**Pearson
Edexcel GCSE**

Centre Number

Candidate Number

Applications of Mathematics
Unit 2: Applications 2
For Approved Pilot Centres ONLY

Higher Tier

Friday 7 November 2014 – Morning
Time: 1 hour 45 minutes

Paper Reference
5AM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

**PEARSON**

GCSE Mathematics 2AM01

Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

**Volume of prism** = area of cross section × length
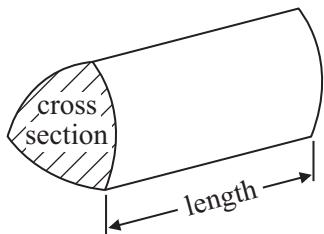

Area of trapezium = $\frac{1}{2}(a + b)h$
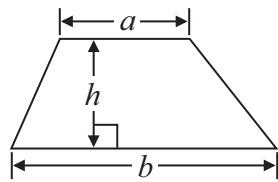
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$
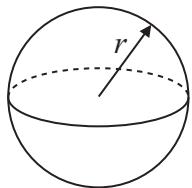
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$
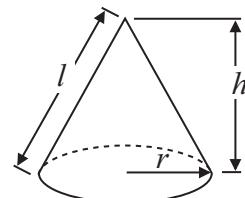
In any triangle *ABC*
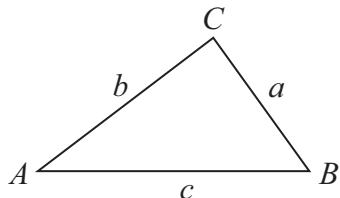
The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

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

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

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1   Eggs are sold in small boxes and in large boxes.

There are 6 eggs in each small box.
There are 12 eggs in each large box.

Sam buys x small boxes of eggs and y large boxes of eggs.
Sam buys a total of t eggs.

(a) Write down a formula for t in terms of x and y.

....
(3)

There are 600 eggs in a shop.

The probability that an egg is bad is $\dfrac{1}{40}$

(b) Work out an estimate for the number of eggs that are bad.

....
(2)

(Total for Question 1 is 5 marks)

2 Asif delivers parcels on his bike.
   He starts from his home.

   Here is a travel graph for the first 40 minutes of Asif's journey.

