Paper Reference(s)

5505/05

Edexcel GCSE

Mathematics A – 1387

Paper 5 (Non-Calculator)

Higher Tier

Tuesday 11 November 2003 – Morning

Time: 2 hours

Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Items included with question papers

Formulae sheet

Instructions to Candidates

Your candidate details are printed next to the bar code above. Check that these are correct and sign your name in the signature box above.
If your candidate details are incorrect, or missing, then complete ALL the boxes above.
Check that you have the correct question paper.
Answer **ALL** the questions in the spaces provided in this question paper.
You must NOT write on the formulae sheet. Anything you write on the formulae sheet will gain NO credit.
If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The total mark for this paper is 100.
The marks for individual questions and parts of questions are shown in round brackets: e.g. (**2**).
Calculators must not be used.
This paper has 20 questions. There are 3 blank pages.

Advice to Candidates

Show all stages in any calculations.
Work steadily through the paper.
Do not spend too long on one question.
If you cannot answer a question, leave it and attempt the next one.
Return at the end to those you have left out.

Turn over

Edexcel
Success through qualifications

Answer ALL TWENTY questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

You must NOT use a calculator.

1. (a) Express 120 as the product of powers of its prime factors.

....
(3)

(b) Find the Lowest Common Multiple of 120 and 150.

....
(2)

2. Nassim thinks of a number.
When he multiplies his number by 5 and subtracts 16 from the result, he gets the same answer as when he adds 10 to his number and multiplies that result by 3.

Find the number Nassim is thinking of.

....
(4)

3. The grouped frequency table shows information about the weights, in kilograms, of 20 students, chosen at random from Year 11.

Weight (w kg)	Frequency
$50 \leqslant w < 60$	7
$60 \leqslant w < 70$	8
$70 \leqslant w < 80$	3
$80 \leqslant w < 90$	2

There are 300 students in Year 11.

Work out an estimate for the number of students in Year 11 whose weight is between 50 kg and 60 kg.

....
(3)

Do not write here

4. (a) Simplify

(i) $p^2 \times p^7$

....

(ii) $x^8 \div x^3$

....

(iii) $\dfrac{y^4 \times y^3}{y^5}$

....
(3)

(b) Expand $t(3t^2 + 4)$

....
(2)

Do not write here

5.

N

Diagram **NOT**
accurately drawn

N

Hospital ● ⌐ ——————— ● Cinema

72°

Art ●
gallery
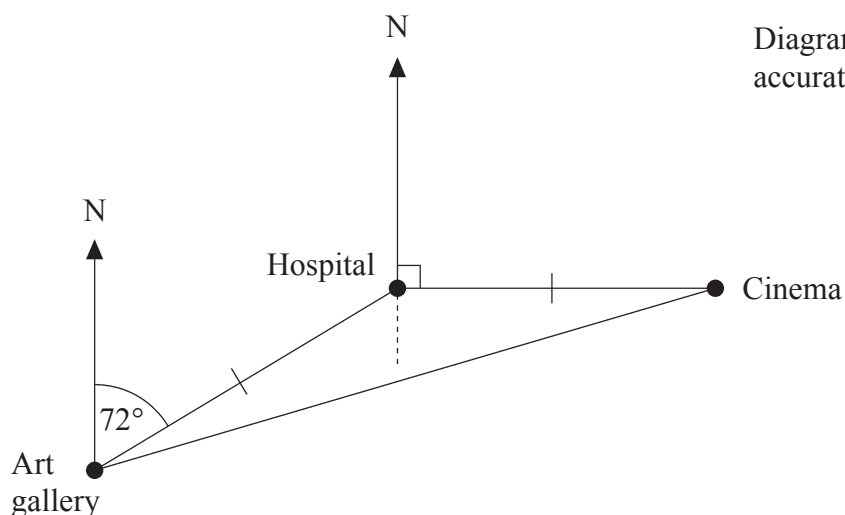
The diagram shows the position of each of three buildings in a town.
The bearing of the Hospital from the Art gallery is 072°.
The Cinema is due East of the Hospital.
The distance from the Hospital to the Art gallery is equal to the distance from the Hospital to the Cinema.

Work out the bearing of the Cinema from the Art gallery.

°
....
(3)

Do not write here

Turn over

6. Here are some expressions.

$\frac{1}{2}ac$	πc	$2b$	$2ab^2$	abc	$a(b+c)$	$\dfrac{ab}{c}$	πa^2

The letters *a*, *b* and *c* represent lengths.
π, 2 and $\frac{1}{2}$ are numbers which have no dimensions.
Three of the expressions could represent areas.
Tick ($\checkmark$) the boxes underneath the **three** expressions which could represent areas.

