Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
January 2019

Mathematics

Unit T6 Paper 2
(With calculator)
Higher Tier

MV18

[GMT62]

THURSDAY 10 JANUARY, 10.45am–12.00 noon

Time

1 hour 15 minutes, plus your additional time allowance.

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 on blank pages or tracing paper.
Complete in black ink only.
Answer **all fifteen** 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 50.
Figures in brackets printed at the end of each question 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 **13**.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is on pages 4 and 5.

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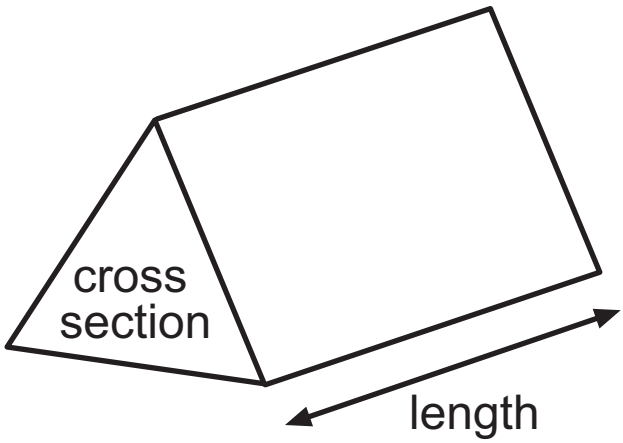
(Questions start on page 6)

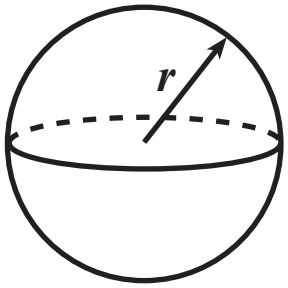
Formula Sheet

Volume of prism = area of cross section × length



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

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



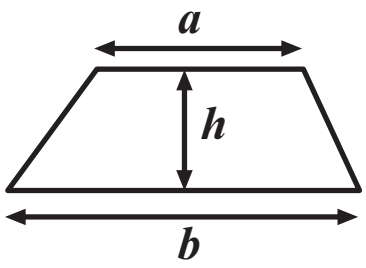
Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$, are given by

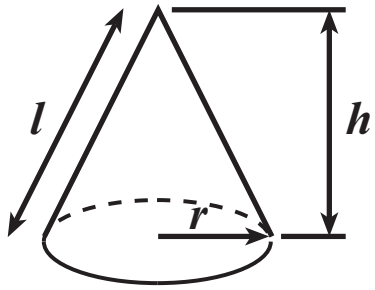
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

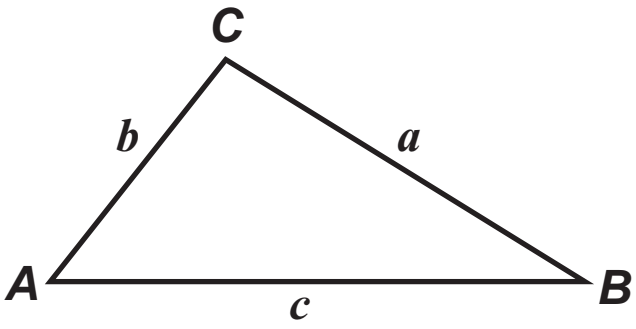


Volume of cone $= \frac{1}{3}\pi r^2 h$

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



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

1 A fruitcake recipe for 8 people needs the ingredients shown.

Complete the ingredients needed for 20 people.
[3 marks]

	8 people	**20 people**
Olive oil	160 ml	ml
Brown sugar	100 g	g
Eggs	2	
Plain flour	220 g	g
Mixed fruit	200 g	g

