EXAMINATIONS COUNCIL OF SWAZILAND
Swaziland General Certificate of Secondary Education

MATHEMATICS **6880/03**

Paper 3 Calculator Structured Questions (Extended) **October/November 2013**

2 hours

Additional Materials: Answer Paper
Graph Paper (2 sheets)
Electronic calculator
Geometrical instruments
Mathematical tables (optional)
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on **all** the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
All working should be clearly shown. It should be done on the same sheet as the rest of the answer.
Marks will be given for working which shows that you know how to solve the problem even if you get the answer wrong.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 100.

This document consists of **10** printed pages and **2** blank pages.

1 It takes Dumile $\frac{1}{5}$ of a second to write the number zero and $\frac{1}{10}$ of a second to write the number one.

How long will it take Dumile to write 10^{20}, in full, as an ordinary number? [3]

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2 At a pupils' farewell party, there were boys and girls in casual wear.
Some of the boys and girls wore jeans.
Some of the girls had long hair.
Using : $\mathscr{E}$ = {People at the party}
G = {girls}
J = {pupils wearing jeans}
L = {girls with long hair}

(a) Draw a Venn diagram to illustrate this information. [3]

(b) On the diagram put an *s* in the region where a girl with short hair, wearing jeans should be. [1]

(c) On the diagram put an *r* in the region where a boy wearing jeans should be. [1]

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3 You are given that T varies directly as C and m^2.

When $C = 10$ and $m = 20$, $T = 12\,000$.

Find the value of m when $T = 7776$ and $C = 18$. [4]

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4 Answer the whole of this question on a sheet of graph paper.

A cheetah decreases its speed uniformly from 32 metres per second to 22 metres per second in 4 seconds.
It maintains this speed for 7 seconds, whereupon it comes to rest in 2 seconds.

(a) Using a scale of 2 cm to represent 5 metres per second on the vertical axis and 1 cm to represent 1 second on the horizontal axis, show the cheetah's journey until it comes to rest. [4]

(b) Find the acceleration for the first 4 seconds of the journey. [2]

(c) Find the total distance covered by the cheetah. [3]

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5 **(a)** Simplify.

$$\frac{3m^2 + 7m + 4}{6m^2 + 8m}$$

[3]

(b) Rearrange this formula to make c the subject.

$$y = \sqrt{\frac{a + b}{c}}$$

[3]

(c) $A = \begin{pmatrix} t & 3 \\ 1 & u \end{pmatrix}$, $B = \begin{pmatrix} -1 & w \\ y & 2 \end{pmatrix}$ and $2A = B^2$.

Find the value of

(i) w [3]
(ii) y [1]
(iii) t [1]
(iv) u. [1]

(d) Solve this equation.

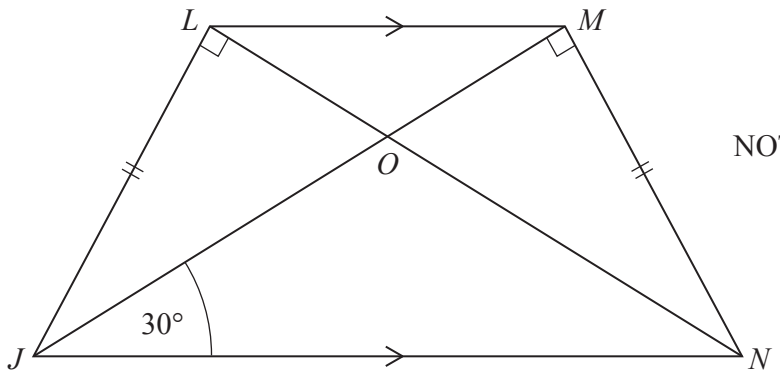
$$\frac{3}{v + 2} = \frac{17}{3 - v}$$

[3]

(e) A is the point $(1, k)$ and B is the point $(h, 1)$.
S is the midpoint of the straight line joining A to B.
The coordinates of S are $(4, -1)$.

Find the values of h and k. [3]

6 *JLMN* is a trapezium with side *LM* parallel to *JN* and *JL* = *NM*.
Diagonals *LN* and *MJ* intersect at *O*.
Angle *JMN* = angle *JLN* = 90° and angle *MJN* = 30°.



