THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

H

Wednesday 11 January 2012 – Morning

GCSE APPLICATIONS OF MATHEMATICS

A381/02 Applications of Mathematics 1 (Higher Tier)

A316900112

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Scientific or graphical calculator
- Geometrical instruments
- Tracing paper (optional)

Duration: 1 hour 15 minutes

A381020

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

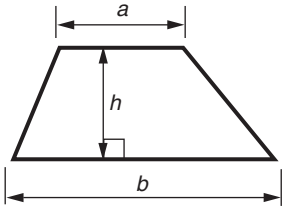
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*****).
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

You are permitted to use a calculator for this paper

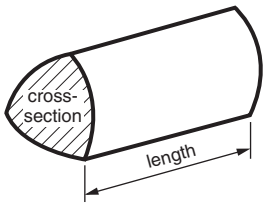
This paper has been pre modified for carrier language

Formulae Sheet: Higher Tier

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



Volume of prism = (area of cross-section) × length

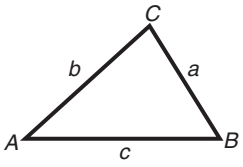


In any triangle *ABC*

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

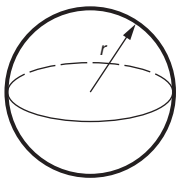
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



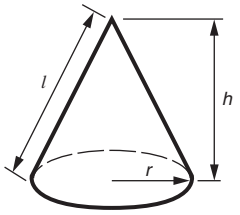
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

Curved surface area of cone $= \pi rl$



The Quadratic Equation

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

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

PLEASE DO NOT WRITE ON THIS PAGE

1 **(a)** A novel has 415 pages.
Each page has an average of 34 lines.
Each line has an average of 11 words.
Dave says there are 15210 words in the novel.

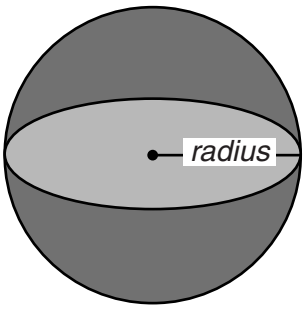
By rounding each number to one significant figure, check Dave's total.
Show the values you use to make your decision.

(a) _____ **[2]**

(b) Ben wants to work out the radius of this sphere.

To do this he has to calculate $\sqrt[3]{\frac{3 \times 530}{4 \times \pi}}$

to give the radius in centimetres.



Calculate the radius, giving your answer correct to two significant figures.

(b) _____ cm **[2]**

(c) Ann and Sara are twins.
They were each given the same amount of money for their birthday.

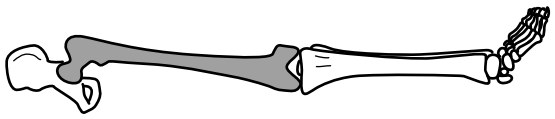
Ann saved $\frac{5}{12}$ of her money.

Sara saved $\frac{7}{18}$ of her money.

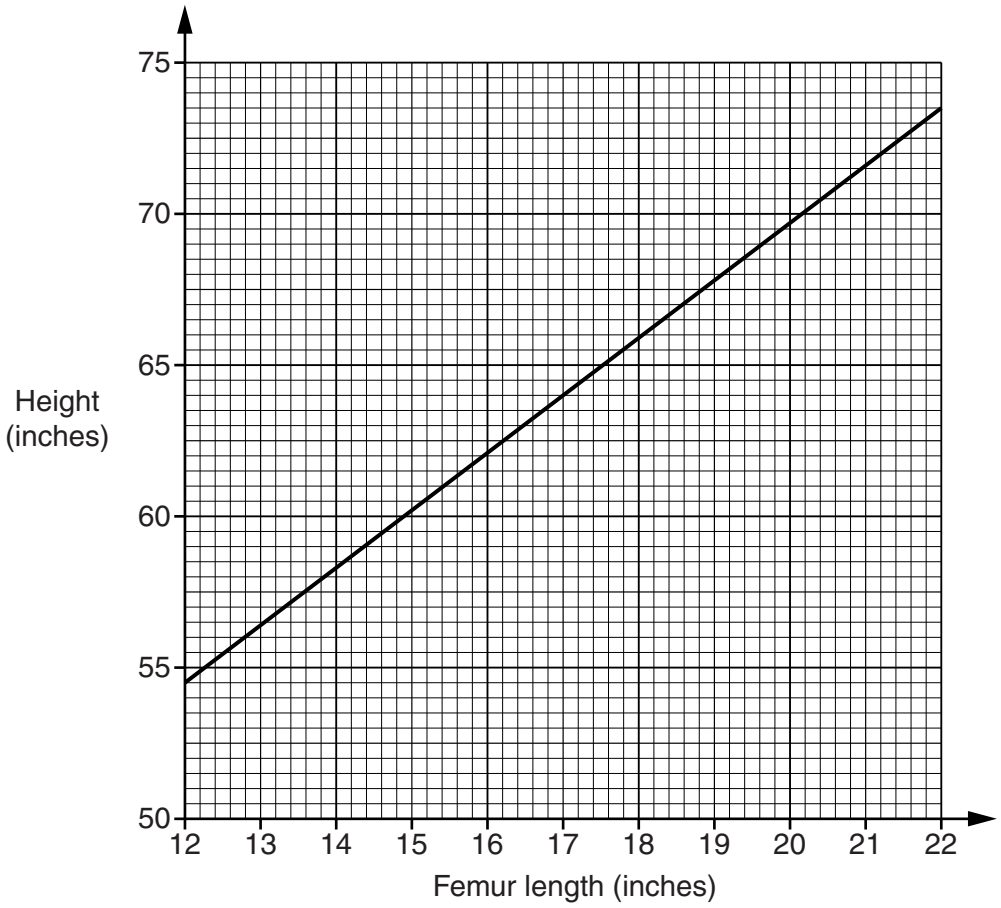
Which girl saved the most money?
Show the calculations you use to make your decision.