2 Work out the area of the trapezium below. [2 marks]

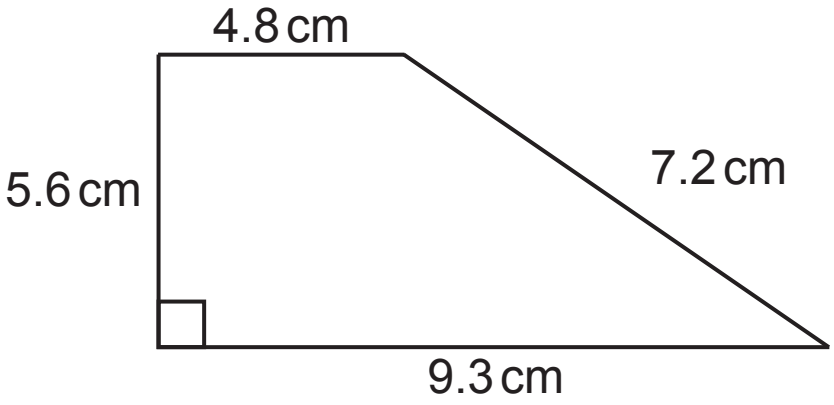
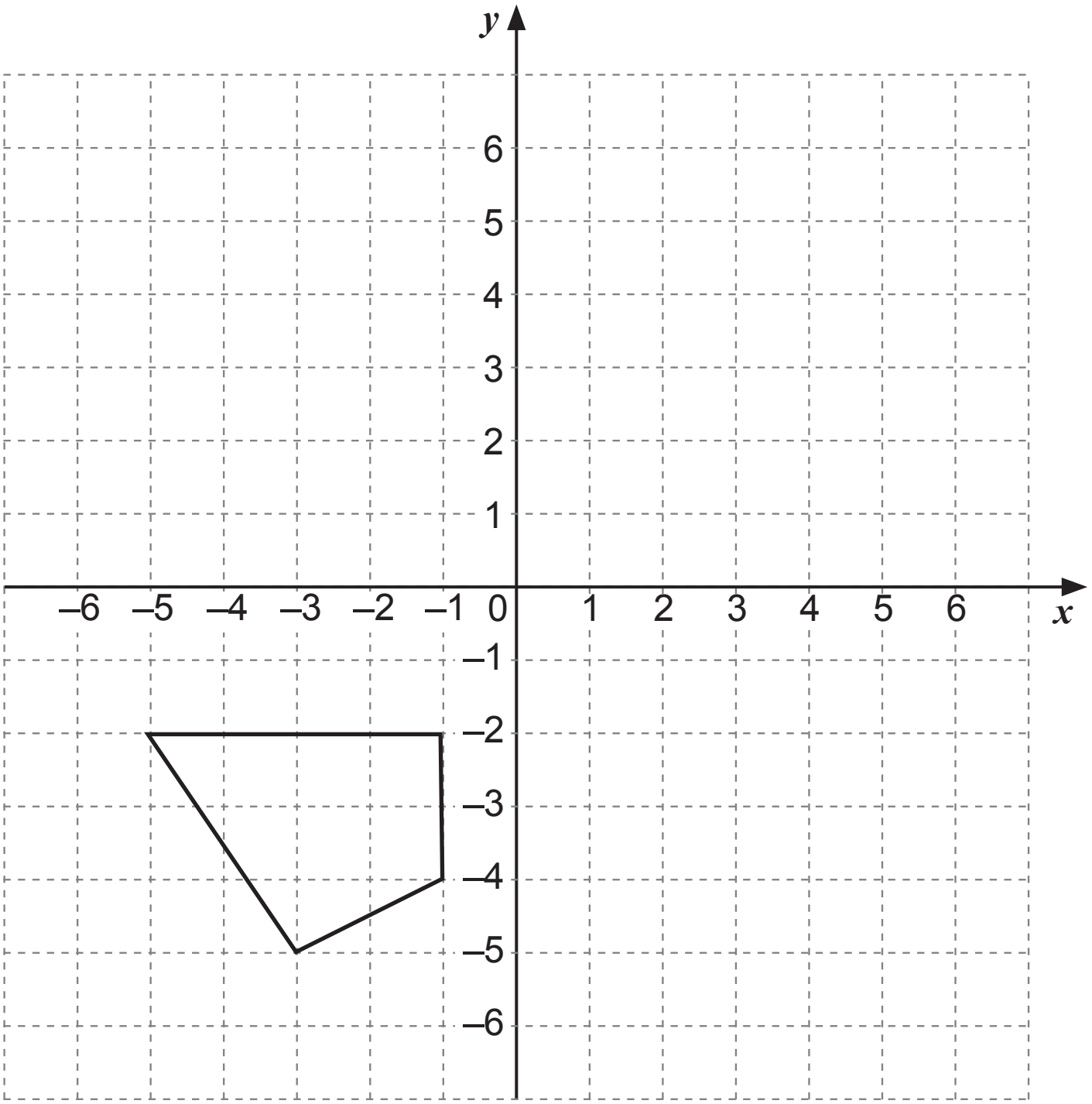


diagram not drawn accurately

Answer _____ cm^2

3 Rotate the shape 90° anticlockwise about the origin.
[3 marks]



4 $S = r\,(2m - p)$

Calculate the value for S when $r = \frac{1}{2}$, $m = 8$ and $p = -2$
[3 marks]