NOT TO SCALE

(a) Name the triangle which is congruent to triangle *JLN*. [1]

(b) Prove that triangle *JON* is similar to triangle *MOL*. [2]

(c) *LM* = 6 cm, *MO* = 3 cm and *JO* = 7 cm.

Calculate the length of *NJ*. [1]

(d) Write down the ratio of the Area of triangle *JON* : Area of triangle *MOL*. [2]

7 A factory makes car batteries.

The probability that a battery is faulty is 0.1.

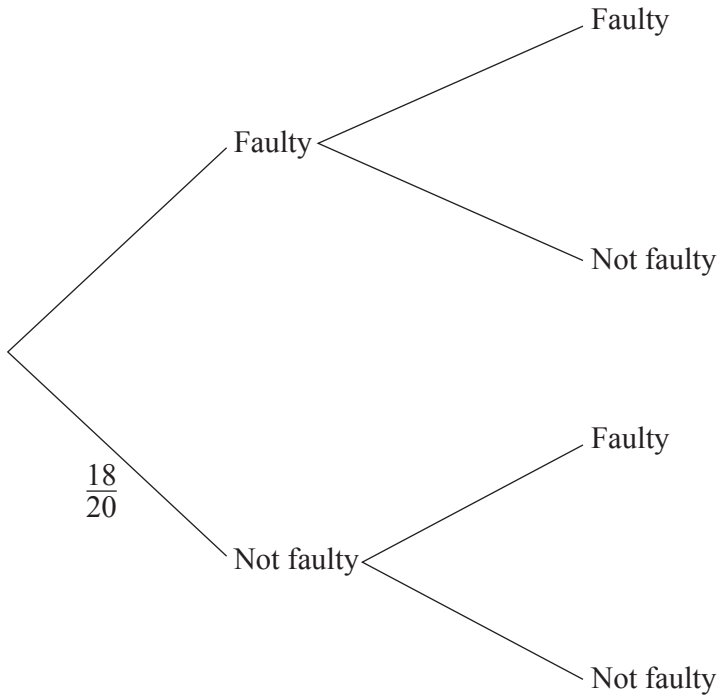
(a) What is the probability that the battery is not faulty? [1]

(b) A company buys 20 batteries.

(i) How many of these are expected to be faulty? [1]

(ii) Two batteries are chosen at random from the 20 batteries.

Assume the number of faulty batteries is as found in part **(b)(i)**.
Copy and complete the tree diagram to show the probabilities of the possible outcomes.

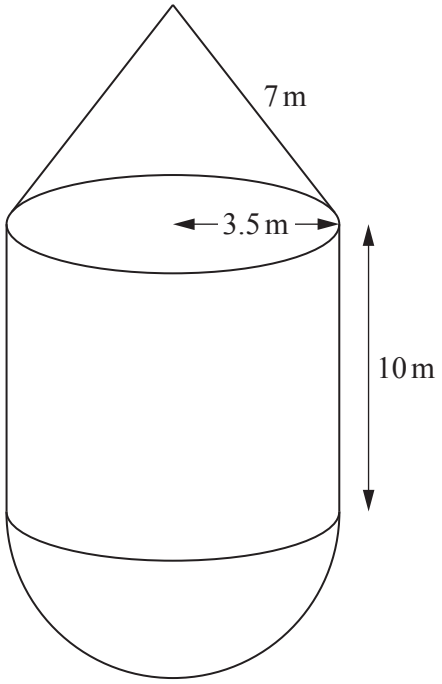


[3]

(iii) From the diagram, find the probability that both batteries are faulty. [2]

(iv) From the diagram, find the probability that exactly one battery is faulty. [3]

8 The diagram below shows a model of a rocket.
It consists of a cone, a cylinder and a hemisphere each with radius 3.5 m.
The cone has a slant height 7 m and the cylinder has a height of 10 m.
The hemispherical end is a fuel tank.



