Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017

Mathematics

Unit T4
(With calculator)
Higher Tier

GMT41

[GMT41]

THURSDAY 25 MAY, 9.15am–11.15am

TIME

2 hours.

INSTRUCTIONS TO CANDIDATES

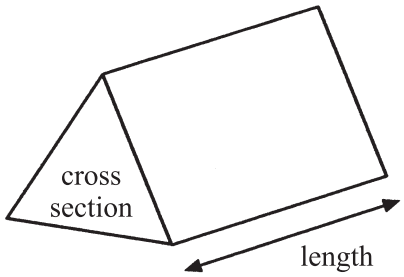
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page, on blank pages or tracing paper.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all nineteen** questions.
All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

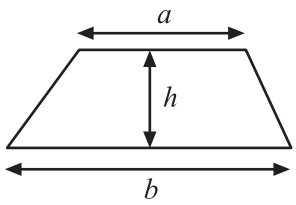
The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in Question **18**.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is on page 2.

Formula Sheet

Volume of prism = area of cross section × length

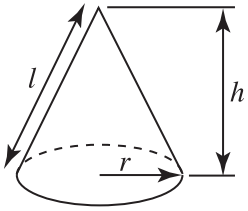


Area of trapezium $= \frac{1}{2}(a+b)h$



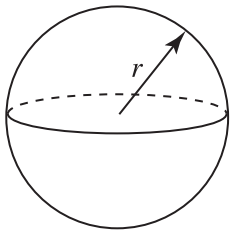
Volume of cone $= \frac{1}{3}\pi r^2 h$

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

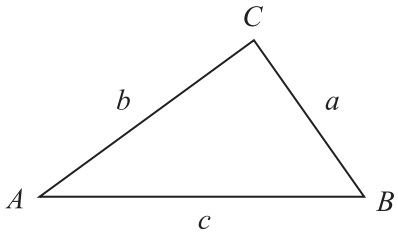


Volume of sphere $= \frac{4}{3}\pi r^3$

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



In any triangle *ABC*



Quadratic Equation

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

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

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

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

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

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(Questions start overleaf)

1 **(a)** Expand $(3x - y)^2$

Answer _____ [2]

(b) Factorise $x^2 - 25$

Answer _____ [1]

2 Gillian sold her formal dress online for £130.50
This was one-eighth more than the cost price of the dress.
What was the cost price?

Answer £ _____ [3]

3 A number is halved, then five is subtracted. The answer is one-third of the original number.
Write an equation and solve it to find the original number.
A solution by trial and improvement will not be accepted.

Equation _____ [1]

Answer _____ [2]

4 Solve $x - 15 = 5y$
$3x = -8y - 1$

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

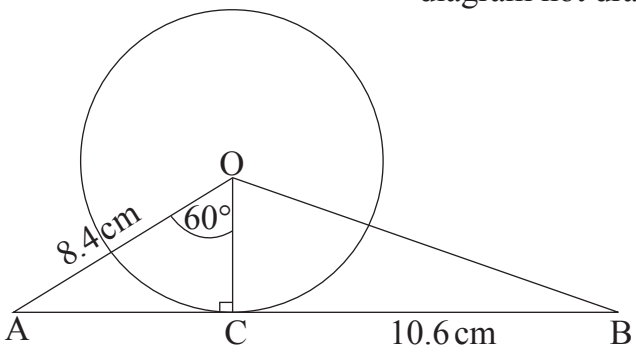
Answer $x =$ _____ $y =$ _____ [4]

[Turn over

5 Solve $x^2 - 5x - 24 = 0$

Answer $x =$ _____ [3]

6 diagram not drawn accurately



This is a circle with O as centre. OA = 8.4 cm, BC = 10.6 cm and angle AOC = 60°

(a) Show that the radius of the circle is 4.2 cm.

[3]

(b) Hence calculate the size of the angle OBC.
Give your answer to an appropriate degree of accuracy.