Answer $S =$ _____

5 A car travels 70 miles in 75 minutes.

Work out its average speed in miles per hour. [3 marks]

Answer _____ mph

6 n is a positive integer.

Which of the following statements below describes the number $2n^2 + 1$? [2 marks]

Explain your answer.

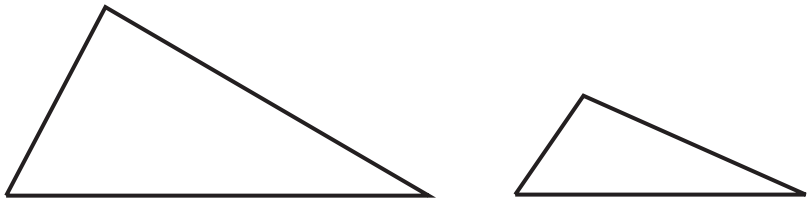
"always even" "always odd" "could be even or odd"

Answer _____

because _____

_____

7



The area of the large triangle is 216 cm^2

The ratio of the area of the large triangle to the area of the small triangle is 3:1

What is the **total area** of the two triangles? [3 marks]

Answer _____ cm^2

8 A survey of the age of cars was carried out in a 4-floor car park.

Floor	Number of cars	Number of cars over 5 years old	Relative frequency (2 d.p.)
1	42	16	0.38
1 and 2	75	27	
1, 2 and 3	105	32	
1, 2, 3 and 4	114	37	

(a) Complete the table for the missing relative frequency values, rounding to 2 decimal places where necessary. [2 marks]

(b) (i) What is the best estimate for the probability of a car being over 5 years old? [1 mark]

Answer _____

(ii) Explain why this is the best estimate. [1 mark]

_____

_____

(c) On another day there were 186 cars in the car park.

Calculate an estimate for the number of cars that were over 5 years old. [2 marks]

Answer _____

9 A metal rod has a density of 11g/cm^3

It has a volume of 48 cm^3

Find its mass. [2 marks]

Answer _____ g

10 In the table below, the letters r, s and t all represent lengths.

Some of the expressions in the table represent areas.

Tick the boxes underneath those expressions which represent areas. [2 marks]

$2rs - t^2$	$\pi r(s+t)^2$	$\frac{1}{3}rst$	$\frac{st^2}{r+s}$	$rs + t$

11 Two buoys, M and N, are fixed 5 km apart as shown on the scale diagram below.

A yacht sails so that it is

- always less than 3 km from N
- always closer to M than to N.

Show, by shading, the locus of all points where the yacht can sail. [3 marks]

