Candidate	Centre	Candidate		
Name	Number	Number		
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GCSE

185/04

MATHEMATICS (2 Tier) HIGHER TIER PAPER 1

A.M. MONDAY, 19 May 2008 2 hours

> CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer all the questions in the spaces provided.

Take π as 3·14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

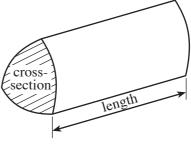
Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

For Examiner's use only							
Question	Maximum Mark	Mark Awarded					
1	2						
2	5						
3	2						
4	4						
5	7						
6	10						
7	6						
8	3						
9	3						
10	4						
11	4						
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19	3						
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22	5						
23	3						
24	3						
25	4						
TOTAL MARK							

Formula List

Volume of prism = area of cross-section \times length

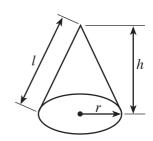


Volume of sphere = $\frac{4}{3} \pi r^3$ Surface area of sphere = $4\pi r^2$



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

Curved surface area of cone = πrl

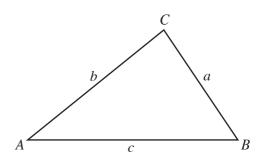


In any triangle ABC

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 = $\frac{1}{2}$ $ab \sin C$



The Quadratic Equation

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

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

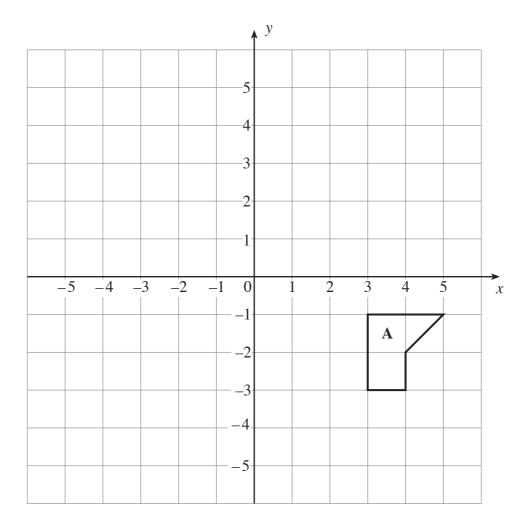
Standard Deviation

Standard deviation for a set of numbers $x_1, x_2, ..., x_n$, having a mean of \overline{x} is given by

$$s = \sqrt{\frac{\sum (x - \overline{x})^2}{n}} \text{ or } s = \sqrt{\frac{\sum x^2}{n} - \left\{\frac{\sum x}{n}\right\}^2}$$

	ly showing how you obtained your answer, ESTIMATE the value of: \[\frac{87 \times 248}{52} \]	
(a) 	Find 240 as a percentage of 600.	
(b)	A recipe for making 12 pancakes includes the following ingredients.	
	2 large eggs 200ml milk 110g flour	
	Calculate the quantities of these ingredients needed to make 30 pancakes.	

3. Reflect the shape marked **A** in the line x = 1.



[2]

4. In a game a player rolls a coin onto a squared board. The squares on the board are coloured red, blue, green or yellow. If the coin lands entirely within one of these coloured squares the player wins a prize, otherwise the player loses.

The table below shows the probabilities of the coin landing entirely within the coloured squares.

Colour	Red	Blue	Green	Yellow	Player loses
Probability	0.15	0.09	0.05	0.06	0.65

(a)	One day 200 people play this game. Approximately how many would you expect to win a prize?
	[2]
(b)	It costs 80p to play the game once. The prize for winning is £2. If the 200 people play the game once, approximately how much profit do you expect the game to make?
	[2]

5. (a) The angles of a quadrilateral are x° , 49°, $3x^{\circ}$ and 111°. Form an equation in x, and use your equation to find the value of x.

[4]

(b) Find the size of **each** of the angles marked x and y in the following diagram.

