OCR
Oxford Cambridge and RSA

F

Thursday 21 May 2015 – Morning

GCSE APPLICATIONS OF MATHEMATICS

A381/01 Applications of Mathematics 1 (Foundation Tier)

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

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

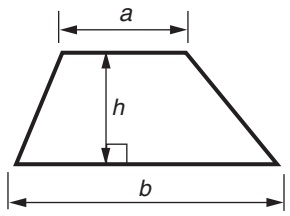
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- Your quality of written communication is assessed in questions marked with an asterisk (*****).
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank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

You are permitted to use a calculator for this paper

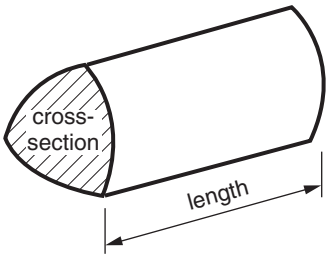
OCR is an exempt Charity

Formulae Sheet: Foundation Tier

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



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



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Answer **all** the questions.

1 **(a)** In the UK £20 billion is spent each year on advertising.

About $\frac{1}{5}$ of this is spent on TV advertising.

How much is spent on TV advertising?

(a) £ _____ billion **[2]**

Advertisers want to reach lots of people as cheaply as possible.
Advertisers use CPM (cost per thousand viewings) as a measure of cost.

$$\text{CPM} = \frac{1000 \times \text{cost of the advert (£s)}}{\text{total number of viewings of the advert}}$$

(b) Recently an advert cost £65 to put on *Facebook*. It got 45 000 viewings.

Work out the CPM for this advert.
Give your answer correct to the nearest penny.

(b) £ _____ **[4]**

Here are some typical CPMs for some other advertising media.

Medium	CPM
Magazines	£1.85
Newspapers	£1.45
Outdoors (posters in the street and on vehicles)	60p
Radio	£1.20
TV	£2.75

(c) What is the difference in cost between the cheapest CPM and the most expensive CPM?

(c) £ _____ **[2]**

(d) The advertising posters in the street and on vehicles are called outdoor advertising.
Of the £20 billion which is spent each year on advertising, £1 billion is spent on outdoor advertising.

(i) What fraction of the total advertising money is spent on outdoor advertising?

(d)(i) _____ **[1]**

(ii) Give your answer to part **(d)(i)** as a percentage.

(ii) _____ % **[1]**

Billboards are a popular form of outdoor advertising.

Billboard sizes are measured in sheets.
This is a popular large billboard size.

(e)* A square metre of the paper used for posters on billboards weighs 120 g.

Could you easily carry the paper for a poster on a 96 sheet size billboard?
You **must** show clearly the calculations you do to support your answer.

_____

_____

_____

_____ **[4]**

(f) Estimate the width of the real billboard.
Include the units with your answer.

(f) _____ _____ **[2]**

There are about 100 000 billboards in the UK.
On average they each cost about £10 000 a year to hire.

(g) Complete the calculations to find the total cost of hiring **all** the billboards in the UK for a year.

100 000 = $10^{\square}$ and £10 000 = £$10^{\square}$

So total cost = $10^{\square}$ x $10^{\square}$ = £$10^{\square}$

£1 million = 10^6, so this is £---------- million

[4]

In 2012 a large digital billboard was put up at the side of the M4 motorway.
Each day 133 800 vehicles go past it.
The advertising company claim that the billboard is seen by over 5 million people a month.

(h)* Is the advertising company's claim reasonable?
You **must** support your answer with clear calculations, noting any assumptions you make.

_____

_____

_____

_____

_____

_____ **[4]**

People need to be able to read the billboards from a distance.
If the print is too small they won't be able to.

There is a simple connection between the smallest height of letters that can easily be read and the reader's distance from the billboard.

distance from billboard (in metres) = 3 × height of letter (in centimetres)

(i) How far away could the letters below be read on a billboard?
Show any measurements and working.

(i) _____ m **[3]**

(j)* Write the information given in the box as an algebraic formula.
State what the symbols you use represent.