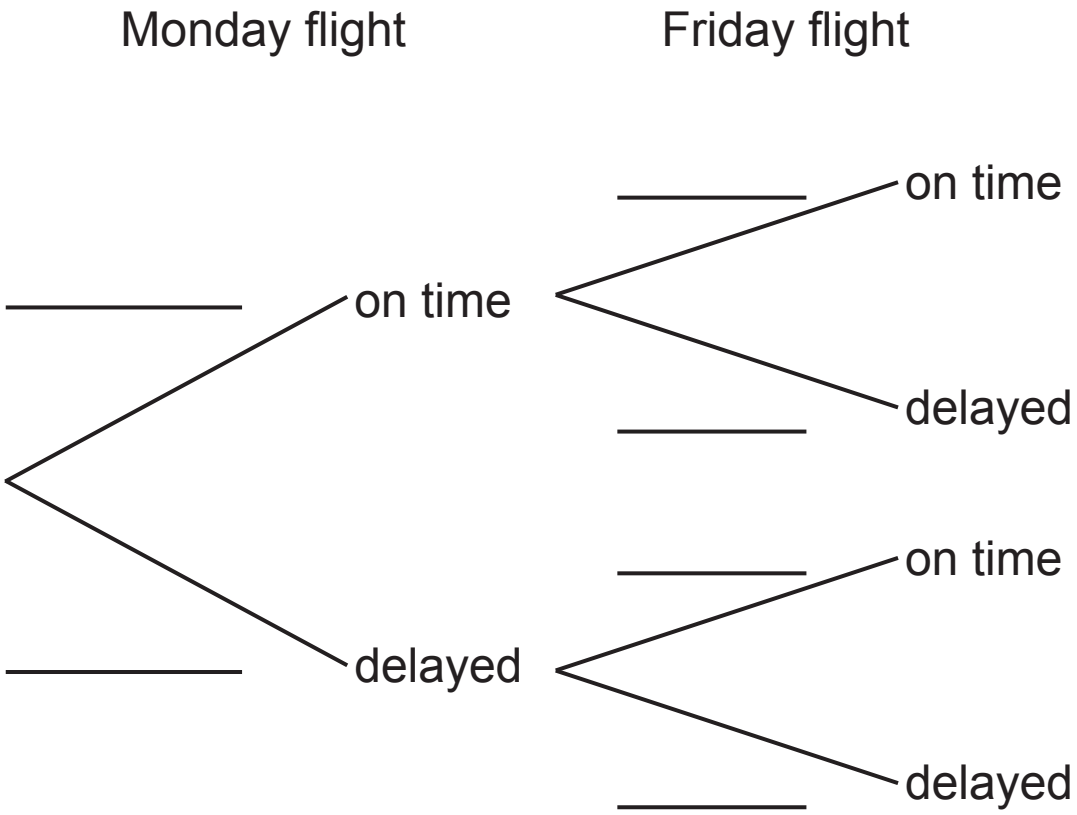
Use scale 2 cm = 1 km

M ——————————————— N

12 Martin gets a flight from Belfast to London for work on Monday and Friday each week.

There is a 25% chance of the Monday flight being delayed.
There is a 40% chance of the Friday flight being delayed.

(a) Complete the tree diagram below to show the probabilities of the possible outcomes for the two flights. [3 marks]



(b) What is the probability that at least one of the two flights will be delayed? [3 marks]

Answer _____

Quality of written communication will be assessed in this question.

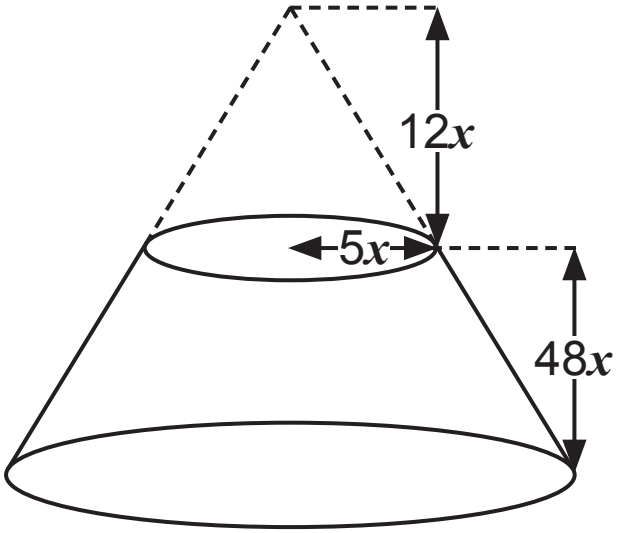
13 Rearrange $C = \frac{t + m}{t - m}$ to make t the subject. [4 marks]

Answer _____

14 Simplify $(3st^3)^4$ [2 marks]

Answer _____

15 The diagram represents the frustum of a **solid** cone, formed when a small cone is removed from the top of a large cone.



The base radius of the small cone is $5x$ and its vertical height is $12x$.

The vertical height of the frustum is $48x$.

Work out the total surface area of the frustum in terms of π and x. [6 marks]

You must show all your working.

Answer _____

THIS IS THE END OF THE QUESTION PAPER

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
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9	
10	
11	
12	
13	
14	
15	
Total Marks	

Examiner Number