOR) HIGHER TIER GMN41 PAPERS

STEMUP

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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
January 2012

Mathematics

Module N4 Paper 1
(Non-calculator)
Higher Tier

[GMN41]

GMN41

WEDNESDAY 11 JANUARY
9.15 am–10.15 am

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eleven** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

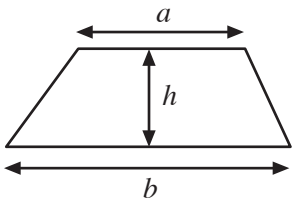
The total mark for this paper is 44.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a ruler, compasses, set-square and protractor.
The Formula Sheet is on page 2.

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total Marks	

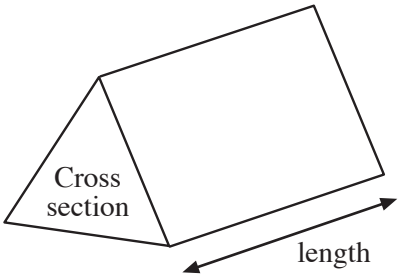
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Formula Sheet

Area of trapezium $= \frac{1}{2}(a + b)h$



Volume of prism = area of cross section × length

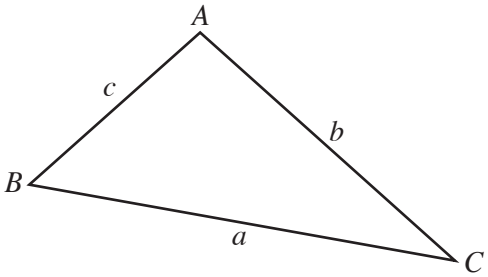


In any triangle *ABC*

Area of triangle $= \frac{1}{2}ab\sin C$

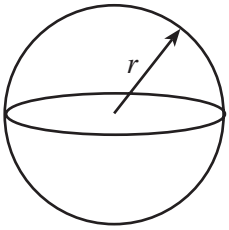
Sine rule : $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$



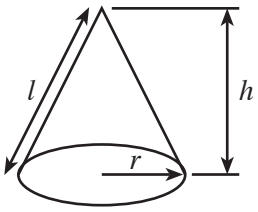
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$



Quadratic equation:

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

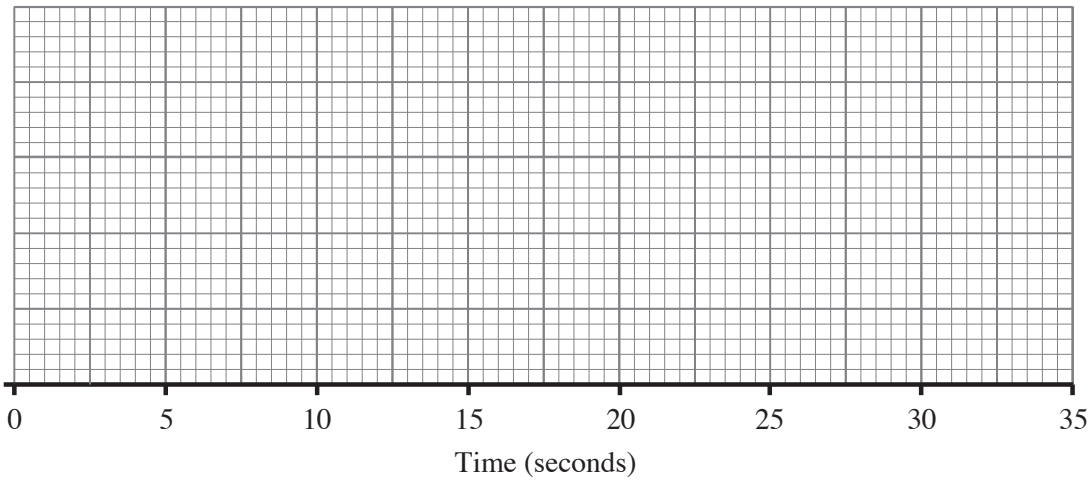
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Examiner Only	
Marks	Remark

1 The times, in seconds, taken by 11 teachers to solve a puzzle are listed in order below.

4, 12, 13, 17, 18, 20, 22, 24, 25, 30, 34

Draw a box plot for this data on the grid below.



[3]

2 Solve the equation $\frac{4x+1}{12}+\frac{2x-3}{6}=\frac{7}{4}$

Answer $x =$ _____ [4]

3 There are 14 boys and 16 girls in a class.

In a test the mean mark for the boys was b.

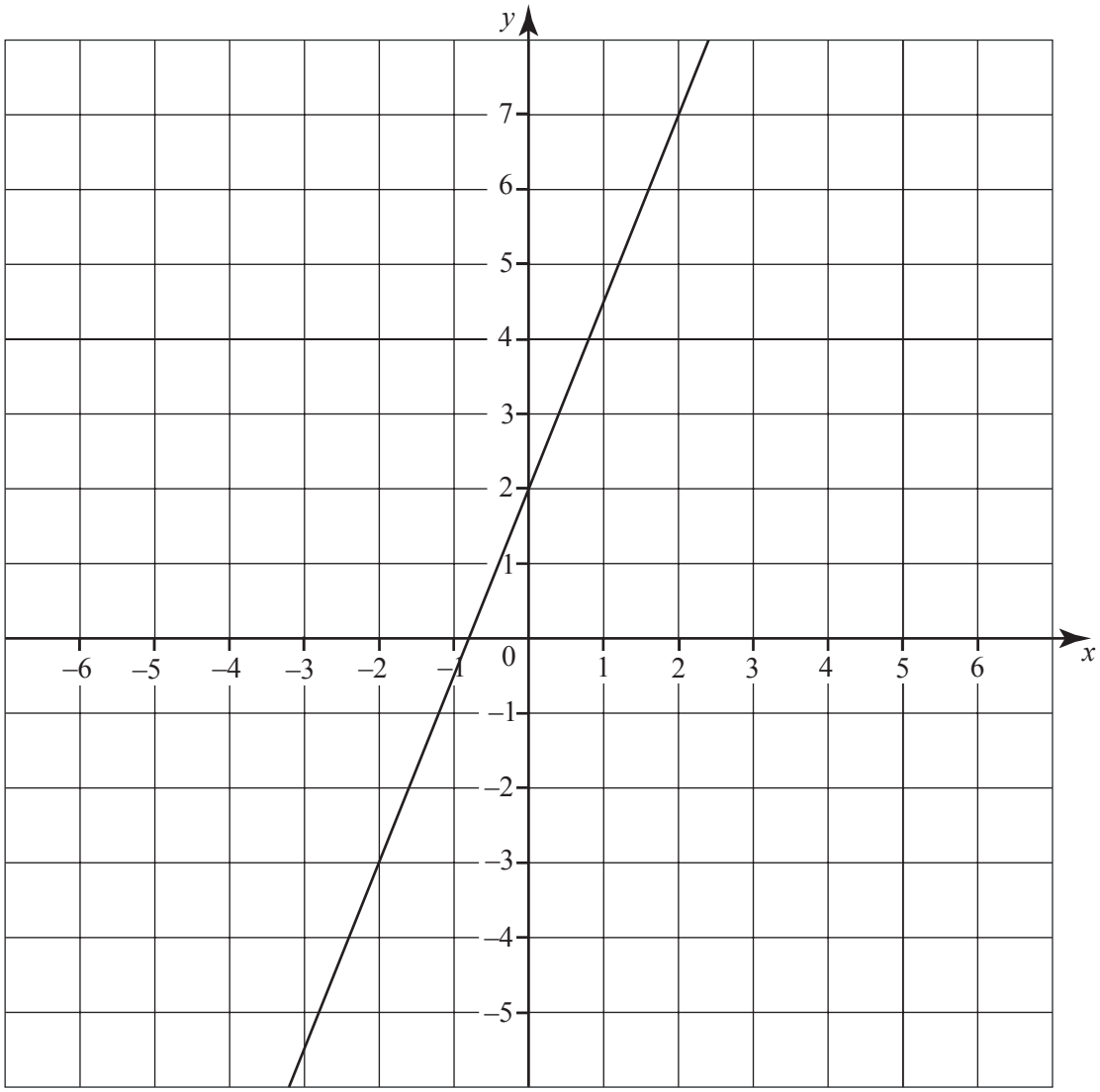
In the same test the mean mark for the girls was g.

Find an expression for the mean mark of the whole class of 30 pupils.

Answer _____ [3]

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4



(a) Write down the gradient of the line drawn above.

Answer _____ [1]

(b) Hence write down the equation of this line.

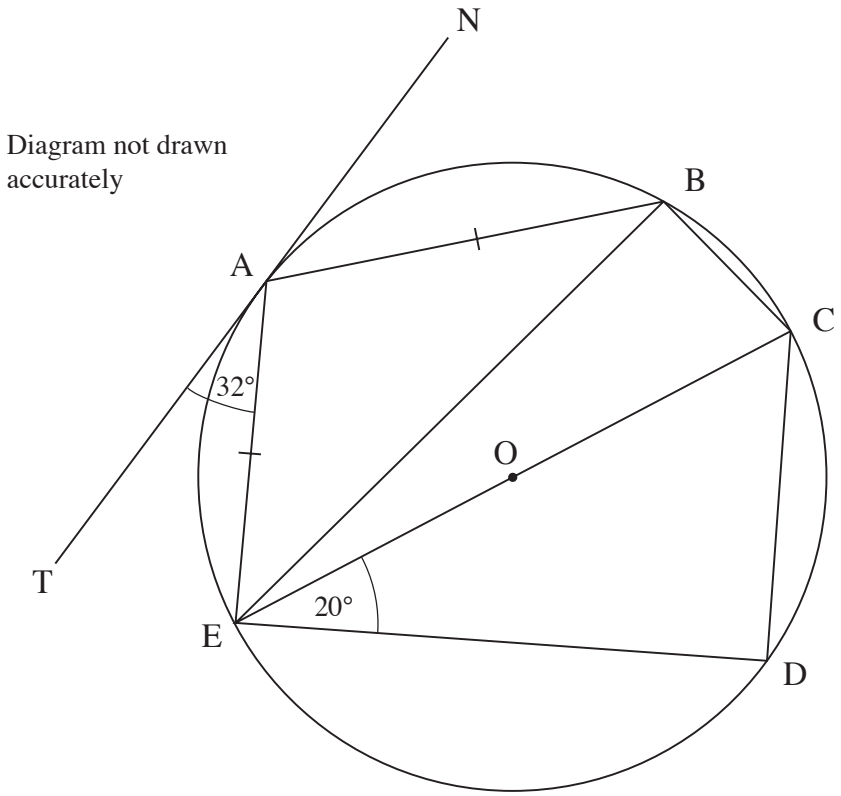
Answer _____ [2]

Examiner Only	
Marks	Remark

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5 In the diagram EC is a diameter of the circle and AE = AB.

The line TN is the tangent at A.



Given that angle TAE = 32° and angle CED = 20°, calculate the size of each of the following:

(a) Angle ABE = _____° [1]

(b) Angle BAE = _____° [1]

(c) Angle BCE = _____° [1]

(d) Angle BED = _____° [1]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

6 Write each of the following values in the correct column in the table as either rational or irrational.

5π $\frac{2\pi}{3\pi}$ $\sqrt{30}$ $\sqrt[3]{64}$ $2.\dot{3}$ 1.62444

Rational	Irrational

[2]

7 There are 600 pupils at Willow High School.

The table below shows information about the pupils.

Year group	Number of boys	Number of girls
8	82	65
9	74	64
10	57	55
11	55	58
12	49	41

Andrew, Karan and Caroline are carrying out a survey in the school to get some information about the use of the school library.

They each decide that they will survey 50 pupils but each of them selects their sample in a different way.

(a) Andrew is going to visit a different Year 8 class each morning for a week and will survey 5 boys and 5 girls each day.

Comment on this method of sampling.

_____

_____ [1]

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Examiner Only	
Marks	Remark

(b) Karan gets an alphabetical list of all 600 pupils in the school and selects every 10th name on the list until she has 50 names. She then surveys these pupils.

Comment on this method of sampling.

_____

_____ [1]

(c) Caroline takes a sample, stratified both by Year group and by gender, of 50 of the 600 pupils.

(i) Calculate the number of Year 10 boys in her sample.

Answer _____ [2]

(ii) Caroline stated that "There will be twice as many Year 8 boys as Year 12 girls in my sample."

Is Caroline's statement correct?

You must explain how you reached your decision.

[2]

---

8 Find the equation of the line through (0, 4) perpendicular to the line $y = 3x + 7$

Answer _____ [2]

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Examiner Only	
Marks	Remark

9 Martin recorded the length, in minutes, of the films shown on television in one week.

Below is a partially completed frequency table and opposite is a partially completed histogram for his data.

Length in minutes (m)	Frequency
$0 < m \leq 60$	30
$60 < m \leq 80$	
$80 < m \leq 90$	68
$90 < m \leq 100$	96
$100 < m \leq 140$	

(a) Use the information in the histogram to complete the frequency table. [2]

(b) Complete the histogram by drawing the missing bars. [2]

(c) Estimate the number of films whose length is between $\frac{3}{4}$ hour and $1\frac{1}{4}$ hours.

Answer _____ [2]

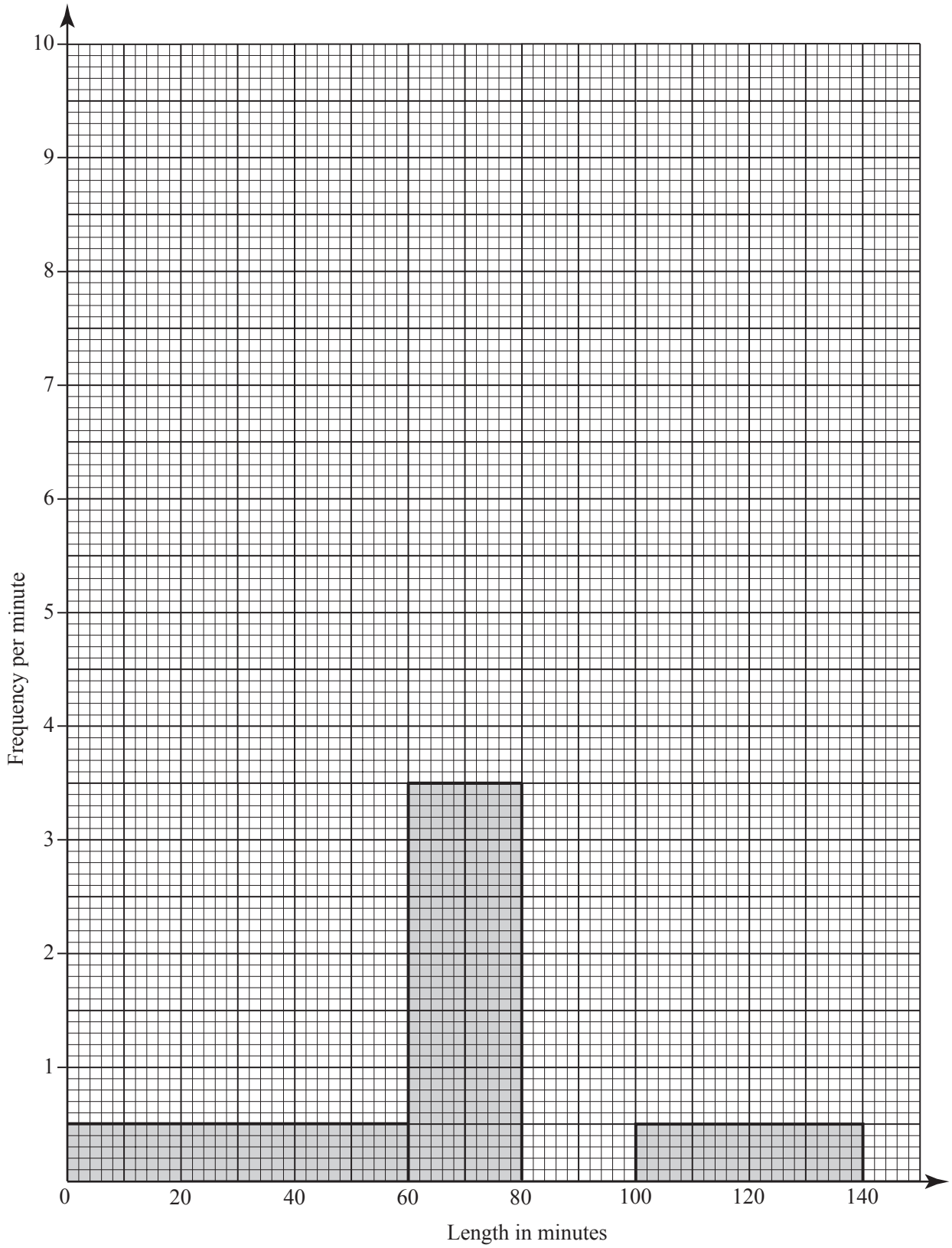
Martin also recorded the lengths, in minutes, of all the films shown on television the following week. He made a new histogram.

Some of his data are given in the table below.

Length in minutes (m)	Frequency	Height of bar (mm)
$60 < m \leq 100$	144	72
$100 < m \leq 160$	x	

(d) Complete the table by finding the height of the second bar, giving your answer **in terms of x**. [2]

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10
9
8
7
6
5
4
3
2
1
Frequency per minute
0
20
40
60
80
100
120
140
Length in minutes

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Examiner Only	
Marks	Remark

10 **(a)** Evaluate $16^{\frac{3}{4}}$

Answer _____ [2]

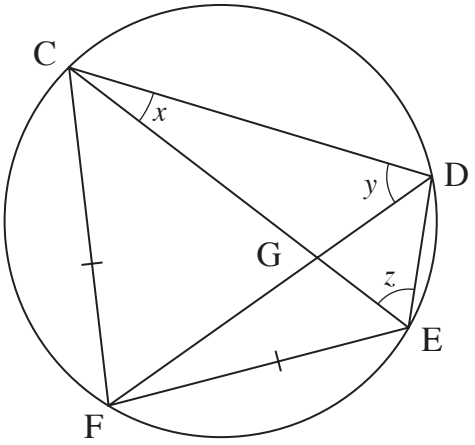
(b) Prove that

$$\left(\frac{8}{27}\right)^{-\frac{4}{3}} \times 0.25^{-2} = 81$$

Show each step of your working.

[4]

11



The diagonals CE and DF of a cyclic quadrilateral CDEF intersect at G.