_____

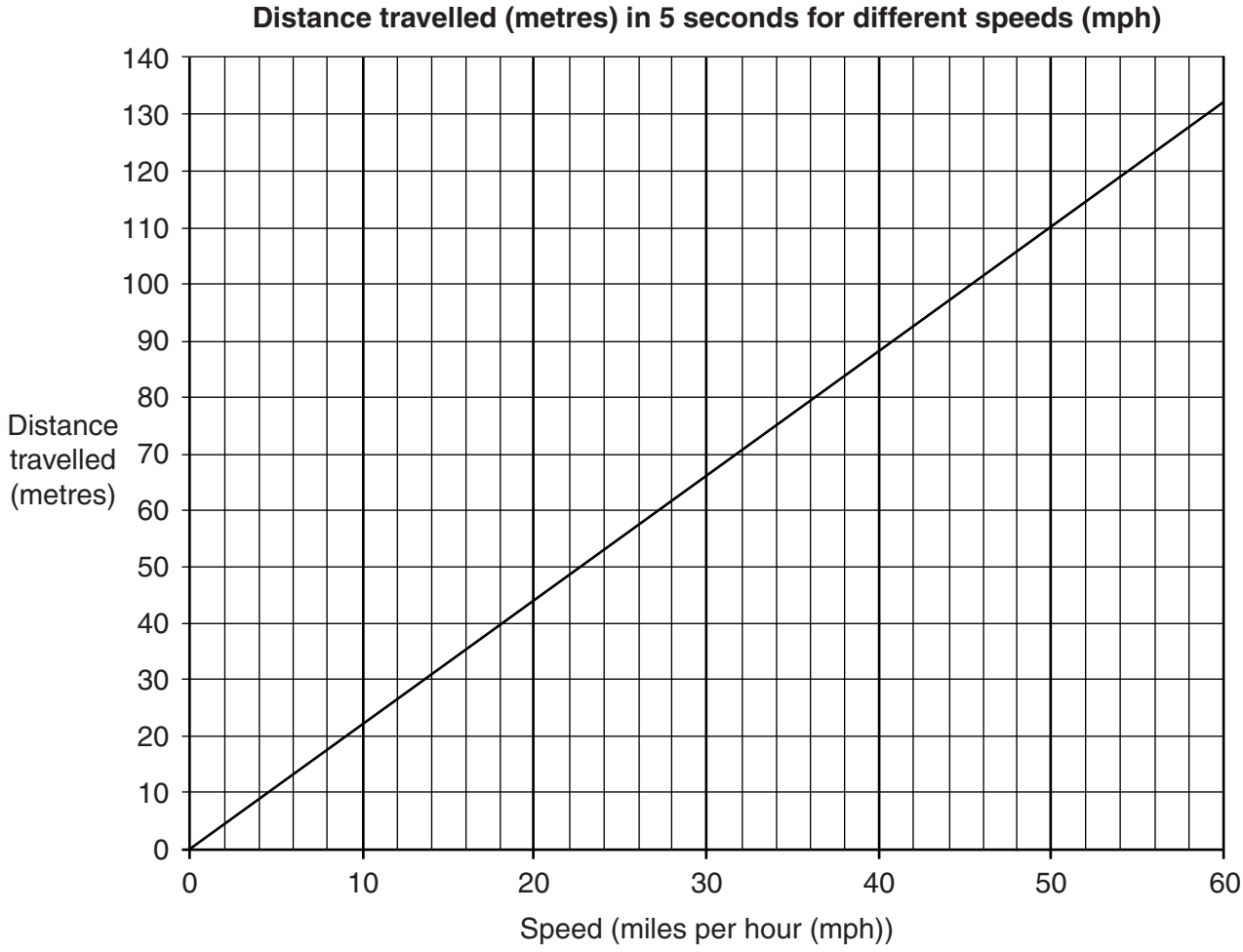
_____

_____ **[2]**

8

A billboard should be readable for 5 seconds before a car passes it.
The letters must be big enough to be read at any point during this time.

The distance a car is from a billboard 5 seconds before passing it depends on the car's speed.



For some of these questions you may need to use this:

distance from billboard (in metres) = 3 × height of letter (in centimetres)

(k) (i) How far does a car travel in 5 seconds at a speed of 35 mph?

(k)(i) _____ metres **[1]**

(ii) How far does a car travel in 5 seconds at a speed of 70 mph?

(ii) _____ metres **[1]**

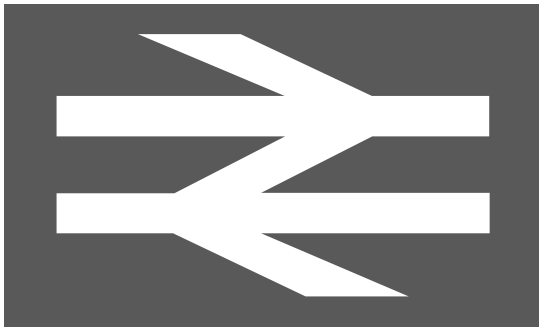
(l) A billboard is at the side of a road.
The traffic speed is 30 mph.

What is the smallest height the letters on the billboard should be?

Support your answer with working.

(l) _____ cm **[3]**

2 This is the famous logo for British Rail.



The logo was first used in 1964.

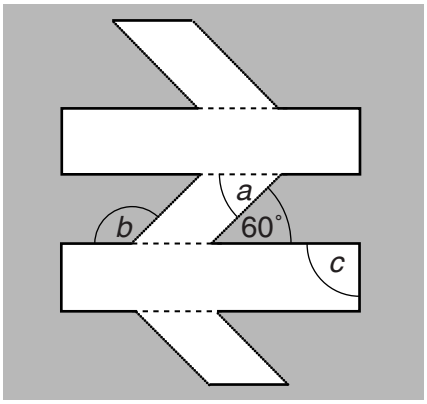
(a) (i) How many years ago was the logo first used?

(a)(i) _____ years **[1]**

(ii) Give your answer to part **(a)(i)** correct to the nearest 10 years.