Kilometres
from home
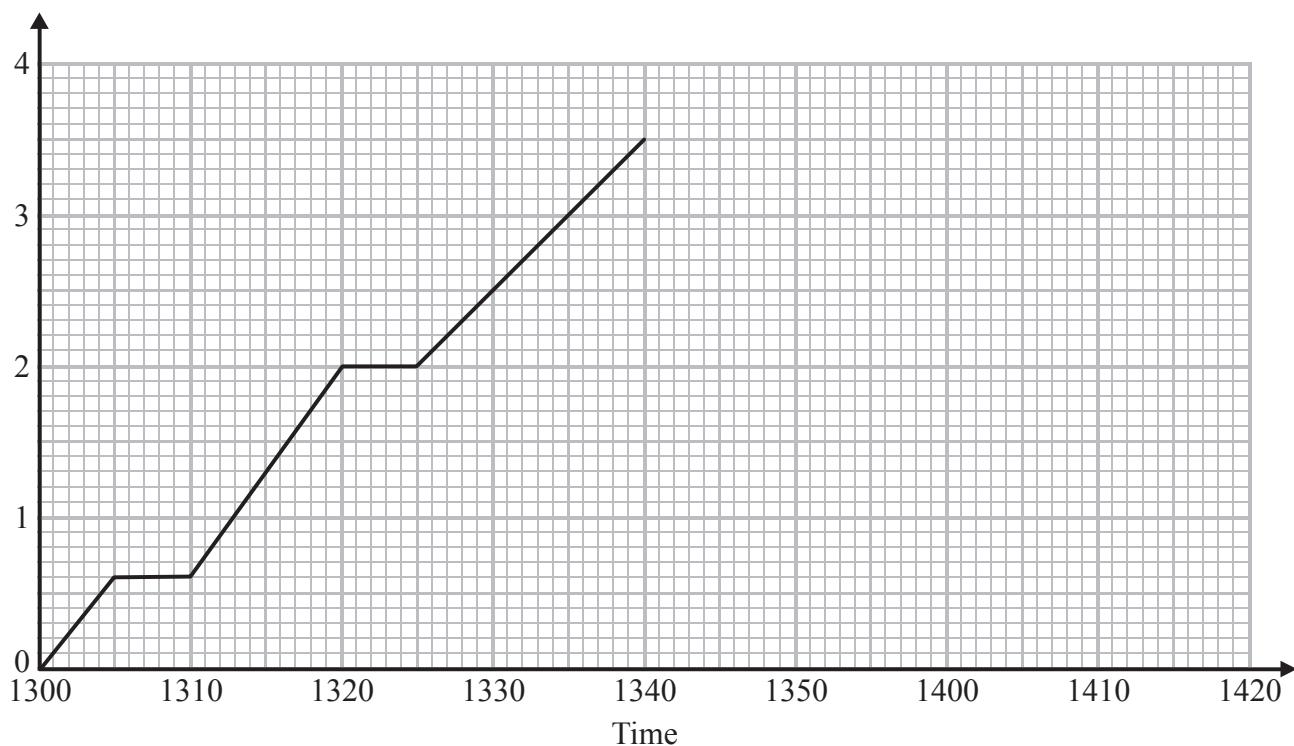
Time

(a) What time did Asif start his journey?

....

(1)

Asif stops to deliver each parcel.

(b) How many minutes long was his first stop?

.... minutes

(1)

(c) What is the distance between the first stop and the second stop shown on the travel graph?

.... km

(2)

At 1340, Asif stops for 10 minutes to deliver his last parcel.
He then cycles back home at a steady speed.
Asif gets home at 1415

(d) Complete the travel graph.

(2)

**(Total for Question 2 is 6 marks)**

*3 Soap powder is sold in three sizes of box.

Diagram **NOT**
accurately drawn

2 kg   5 kg   9 kg
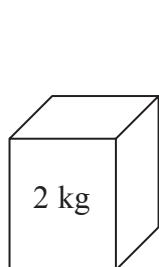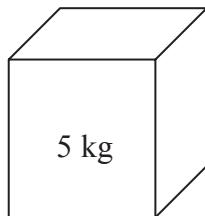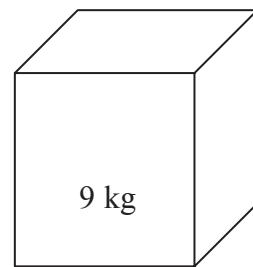
£1.90   £4.35   £8.45

A 2 kg box costs £1.90
A 5 kg box costs £4.35
A 9 kg box costs £8.45

Which size of box is the best value for money?
Explain your answer.
You must show all your working.

(**Total for Question 3 is 4 marks**)

4 Bill has some models of meerkats.
He has models of meerkat children and models of meerkat adults.

Bill has twice as many models of meerkat children as models
of meerkat adults.
He has a total of 30 models.

Each model meerkat child has a value of £2.80
Bill's models have a total value of £98.00

Each model meerkat adult has the same value.

Work out the value of a model of a meerkat adult.

meerkat

£ ....

(Total for Question 4 is 4 marks)

5 A small photograph has a length of 6 cm and a width of 5 cm.
The small photograph is enlarged to make a large photograph.

The large photograph has a length of 21 cm.

Diagram **NOT**
accurately drawn

5 cm

6 cm

Small photograph

21 cm

Large photograph

The two photographs are similar rectangles.

Work out the perimeter of the large photograph.

.... cm

(Total for Question 5 is 3 marks)

*6 Here are the ingredients to make 12 cupcakes.

For **12** cupcakes
200 g butter
200 g caster sugar
4 eggs
240 g flour

Martin is making cupcakes to sell at his school play.
Martin wants to make 1 cupcake for each adult and 2 cupcakes for each child.

There will be 90 children and 120 adults at the school play.

Martin can get these ingredients from the school kitchen.

5 kg butter
5 kg caster sugar
90 eggs
5 kg flour

Make a shopping list of any ingredients Martin still needs, showing the amount of each ingredient.
You must show all your working.