Given that CF = FE, prove that angle CGD = angle FED

[3]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
January 2012

Mathematics

Module N4 Paper 1
(Non-calculator)
Higher Tier

[GMN41]

WEDNESDAY 11 JANUARY
9.15 am–10.15 am

MARK SCHEME

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Introduction

The mark scheme normally provides the most popular solution to each question. Other solutions given by candidates are evaluated and credit given as appropriate; these alternative methods are not usually illustrated in the published mark scheme.

The marks awarded for each question are shown in the right-hand column and they are prefixed by the letters **M, A** and **MA** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.

A indicates marks for accurate working, whether in calculation, readings from tables, graphs or answers.

MA indicates marks for combined method and accurate working.

The solution to a question gains marks for correct method and marks for an accurate working based on this method. Where the method is not correct no marks can be given.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

It should be noted that where an error trivialises a question, or changes the nature of the skills being tested, then as a general rule, it would be the case that not more than half the marks for that question or part of that question would be awarded; in some cases the error may be such that no marks would be awarded.

Positive marking:

It is our intention to reward candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier only a proportion of the marks will be available (based on the professional judgement of the examiner).

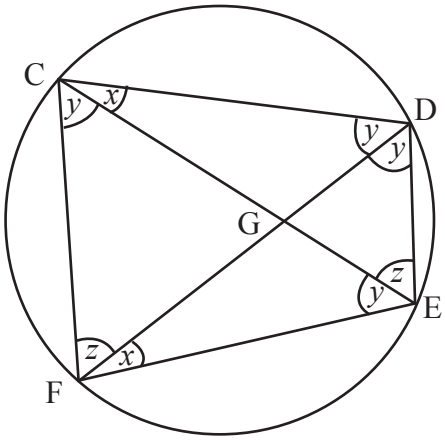
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			AVAILABLE MARKS
1	Median Quartiles limits	A1 A1 A1	3
2	$\frac{4x+1+4x-6}{12} = \frac{21}{12}$	MA1	
	$4x + 1 + 4x - 6 = 21$	MA1	
	$8x = 26$	MA1	
	$x = \frac{26}{8}$ **or** $\frac{13}{4}$ **or** 3.25	MA1	4
3	$14b$; $16g$	A1, A1	
	$\frac{14b+16g}{30}$	A1	3
4	**(a)** $\frac{5}{2}$	MA1	
	(b) $y = \frac{5}{2}x + 2$	MA1, MA1	3
5	**(a)** Angle ABE = 32°	A1	
	(b) Angle BAE = 116°	A1	
	(c) Angle BCE = 64°	A1	
	(d) Angle BED = 46°	A1	4
6			

Rational	Irrational
$\sqrt[3]{64}$	5π
$2.\dot{3}$	$\sqrt{30}$
1.62444	
$\frac{2\pi}{3\pi}$	

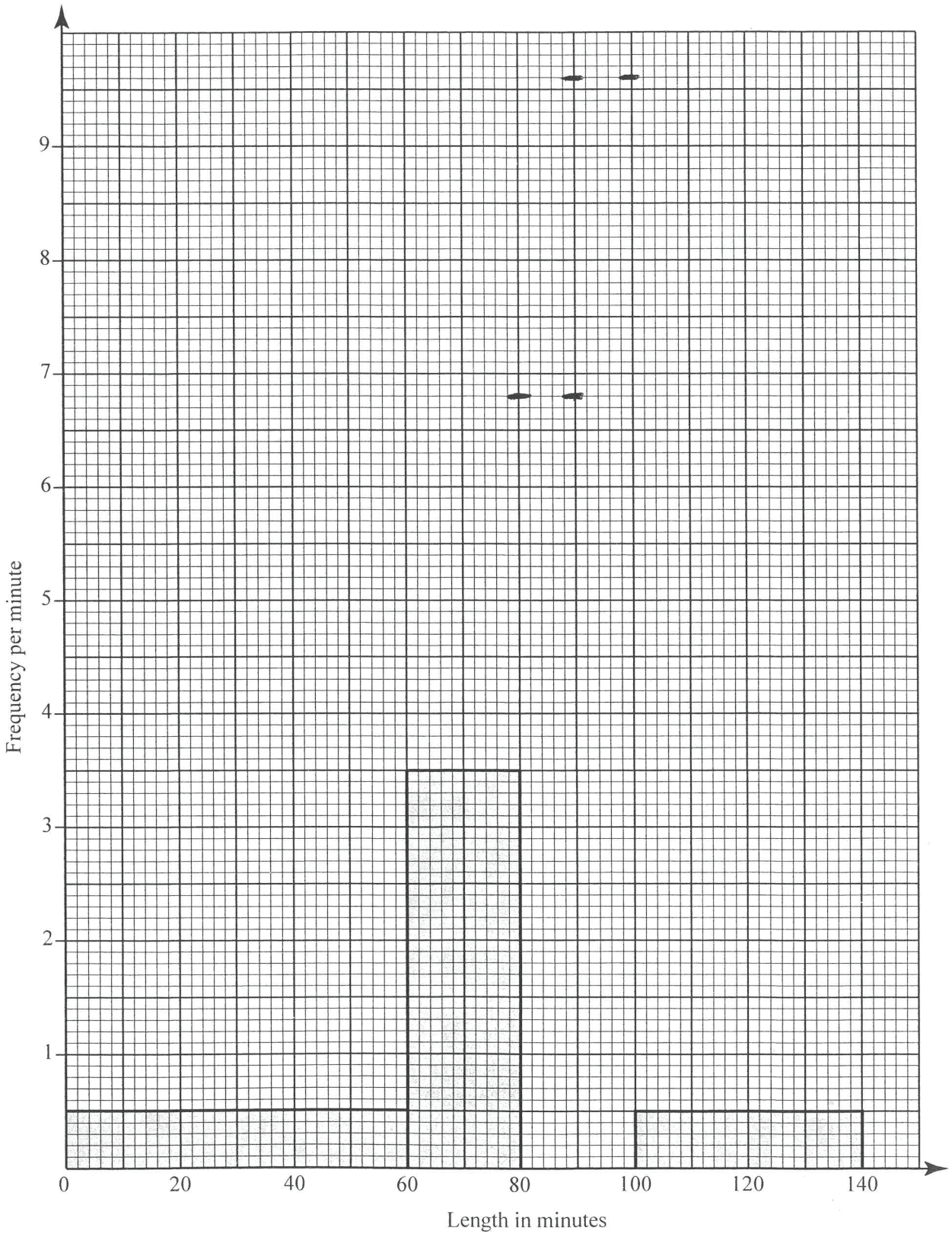
6 correct A2 (4 correct A1)	A2	2

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			AVAILABLE MARKS
7	**(a)** e.g. Only sampling Year 8 pupils	A1	
	(b) e.g. Pupils at end of list miss out	A1	
	(c) **(i)** $57 \times \frac{50}{600}$ or using $\frac{1}{12}$	MA1	
	$4.75 \rightarrow 5$	A1	
	(ii) No, because $82 \times \frac{50}{600} = 6.83\ldots \rightarrow 7$		
	and $41 \times \frac{50}{600} = 3.416\ldots \rightarrow 3$	MA2	6
8	$\frac{-1}{3}$	MA1	
	$y = -\frac{1}{3}x + 4$	MA1	2
9	**(a)** 70 and 20	A1, A1	
	(b) Two bars drawn to correct heights (6.8 and 9.6)	A1, A1	
	(c) 7.5 + 52.5	MA1	
	60	A1	
	(d) $\frac{x}{60} \times 20$ **or** $\frac{144}{40} = 3.6, 3.6 \times 20 = 72$	MA1	
	$\frac{x}{3}$ $h = \frac{x}{60} \times 20 = \frac{x}{3}$	A1	8
10	**(a)** $16^{\frac{1}{4}} = 2$ $2^3 = 8$	MA1, MA1	
	(b) $\left(\frac{8}{27}\right)^{-\frac{4}{3}} = \left(\frac{27}{8}\right)^{\frac{4}{3}} = \left(\sqrt[3]{\frac{27}{8}}\right)^4 = \left(\frac{3}{2}\right)^4 = \frac{81}{16}$	MA2	
	$0.25^{-2} = \left(\frac{1}{4}\right)^{-2} = 4^2 = 16$	MA1	
	$\frac{81}{\cancel{16}} \times \cancel{16} = 81$	A1	6
11			
	FÊC = FD̂C (= y) Angles at circumference standing on the same arc FĈE = FÊG (isosceles △) = y FĈE = FD̂E (= y) Angles on same arc EF̂D = EĈD (= x) Angles on same arc	MA1	
	CĜD = 180 – (x + y) (angles of △ CGD) FÊD = 180 (x + y) (angles of △ FED)	MA1	
	∴ CĜD = FÊD	MA1	3
		Total	**44**

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GCSE MATHEMATICS JANUARY 2012
MODULE N4–1
OVERLAY QUESTION 9



Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011

Mathematics

Module N4 Paper 1
(Non-calculator)
Higher Tier

[GMN41]

TUESDAY 31 MAY
9.15 am – 10.15 am

GMN41

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all ten** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
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INFORMATION FOR CANDIDATES

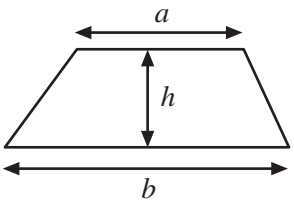
The total mark for this paper is 44.
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Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

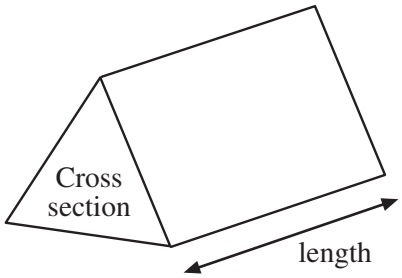
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Formula Sheet

Area of trapezium = $\frac{1}{2}(a + b)h$



Volume of prism = area of cross section × length

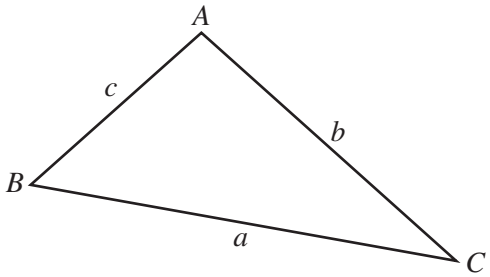


In any triangle *ABC*

Area of triangle = $\frac{1}{2}ab\sin C$

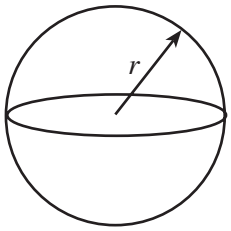
Sine rule : $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$



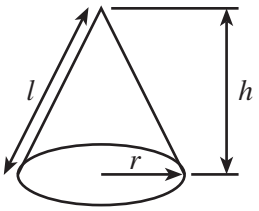
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



Quadratic equation:

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Examiner Only	
Marks	Remark

1 Solve the equation $\frac{2x-4}{5}+\frac{x+11}{2}=2$

Show your working.
A solution by trial and improvement will not be accepted.

Answer $x =$ _____ [4]

---

2 Calculate $2\frac{1}{3} \div 1\frac{1}{4}$

Give your answer as a mixed number.

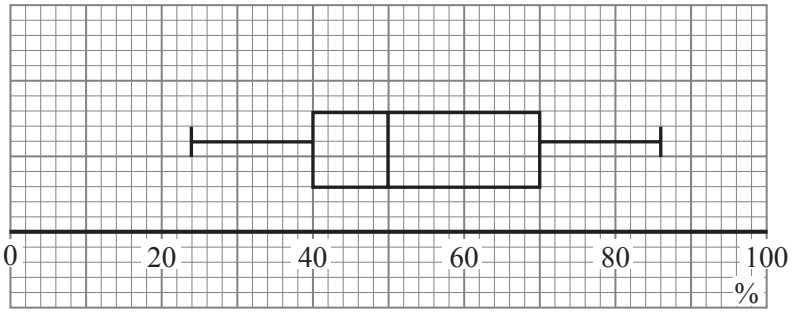
Answer _____ [3]

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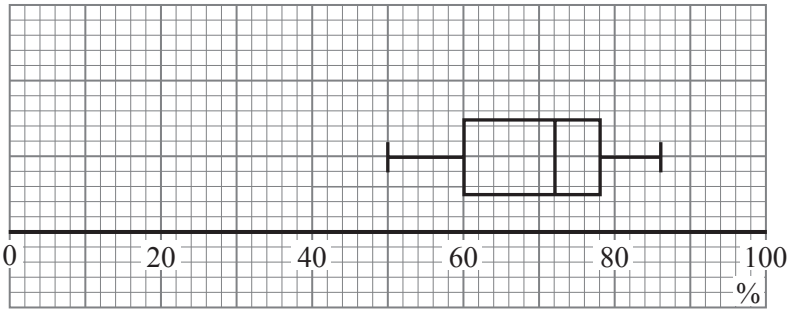
3 The box plots show the distribution of test results for two different classes.

Examiner Only	
Marks	Remark

Class P



Class Q



Comment on **two** differences between the classes.

(i) _____

_____ [1]

(ii) _____

_____ [1]

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Examiner Only	
Marks	Remark

4 **(a)** In the diagram O is the centre of the circle.
SOQ is a straight line.
Angle ORQ = 41° and angle PQS = 24°

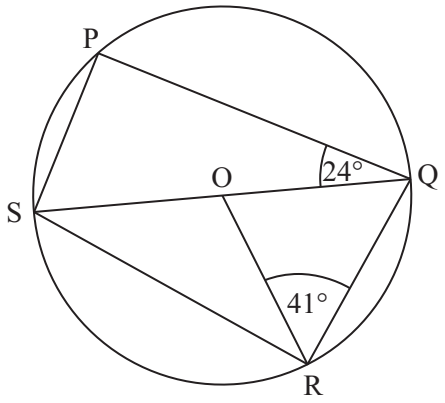


diagram not drawn accurately

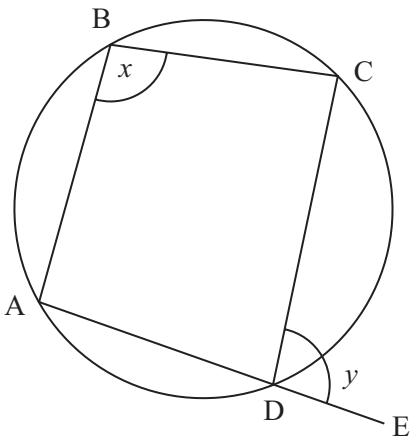
Find the size of the following angles:

(i) OQR = _____ ° [1]

(ii) PSQ = _____ ° [1]

(iii) PSR = _____ ° [1]

(b) Prove that the exterior angle of the cyclic quadrilateral equals the interior opposite angle (i.e. $x = y$)



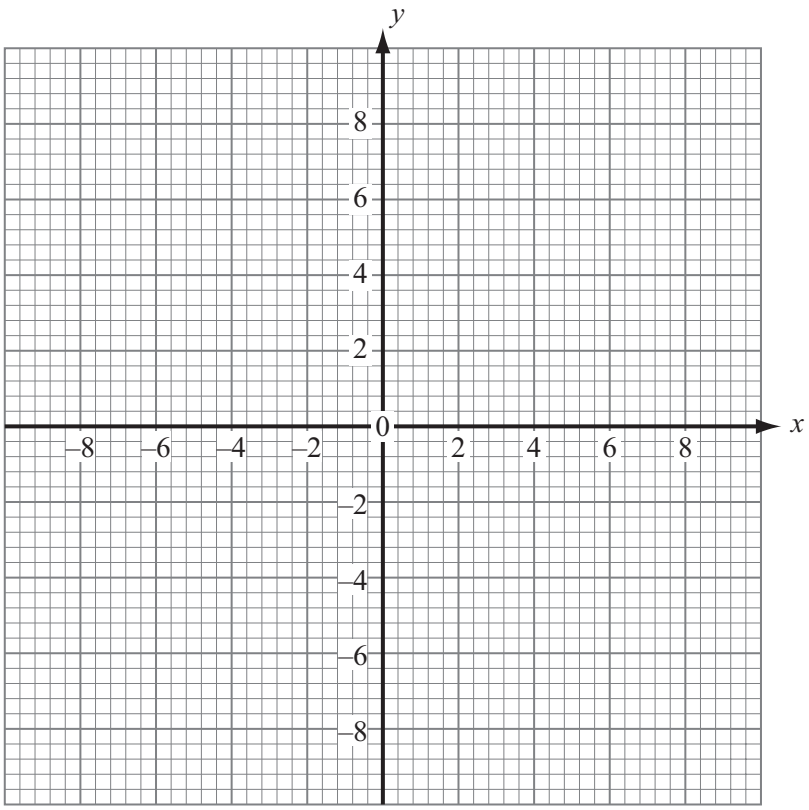
[3]

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Examiner Only	
Marks	Remark

5 **(a)** On the grid below show by shading and the letter R, the region represented by the inequalities

$y \leq 3x + 2$
$y \geq -6$
$2x + y \leq 7$



[3]

(b) Find the maximum value of $2x - y$, where x, y are integers, from a point of your solution set.

Answer _____ [2]

Examiner Only	
Marks	Remark

6 Triangles ABC and DEC are similar triangles.
Find the length of AD.

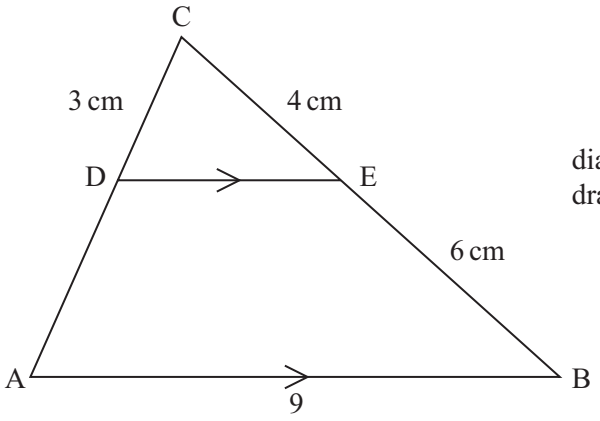


diagram not drawn accurately

Answer: AD = _____ cm [3]

---

7 Evaluate

(a) $81^{0.5}$

Answer _____ [1]

(b) $125^{\frac{2}{3}}$

Answer _____ [2]

(c) $32^{-0.4}$

Answer _____ [2]

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8 The table gives information about the weights of 100 children.