(3)

7. Work out $5\frac{2}{3} - 2\frac{3}{4}$

....

(3)

Do not write here

8. The table shows information about the heights of 40 bushes.

Height (h cm)	Frequency
$170 \leqslant h < 175$	5
$175 \leqslant h < 180$	18
$180 \leqslant h < 185$	12
$185 \leqslant h < 190$	4
$190 \leqslant h < 195$	1

(a) Complete the cumulative frequency table.

Height (h cm)	Cumulative frequency
$170 \leqslant h < 175$	
$170 \leqslant h < 180$	
$170 \leqslant h < 185$	
$170 \leqslant h < 190$	
$170 \leqslant h < 195$	

(1)

(b) On the grid, draw a cumulative frequency graph for your table.
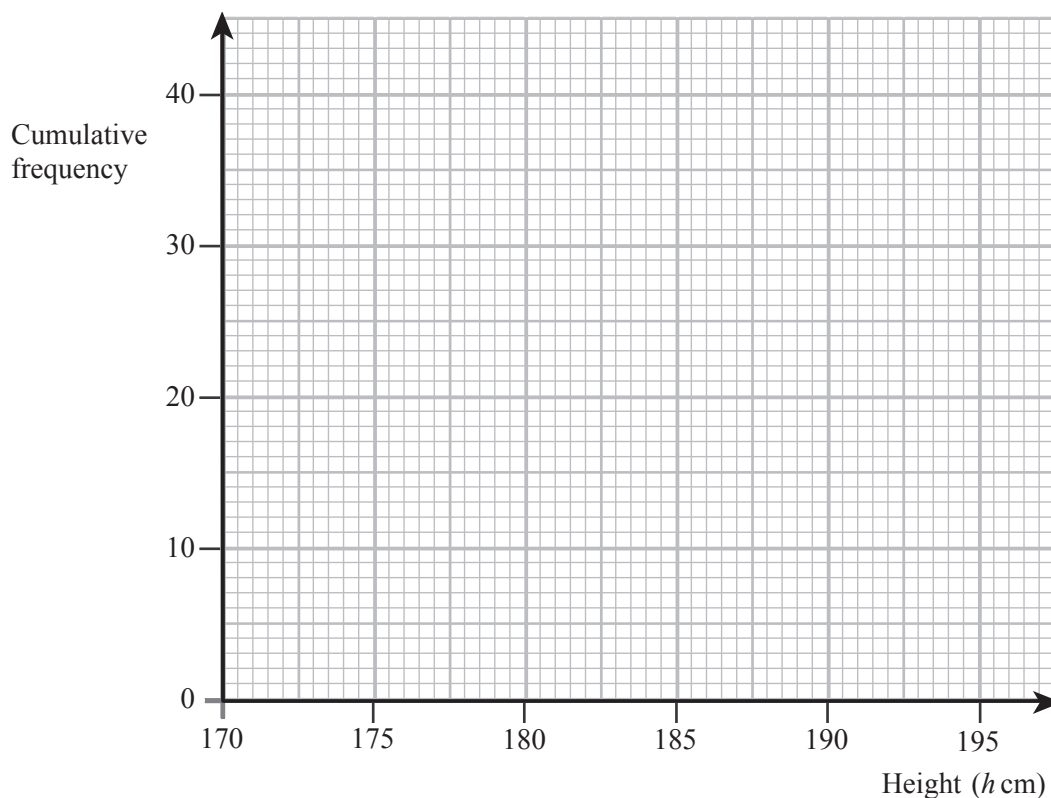
(2)

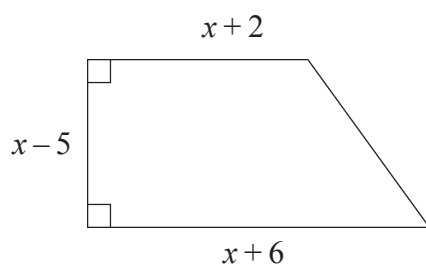(c) Use your graph to find an estimate for the median height of the bushes.

.... cm

(1)

Turn over

9.

$x+2$

Diagram **NOT**
accurately drawn

$x-5$

$x+6$

The diagram shows a trapezium.
The lengths of three of the sides of the trapezium are $x-5$, $x+2$, and $x+6$.
All measurements are given in centimetres.

The area of the trapezium is 36 cm^2.

(a) Show that $x^2-x-56=0$

(4)

(b) (i) Solve the equation $x^2-x-56=0$

....

(ii) Hence find the length of the shortest side of the trapezium.