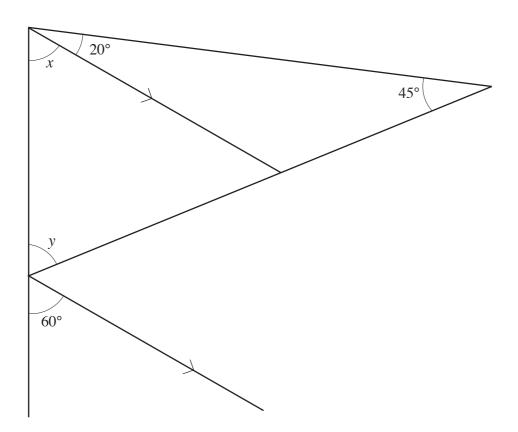
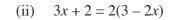


Diagram not drawn to scale.

[3]

6. (a) Solve **each** of the following equations.

(i)	7 <i>x</i>	+	4	=	3x	+	16
(1)	$I\Lambda$	т	┰	_	$J\lambda$	_	10



[6]

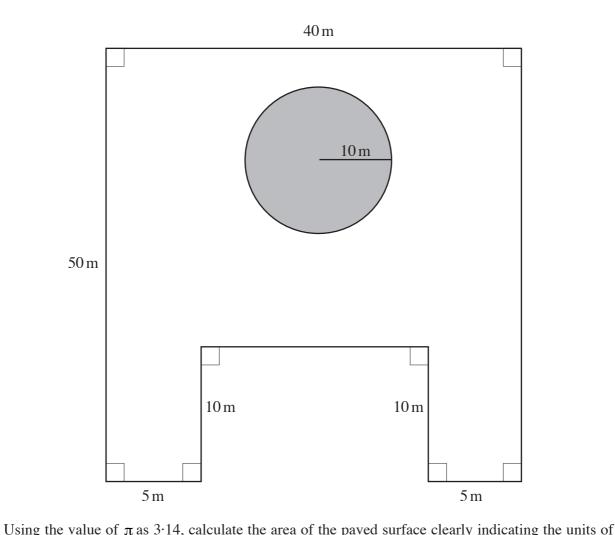
(b) Simplify each of the following.

(i) 2(3r+1)+5r

(ii) 3(2p+3)-2(p-1)

[4]

7. The following diagram shows a paved area with a circular pond of radius 10m.



your answer.

8.	Showing all your working, estimate the value of:	$\frac{601.9 \times 19.94}{0.305}$
		[3]

Express 500 as a product of prime numbers in index form.				

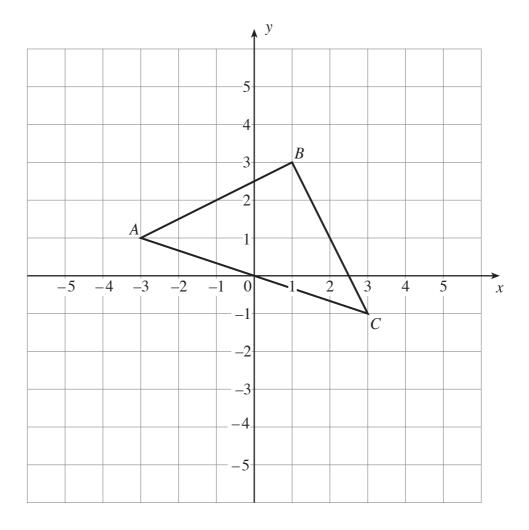
[2]

10. Write down, in terms of n, the nth term of each of the following sequences.

	 19	15	11	7	3	(a)
[2]	 					
		4 × 6	3×5	2×4	1 × 3	<i>(b)</i>

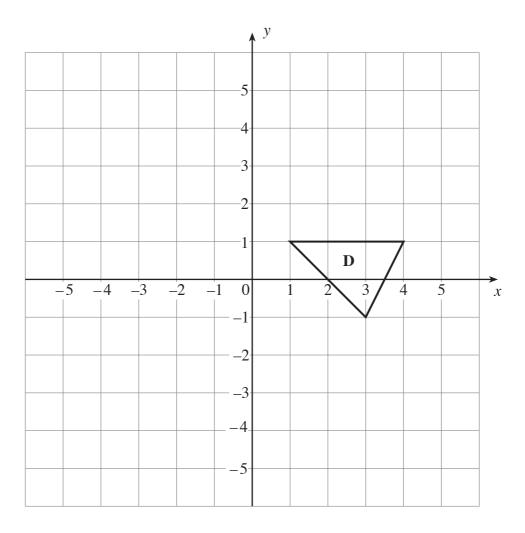
11. (a) Draw the reflection of the triangle ABC in the line y = x.