Weight, w kg	Number of children
$20 \leq w < 30$	16
$30 \leq w < 35$	28
$35 \leq w < 40$	36
$40 \leq w < 60$	18
$60 \leq w < 65$	2

Examiner Only

Marks	Remark

(a) Illustrate the data by drawing a histogram (A) on the graph paper opposite. [3]

(b) A stratified sample of 20 children was taken from those whose weight was less than 40 kg.

How many of the sample were taken from the interval $35 \leq w < 40$?

Answer _____ [2]

(c) The histogram (B) already drawn illustrates the weights of a different group of 100 children. Compare this histogram with the one you have drawn. Give two comparisons.

Comparison 1: _____

_____ [1]

Comparison 2: _____

_____ [1]

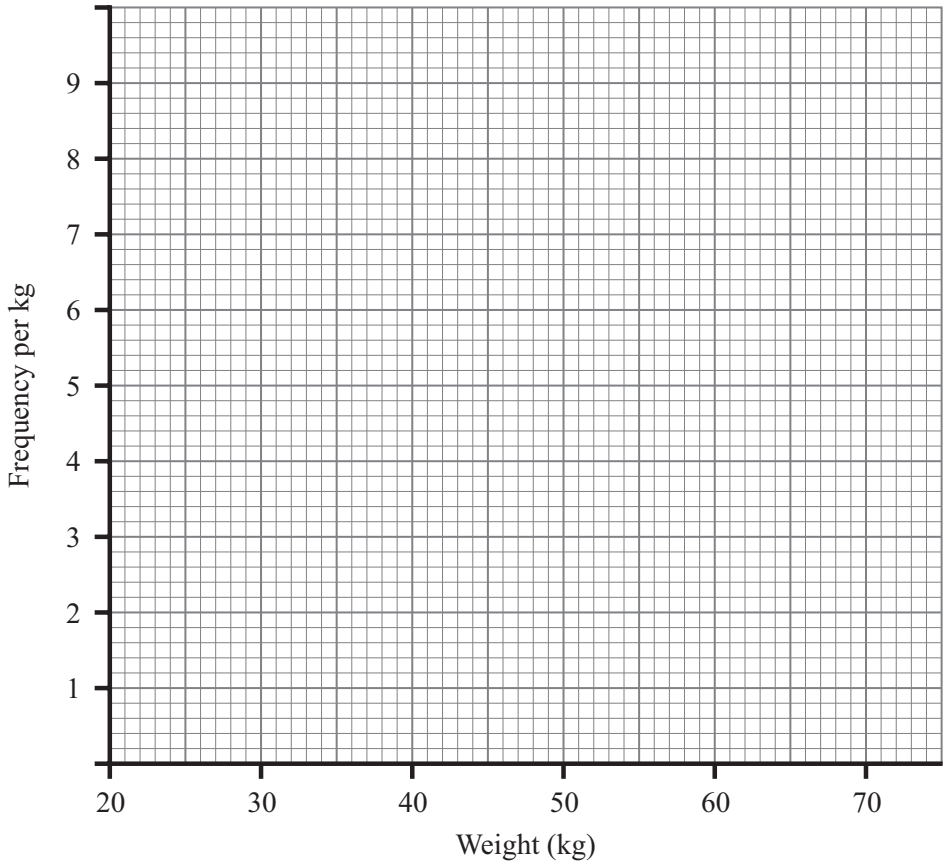
(d) Suggest a reason for the difference in the two histograms.

Answer _____

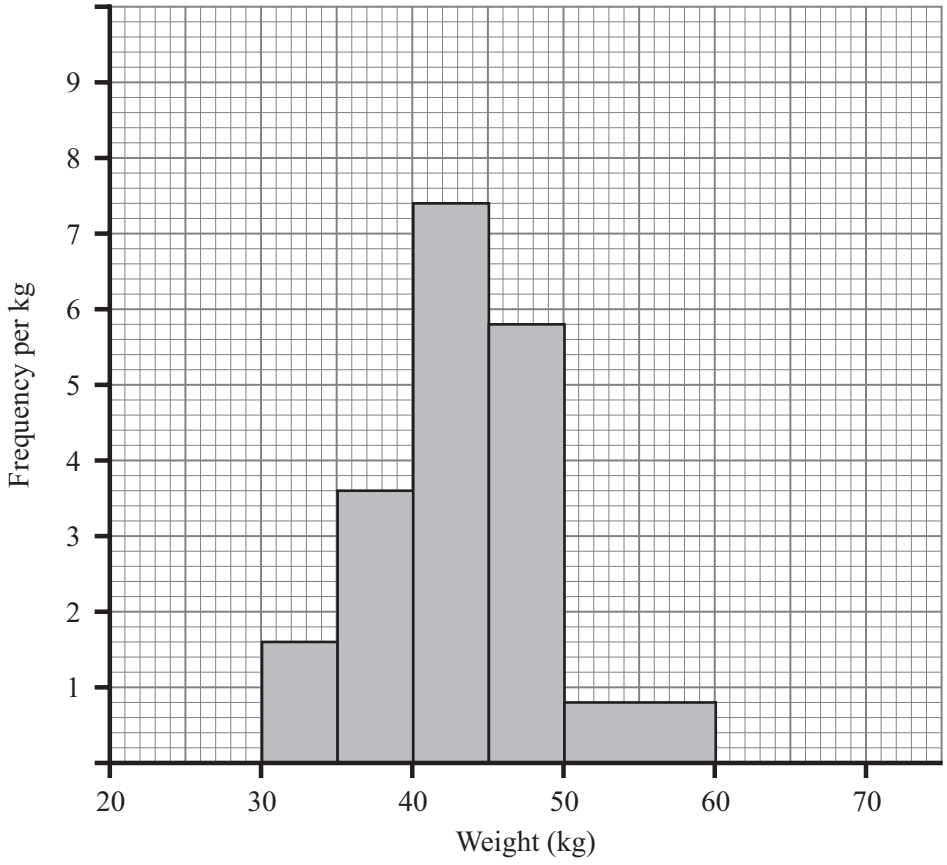
_____ [1]

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A



B



Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

9 The following equation has solutions which are rational.

$$\frac{8x^2}{3} = 6$$

Write down a **similar** equation with solutions which are **irrational**.

Explain your answer.

Answer _____ because _____

_____ [2]

---

10 Solve $\frac{10}{2x-5} + \frac{7}{x+2} = 3$

A solution by trial and improvement will not be accepted.

Answer _____ [6]

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THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
Summer 2011

Mathematics

Module N4 Paper 1
(Non-calculator)
Higher Tier

[GMN41]

TUESDAY 31 MAY
9.15 am – 10.15 am

MARK SCHEME

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Introduction

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M indicates marks for correct method.

A indicates marks for accurate working, whether in calculation, reading from tables, graphs or answers. Accuracy marks may depend on preceding **M** (method) marks, hence **M0 A1** cannot be awarded i.e. where the method is not correct no marks can be given.

MA indicates marks for combined method and accurate working.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

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(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

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General Marking Advice

(i) If the correct answer is seen in the body of the script and the answer given in the answer line is clearly a transcription error, full marks should be awarded.

(ii) If the answer is missing, but the correct answer is seen in the body of the script, full marks should be awarded.

(iii) If the correct answer is seen in working but a completely different answer is seen in the answer space, then some marks will be awarded depending on the severity of the error.

(iv) Work crossed out but not replaced should be marked.

(v) In general, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered (with no solution offered on the answer line), mark the poorest answer.

(vi) For methods not provided for in the mark scheme, give as far as possible equivalent marks for equivalent work.

(vii) Where a follow through mark is indicated on the mark scheme for a particular part question, the marker must ensure that you refer back to the answer of the previous part of the question.

(viii) Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures seen. E.g. the answer in the mark scheme is 4.65 and the candidate then correctly rounds to 4.7 or 5 on the answer line. Allow full marks for 4.65 seen in the working.

(ix) Anything in the mark scheme which is in brackets (...) is not required for the mark to be earned, but if present it must be correct.

(x) For any question, the range of answers given in the mark scheme is inclusive.

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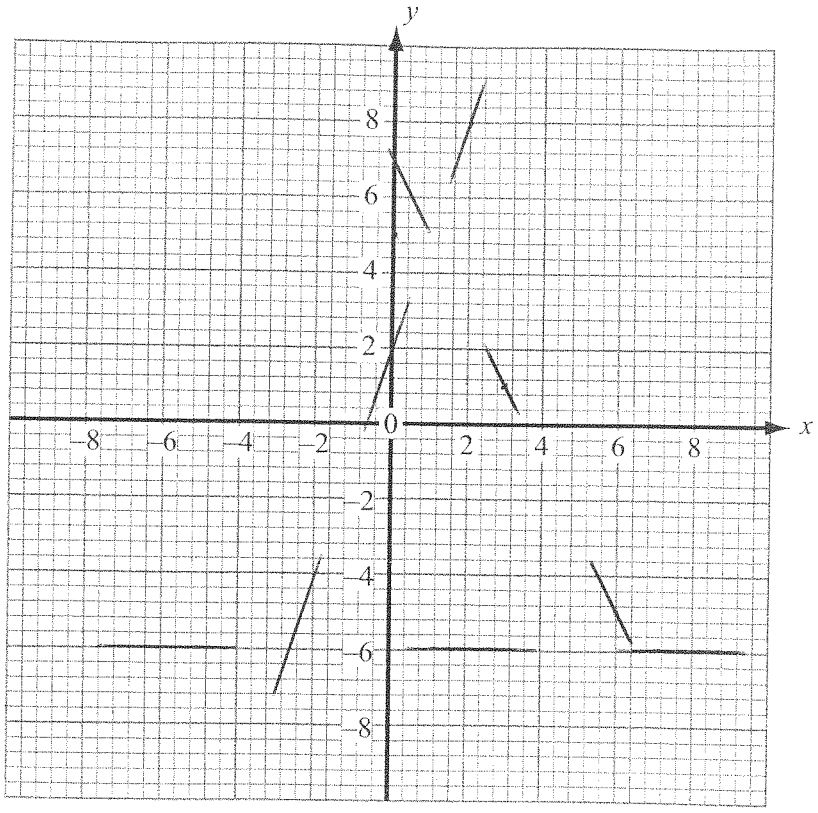
			AVAILABLE MARKS
1	$2(2x - 4) + 5(x + 11) = 20$	MA1	
	$4x - 8 + 5x + 55 = 20$	MA1	
	$9x + 47 = 20$	MA1	
	$9x = -27$		
	$x = -3$	MA1	4
2	$\frac{7}{3} \div \frac{5}{4}$	MA1	
	$\frac{7}{3} \times \frac{4}{5} = \frac{28}{15}$	MA1	
	$1\frac{13}{15}$	MA1	3
3	suitable comments e.g.		
	median and/or quartiles higher for class Q	A1	
	range or IQR or spread is greater for class P	A1	2
4	**(a)** **(i)** 41	A1	
	(ii) 66	A1	
	(iii) 115	A1	
	(b) ADC + x = 180 reason	A1	
	y + ADC = 180 reason	A1	
	so $x = y$	A1	6
5	**(a)** A1 for each correct line with shading		
	A3 {P1 if R not clearly identified}		
	(b) 18 $[2 \times 6 - (-6)]$	M1 A1	5
6	$\frac{4}{10} = \frac{3}{AC}$	MA1	
	$4AC = 30$	MA1	
	$AC = 7.5$		
	$AD = 4.5$	A1	3

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			AVAILABLE MARKS
7	**(a)** 9	A1	
	(b) $125^{\frac{2}{3}} = 5^2 = 25$	A1 A1	
	(c) $\frac{1}{32^{0.4}} = \frac{1}{4}$	M1 A1	5
8	**(a)** 1.6, 5.6, 7.2, 0.9, 0.4	M1 A1	
	graph	A1	
	(b) $\frac{36}{80} \times 20$	MA1	
	9	A1	
	(c) **(i)** weights of second group are on average higher	A1	
	(ii) weights of first group are more spread out	A1	
	(d) suitable reason e.g. first group could be girls and second group boys or second group could be older children	A1	8
9	suitable equation e.g. $\frac{5x^2}{3} = 6$, $\frac{8x^2}{3} = 7$	A1	
	suitable explanation e.g. $x^2 = \frac{18}{5}$, $x^2 = \frac{21}{8}$ making $x = \frac{\sqrt{18}}{\sqrt{5}}$, $x = \frac{\sqrt{21}}{\sqrt{8}}$ which is irrational	A1	2
10	$10(x + 2) + 7(2x - 5) = 3(2x - 5)(x + 2)$	M1	
	$10x + 20 + 14x - 35 = 3(2x^2 - 5x + 4x - 10)$	MA1	
	$24x - 15 = 6x^2 - 3x - 30$	MA1	
	$6x^2 - 27x - 15 = 0$	MA1	
	$3(2x^2 - 9x - 5) = 0$		
	$(2x + 1)(x - 5) = 0$	MA1	
	$x = -\frac{1}{2}$ or 5	MA1	6
		Total	**44**

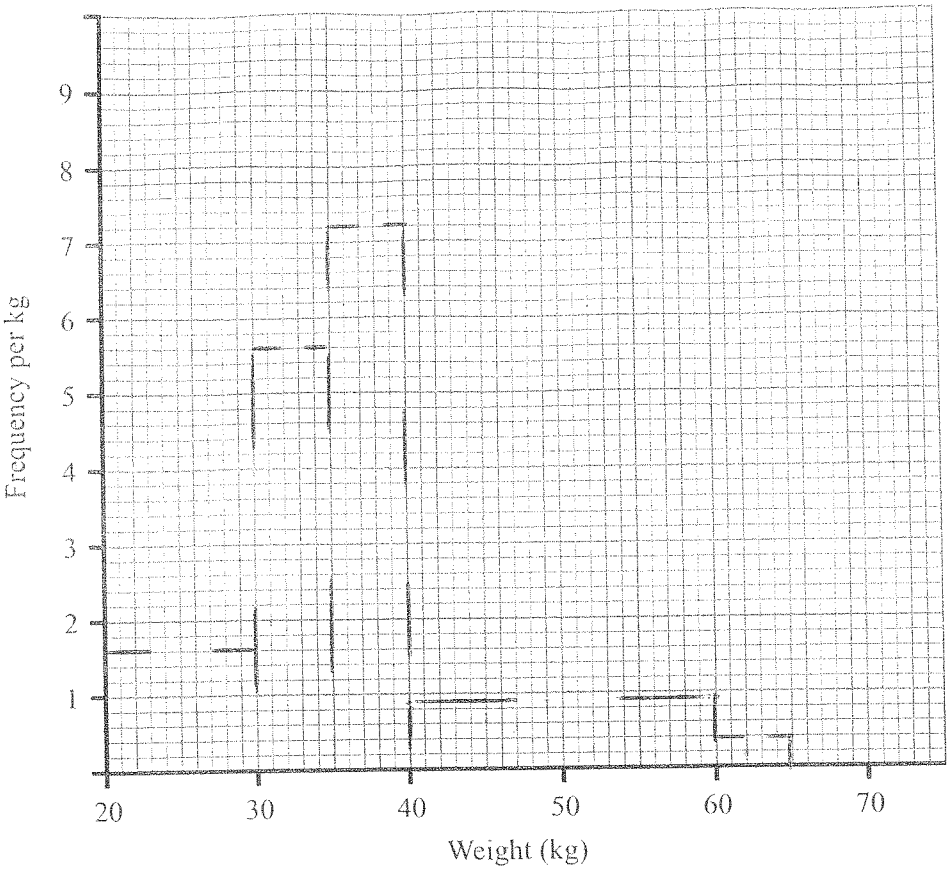
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GCSE MATHEMATICS SUMMER 2011
MODULE N4-1
OVERLAYS QUESTION 5A



GCSE MATHEMATICS SUMMER 2011
MODULE N4-1
OVERLAYS QUESTION 8A

A



Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
January 2011

Mathematics

Module N4 Paper 1
(Non-calculator)
Higher Tier

[GMN41]

TUESDAY 11 JANUARY
9.15 am – 10.15 am

GMN41

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eleven** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

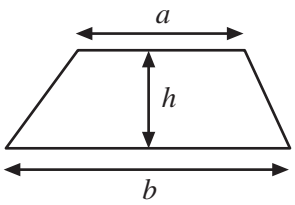
The total mark for this paper is 44.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a ruler, compasses, set-square and protractor.
The Formula Sheet is on page 2.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total Marks	

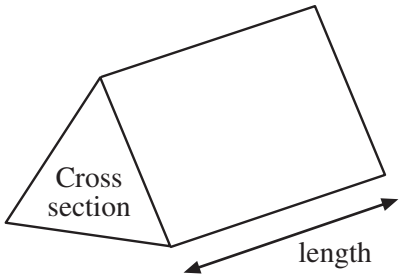
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Formula Sheet

Area of trapezium = $\frac{1}{2}(a + b)h$



Volume of prism = area of cross section × length

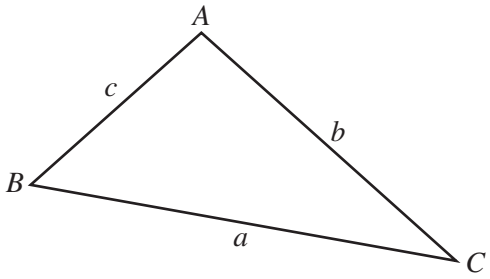


In any triangle *ABC*

Area of triangle = $\frac{1}{2}ab\sin C$

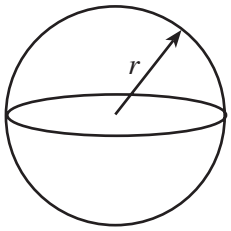
Sine rule : $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$



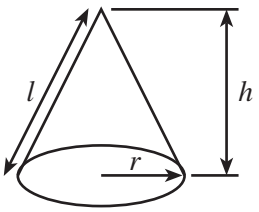
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



Quadratic equation:

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1 A green light flashes every 6 minutes while a red light flashes every 32 minutes.

Both lights flash together at 12 noon.

When is the next time that both lights will flash together?

