



General Certificate of Secondary Education January 2012

Mathematics



Unit T4 (With calculator) Higher Tier

[GMT41]

WEDNESDAY 11 JANUARY

9.15 am–11.15 am



2 hours.

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 eighteen** questions.

Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.

You may use a calculator for this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100. Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Functional Elements will be assessed in this paper.

Quality of written communication will be assessed in **question 7**.

You should have a calculator, ruler, compasses and a protractor.

The Formula Sheet is overleaf.

7280.06**R**



For Examiner's			
Question Number	Marks		
1			
2			
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Total Marks			

Formula Sheet

Volume of prism = area of cross section × length





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

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



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

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

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

Curved surface area of cone = πrl





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

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

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

		Answer all questions.	Examiner O	nly
1	(a)	Jane attends both piano and flute lessons on August 31st. She attends flute lessons every 8 days and piano lessons every 10 days. On what date will she next attend both lessons?	Marks Ren	nark
	(b)	Answer [2] An electric fire cost £135.66 including VAT at 20%.		
		How much VAT was payable on the bill?		
		Answer f [2]		
		Allswel L [5]		
7280.0	06 R		[Turn o	ver

2 Fifty-five pupils in Year 11 do an end of year French test.

Their data is recorded in the table below.

	1						
Mark	0–20	21–40	41-6	0	61	-80	81-100
Frequency	6	17	20			9	3
a) Complet	e the cumulat	tive frequen	icy table l	oelov	V.		
Mark (less than or equal to) 20 40 60 80 100							
Cumulativ	e Frequency	6					
							[1
(b) Draw a cumulative frequency graph opposite to illustrate this information. [3](c) Use your graph to estimate the median mark.							
				An	swer		[1
he pass mar	k for the example	mination wa	as 52.				
d) Use your examina	r graph to estition.	imate the nu	umber of	stude	ents w	vho pass	sed the
				An	swer		[2
(e) Draw a b	oox plot for th	ne data on th	ne grid be	low	your	graph.	[3

Examiner Only Marks Remark





4 The diagram shows a pyramid PQRS in which RS is at right angles to the horizontal base PQR. PQ = 5 cm, QR = 13 cm, angle PQR = 90° and angle RQS = 48°.

48°

13 cm

R

(a) Calculate the length SR.

5 cm

Q

Р

Answer _____ cm [3]

Answer _____° [3]

(b) Calculate the size of angle RPS.



Examiner Only

Marks Remark



In the diagram EC is a diameter of the circle and AE = AB. 6

The line TN is the tangent at A.



[Turn over

Examiner Only Marks

Rer

Quality of written communication will be assessed in this question.

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]

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]



9	(a)	Find the equation of the line through $(0, 4)$ perpendicular to the line $y = 3x + 7$		Examin Marks	er Only Remark
		Answer	[2]		
	(b)	Expand and simplify $(3p + 2q)(4p - 7q)$.			
		Answer	[3]		
10	y is	inversely proportional to the square of x .			
	Wh	x = 3, y = 4			
	(a)	Find a formula connecting y and x .			
		Answer	[2]		
	(b)	Calculate <i>y</i> when $x = 12$			
		Answer	[1]		
	(c)	What happens to the value of <i>y</i> when <i>x</i> is doubled? Explain your answer .			
		Answer			
			[2]		

11 A field ABCD has straight sides. AB = 80 m.

An underground pipeline crosses the field from B to D and is 264 m long.

Examiner Only Marks Rema

Angle ABD = 44° .



	Diagr drawr	am not n accurately
	x	
a) Sho	we that x is a solution of the equation $2x^2 - 10x - 10x$	-119 = 0 [3]
b) Sol	ve the equation to find the length of the rectangle).
Giv	e your answer correct to 1 decimal place.	
	Answer $x =$	cm [3]

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(Questions continue overleaf)

13 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
$0 < m \le 60$	30
$60 < m \le 80$	
$80 < m \le 90$	68
$90 < m \le 100$	96
$100 < m \le 140$	

- (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)
$60 < m \le 100$	144	72
$100 < m \le 160$	x	

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

Examiner Only Marks Remark





(b) Calculate the radius of the circus ring.		Examiner Only Marks Remark
	Answer m [3]	
(c) Calculate the length of one of the wires.		
	Answer m [2]	
16 Given that $x^2 - 8x + p \equiv (x + q)^2$ find p and q	<i>q</i> .	
Answer $p =$, <i>q</i> = [3]	
7280.06 R		Turn over

17 Solve
$$\frac{2}{x+1} + \frac{6}{3x-2} = 1$$



Examiner Only Marks Remark



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