(b) Rotate the triangle $\bf D$ through 90° clockwise about the point (-1, 2). Label the image $\bf E$.

[2]



(185-04) **Turn over.**

12.	Solve the fe	ollowing	simultaneous ed	quations by	an algebraic	(not graphi	cal) method
					0	\ O I	,

2x + 5y = 43x + 4y = 13

13. (a) Simplify $4p^3r^6 \times 3pr^2$.

[2]

(b) Factorise $6a^2b + 9a$.

[2]

[4]

14. In each of the following formulae, every letter stands for the measurement of a length. By considering the dimensions implied by the formulae, write down, for each case, whether the formulae could be for a length, an area, a volume or none of these. The first one has been done for you.

Formula could be for

[1]

15. (a) Solve the inequality

$$13 - 3x \geqslant 22 - 7x.$$

[2]

(b) Write down the smallest whole number that satisfies this inequality.

[1]

- **16.** In the diagram, AB is parallel to DE.
 - (a) Show that triangles ABC and EDC are similar.

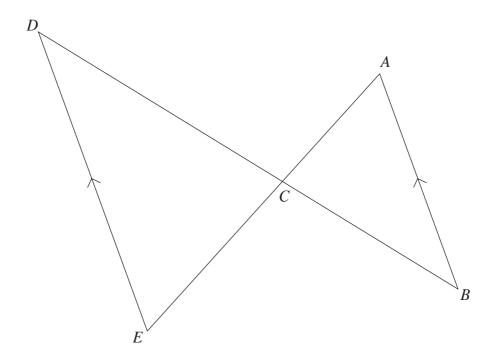
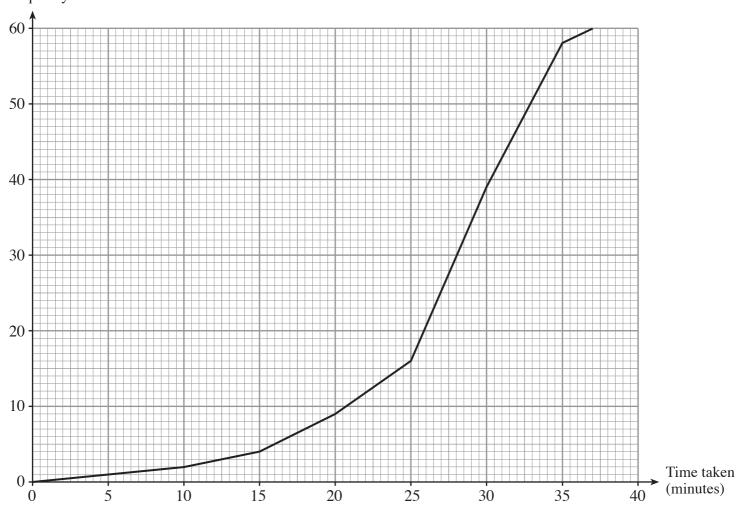


Diagram not drawn to scale.

	[2]
(b) The lengths $AP = 2$ on $PC =$	10 1 DC 15
(U) The lengths $AD = 00011$, $DC = 00000$	From and $DC = 15$ cm.
(b) The lengths $AB = 8$ cm, $BC =$	From and $DC = 15$ cm.
Calculate the length of DF	From and $DC = 15$ cm.
Calculate the length of DE .	From and $DC = 15$ cm.
(b) The lengths $AB = 8 \text{cm}$, $BC = \text{Calculate}$ the length of DE .	From and $DC = 15$ cm.
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Calculate the length of DE.	From and $DC = 15$ cm.
Calculate the length of DE.	From and $DC = 15$ cm.
Calculate the length of DE.	From and DC = 15cm.
Calculate the length of DE.	10cm and <i>DC</i> = 15cm.

17. Each of 60 pupils is given a task and the time taken to complete the task is recorded. The results are summarised in the cumulative frequency polygon below.