.... cm
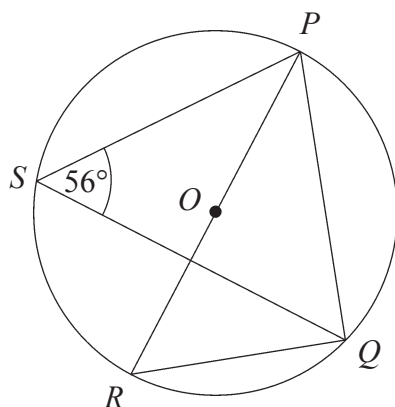**(4)**

10.

Diagram **NOT** accurately drawn

P, *Q*, *R* and *S* are points on the circumference of a circle, centre *O*.
PR is a diameter of the circle.
Angle *PSQ* = 56°.

(a) Find the size of angle *PQR*.
   Give a reason for your answer.

.... °

(2)

(b) Find the size of angle *PRQ*.
   Give a reason for your answer.

.... °

(2)

(c) Find the size of angle *POQ*.
   Give a reason for your answer.

.... °

(2)

11. The fraction, p, of an adult's dose of medicine which should be given to a child who weighs w kg is given by the formula

$$p = \frac{3w + 20}{200}$$

(a) Use the formula $p = \dfrac{3w + 20}{200}$ to find the weight of a child whose dose is the same as an adult's dose.

.... kg

(3)

(b) Make w the subject of the formula $p = \dfrac{3w + 20}{200}$

$w =$ ....

(3)

$$\frac{3w + 20}{200} = \frac{A}{A + 12}$$

(c) Express A in terms of w.

$A =$ ....

(4)

12. Mathstown College has 500 students, all of them in the age range 16 to 19.
The incomplete table shows information about the students.

Age (years)	Number of male students	Number of female students
16	50	30
17	60	40
18	76	54
19		

A newspaper reporter is carrying out a survey into students' part-time jobs.
She takes a sample, stratified both by age and by gender, of 50 of the 500 students.

(a) Calculate the number of 18 year old male students to be sampled.

....
(3)

In the sample, there are 9 female students whose age is 19 years.

(b) Work out the least number of 19 year old female students in the college.

....
(2)

A newspaper photographer is going to take photographs of two students from Mathstown
College.

He chooses
    one student at random from all of the 16 year old students and
    one student at random from all of the 17 year old students.

(c) Calculate the probability that he will choose two female students.

....
(3)

Turn over

13. Convert the recurring decimal $0.2\dot{9}$ to a fraction.

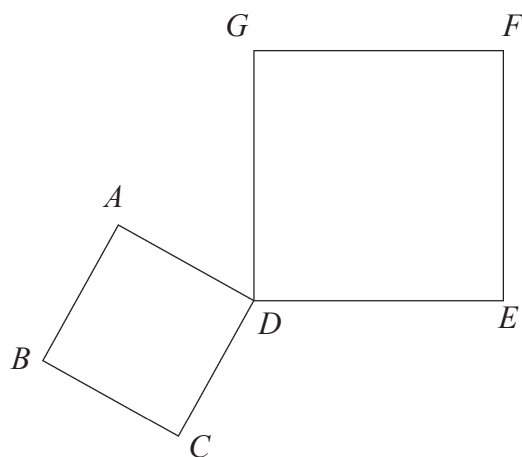.......................................
(2)

14.

Diagram **NOT** accurately drawn

ABCD and *DEFG* are squares.

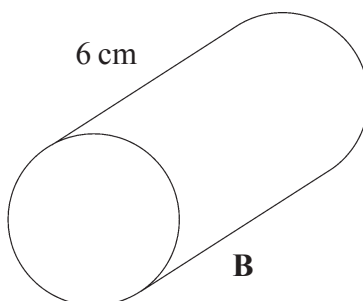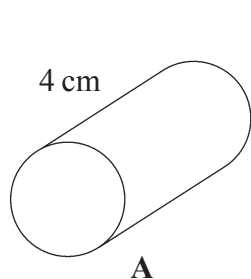Prove that triangle *CDG* and triangle *ADE* are congruent.

(3)

15. A straight line, **L**, passes through the point with coordinates (4, 7) and is perpendicular to the line with equation $y = 2x + 3$.

Find an equation of the straight line **L**.

....

(3)

16.

4 cm

6 cm

Diagrams **NOT** accurately drawn

A

B

Cylinder **A** and cylinder **B** are mathematically similar.
The length of cylinder **A** is 4 cm and the length of cylinder **B** is 6 cm.
The volume of cylinder **A** is 80 cm^3.

Calculate the volume of cylinder **B**.

.... cm^3

(3)

17. (a) Evaluate

(i) 3^{-2}

....

(ii) $36^{\frac{1}{2}}$

....

(iii) $27^{\frac{2}{3}}$

....