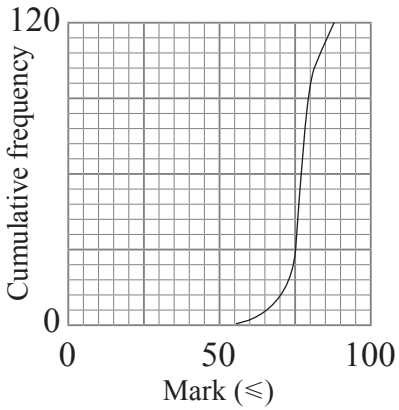
Answer _____ ° [4]

[Turn over

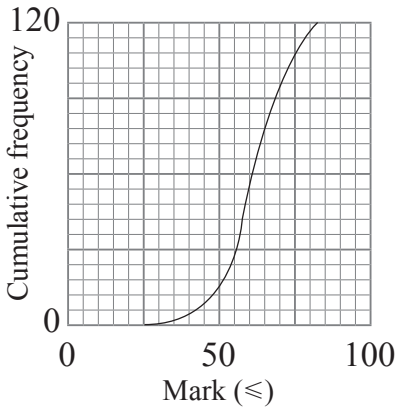
7 The mean of four numbers is x.
y is added to one of the numbers and z is added to each of the other three numbers.
Write an expression for the new mean.

Answer _____ [3]

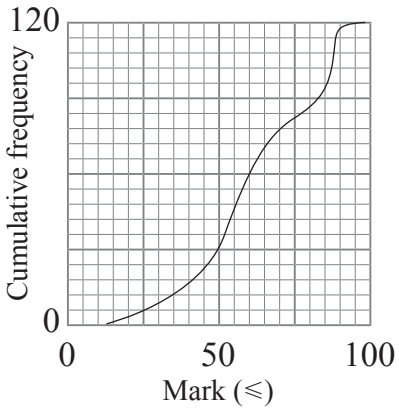
8 Examinations in Chemistry, Physics and Biology were taken by 120 students. Each examination was marked out of 100 and the cumulative frequency graphs below illustrate the results.



Chemistry



Physics



Biology

(a) Which subject has the highest median?

Answer _____ [1]

(b) In which subject was the interquartile range the greatest?

Answer _____ [1]

(c) The pass mark was 50. What percentage of the students did not pass Physics?

Answer _____% [1]

[Turn over

9 E varies as the square of x.

(a) When x is 0.5, E is 1.4

Find the formula expressing E in terms of x.

Answer _____ [3]

(b) Calculate the value of E when $x = 1.25$

Answer _____ [2]

(c) By how much has x increased when E changes from 2.5 to 4.8?
Give your answer correct to 2 decimal places.

Answer x increases by _____ [3]

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

Answer _____ [2]

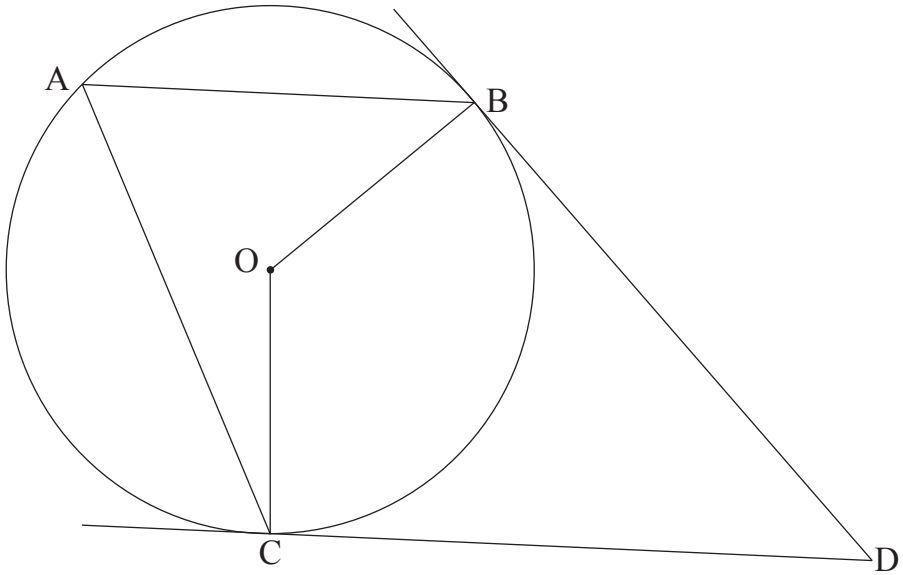
11 Solve $y = x + 3$ and $x^2 + y^2 = 14$