Cumulative frequency

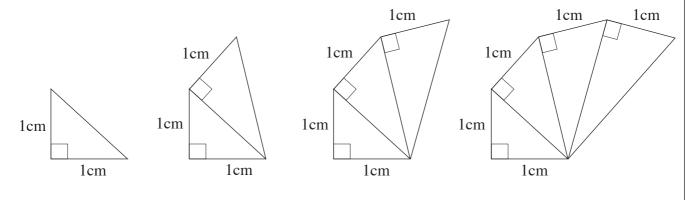


Use th	ne cumulative frequency polygon to answer the following questions.
(a)	Find an estimate for the interquartile range.
	[0]
(b)	Giving full details, find an estimate for the number of pupils that take between 20 and 30 minutes to complete the task.

[2]

18.	(a)	Factorise $16p^2 - 25$.		
	(b)	Factorise $4q^2 + 3q - 10$.	[2]	
			[2]	
19.	Make	h the subject of the formula	10(h - 2e) = 7(h - k).	
			[3]	

20. Patterns are generated as shown in the diagram.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

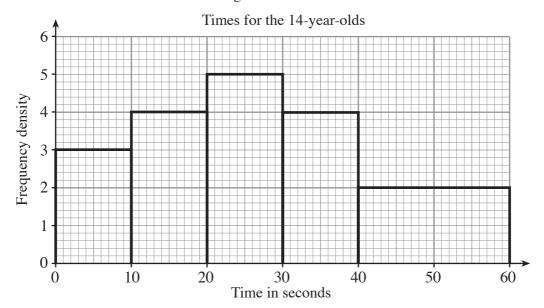
Diagrams not drawn to scale.

Find the perimeter of Pattern 6 in the form $a + \sqrt{b}$, where a and b are whole numbers. Show your working.

[4]

21. As part of an investigation, the time taken to complete an obstacle course was measured for each pupil in a group of fourteen-year-olds.

The results are summarised in the histogram below.



(a) Use the histogram to calculate the number of fourteen-year-olds in this group.

 •••••	•••••	

[3]

(b) The time taken to complete the same obstacle course was measured for each student in a group of 200 eighteen-year-olds.

The following grouped frequency distribution was obtained.

Time, t seconds	$0 < t \leqslant 10$	$10 < t \le 20$	$20 < t \leqslant 30$	$30 < t \leqslant 40$	$40 < t \leqslant 60$
Numbers of students	10	20	30	40	100

Find an estimate for the median of this distribution.

22.	x cm	A cylinder, with base of radius x cm and height h cm, has the same volume as a cuboid with length x cm, width x cm and height $(x + 2)$ cm. Find an expression for h in terms of x and π , simplifying your answer.			
			[5]		
23.	(a)	Write down a value of x (where $x > 1$) for which $x^{\frac{3}{2}}$ is rational.			
	(h)	Express 0.541 as a fraction.	[1]		
		Express 0°341 as a fraction.			
			[2]		

24.	24. A box contains 2 strawberry yogurts, 4 vanilla yogurts and 6 cherry yogurts. Three yogurts are selected at random from the box. Calculate the probability that at least one of the selected yogurts is a cherry yogurt.				
	[3]				

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25. The diagram shows a quadrilateral *OABC*.

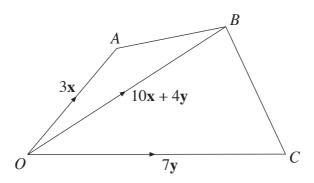


Diagram not drawn to scale.

In the quadrilateral OABC, the vectors \mathbf{OA} , \mathbf{OB} and \mathbf{OC} are given by $\mathbf{OA} = 3\mathbf{x}$, $\mathbf{OB} = 10\mathbf{x} + 4\mathbf{y}$ and $\mathbf{OC} = 7\mathbf{y}$.

(a) 	Express CA in terms of x and y .
	[1]
(b)	Given that M is the mid-point of OB , express each of the following in terms of \mathbf{x} and \mathbf{y} in their simplest form.
	(i) OM
	(ii) MA
	[2]

(c)	Does M lie on the line CA? Give a reason for your answer.	
		1]