(iv) $\left(\dfrac{16}{81}\right)^{-\frac{3}{4}}$

....
(5)

(b) (i) Rationalise the denominator of $\dfrac{21}{\sqrt{7}}$ and simplify your answer.

....

(ii) Expand $\left(\sqrt{5}+2\sqrt{3}\right)\left(\sqrt{5}-2\sqrt{3}\right)$
Express your answer as simply as possible.

....
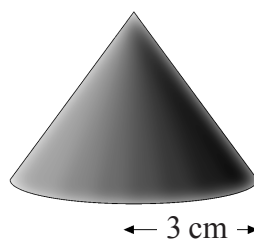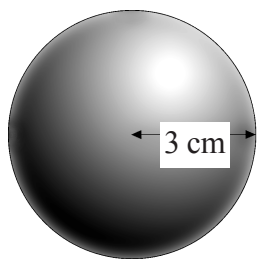**(4)**

18.

3 cm

Diagram **NOT** accurately drawn

← 3 cm →

The radius of a sphere is 3 cm.
The radius of the base of a cone is also 3 cm.
The volume of the sphere is 3 times the volume of the cone.

Work out the curved surface area of the cone.
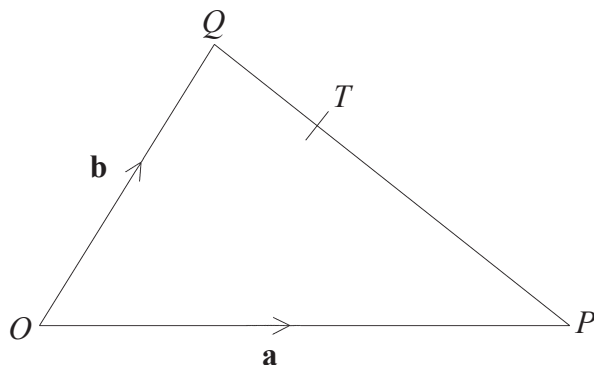Give your answer as a multiple of π.

.... cm^2

(7)

19.

Diagram **NOT** accurately drawn

OPQ is a triangle.
T is the point on *PQ* for which $PT : TQ = 2 : 1$
$\overrightarrow{OP} = \mathbf{a}$ and $\overrightarrow{OQ} = \mathbf{b}$.

(a) Write down, in terms of $\mathbf{a}$ and $\mathbf{b}$, an expression for $\overrightarrow{PQ}$.

$\overrightarrow{PQ}$ = ...
(1)

(b) Express $\overrightarrow{OT}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.
Give your answer in its simplest form.

$\overrightarrow{OT}$ = ...
(2)

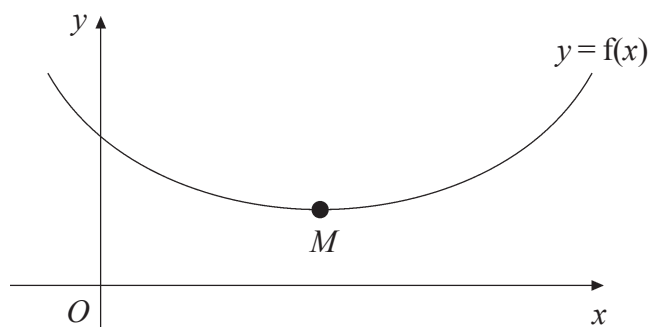**20.** The expression $x^2 - 6x + 14$ can be written in the form $(x - p)^2 + q$, for all values of *x*.

(a) Find the value of   (i) *p*,   (ii) *q*.

(i) p = ...
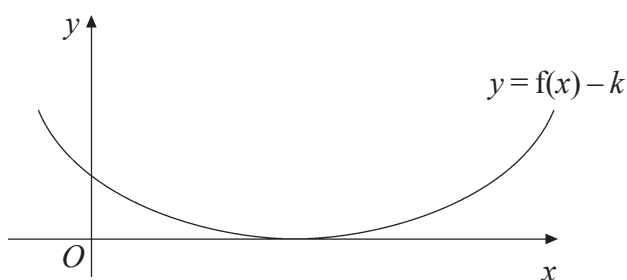
(ii) q = ...
(3)

The equation of a curve is $y = f(x)$, where $f(x) = x^2 - 6x + 14$.
Here is a sketch of the graph of $y = f(x)$.

(b) Write down the coordinates of the minimum point, M, of the curve.

....

(1)

Here is a sketch of the graph of $y = f(x) - k$, where k is a positive constant.
The graph touches the x-axis.

(c) Find the value of k.

$k =$ ....
(1)

(d) For the graph of $y = f(x - 1)$,

   (i) write down the coordinates of the minimum point,

....

   (ii) find the coordinates of the point where the curve crosses the y-axis.

....

(3)

TOTAL FOR PAPER: 100 MARKS

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