Give your answers to 2 decimal places.

Answer _____ [7]

[Turn over

12



O is the centre of the circle. A, B, C are points on the circumference.

DB and DC are tangents. The angle CAB is x.

Find, in simplest form, in terms of x,

(a) angle BOC,

Answer _____ [1]

(b) angle BDC.

Answer _____ [2]

Given that the lines AB and CD are parallel find, in simplest form, in terms of x,

(c) angle ABO,

Answer _____ [2]

(d) angle ACO.

Answer _____ [2]

13 A group of p people were asked their ages in years.

The total of their ages was 960 years.

When 20 of the people were removed from the group the total of the ages of the remaining group was 480

Given that the mean of the original group was three-quarters of the mean of the remaining group, find the number of people in the original group.

Answer $p =$ _____ [3]

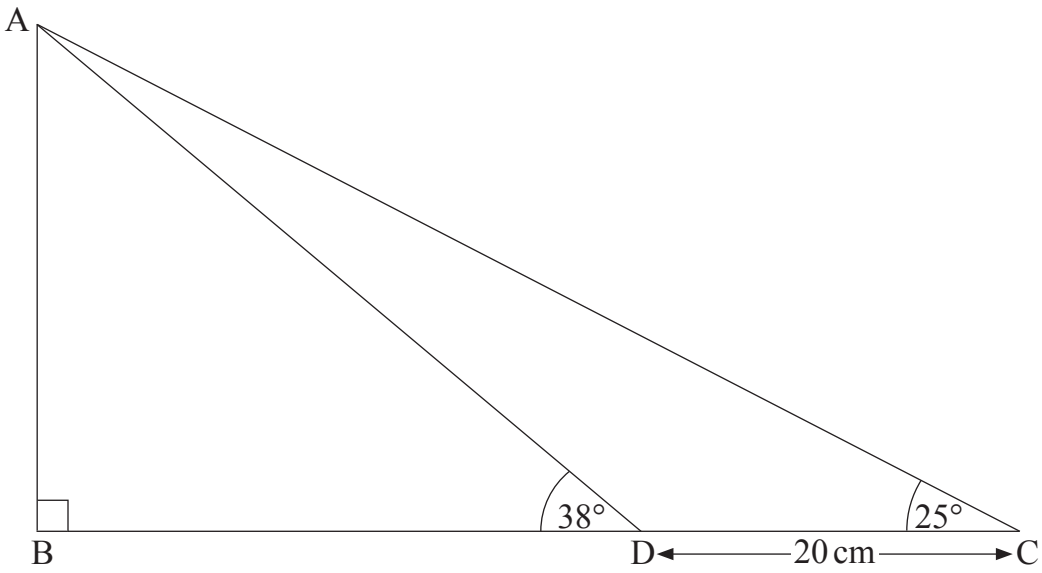
[Turn over

14 In the triangle shown

angle ABC = 90°, angle ADB = 38°, angle ACD = 25°

The length of DC = 20 cm.

Find the area of the triangle ABC.