(Total for Question 6 is 5 marks)

7 The students in a class are asked how they got to school on Monday.
12 students used the bus, 7 students travelled by car and 8 students walked.

A student is chosen at random from the class.

(a) Write down the probability that this student travelled by car.

....
(2)

There are 18 boys in a different class.
A student is chosen at random from this class.
The probability that this student is a girl is 0.4

(b) Work out the total number of students in this class.

....
(3)

(Total for Question 7 is 5 marks)

8 The diagram shows a wire frame.
The diagram is a rectangle and two diagonals.

Diagram **NOT**
accurately drawn

40 cm

55 cm
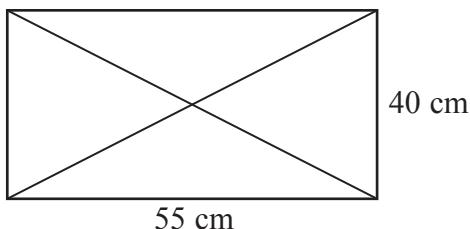
Work out the total length of wire used to make the frame.

.... cm

(Total for Question 8 is 5 marks)

*9 Here is a diagram of part of a wooden roof.
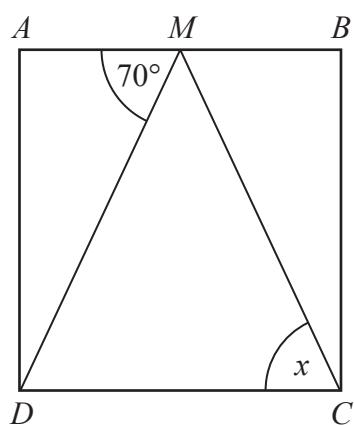
Diagram **NOT** accurately drawn

ABCD is a rectangle.
M is the midpoint of *AB*.
Angle *AMD* is 70°

Work out the size of the angle marked *x*.
You must give reasons for your answer.

(Total for Question 9 is 3 marks)

P 4 3 3 9 0 A 0 1 0 2 4

10 Manchester is on a bearing of 335° from London.

(a) Find the bearing of London from Manchester.

.... °

(2)

The distance from Manchester to London is 185 miles.

A plane flies at an average speed of 125 mph from Manchester to London.

(b) Work out how long the plane takes.

....

(3)

(Total for Question 10 is 5 marks)

11 Jill makes solid metal shapes.

The diagram shows a prism Jill made.
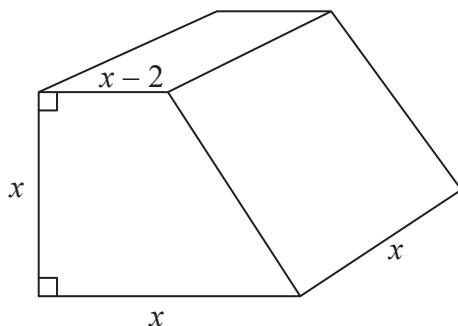
Diagram **NOT**
accurately drawn

All measurements are in centimetres.

The prism has a volume of 24 cm³.

(a) Show that $x^3 - x^2 = 24$

(2)

(b) Use a trial and improvement method to find the value of x.
You must show **all** your working.
Give your answer correct to 1 decimal place.

$x = $ ....

(4)

(Total for Question 11 is 6 marks)

12 Coventry Estates sells houses.

In February they sold twice as many houses as in January.
In March they sold 10 more houses than in February.
In April they sold half as many houses as in March.

Coventry Estates sold a minimum of 123 houses from 1st January to 30th April.

Find the least number of houses sold in January.

....

(Total for Question 12 is 5 marks)

13 The diagram shows a rectangular path.

82 m

Diagram **NOT**
accurately drawn

3.1 m
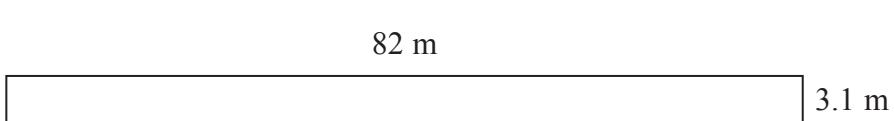
The length of the path is 82 metres, to the nearest metre.
The width of the path is 3.1 metres, to the nearest 0.1 metre.