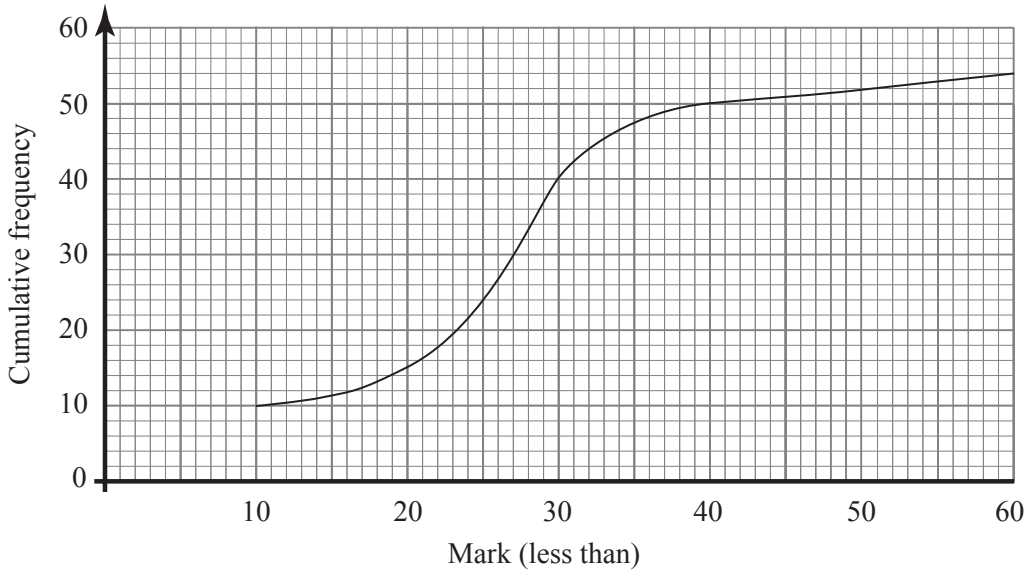
Answer _____ [2]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

2



The cumulative frequency graph above illustrates the marks scored by pupils in a Physics test.

(a) Estimate the median mark.

Answer _____ [1]

(b) Estimate the interquartile range.

Answer _____ [2]

(c) The pass mark was set at 34. Estimate the number of pupils who passed.

Answer _____ [2]

---

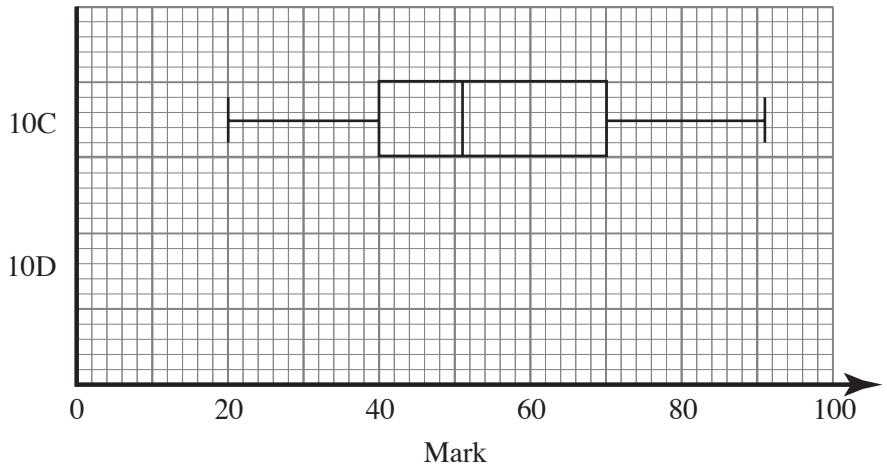
3 Solve the simultaneous equations $4x - 2y = 19$
$2x - 2y = 9$

Show all working

Answer $x =$ ___ $y =$ ___ [2]

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4 The box plot shows the marks in a test for class 10C.



(a) Class 10D did the same test and the median mark was 52, the lower quartile was 35, the upper quartile was 82, the lowest mark was 22 and the highest mark was 93.

Draw a box plot for 10D on the grid above. [2]

(b) The head of the mathematics department says that these classes performed similarly in the test. Do you agree with her comment? Give **two** reasons to support your decision.

Answer _____ because _____

_____

_____ [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

5 **(a)** The diagram shows a circle with centre O.

A, B and C are three points on the circumference of the circle.

Angle AOC is 130°

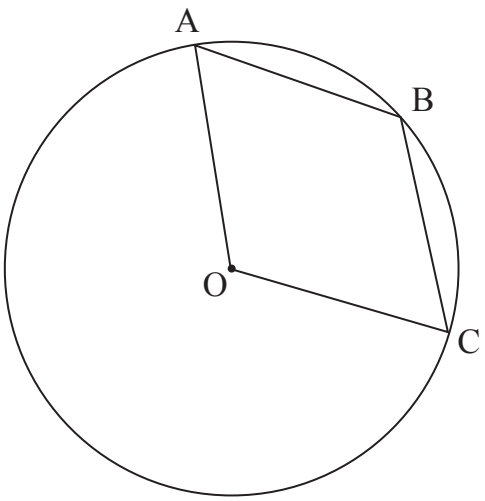


Diagram not drawn accurately.

(i) Explain why angle ABC is 115°

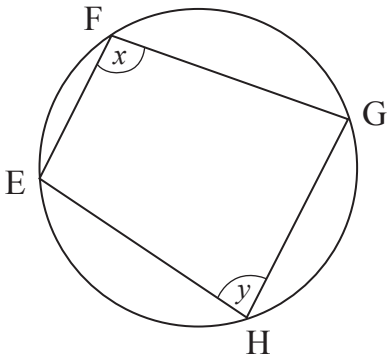
[2]

(ii) The lengths AB and OB are equal. Calculate angle OBC.

Answer _____ ° [1]

Examiner Only	
Marks	Remark

(b)



Prove that opposite angles of a cyclic quadrilateral add up to 180°

[3]

6 **(a)** Expand and simplify

$(5a - d)(a + 2d)$

Answer _____ [3]

(b) Factorise

$6cd - 7c - 6d + 7$

Answer _____ [2]

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7 Evaluate

(a) $16^{1.5} \times 2^{-4}$

Answer _____ [2]

(b) $81^{-\frac{3}{4}}$

Answer _____ [2]

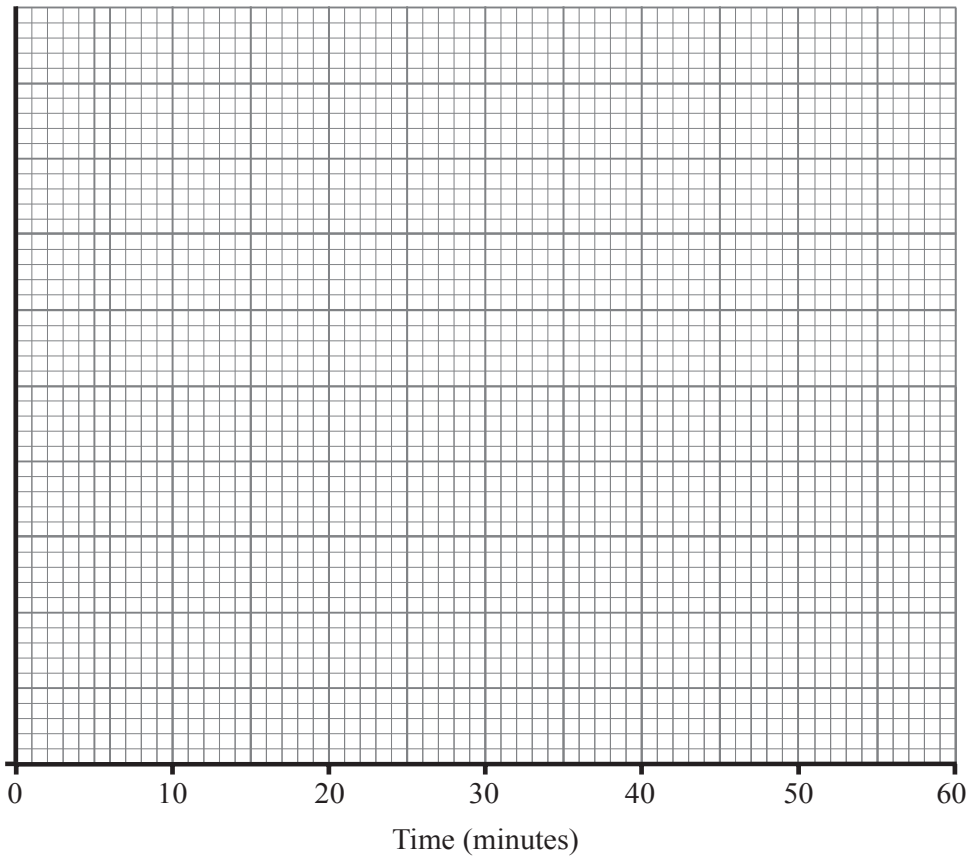
Examiner Only	
Marks	Remark

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8 The times taken by a group of men to complete a questionnaire were recorded.

Time (t minutes)	Frequency
$0 < t \leq 5$	36
$5 < t \leq 15$	60
$15 < t \leq 20$	49
$20 < t \leq 35$	30
$35 < t \leq 60$	25

(a) Draw on the axes provided a clearly labelled histogram to illustrate this data.



[3]

(b) A stratified sample of 18 men is required from the men who took more than 25 minutes to complete the questionnaire. Calculate an estimate for how many of the stratified sample took more than 35 minutes.

Answer _____ [3]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

9 **(a)** Given that sin 30° = 0.5 write down the value of sin 210°

Answer _____ [1]

(b) Complete the blank with a different angle between 0° and 360°

cos _____ = cos 120° [1]

---

10 Which of these equations has a rational solution?

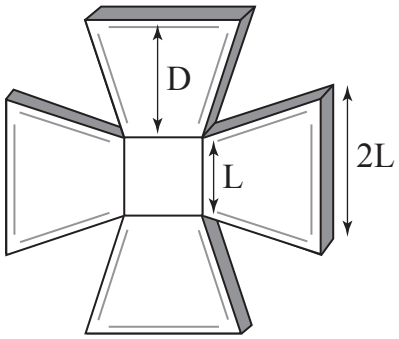
A: $\frac{2}{5}x^3 = 36$, B: $\frac{3}{5}x^2 = 54$, C: $\frac{2}{5}x^3 = 50$

Answer _____ [2]

Explain your answer.

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11



The medal shown is cut from a square block of bronze, side L + 2D cm and thickness $\frac{1}{4}$L cm.

The centre piece is a square of side L with its sides parallel to the original square.

Find an expression, in terms of L and D, for the volume of bronze wasted.

Answer _____ cm^3 [6]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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General Certificate of Secondary Education
January 2011

Mathematics

Module N4 Paper 1
(Non-calculator)
Higher Tier

[GMN41]

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9.15 am – 10.15 am

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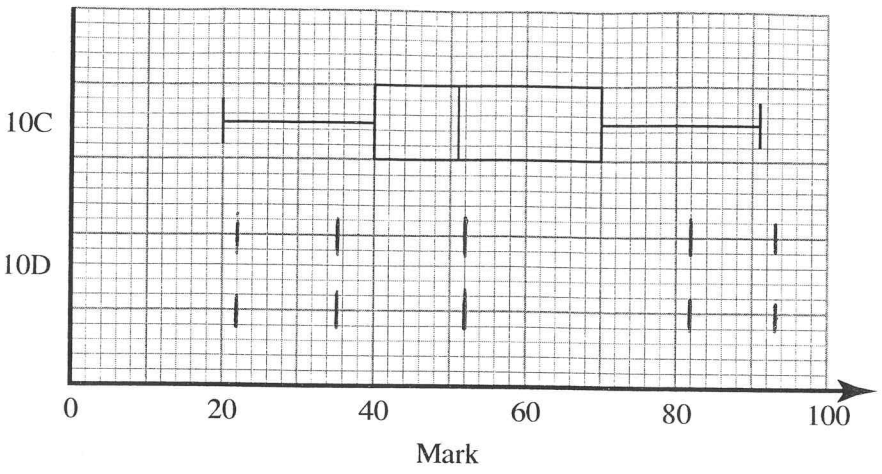
			AVAILABLE MARKS
1	every 96 mins 1.36 pm	MA1 A1	2
2	**(a)** 26	A1	
	(b) IQ readings value	MA1, A1	
	(c) correct reading at 34 54 − reading 46 = 8	MA1 MA1	5
3	$2x = 10$ $x = 5$ $20 - 2y = 19$ $2y = 1$ $y = \frac{1}{2}$	MA1 MA1	2
4	**(a)** Median and Quartiles correct Extreme values	MA1 MA1	
	(b) If yes − approx same median, same range **OR** If no − two acceptable reasons	MA2 MA2	4
5	**(a)** **(i)** AOC reflex = 360 − 130 = 230° ABC = $\frac{1}{2}$(230) = 115° because angle at circumference = $\frac{1}{2}$ angle at centre.	MA1 A1	
	(ii) 55°	MA1	
	(b) Angle at centre = $2x$ and angle at centre = $2y$ (angle at centre is twice angle at circumference) $2x + 2y = 360$ $x + y = 180$	MA1 MA1 A1	6
6	**(a)** $5a^2 + 10ad - ad - 2d^2$ $5a^2 + 9ad - 2d^2$	MA2 A1	
	(b) $c(6d - 7) - 1(6d - 7)$ $(c - 1)(6d - 7)$	MA1 A1	5

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				AVAILABLE MARKS
7	**(a)**	$64 \times \frac{1}{16}$	MA1	
		$= 4$	A1	
	(b)	$81^{\frac{3}{4}} = 27$	MA1	
		$\frac{1}{27}$	A1	4
8	**(a)**	scale marked or shown	MA1	
		5 blocks correct	MA2	
	(b)	> 25 mins $= \frac{2}{3} \times 30 + 25 = 45$ > 35 mins $= 25$	MA1	
		$\frac{18}{45} \times 25 = 10$	M1 A1	6
9	**(a)**	-0.5	A1	
	(b)	240°	A1	2
10		$x^3 = 90, x^2 = 90, x^3 = 125$ so $x = 5$	MA1	
		C	A1	2
11	Area of front face of Medal	$= 4 \times \frac{1}{2}(2L + L)\,D + L^2$	M1 A1	
		$= 4\,(\frac{3}{2}LD) + L^2$		
		$= 6LD + L^2$	A1	
	Area Wasted	$= (L + 2D)^2 - (6LD + L^2)$		
		$= L^2 + 4LD + 4D^2 - 6LD - L^2$	MA1	
		$= 4D^2 - 2LD$	MA1	
	Volume Wasted	$= \frac{1}{4}L\,(4D^2 - 2LD)$		
		$= LD^2 - \frac{1}{2}L^2D$	MA1	6
			Total	44

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GCSE MATHEMATICS JANUARY 2011
MODULE N4-1
OVERLAY QUESTION 4



Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2010

Mathematics



Module N4 Paper 1
(Non-calculator)
Higher Tier

[GMN41]

GMN41

TUESDAY 1 JUNE

9.15 am – 10.15 am

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all ten** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

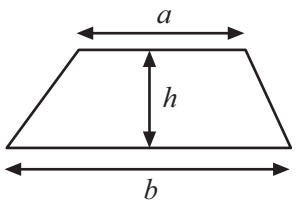
The total mark for this paper is 44.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a ruler, compasses, set-square and protractor.
The Formula Sheet is on page 2.

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

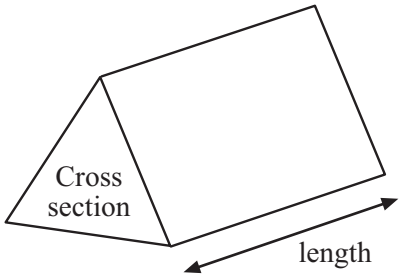
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Formula Sheet

Area of trapezium $= \frac{1}{2}(a + b)h$



Volume of prism = area of cross section × length

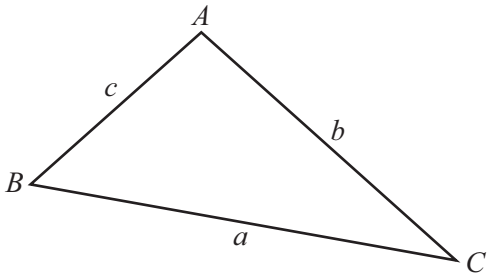


In any triangle ABC

Area of triangle $= \frac{1}{2}ab\sin C$

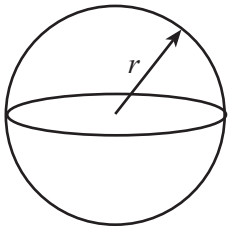
Sine rule : $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$



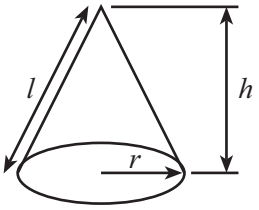
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$



Quadratic equation:

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Examiner Only	
Marks	Remark

1 Solve the equation $\frac{4x+3}{10}+\frac{6x-5}{5}=\frac{13}{2}$

Answer $x =$ _____ [4]

---

2 **(a)** Find the equation of the line passing through the points $(0, 1)$ and $(2, 9)$.

Answer _____ [3]

(b) Find the exact length of the line from $(4, -7)$ to $(-1, 5)$.

Answer _____ [3]

(c) Find the equation of the line through $(0, 2)$ perpendicular to the line $y = 5x$.