(c) _____ because _____ **[2]**

2 The femur, shown shaded in the diagram, is a bone in the leg.



Forensic scientists use the length of the femur to estimate the height of a person.
They use the graph to estimate the height of a man.



(a) A man's femur is 20 inches long.
Use the graph to estimate the height of this man.

(a) _____ inches **[1]**

(b) Forensic scientists use this formula to estimate the height of a woman.

$$H = 2L + 29$$

H is the height in inches

L is the length of the femur in inches

Draw the graph of $H = 2L + 29$ on the grid on the previous page.

You may use this table to help you.

L	12	16	22
H			

[3]

(c) A man and a woman are both 63 inches tall.

Using your graph, estimate the difference in the lengths of their femurs.

(c) _____ inches **[2]**

3 Hannah hires a paint sprayer.
This table shows the costs.

First day	Each additional day	A whole weekend	A whole week
£157.35	£78.50	£209.75	£332
Delivery £7.50 Collection £7.50			
VAT at 20% will be added.			

Hannah hires the paint sprayer for Monday and Tuesday.

Work out the total cost including delivery, collection and VAT.

£ _____ **[4]**

4 A swimming pool has a length of 40 m and a width of 15 m.
Sima and Sally started swimming at the same time and with the same speed.
Sima swam lengths and Sally swam widths.

(a) How many lengths had Sima swum before both girls were back at their starting positions again?

(a) _____ **[2]**

(b) How far had Sima swum at that time?

(b) _____ m **[1]**

5 Dafydd is going to lay a rectangular concrete slab as a base for a shed.
The slab will measure 2.5 m by 1.8 m and will be 10 cm thick.
He uses this formula to calculate the volume of concrete he needs.

$$V = \text{length} \times \text{width} \times \text{depth}$$

(a) Calculate the volume of concrete he needs.
Give your answer in m^3.

(a) _____ m^3 **[1]**

(b) (i) These are the raw materials to make 1 m^3 of concrete.

300 kg	cement
600 kg	sand
1200 kg	gravel
160 litres	water

Calculate the amount of each of the raw materials Dafydd needs.

(b)(i) cement _____ kg

sand _____ kg

gravel _____ kg

water _____ litres **[2]**

(ii) Cement is sold in 25 kg bags.

How many bags of cement does Dafydd need?

(ii) _____ **[2]**

6 **(a)** A car is travelling at 54 kilometres per hour.

Change 54 kilometres per hour to metres per second.

(a) _____ m/s **[2]**

(b) **(i)** A person's carbon footprint is the total amount of greenhouse gases (such as CO_2) produced by their activities.

Robert and Teresa drive from Calais to Bordeaux in France.
The distance they drive is 545 miles.
Their car produces 159 grams of CO_2 each kilometre.

1 mile ≡ 1.6 km

Calculate the amount of CO_2 produced by their car journey.
Give your answer in kilograms.

(b)(i) _____ kg **[3]**

(ii) The distance from Calais to Bordeaux by train is 832 km.
For a train journey the amount of CO_2 produced is estimated to be 0·0534 kg per kilometre for each passenger.

Calculate how much less CO_2 would be produced if Robert and Teresa travel by train instead of by car.

(ii) _____ kg **[2]**

7 A bakery bakes bread 24 hours a day, 7 days a week.

(a) In one hour, the bakery can bake a maximum of 4500 loaves of bread.