$\left[\text{Volume of sphere} = \frac{4}{3}\pi r^3, \text{surface area of sphere} = 4\pi r^2 \text{ and curved surface area of cone} = \pi rs\right]$

(a) Calculate the total surface area of the rocket. [4]

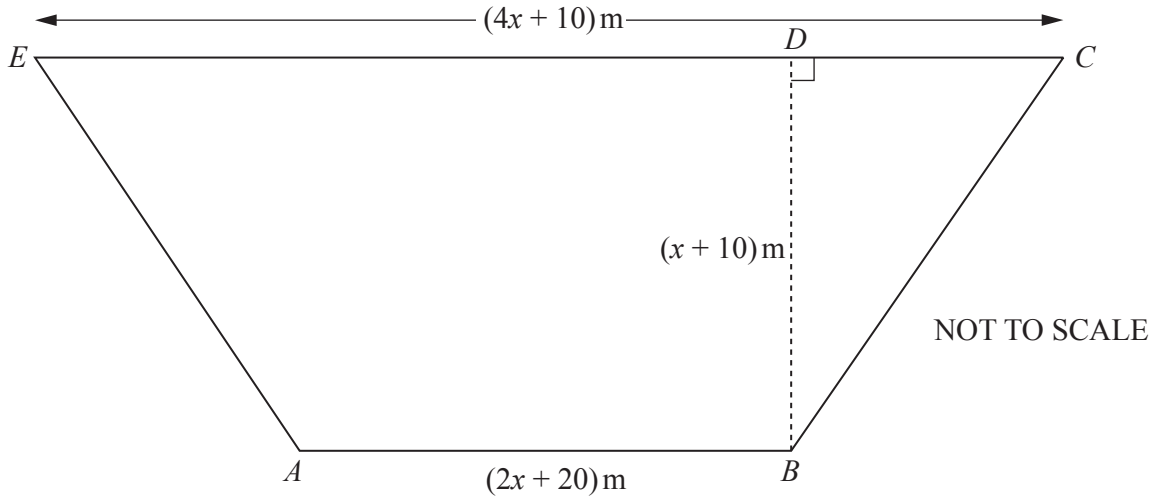
(b) Calculate the volume of the fuel required to fill the hemispherical tank. [2]

(c) When the rocket is launched it takes 45 minutes to travel 540 000 km.

Calculate its speed, in kilometres per hour, giving the answer in standard form. [3]

(d) How many planes of symmetry has the model? [1]

9 A field shaped like a trapezium is shown below.



BD is perpendicular to *EC* and has length $(x + 10)$ metres.

It is given that $AB = (2x + 20)$ metres and $EC = (4x + 10)$ metres.

(a) Show that the area of the field is $3x^2 + 45x + 150$. [3]

(b) Given that the area of the field is $1800\,\text{m}^2$

(i) form an equation for the area of the field and show that it reduces to

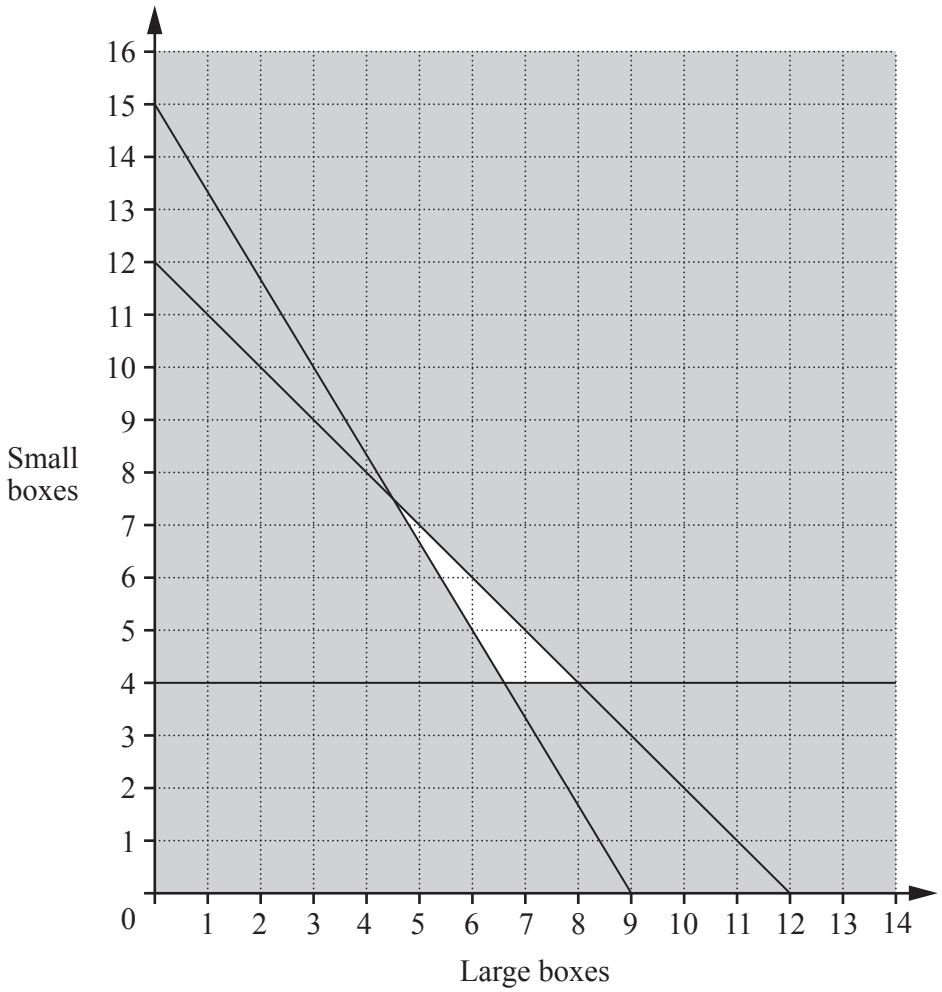
$$x^2 + 15x - 550 = 0,$$ [3]