Answer _____ [2]

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3 **(a)** Solve

(i) $2^x = 1$

Answer $x =$ _____ [1]

(ii) $2^y = \frac{1}{16}$

Answer $y =$ _____ [1]

(b) Evaluate $16^{-\frac{3}{4}}$

Answer _____ [2]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

4 **(a)** Draw the lines $y = 2x + 4$, $y = 8 - x$ and $y = 2$ on the grid below. Indicate clearly, using shading, the region R where

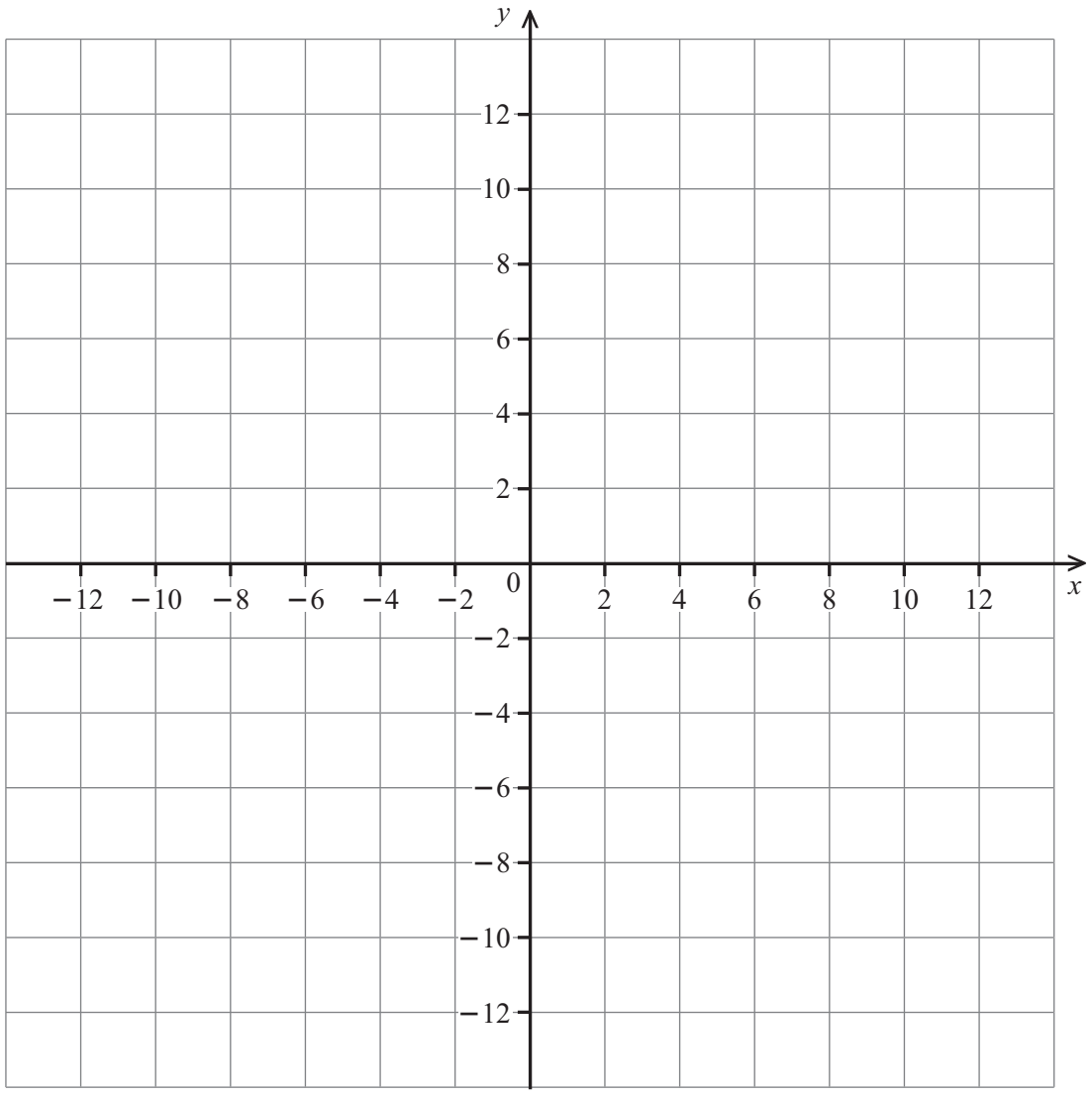
$$y \leqslant 2x + 4,\ y \leqslant 8 - x \text{ and } y \geqslant 2 \qquad [3]$$

(b) **(i)** Find the least value of x for which (x, y) satisfies all the inequalities.

Answer _____ [1]

(ii) Find the greatest value of $2y + 3x$ for which (x, y) satisfies all the inequalities.

Answer _____ [2]



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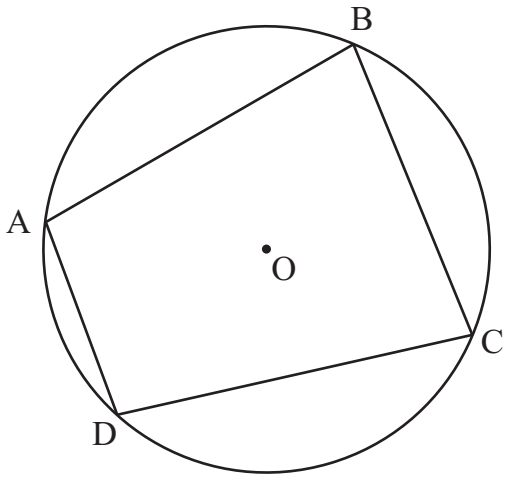
Examiner Only	
Marks	Remark

5 Twenty planks of wood are purchased at a local shop.
Each plank is 2.6 m long, measured to the nearest 0.1 of a metre.
Find the least and greatest possible **total** length of all the planks.

Answer Least _____ m [1]

Greatest _____ m [1]

6



Prove that the opposite angles of a cyclic quadrilateral add up to 180°.

[3]

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Examiner Only	
Marks	Remark

7 **(a)** Write down a rational number between $\frac{1}{9}$ and $\frac{1}{10}$

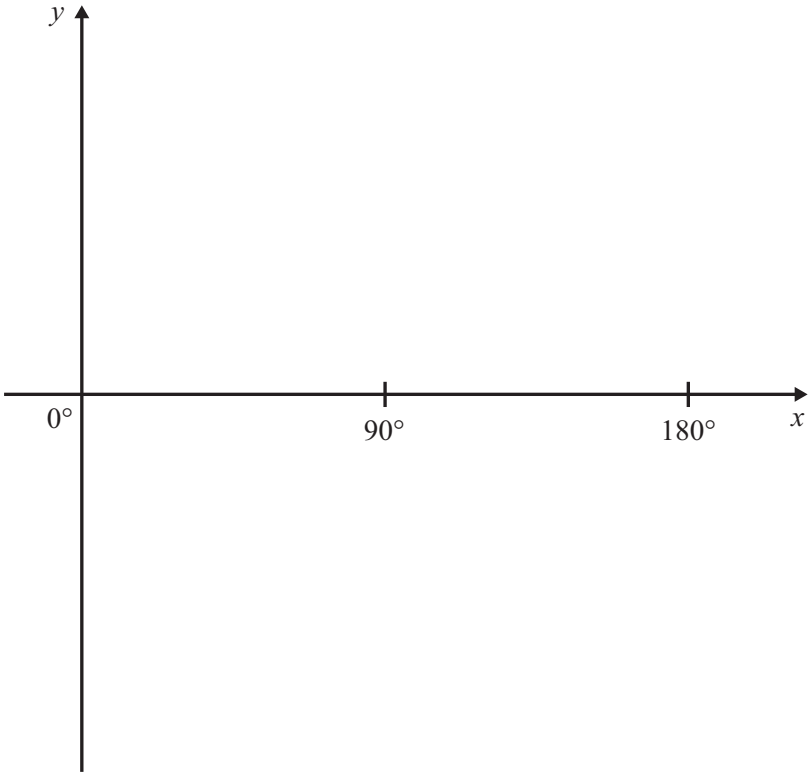
Answer _____ [1]

(b) Write down an irrational number between 9 and 10

Answer _____ [1]

---

8 Sketch the graph of $y = \tan x$ on the axes provided.



[2]

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Examiner Only	
Marks	Remark

9 **(a)** The mean weekly wage of supermarket workers in Bargn Buys is £160 and in Hot Deals is £200
Would the combined mean weekly wage be £180?

Answer _____

Explain your answer.

[2]

(b) There are 100 Year 12 pupils in Mullan Comprehensive. There are 50 boys and 50 girls. A survey is to be carried out to discuss changes to the school uniform. Fourteen Year 12 pupils are needed for this survey.

(i) Each Year 12 is given a number from 1 to 100
The numbers 1 to 100 are written on a piece of paper and placed in a hat.
Fourteen numbers are picked out and the pupils with those numbers are selected for the survey.
State **one** disadvantage of this method.

[2]

(ii) Suggest a more suitable way of choosing the sample.

[2]

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10 Solve the simultaneous equations $y = 2x - 9$

$x^2 + 2y^2 = 243$

Examiner Only	
Marks	Remark

Answer _____ [7]

THIS IS THE END OF THE QUESTION PAPER

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GCSE

Mathematics (Modular)

Summer 2010

Mark Schemes

Issued: October 2010

STEMUP.CO.UK

General Certificate of Secondary Education
2010

Mathematics

Module N4 Paper 1
(Non-calculator)
Higher Tier

[GMN41]

TUESDAY 1 JUNE

9.15 am – 10.15 am

MARK SCHEME

STEMUP.CO.UK

GCSE MATHEMATICS 2010

Introduction

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The marks awarded for each question are shown in the right hand column and they are prefixed by the letters **M, A** and **MA** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.

A indicates marks for accurate working, whether in calculation, readings from tables, graphs or answers.

MA indicates marks for combined method and accurate working.

The solution to a question gains marks for correct method and marks for an accurate working based on this method. Where the method is not correct no marks can be given.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

It should be noted that where an error trivialises a question, or changes the nature of the skills being tested, then as a general rule, it would be the case that not more than half the marks for that question or part of that question would be awarded; in some cases the error may be such that no marks would be awarded.

Positive marking:

It is our intention to reward candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier only a proportion of the marks will be available (based on the professional judgement of the examiner).

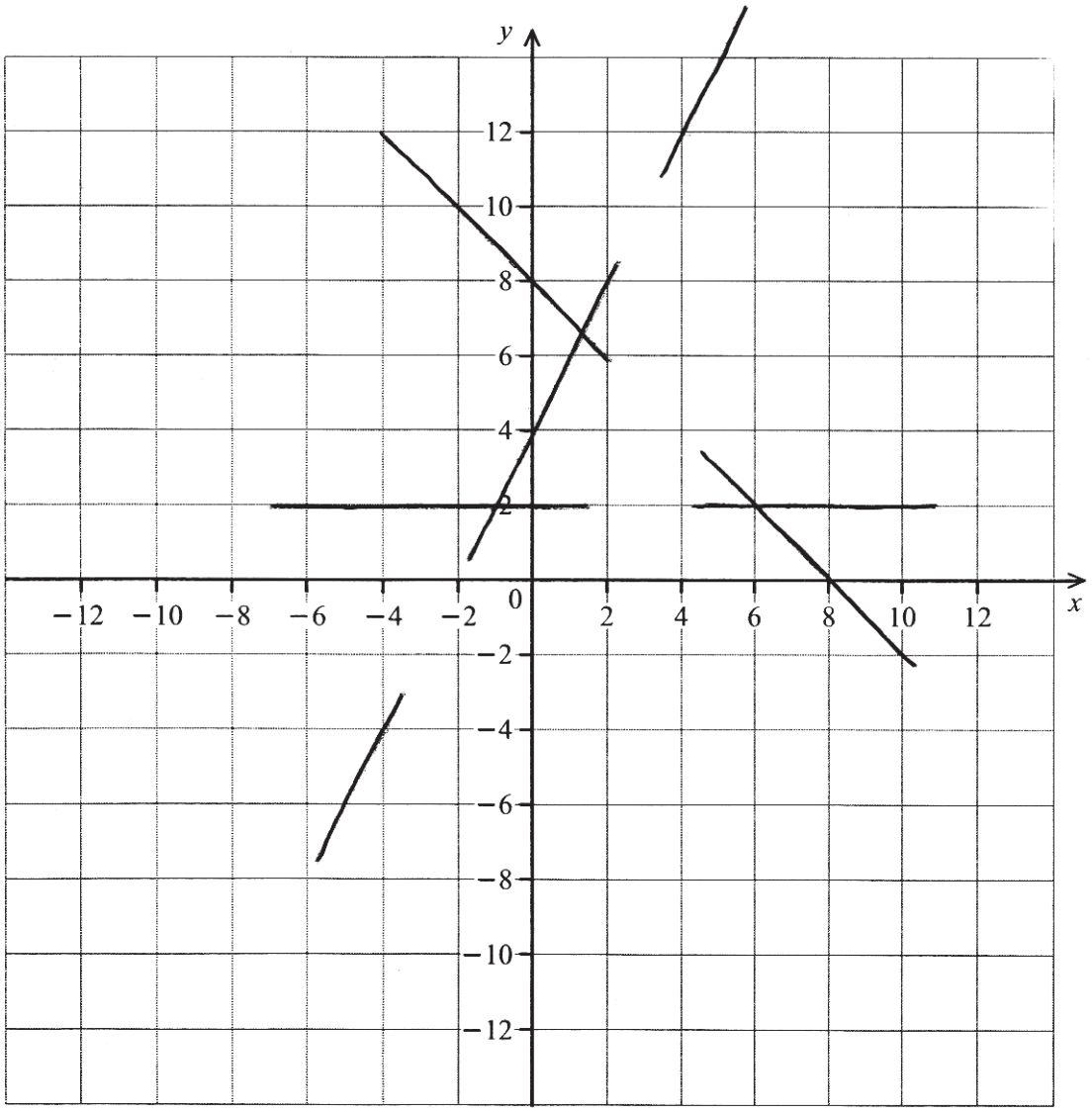
			AVAILABLE MARKS
1	$\frac{4x+3+12x-10}{10} = \frac{65}{10}$ **or** $\frac{13}{2}$	MA1	
	$4x + 3 + 12x - 10 = 65$	MA1	
	$16x = 72$	MA1	
	$x = \frac{9}{2}$	MA1	4
2	**(a)** gradient $= (9 - 1)/(2 - 0) = 4$	M1, A1	
	$y = 4x + 1$	MA1	
	(b) Length $= \sqrt{5^2 + 12^2}$	M1, A1	
	$= \sqrt{(25 + 144)} = \sqrt{169} = 13$	A1	
	(c) $y = -\frac{1}{5}x + 2$	A1, A1	8
3	**(a) (i)** 0	A1	
	(ii) −4	A1	
	(b) $\frac{1}{(\sqrt[4]{16})^3}$	MA1	
	$= \frac{1}{8}$	A1	4
4	**(a)** See overlay		
	correct side of $y = 2x + 4$	MA1	
	correct side of $y = 8 - x$	MA1	
	correct side of $y = 2$	MA1	
	(b) (i) −1	MA1	
	(ii) (6, 2)	MA1	
	22	A1	6
5	Least $20 \times 2.55 = 51$	MA1	
	Greatest $20 \times 2.65 = 53$	MA1	2

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			AVAILABLE MARKS
6	Angle AOC = 2 × angle ABC (angle at centre twice angle at circumference) Reflex angle AOC = 2 × angle ADC (same reason)	MA1	
	AOC + reflex AOC = 360° = 2 (ABC + ADC)	MAI	
	So ABC + ADC = 180°	A1	3
7	**(a)** 0.1 < decimal < 0.11111 ... **or** $\frac{1}{10}$ < fraction < $\frac{1}{9}$ such as $\frac{19}{180}$	A1	
	(b) suitable value e.g. $\sqrt{85}$, $\sqrt{99}$, 3π	A1	2
8	Central section correct	MA1	
	Both outer sections correct	MA1	2
9	**(a)** Same number of workers in each supermarket will result in mean being £180	A1	
	A different number of workers will not produce this mean	A1	
	(b) **(i)** The 14 selected could be all boys or all girls	A2	
	(ii) Suitable method	A2	6
10	$x^2 + 2(2x - 9)^2 = 243$	MA1	
	$x^2 + 2(4x^2 - 36x + 81) = 243$	MA1	
	$9x^2 - 72x - 81 = 0$ **or** $x^2 - 8x - 9 = 0$	A1	
	$9(x - 9)(x + 1) = 0$ **or** $(x - 9)(x + 1) = 0$	MA2	
	$x = 9$ and $y = 9$	MA1	
	$x = -1$ and $y = -11$	MA1	7
		Total	**44**

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GCSE MATHEMATICS SUMMER 2010
MODULE N4-1
OVERLAYS QUESTION 4



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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
January 2010

Mathematics



Module N4 Paper 1
(Non-calculator)
Higher Tier

[GMN41]

GMN41

TUESDAY 12 JANUARY

9.15 am – 10.15 am

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all fourteen** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

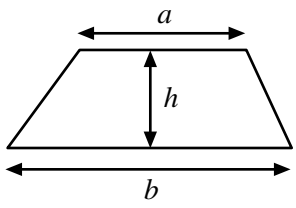
The total mark for this paper is 44.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a ruler, compasses, set-square and protractor.
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For Examiner's use only	
Question Number	Marks
1	
2	
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11	
12	
13	
14	
Total Marks	

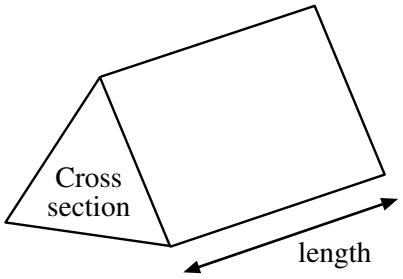
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Formula Sheet

Area of trapezium = $\frac{1}{2}(a + b)h$



Volume of prism = area of cross section × length

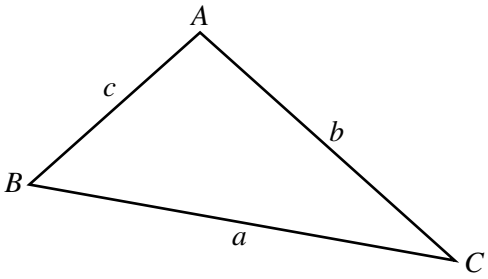


In any triangle ABC

Area of triangle = $\frac{1}{2}ab\sin C$

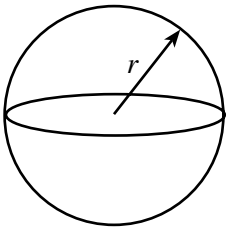
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$



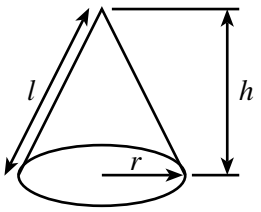
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



Quadratic equation:

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Examiner Only	
Marks	Remark

1 A new HD ready TV was sold at the reduced price of £434 because the surround was slightly damaged.

30% of the original price had been deducted.
What was the original price?