Answer _____ cm^2 [5]

15 Factorise fully $100ax^2 + 65axy - 75ay^2$

Answer _____ [3]

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

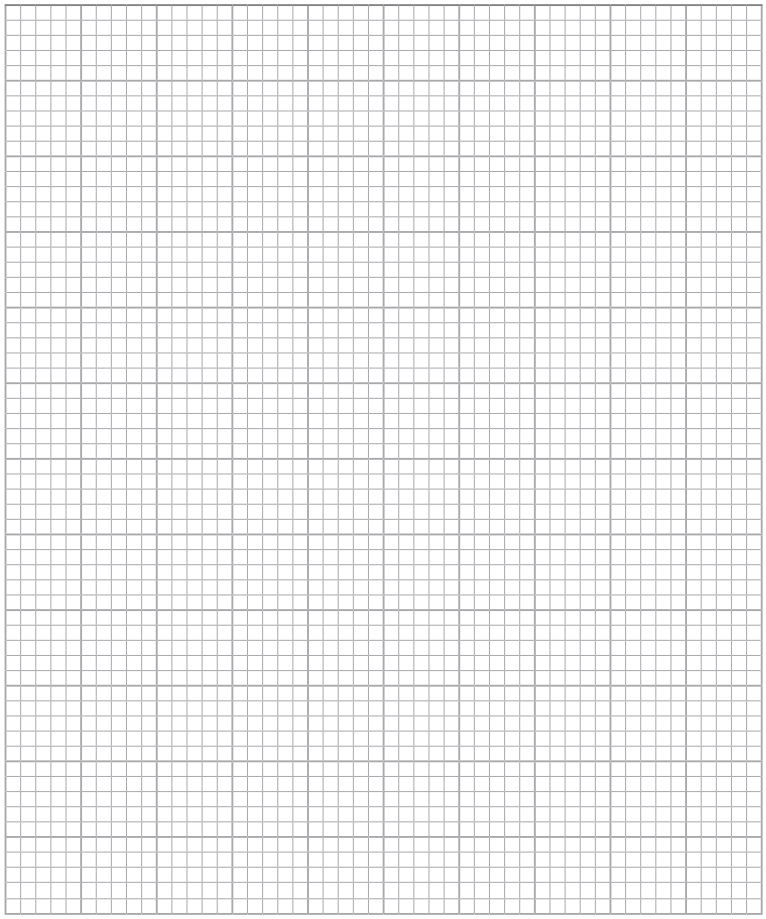
Answer _____ [6]

[Turn over

17 A table of lengths, m, of mobile phone calls to a company is shown.

Length (seconds)	Frequency
$0 < m \leqslant 3$	6
$3 < m \leqslant 12$	9
$12 < m \leqslant 20$	12
$20 < m \leqslant 32$	18
$32 < m \leqslant 36$	10
$36 < m \leqslant 41$	12

(a) On the grid provided draw a clearly labelled histogram to illustrate this data.



[3]

(b) Estimate the number of calls that were between 15 and 35 seconds.

Answer _____ [3]

(c) Explain what a stratified sample is.

Answer _____

_____ [2]

(d) A stratified sample of size 25 is to be taken from those calls which are shorter than 30 seconds. Estimate how many of these will be greater than 12 seconds.

Answer _____ [3]

(e) Calculate an estimate of the interquartile range of the lengths of calls.

Answer _____ secs [4]

[Turn over

Quality of written communication will be assessed in this question.

18 A customer bought a number of toys all at the same price. In total she spent £60

If the price of each toy had been £1 more she could have bought 16 less toys for £60

Find the price paid for each toy.

A method of trial and improvement will not be accepted.

Answer £ _____ [7]

19 Two coastguard stations P and Q are 7 km apart and P is due west of Q.

From P the bearings of two ships A and B are 024° and 065° respectively.

From Q the bearings of A and B are 291° and 336° respectively.

Find the distance between the ships.

A solution by scale drawing will not be accepted.

Answer _____ km [8]

THIS IS THE END OF THE QUESTION PAPER

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For Examiner's use only	
Question Number	**Marks**
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Examiner Number