Work out the lower bound for the area of the path.

.... m²

(Total for Question 13 is 3 marks)

14 A farmer has two closed storage tanks.
Each tank is a cylinder.

Diagram **NOT**
accurately drawn

The first tank has a diameter of 12 m.
It has a height of 16 m.

The outside of this tank needs painting.

(a) Work out the total surface area of this tank.
Give your answer correct to 1 decimal place.

16 m

12 m
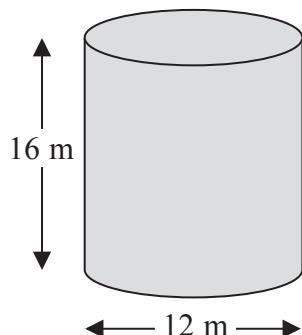
.... m²

(3)

The second tank holds 225 000 litres of water when it is full.
It has a diameter of 6 m.

(b) Calculate the height of the second tank.
Give your answer correct to 3 significant figures.

.... m

(4)

(Total for Question 14 is 7 marks)

*15 When a water pipe bursts the water can cause damage.

The damage can be minor or severe.
The probability of minor damage is 0.55
The probability of severe damage is 0.45

Insurance claims can be made for the damage.
When the damage is minor, the probability that an insurance claim is made is 0.22
When the damage is severe, the probability that an insurance claim is made is 0.74

Damage

Insurance claim

0.55 — minor

.... claim

.... no claim

0.45 — severe

.... claim

.... no claim
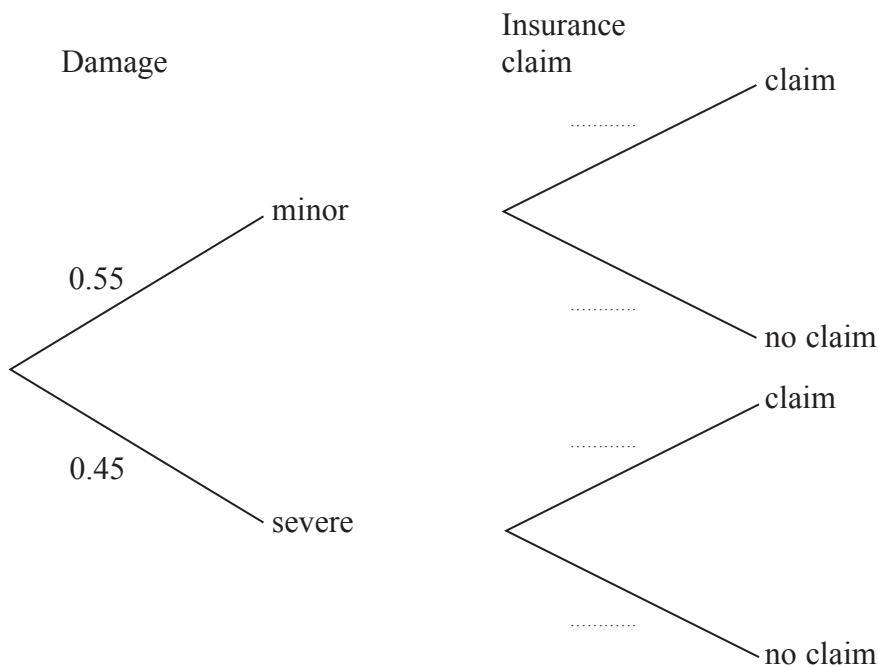
(a) Complete the decision tree diagram.

(2)

P 4 3 3 9 0 A 0 1 6 2 4

The insurance company uses the information in the decision tree diagram to decide whether they need to increase their charges for insurance.

If the probability that insurance claims for damage will be made is greater than 50%, the insurance company will increase their charges for insurance.

*(b) Will the insurance company increase their charges?