Answer £ _____ [3]

---

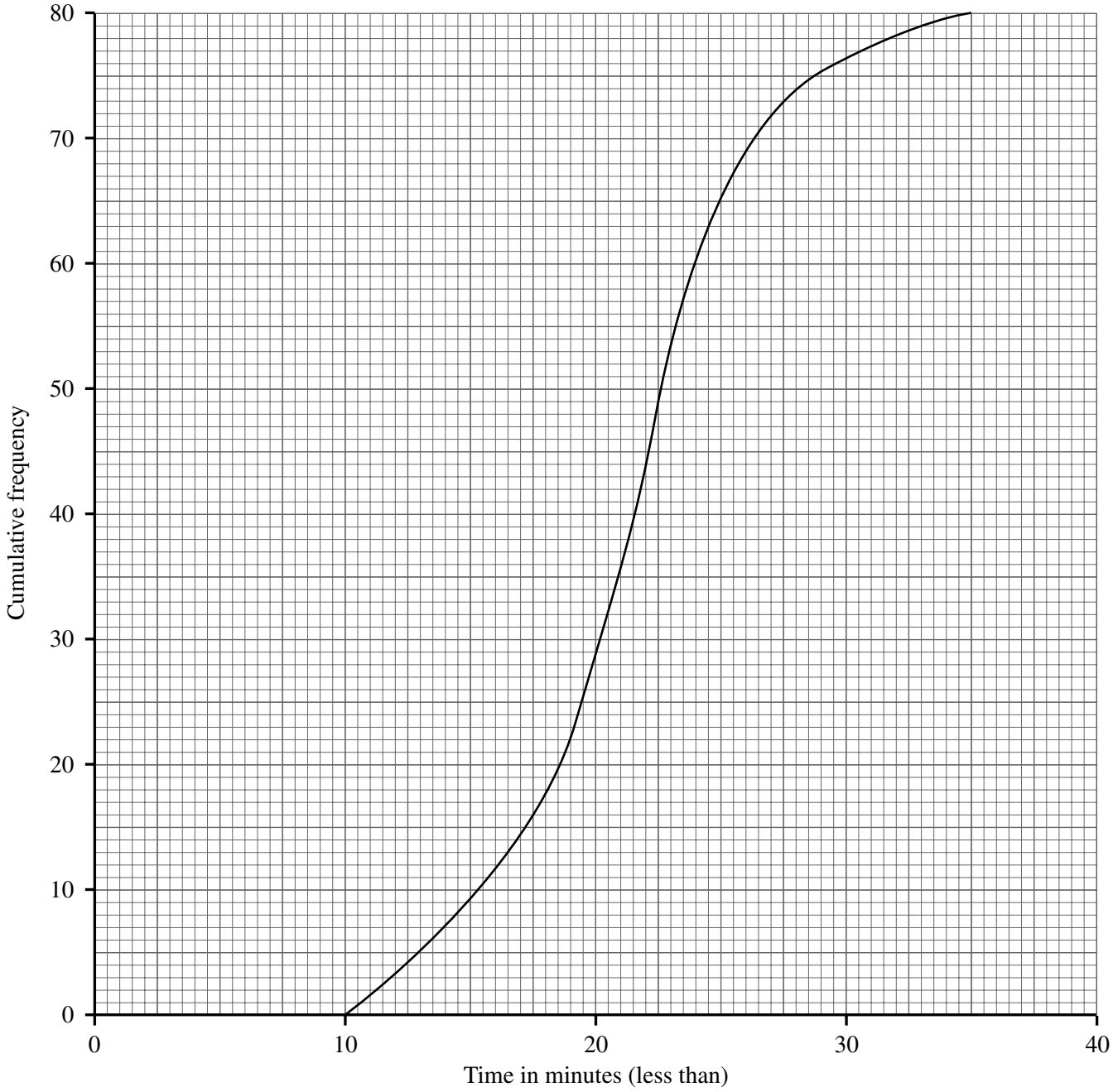
2 Bags of potatoes weigh 15 kg to the nearest kilogram.
Find the greatest and least total weights of 10 of these bags.

Answer greatest _____ kg

least _____ kg [2]

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3 The time taken by a number of adults to complete a Sudoku puzzle was recorded.
The cumulative frequency graph for the results is shown.



Use the graph to estimate

(a) the median time,

Answer _____ minutes [1]

(b) the interquartile range,

Answer _____ minutes [2]

(c) the **percentage** of adults who took more than 28 minutes to complete the puzzle.

Answer _____ % [2]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

4 A, B, C and D are points on the circumference of a circle with centre O.
Angle DAC = 20°

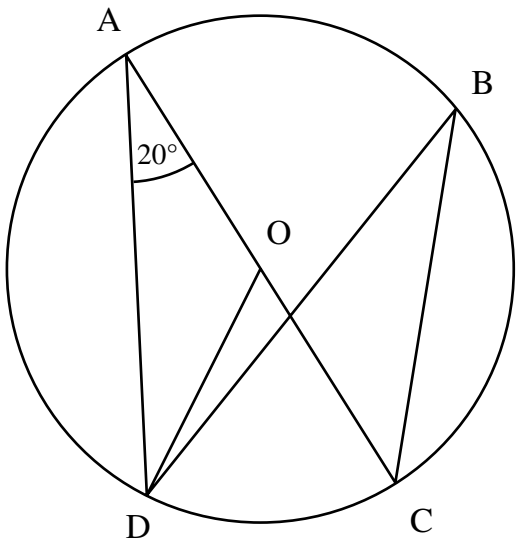


Diagram not drawn accurately

(a) Find the size of angles:

(i) DOC, Answer _____ ° [1]

(ii) ADC. Answer _____ ° [1]

(b) Explain why angle DBC = 20°

Answer _____ [1]

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5 A questionnaire designed to gather information on the use of the local library included the question:

'How many times have you visited your local library in the last year?'

less than 5 ☐ **5–10** ☐ **10 or more** ☐

Explain why this is unsuitable in its present form.

Answer _____[1]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

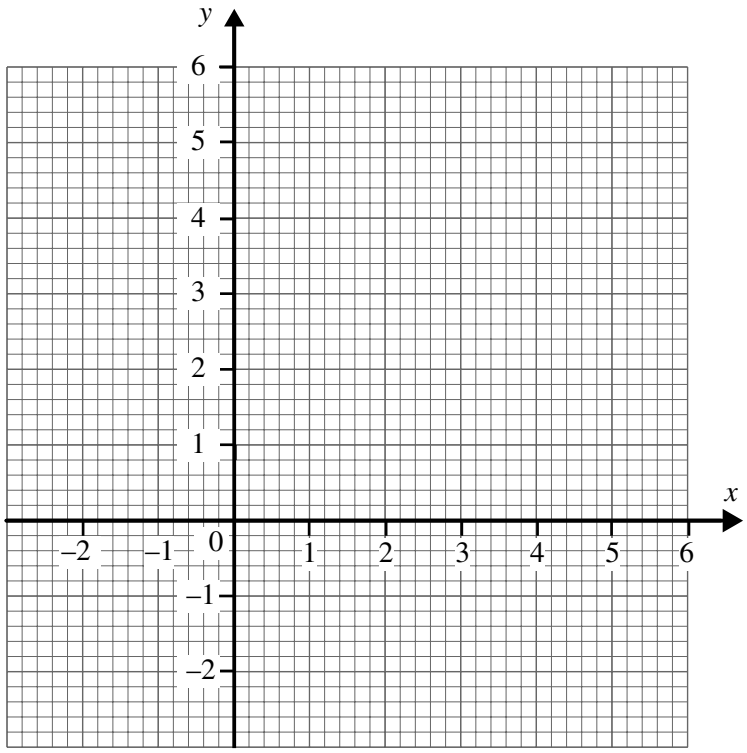
6 **(a)** On the grid below, draw the lines $3x + 4y = 12$

$$y = 3 - 3x$$

and $y = -1$

Hence indicate clearly the region R where

$3x + 4y \leqslant 12 \quad y \geqslant 3 - 3x \quad$ and $\quad y \geqslant -1$



[3]

(b) Use your graph to find the minimum value of $x + 3y$ which satisfies these inequalities when x and y are integers.

Answer _____ [2]

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7 The table shows the number of employees working in various departments of a supermarket chain.

Department	Fruit & Veg.	Frozen Food	Meat & Fish	Tinned & Dried Food	Bakery
Number of employees	30	90	75	75	180

A survey on job satisfaction is to be carried out.

(a) Explain why a simple random sample of employees is unsuitable.

_____

_____ [2]

(b) A stratified sample of size 30 is used.
How many employees from the Frozen Food Department should be included?

Answer _____ [2]

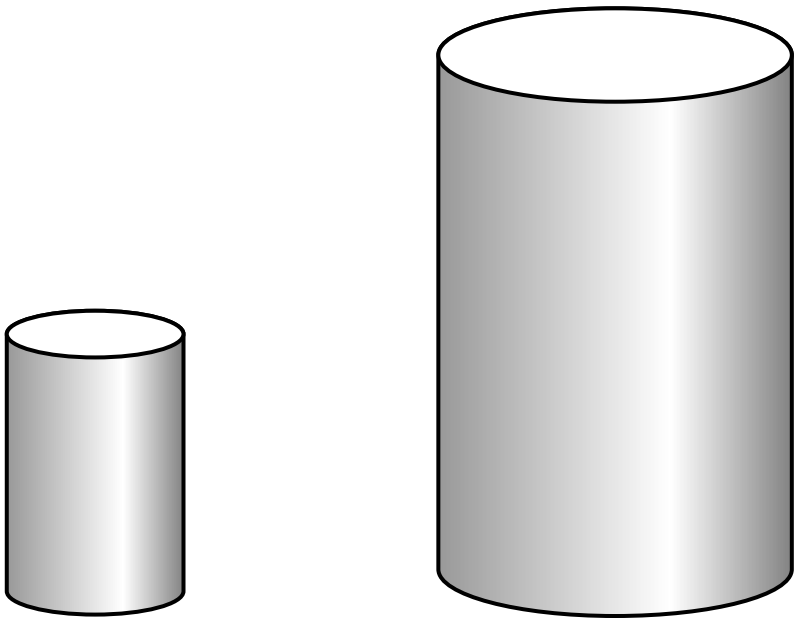
---

8 Factorise $49 - 9x^2$

Answer _____ [2]

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9



Two similar waste containers are made from thin metal sheet.
The large container has volume 8 times that of the smaller one.

What is the ratio of their surface areas?

Answer _____ [2]

Examiner Only	
Marks	Remark

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10 **(a)** Evaluate $27^{\frac{2}{3}}$

Answer _____ [2]

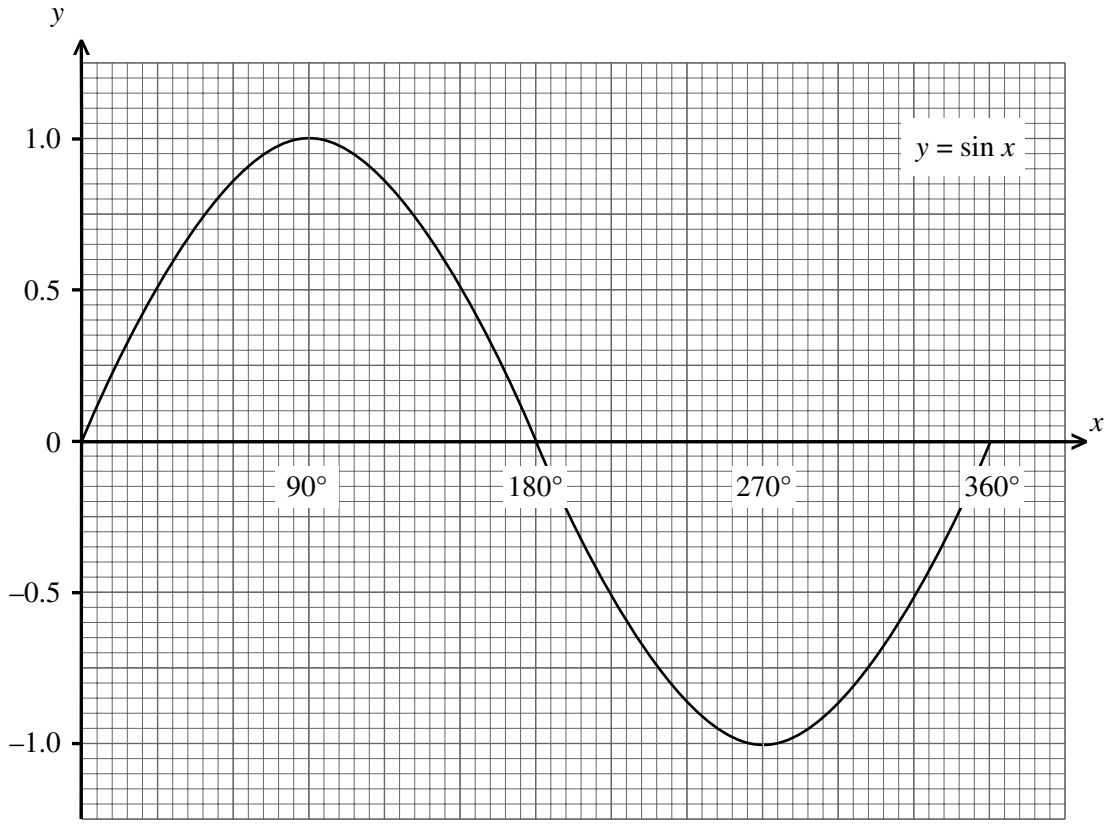
(b) Given that $3^y = \frac{1}{27}$ find the value of y.

Answer y = _____ [2]

Examiner Only	
Marks	Remark

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11



Use the graph to find the solutions of

(a) $\sin x = -0.75$ Answer _____ ° [2]

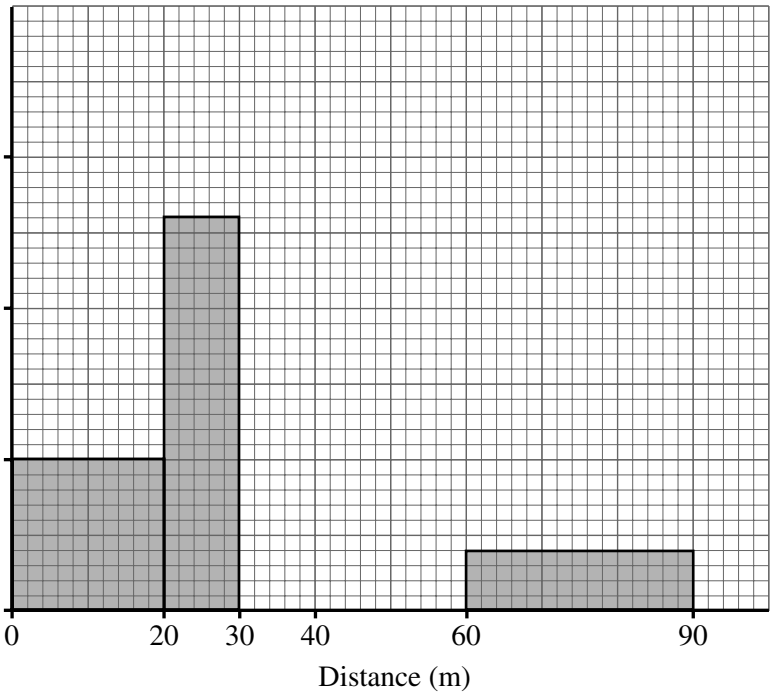
(b) $4 \sin x = 1$ Answer _____ ° [2]

Examiner Only	
Marks	Remark

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12 Data relating to distances thrown in a javelin competition was recorded. Some information is recorded in the table and some is displayed in the histogram.

Distance (m)	Frequency
$0 < d \leqslant 20$	10
$20 < d \leqslant 30$	
$30 < d \leqslant 40$	16
$40 < d \leqslant 60$	5
$60 < d \leqslant 90$	



Complete both the table and the histogram. [3]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

13 **(a)** Given that $\sqrt{62.3} = 7.893$ correct to four significant figures, explain how $\sqrt{6230}$ can be found correct to four significant figures without the use of a calculator.

[2]

(b) Which of the following is **not** irrational? Circle your answer.

$\sqrt{7}$ $\quad$ $\sqrt[3]{65}$ $\quad$ $3.\dot{1}\dot{4}$ [1]

---

14 Factorise $9ax^2 - 9axy + 2ay^2$ fully.

Answer _____ [3]

THIS IS THE END OF THE QUESTION PAPER

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1312-048-1

GCSE

Mathematics (Modular)

January 2010

Mark Schemes

Issued: April 2010

General Certificate of Secondary Education
January 2010

Mathematics

Module N4 Paper 1
(Non-calculator)
Higher Tier

[GMN41]

TUESDAY 12 JANUARY

9.15am – 10.15am

MARK SCHEME

STEMUP.CO.UK

GCSE MATHEMATICS 2010

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A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

It should be noted that where an error trivialises a question, or changes the nature of the skills being tested, then as a general rule, it would be the case that not more than half the marks for that question or part of that question would be awarded; in some cases the error may be such that no marks would be awarded.

Positive marking:

It is our intention to reward candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier only a proportion of the marks will be available (based on the professional judgement of the examiner).

			AVAILABLE MARKS
1	£434 = 70%	MA1	
	£62 = 10%	MA1	
	Original price = 62 × 10 = £620	MA1	3
2	155	A1	
	145	A1	2
3	**(a)** $21\frac{1}{2}$	MA1	
	(b) $24 - 18\frac{1}{2} = 5\frac{1}{2}$	M1, A1	
	(c) Reading of 74	MA1	
	$\frac{6}{80} \times 100 = 7.5\%$	MA1	5
4	**(a)** **(i)** 40°	MA1	
	(ii) 90°	MA1	
	(b) Suitable explanation	MA1	3
5	10 visits occurs in two different groups	A1	1

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				AVAILABLE MARKS
6	**(a)**	2 correct lines and correct shading	MA1	
		3rd line drawn and correct shading	MA1	
		Rc orrectlypos itioned	MA1	
	(b)	Minimum occurs at point (2, − 1), Value − 1	M1, A1	5
7	**(a)**	Number of employees in each department varies and this must be represented in sample, otherwise results may be biased if too many from one particular department appear in sample chosen via simple random sampling (or similar explanation)	A2	
	(b)	$\frac{30}{450} = \frac{1}{15}$	MA1	
		$\frac{90}{15} = 6$	MA1	4
8		$(7 - 3x)(7 + 3x)$	MA2	2
9		Length ratio = 2:1	MA1	
		Area ratio = 4:1	MA1	2
10	**(a)**	$27^{\frac{1}{3}} = 3$	MA1	
		$3^2 = 9$	MA1	
	(b)	$3^y = 3^{-3}$	MA1	
		$y = -3$	MA1	4
11	**(a)**	228 ± 1	MA1	
		312 ± 1	MA1	
	(b)	$\sin x = 0.25$ 13 ± 1 167 ± 1	 MA1 MA1	 4

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				AVAILABLE MARKS
12	Vertical axis scale 1cm = 0.25 **or** Key 1cm^2 = 2.5		MA1	
	$20 < d \leq 30$, $1.3 \times 10 = 13$	$5.2 \times 2.5 = 13$		
	$60 < d \leq 90$, $0.2 \times 30 = 6$	$2.4 \times 2.5 = 6$	MA1	
	$30 < d \leq 40$, $16 \div 10 = 1.6$	$16 \div 2.5 = 6.4\text{cm}^2$		
	$40 < d \leq 60$, $5 \div 20 = 0.25$	$5 \div 2.5 = 2\text{cm}^2$	MA1	3
13	**(a)** $62.3 = 7.893^2$			
	$6230 = 100 \times 7.893^2$		MA1	
	$= 10^2 \times 7.893^2$			
	$= 78.93^2$			
	$\sqrt{6230} = 78.93$		A1	
	(b) $3.1\dot{4}$		A1	3
14	$a\,(3x - 2y)\,(3x - y)$		A1, A1, A1	3
			Total	**44**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2009

Mathematics



Module N4 Paper 1
(Non-calculator)
Higher Tier

[GMN41]

MONDAY 18 MAY

1.30 pm – 2.30 pm

GMN41

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eleven** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

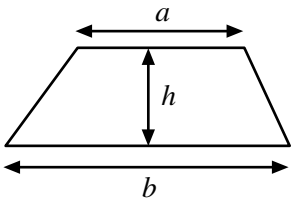
The total mark for this paper is 44.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a ruler, compasses, set-square and protractor.
The Formula Sheet is on page 2.