(ii) solve the equation $x^2 + 15x - 550 = 0$, giving your answer to two decimal places, [4]

(iii) find the length of *EC*. [1]

10 A stationery shop sells pens in boxes of different sizes.
A large box holds 5 pens and a small box holds 3 pens.
A school needs at least 45 pens.
You are given that x represents the number of large boxes and y represents the number of small boxes.

The unshaded region in the diagram represents the conditions that should be satisfied when buying the pens.



(a) From the graph above write the three inequalities that satisfy the unshaded region. [3]

(b) Find

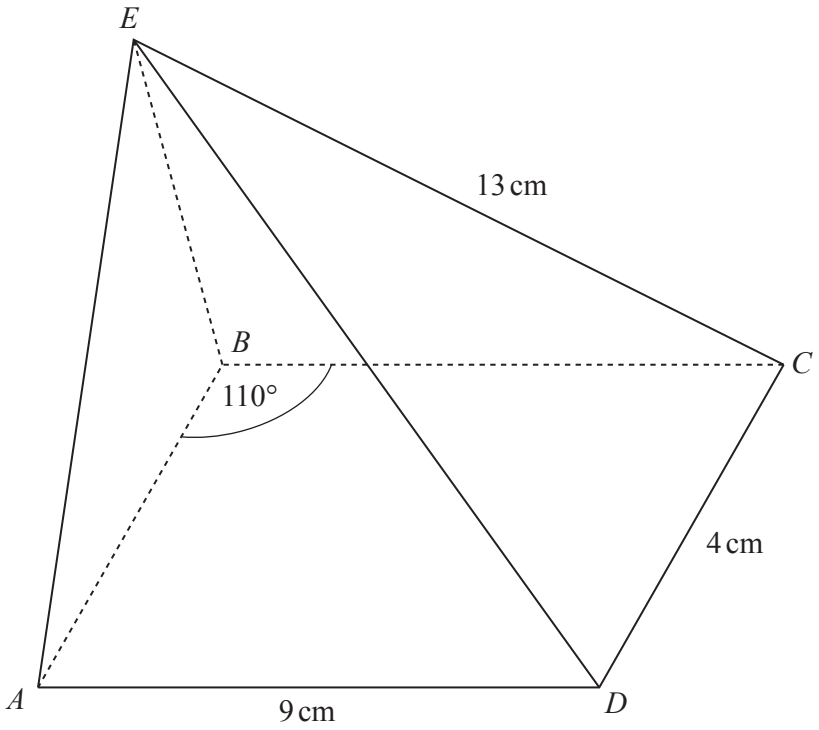
(i) the minimum number of small boxes that can be bought by the school, [1]

(ii) the maximum number of boxes that the school can buy. [2]

(c) The cost of a large box is E30 and the cost of a small box is E10.

Find the cheapest way of getting the required number of pens. [2]

11 $ABCDE$ is a pyramid with a parallelogram base.
$CD = 4\,\text{cm}$, $AD = 9\,\text{cm}$, $EC = 13\,\text{cm}$ and $A\hat{B}C = 110°$.