(4)

(Total for Question 15 is 6 marks)

Turn over ▶

16 An activity park has zip lines.

The diagram below shows information about two of their zip lines, *DB* and *DC*.
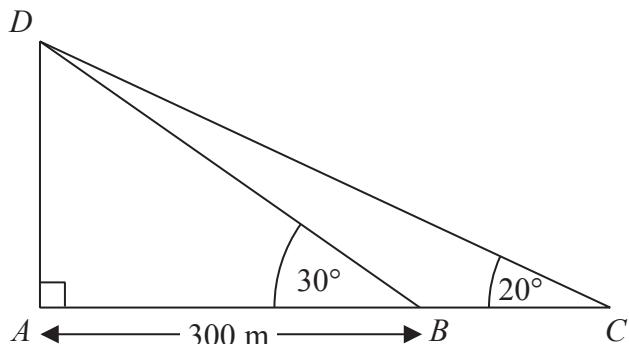
Diagram **NOT**
accurately drawn

A, *B* and *C* are three points in a straight line on horizontal ground.
The angle of elevation of *D* from *B* is 30°.
The angle of elevation of *D* from *C* is 20°.

(a) Calculate the distance *BC*.
Give your answer correct to 3 significant figures.

.... m

(5)

At the activity park the maximum speed along a zip line is directly proportional to the angle of elevation.

The maximum speed along the zip line *DC* is 16 km/h.

(b) Find the angle of elevation needed to give a maximum speed of 50 km/h along a zip line.

.... °

(3)

(Total for Question 16 is 8 marks)

**17** Fred has a solid brass model of an Egyptian pyramid.

Diagram **NOT** accurately drawn

The model has a volume of 3000 cm³.
The density of the brass is 8.5 g/cm³.

(a) Calculate the mass of the model.
Give your answer in kg.

Model   Egyptian pyramid
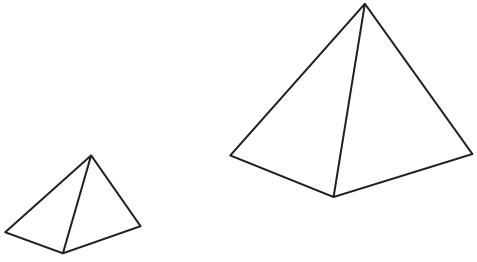
.... kg

(2)

The model and the Egyptian pyramid are mathematically similar.
The length of the base of the model is 25 cm.
The length of the base of the Egyptian pyramid is 225 m.

(b) Calculate the volume of the Egyptian pyramid.
Give your answer in m³.

.... m³

(3)

(Total for Question 17 is 5 marks)

18 Gary has smoothies of different flavours.
He has 3 strawberry smoothies, 4 banana smoothies and 5 orange smoothies.

Gary takes at random one smoothie and drinks it.
He then takes at random a second smoothie.

Work out the probability that both smoothies were different flavours.

....

(Total for Question 18 is 5 marks)

19 Here is a sketch of the graph of $y = 2 - \dfrac{1}{8}x^2$
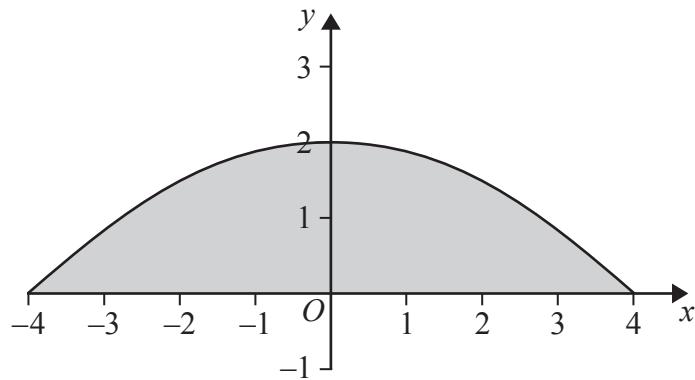
The graph is used to model the shape of a cross-section of a domed roof.
The cross-section of the roof is shaded.

(a) Calculate an estimate of the area of the cross-section of the roof.

....

(4)

(b) Describe how you could increase the accuracy of your estimate.

....

....

....

(1)

(Total for Question 19 is 5 marks)

20 The number of mosquitoes in a colony is increasing exponentially.

On Monday there are 1000 mosquitoes.
After 2 days there are 1800 mosquitoes.

After how many days will there be 10 000 mosquitoes in the colony?

.... days

(Total for Question 20 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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