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total Marks	

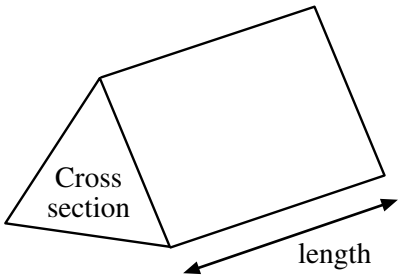
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Formula Sheet

Area of trapezium = $\frac{1}{2}(a + b)h$



Volume of prism = area of cross section × length

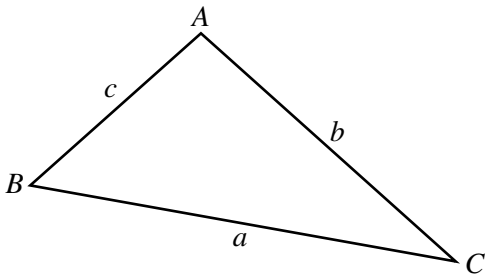


In any triangle ABC

Area of triangle = $\frac{1}{2}ab\sin C$

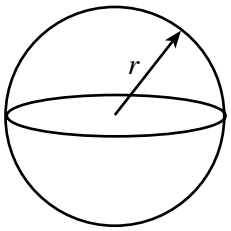
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$



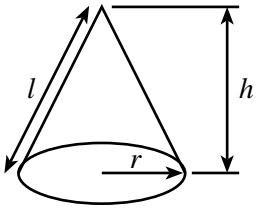
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



Quadratic equation:

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Examiner Only	
Marks	Remark

1 **(a)** Expand and simplify $(3x - 2)(2x + 1)$

Answer _____ [2]

(b) Solve the simultaneous equations

$$3x - 2y = 14$$
$$x + 2y = 10$$

Show your working.
A solution by trial and improvement will not be accepted.

Answer x = _____, y = _____ [2]

---

2 Calculate $2\frac{1}{5} \div 1\frac{2}{3}$

Answer _____ [3]

---

3 Solve the equation $\frac{2x + 1}{3} - \frac{x + 1}{5} = 3$

Show your working.
A solution by trial and improvement will not be accepted.

Answer x = _____ [4]

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Examiner Only	
Marks	Remark

4 A glacier is losing 20% of its volume each year.
What % of its original volume will be left after 3 years?

Answer _____ % [2]

5

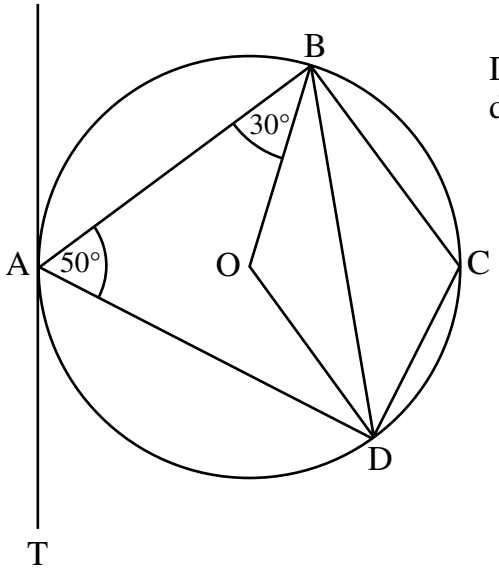


Diagram not drawn accurately

O is the centre of a circle and A, B, C and D are points on the circumference of the circle.
TA is a tangent to the circle.
Angle BAD is 50°. Angle ABO is 30°.
Calculate the size of

(a) angle OAT,

Answer _____° [1]

(b) angle BCD,

Answer _____° [1]

(c) angle BOD,

Answer _____° [1]

(d) angle TAD.

Answer _____° [2]

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Examiner Only	
Marks	Remark

6 **(a)** Factorise $x^2 - 4$

Answer _____ [1]

(b) Hence simplify $\dfrac{x^2 - 4}{2x^2 - x - 6}$

Answer _____ [3]

---

7 Which of the three measures of central tendency ("average") would be of most use to a shoe shop manager when placing an order for more shoes? Give a reason for your answer.

Answer _____ because _____

_____ [2]

---

8 Write down the equation of the straight line which passes through the point (0, 2) and is perpendicular to the line with equation $y = 3x$.

Answer _____ [2]

---

9 Evaluate

(a) $9^{\frac{3}{2}}$

Answer _____ [2]

(b) $81^{-\frac{1}{2}}$

Answer _____ [2]

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10 The table gives information about the weights of schoolbags.

Weight, w kg	Number of schoolbags
$2.0 \leqslant w < 3.0$	18
$3.0 \leqslant w < 3.5$	28
$3.5 \leqslant w < 4.0$	34
$4.0 \leqslant w < 6.0$	16
$6.0 \leqslant w < 6.5$	4

(a) Illustrate the data by drawing a histogram on the graph paper opposite, using the scale provided. [3]

(b) A stratified sample of 20 schoolbags was taken from those whose weight was less than 4.0 kg.

(i) How many of the sample were taken from the class interval $3.0 \leqslant w < 3.5$?

Answer _____ [2]

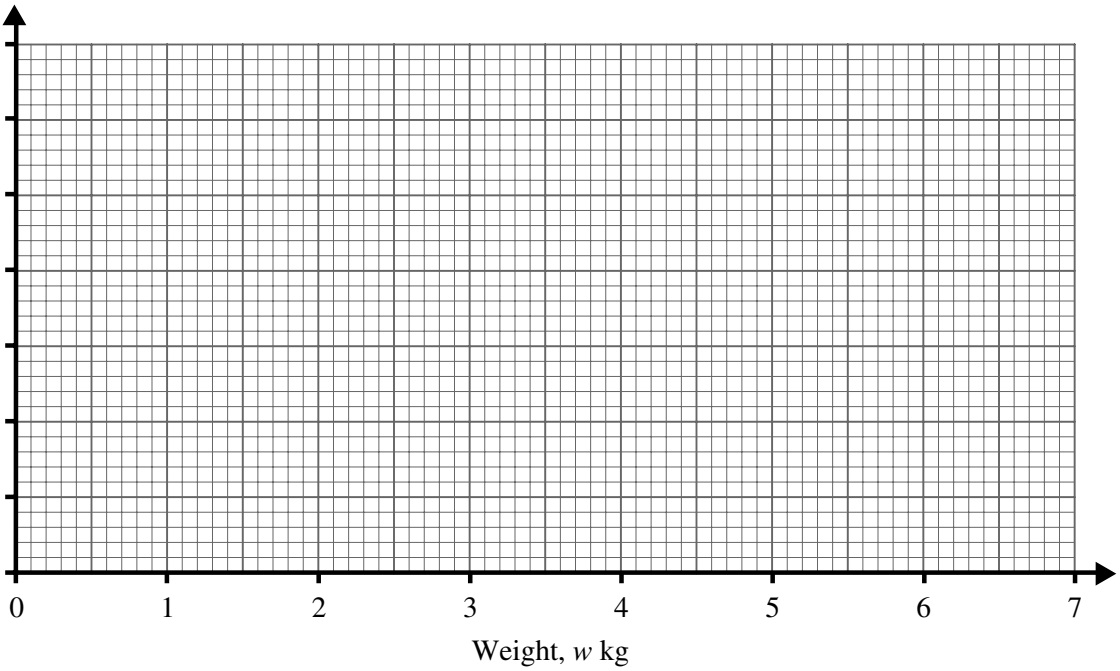
(ii) In this stratified sample, half the schoolbags weighed less than 3.2 kg. Estimate how many of the original full set of schoolbags weighed 3.2 kg or more.

Answer _____ [2]

Examiner Only

Marks	Remark

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---

11 Solve the simultaneous equations $y = x^2 + 3x - 2$ and $3x + 2y = 22$.

Answer _____ [7]

Examiner Only	
Marks	Remark

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GCSE

Mathematics (Modular)

Summer 2009

Mark Schemes

Issued: October 2009

Rewarding Learning

General Certificate of Secondary Education

2009

Mathematics

Module N4 Paper 1

(Non-calculator)

Higher Tier

[GMN41]

MONDAY 18 MAY

1.30 pm – 2.30 pm

MARK SCHEME

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GCSE MATHEMATICS 2009

Introduction

The mark scheme normally provides the most popular solution to each question. Other solutions given by candidates are evaluated and credit given as appropriate; these alternative methods are not usually illustrated in the published mark scheme.

The marks awarded for each question are shown in the right hand column and they are prefixed by the letters **M**, **A** and **MA** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.

A indicates marks for accurate working, whether in calculation, readings from tables, graphs or answers.

MA indicates marks for combined method and accurate working.

The solution to a question gains marks for correct method and marks for an accurate working based on this method. Where the method is not correct no marks can be given.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be followed through from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

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				AVAILABLE MARKS
1	**(a)**	$6x^2 + 3x - 4x - 2$	MA1	
		$= 6x^2 - x - 2$	A1	
	(b)	$4x = 24$		
		$x = 6$	MA1	
		$y = 2$	A1	4
2		$\frac{11}{5} \div \frac{5}{3}$	MA1	
		$\frac{11}{5} \times \frac{3}{5}$	MA1	
		$\frac{33}{25} \left(=1\frac{8}{25}\right)$	A1	3
3		$5(2x + 1) - 3(x + 1) = 45$	MA1	
		$10x + 5 - 3x - 3 = 45$	MA1	
		$7x + 2 = 45$	MA1	
		$7x = 45 - 2$		
		$7x = 43$		
		$x = \frac{43}{7}$ or $6\frac{1}{7}$	A1	4
4		0.80 left after 1 yr		
		0.8^2 left after 2 yrs = 0.64	M1	
		0.8^3 left after 3 yrs = 0.512 $\rightarrow$ 51.2%	A1	2
5	**(a)**	90	MA1	
	(b)	130	MA1	
	(c)	100	MA1	
	(d)	70	MA2	5
6	**(a)**	$(x - 2)(x + 2)$	A1	
	(b)	$\frac{(x - 2)(x + 2)}{(2x + 3)(x - 2)}$	MA2	
		$= \frac{x + 2}{2x + 3}$	A1	4
7		Mode	A1	
		because it is the one he needs to order most of or other suitable reason	A1	2

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			AVAILABLE MARKS
8	$y = -\frac{1}{3}x + 2$	A1, A1	2
9	**(a)** $(3)^3$	M1	
	27	A1	
	(b) $\frac{1}{81^{\frac{1}{2}}}$	M1	
	$\frac{1}{9}$	A1	4
10	**(a)** Frequency per unit interval 18, 56, 68, 8, 8 and correctly drawn,	MA1, A1	
	correct vertical scale or key	A1	
	(b) **(i)** $\frac{20}{80} \times 28$	MA1	
	7	A1	
	(ii) $\frac{1}{2}(80) = 40$		
	$40 + 16 + 4 = 60$	M1, A1	7
11	$3x + 2(x^2 + 3x - 2) = 22$	MA2	
	$3x + 2x^2 + 6x - 4 = 22$	MA1	
	$2x^2 + 9x - 26 = 0$	MA1	
	$(2x + 13)(x - 2) = 0$	MA1	
	$x = -6\frac{1}{2}$ or $x = 2$	MA1	
	$y = 20\frac{3}{4}$ or $y = 8$	A1	7
		Total	**44**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
January 2009

Mathematics



Module N4 Paper 1
(Non-calculator)
Higher Tier

[GMN41]

GMN41

FRIDAY 9 JANUARY

9.15 am – 10.15 am

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all twelve** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

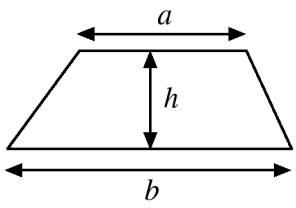
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Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a ruler, compasses, set-square and protractor.
The Formula Sheet is on page 2.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
Total Marks	

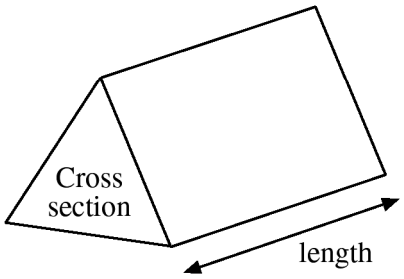
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Formula Sheet

Area of trapezium = $\frac{1}{2}(a + b)h$



Volume of prism = area of cross section × length

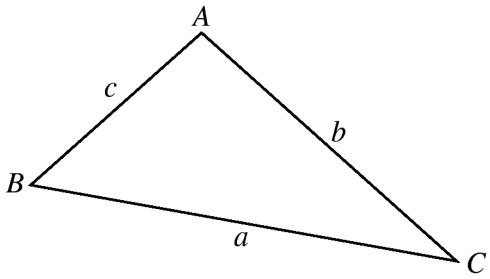


In any triangle ABC

Area of triangle = $\frac{1}{2}ab\sin C$

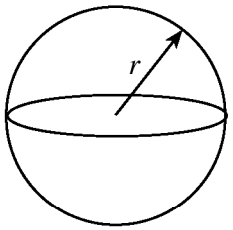
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$



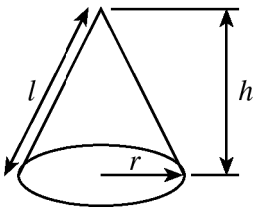
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$



Quadratic equation:

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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(Questions begin overleaf)

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Examiner Only	
Marks	Remark

1 Eileen constructed a cumulative frequency table from her mobile phone bill to display her call times over the previous month. The results are shown in the table below.

Time in minutes	Cumulative frequency
<5	29
<10	62
<15	114
<20	153
<25	179
<30	195

(a) Draw a cumulative frequency graph, on the opposite page, to display the data. [3]

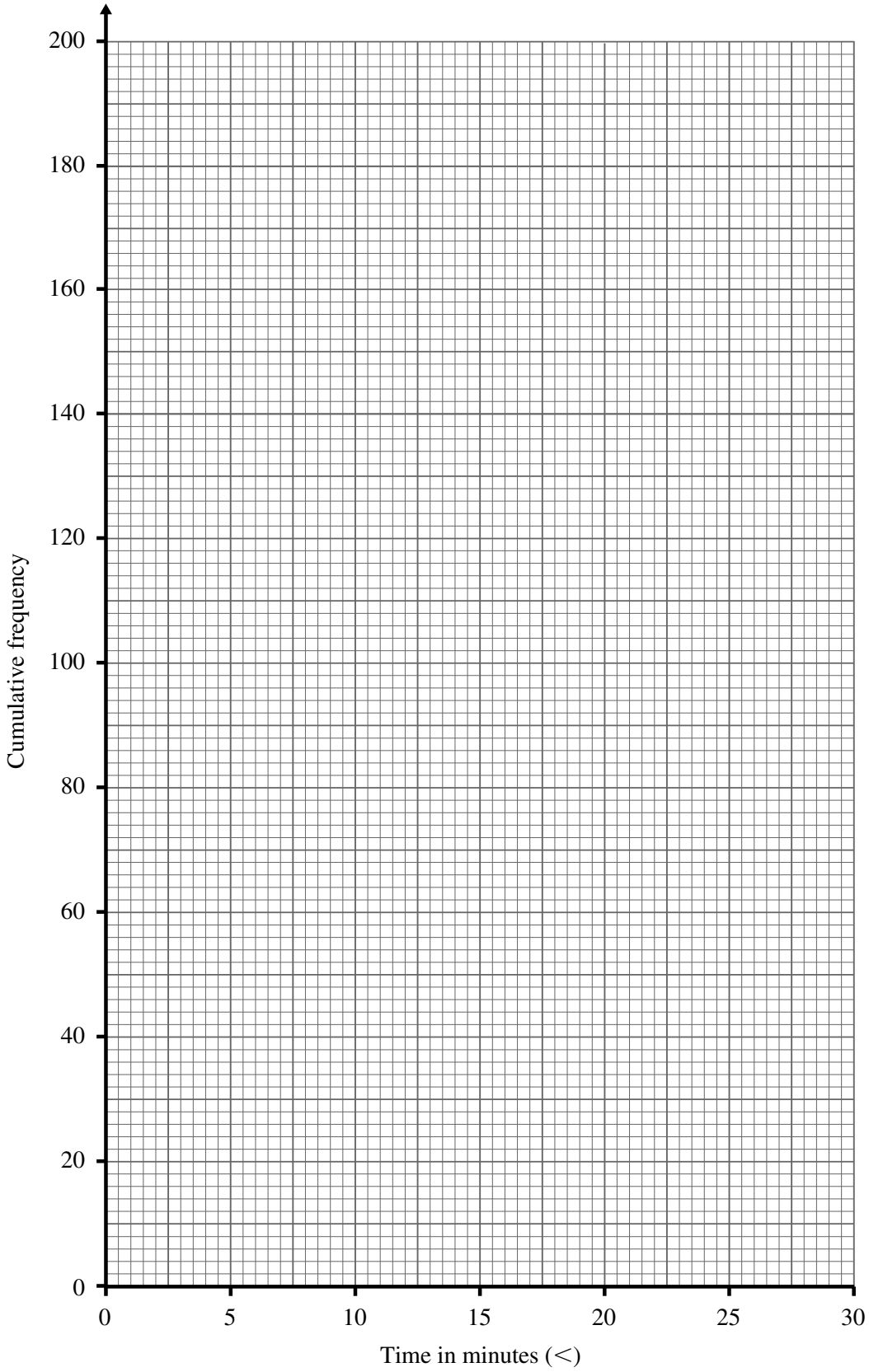
(b) From your graph, estimate the median for Eileen's call times.