During one week the bakery loses

- 3% of its production due to breakdown and
- 6% of its production due to cleaning and
- 8% of its production due to staff training.

Calculate the number of loaves baked that week.

(a) _____ **[3]**

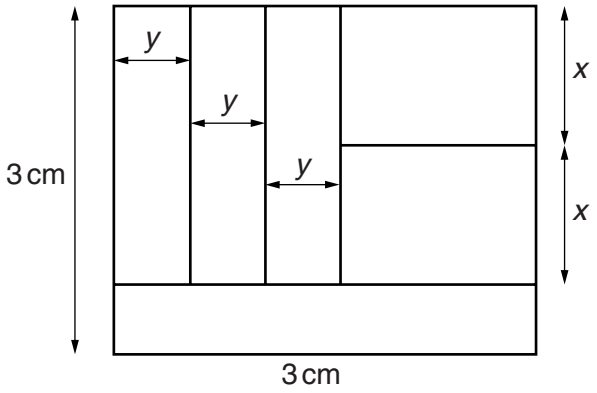
(b) Another week the bakery makes 650 000 loaves.
The bakery uses 200 kg of flour to make 350 loaves of bread.
Flour is delivered to the bakery by tankers that carry 28 tonnes.

1 tonne = 1000 kg

How many tanker loads did the bakery need for that week?

(b) _____ **[4]**

8 A square has sides of 3 cm.
The square is divided into six rectangles of equal area as shown.



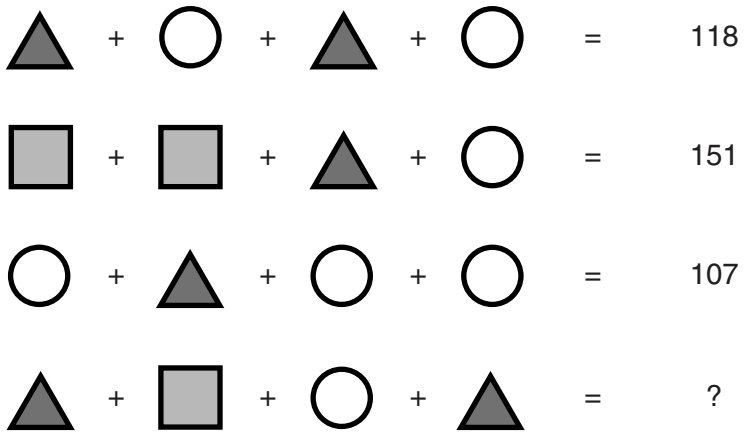
Not to scale

Work out the lengths labelled x and y.

x = _____ cm

y = _____ cm **[5]**

9 In this puzzle, each symbol represents a different whole number.



(a) Use the first two rows to show that the value of  is 46.

_____

_____

_____

_____ **[1]**

(b) Find the value of the last row.

(b) _____ **[3]**

10 Simplify $\left(\frac{8x^3}{27}\right)^{-\frac{2}{3}}$.

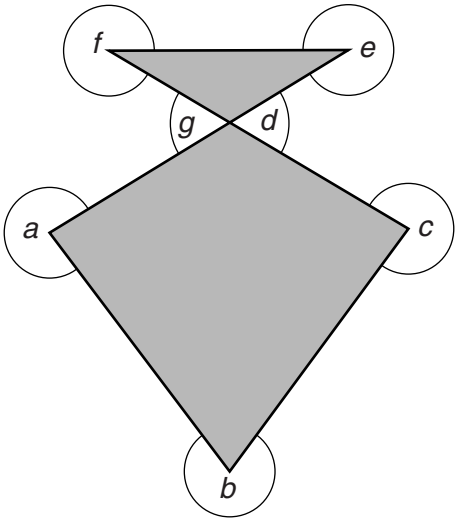
_____ **[3]**

11 On February 2nd a share in a company was worth 9% more than on February 1st.
On February 3rd a share was worth 9% more than on February 2nd.
On February 4th a share was worth 9% more than on February 3rd.
Its value on February 4th was 362.5 p.

What was the value of a share on February 1st?

_____ p **[3]**

12* Dipak uses this logo for his company.



Calculate the sum of the angles *a*, *b*, *c*, *d*, *e*, *f* and *g*.
Justify each step of your working.

_____ ° **[3]**

13 Trevor makes model cars to scale.
The windscreen of one of his models has an area of 6.1 cm^2.
The actual car has a windscreen with an area of 0.55 m^2.
The model has a boot with a volume of 12.6 cm^3.

Calculate the volume of the boot of the actual car.

_____ m^3 **[4]**

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

PLEASE DO NOT WRITE ON THIS PAGE