(a) Calculate the length of the diagonal AC. [4]

(b) Given that angle $ADE = 40°$ and angle $AED = 60°$, find length AE. [3]

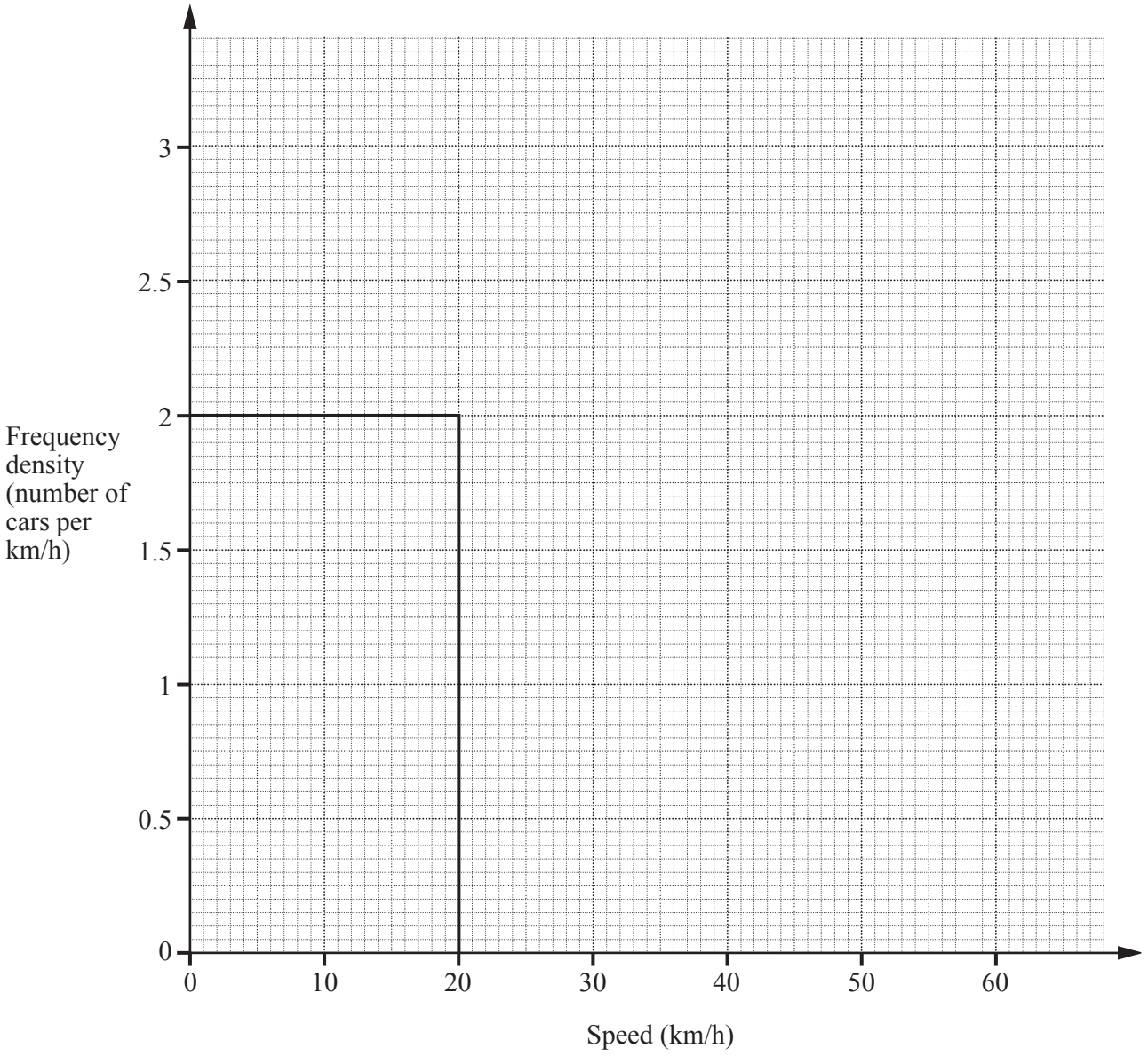
(c) Given that the area of triangle ACE is $36.7\,\text{cm}^2$, calculate angle AEC. [3]

12 Answer the whole of this question on a sheet of graph paper.
In a survey the speeds, v km/h, of 100 cars were recorded.

Speed(v km/h)	$0 < v \leqslant 20$	$20 < v \leqslant 30$	$30 < v \leqslant 40$	$40 < v \leqslant 60$
Frequency	40	28	20	12

(a) Calculate an estimate of the mean. [3]

(b) Copy and complete the histogram to represent the information in the table.



[3]

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