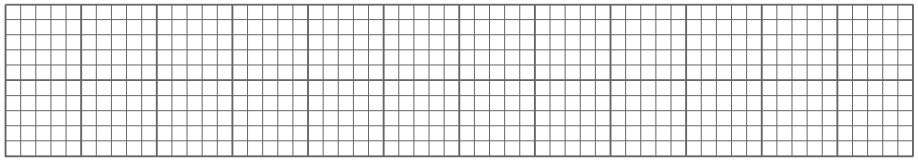
Answer _____ minutes [1]

(c) Eileen's pricing plan with the phone company allows her free calls provided that they last no more than 12 minutes.
From your graph, estimate the number of calls which will be charged to Eileen's account by the phone company.

Answer _____ calls [2]

(d) The shortest call took one minute and the longest took 29 minutes.
Draw a box plot on the grid below the cumulative frequency graph to illustrate the data. [3]





Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

2 Calculate $4\frac{1}{4} \times 2\frac{2}{3}$

Give your answer as a mixed number.

Answer _____ [3]

---

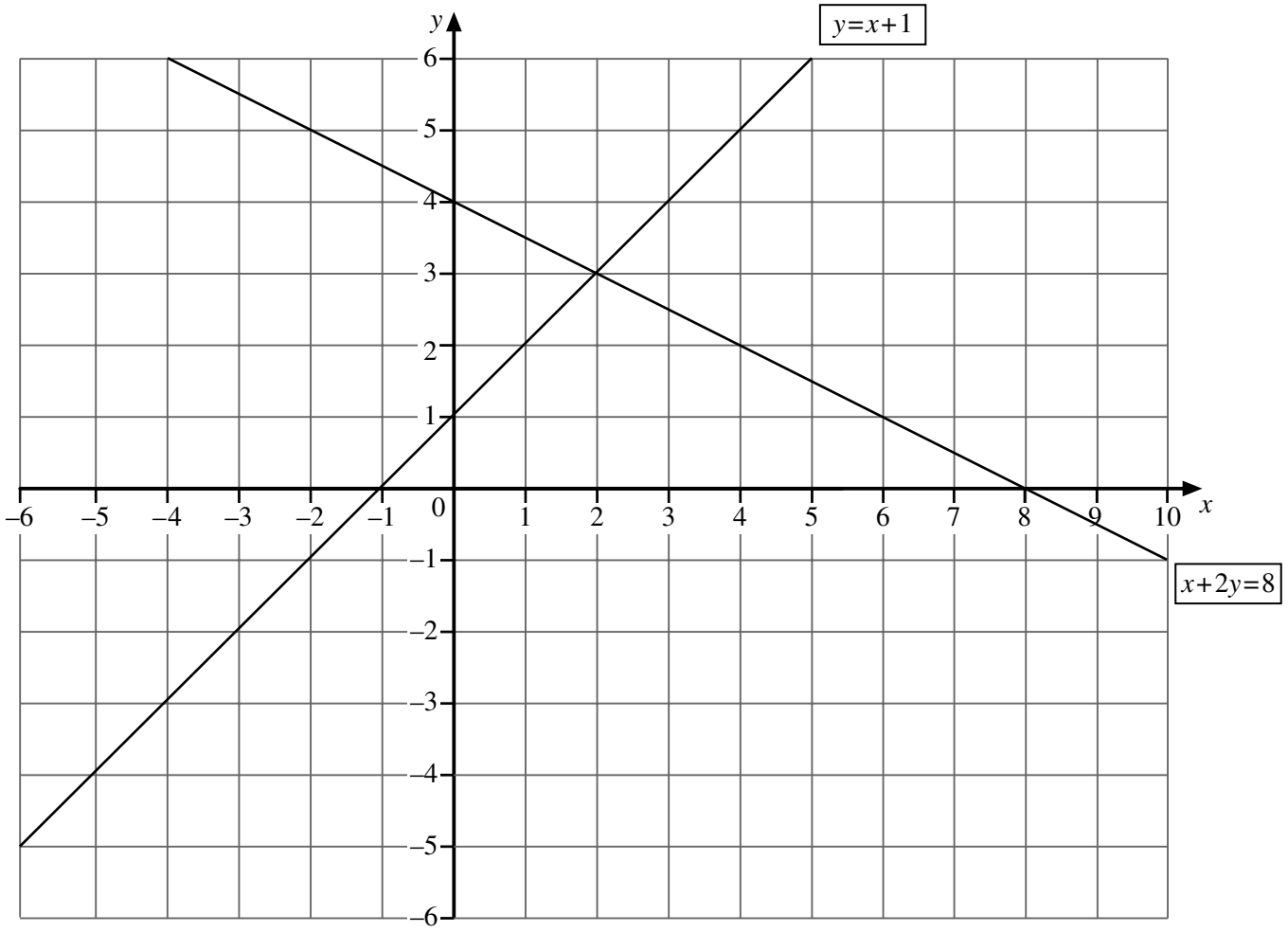
3 Solve the equation $\frac{x+2}{2} - \frac{2x-1}{3} = 2$

Show your working.
A solution by trial and improvement will not be accepted.

Answer x = _____ [4]

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4 The graphs of the lines $y = x + 1$ and $x + 2y = 8$ are shown in the diagram.



Examiner Only	
Marks	Remark

(a) Identify with a letter R, the region which satisfies the inequalities

$y \geq x + 1$ $x + 2y \leq 8$ $x \geq 0$ [2]

(b) What is the greatest value of x in this region?

Answer _____ [1]

(c) What point (x, y) in the region R maximises the value of the expression $y - x$?

Answer $x =$ _____ $y =$ _____ [2]

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Examiner Only	
Marks	Remark

5 536 pupils attend a secondary school. There are a total of 20 registration classes.

A random sample of 40 pupils is to be chosen to represent the school at a charity event.

The principal suggests that every 10th pupil in alphabetical order in each registration class should be chosen to attend the charity event.

Give **two** reasons why this selection process is flawed.

Reason 1 _____

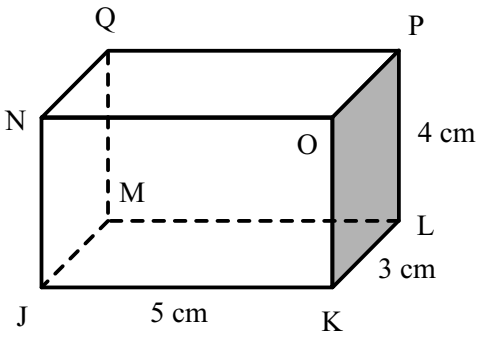
_____ [1]

Reason 2 _____

_____ [1]

---

6 Calculate the length of the space diagonal JP in the cuboid shown.
Give your answer in the form $\sqrt{n}$.



Answer _____ cm [2]

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Examiner Only	
Marks	Remark

7 A wedding cake has two tiers, which are similar in shape.
The area to be iced on the small tier is 100 square inches.
The area to be iced on the large tier is 225 square inches.
The width of the larger tier is 12 inches.
What is the width of the smaller tier?

Answer _____ inches [2]

---

8 Evaluate

(a) $64^{0.5}$

Answer _____ [1]

(b) $27^{2/3}$

Answer _____ [2]

(c) $16^{-3/4}$

Answer _____ [2]

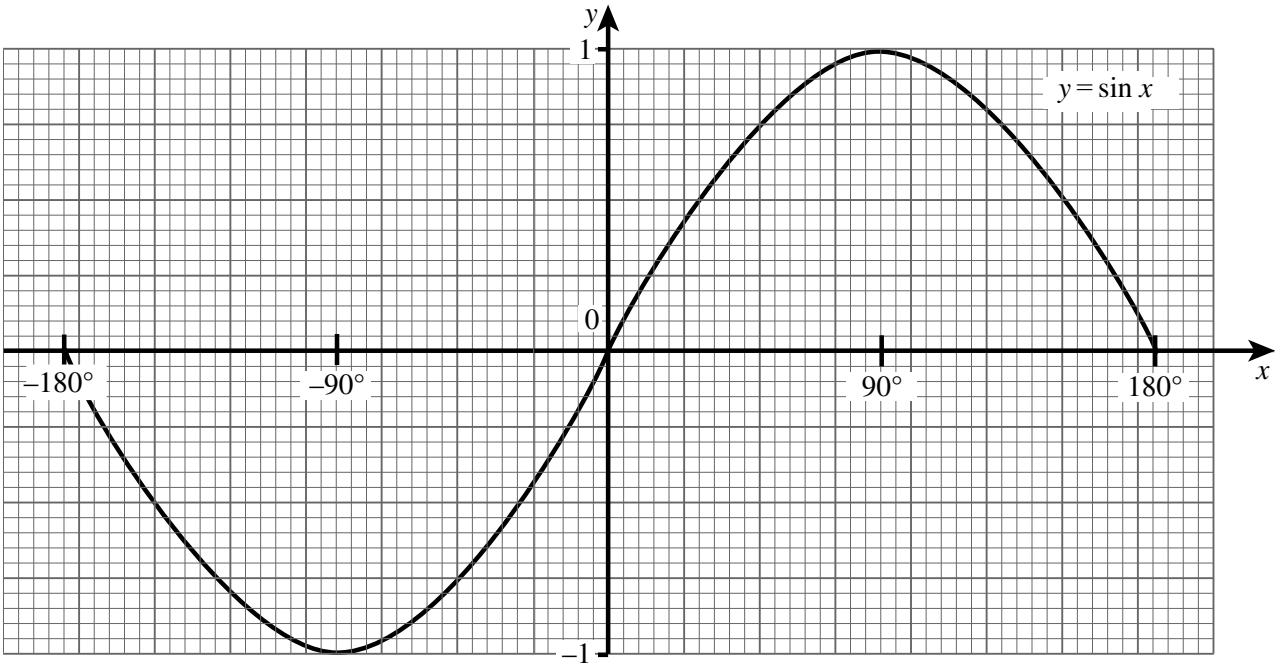
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9 Simplify $\dfrac{2x^2 - 3xy + y^2}{4x - 2y}$

Answer _____ [3]

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10



Use the graph to find solutions for the equation

(a) $\sin x = -0.95$ Answer $x =$ _____ [2]

(b) $5 \sin x = 3$ Answer $x =$ _____ [2]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

11 State which one of the following equations has solutions which are rational. Explain why this is the case.

(a) $\frac{x^3}{3} = 8$

(b) $\frac{8x^3}{3} = 9$

(c) $\frac{x^3}{4} = 9$

Answer _____ because _____

_____ [2]

12 $(x - a)^2 \equiv x^2 - 12x + b$

Find the values for a and b

Answer a = _____ b = _____ [3]

THIS IS THE END OF THE QUESTION PAPER

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GCSE

Mathematics (Modular)

January 2009

Mark Schemes

Issued: April 2009

Rewarding Learning

General Certificate of Secondary Education

January 2009

Mathematics

Module N4 Paper 1

(Non-calculator)

Higher Tier

[GMN41]

FRIDAY 9 JANUARY

9:15 am – 10:15 am

MARK SCHEME

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GCSE MATHEMATICS JANUARY 2009

Introduction

The mark scheme normally provides the most popular solution to each question. Other solutions given by candidates are evaluated and credit given as appropriate; these alternative methods are not usually illustrated in the published mark scheme.

The marks awarded for each question are shown in the right hand column and they are prefixed by the letters **M**, **A** and **MA** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.

A indicates marks for accurate working, whether in calculation, readings from tables, graphs or answers.

MA indicates marks for combined method and accurate working.

The solution to a question gains marks for correct method and marks for an accurate working based on this method. Where the method is not correct no marks can be given.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

It should be noted that where an error trivialises a question, or changes the nature of the skills being tested, then as a general rule, it would be the case that not more than half the marks for that question or part of that question would be awarded; in some cases the error may be such that no marks would be awarded.

Positive marking:

It is our intention to reward candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier only a proportion of the marks will be available (based on the professional judgement of the examiner).

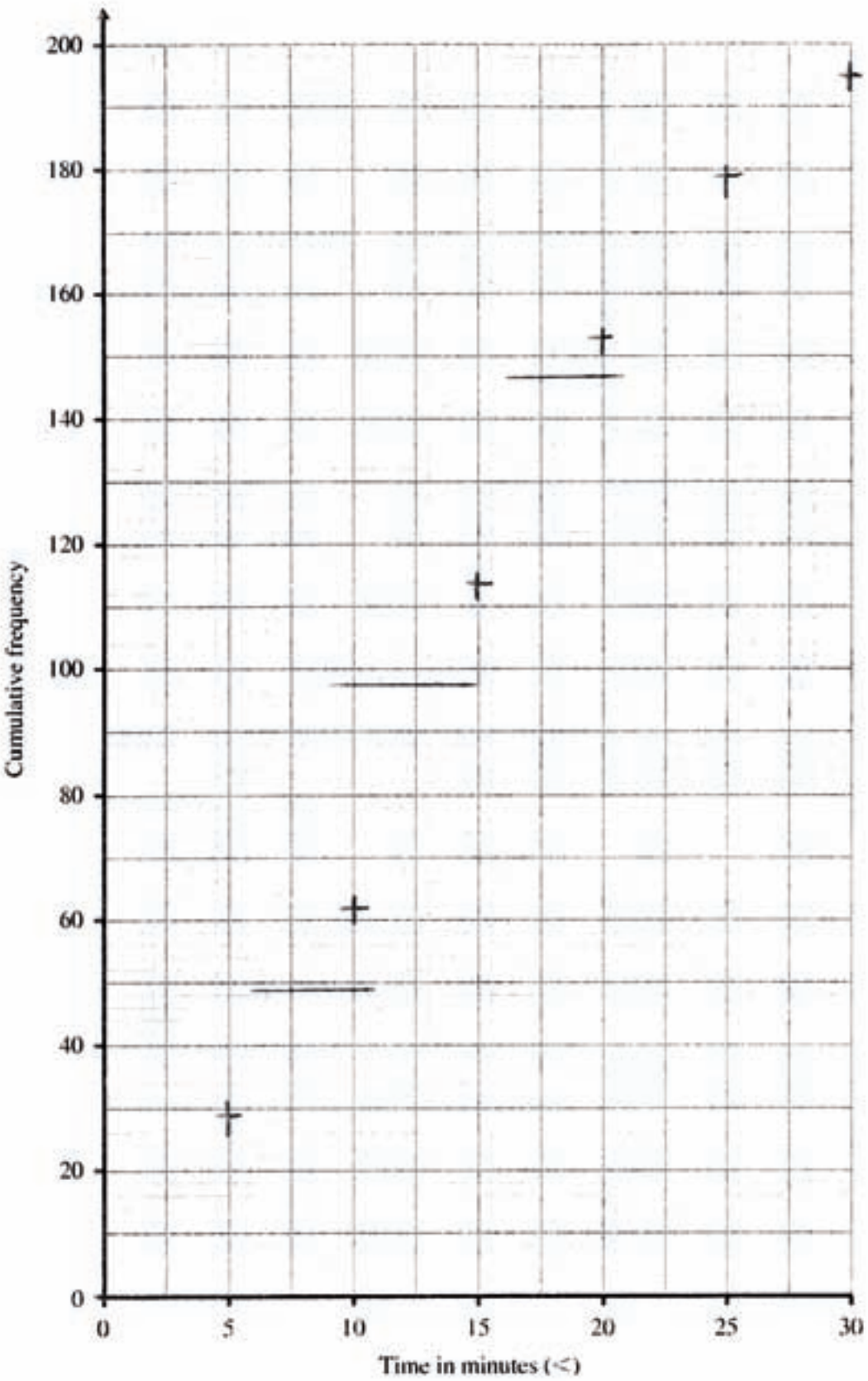
			AVAILABLE MARKS
1	**(a)** See overlay points A2 curve/lines A1	A3	
	(b) reading from graph at 97.5	A1	
	(c) reading from graph 195 – 83 = 112	MA1 MA1	
	(d) range, box median (13.3) approx	A3	9
2	$\frac{17}{4} \square \frac{8}{3}$	MA1	
	$= \frac{136}{12}$	MA1	
	$= 11\frac{1}{3}$	MA1	3
3	$3(x + 2) – 2(2x – 1) = 12$ $3x + 6 – 4x + 2 = 12$ $–x + 8 = 12$ $–x = 4$ $x = –4$	MA1 MA1 MA1 A1	4
4	**(a)** Correct side of $y = x + 1$ Correct side of $x + 2y = 8$ Correct side of $x = 0$	Three correct MA2 Two correct MA1	
	(b) $x = 2$	MA1	
	(c) $x = 0$ and $y = 4$	A2 (MA1 for trial of points)	5
5	Class sizes unlikely to be the same Pupils early in the alphabet unlikely to be chosen other suitable reason	MA2	2
6	$\sqrt{4^2 + 5^2 + 3^2}$ $= \sqrt{50}$ or $5\sqrt{2}$	M1 A1	2
7	area ratio 100 : 225 = 4:9 width ratio 2 : 3 widths x : 12 $x = 8$	 MA1 MA1	2

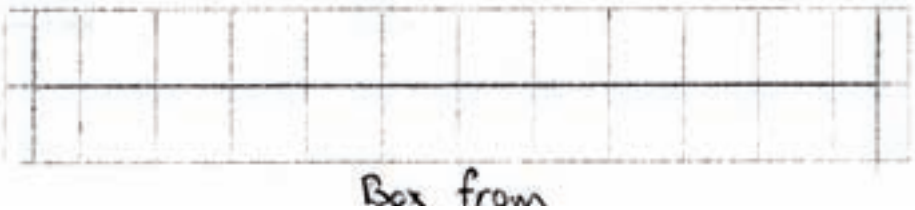
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			AVAILABLE MARKS
8	**(a)** 8	A1	
	(b) $27^{\frac{2}{3}} = 3^2 = 9$	A1, A1	
	(c) $\frac{1}{16^{\frac{3}{4}}} = \frac{1}{8}$	M1, A1	5
9	$\frac{(2x-y)(x-y)}{2(2x-y)}$	MA1	
		MA1	
	$= \frac{x-y}{2}$	MA1	3
10	**(a)** readings –74°, –106° (±2°)	MA1, MA1	2
	(b) $\sin x = 0.6$		
	$x = 37°$ (1 correct reading) (±2°)	MA1	
	$x = 143°$ (2nd correct reading) (±2°)	A1	2
11	B because $x^3 = \frac{27}{8}$ $x = \frac{3}{2}$ which is rational	MA2	2
12	$x^2 - 2ax + a^2 = x^2 - 12x + b$	MA1	
	$a = 6$	A1	
	$b = 36$	A1	3
		Total	**44**

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GCSE MATHEMATICS JANUARY 2009
MODULE N4-1
OVERLAY QUESTION 1





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