(ii) _____ years **[1]**

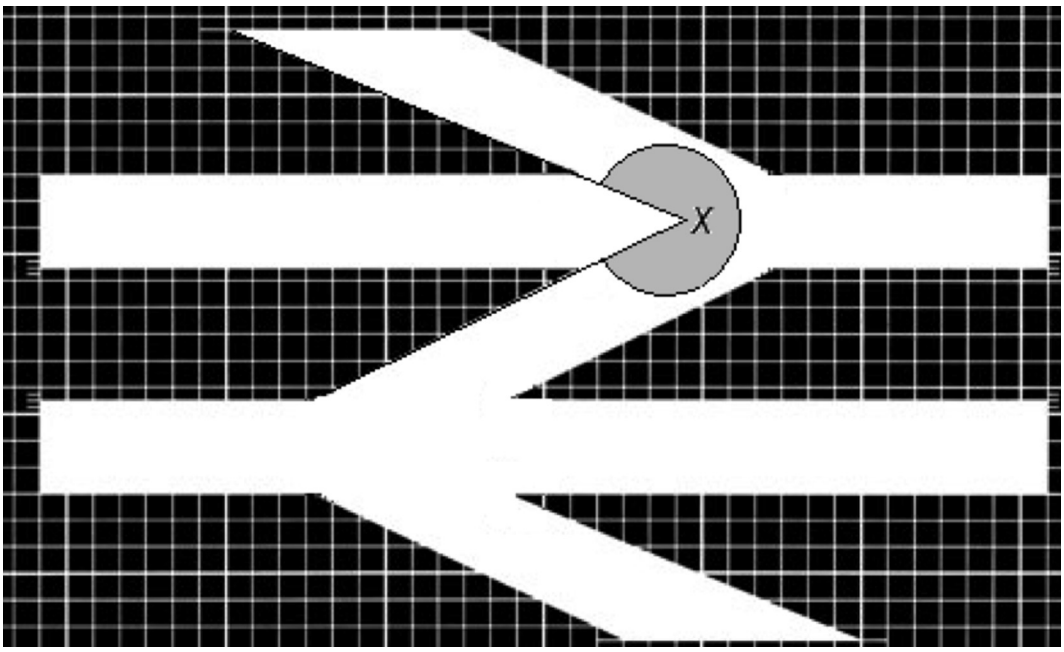
(iii) The white part of this logo is made from three parallelograms and two rectangles.
Work out the sizes of the lettered angles.



Not to scale

a = _____ ° b = _____ ° c = _____ ° **[3]**

This is one of the original designs for the British Rail logo.

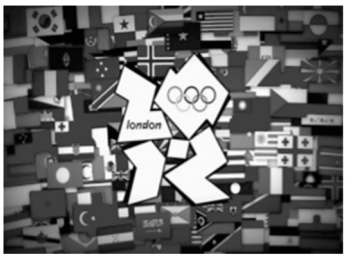


(iv) Measure the angle *x*.

(iv) _____ ° **[2]**

(b) Logos can be very expensive to design. It can also be very expensive to change them. Here are some famous logos and their cost, in dollars ($) or pounds (£).

Pepsi $1 000 000



London Olympics $625 000

Next £66 000

The *Next* logo cost 10% of the cost of the *Pepsi* logo.

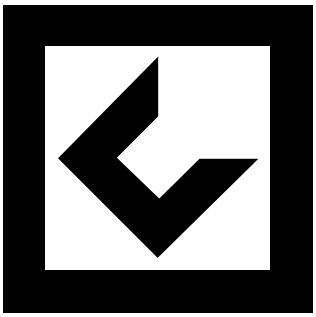
Work out the cost **in pounds** of the *London Olympics* logo.
Only use the information given above.

(b) £ _____ **[4]**

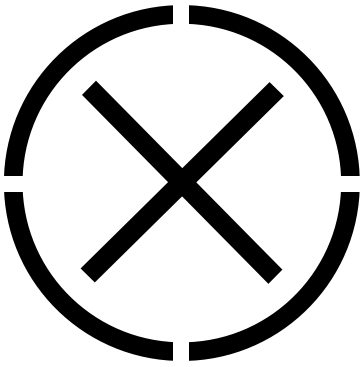
(c) Here are six more logos.

A

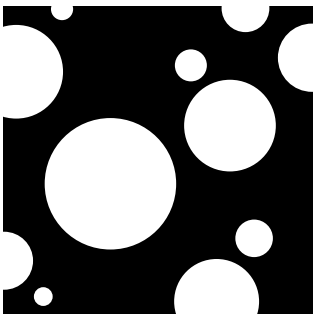
B



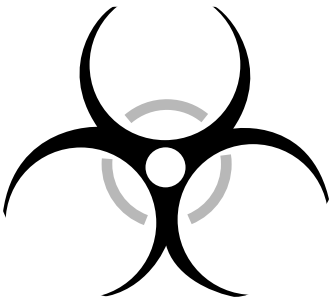
C



D



E



F

Which two logos have **both** rotation **and** reflection symmetry?

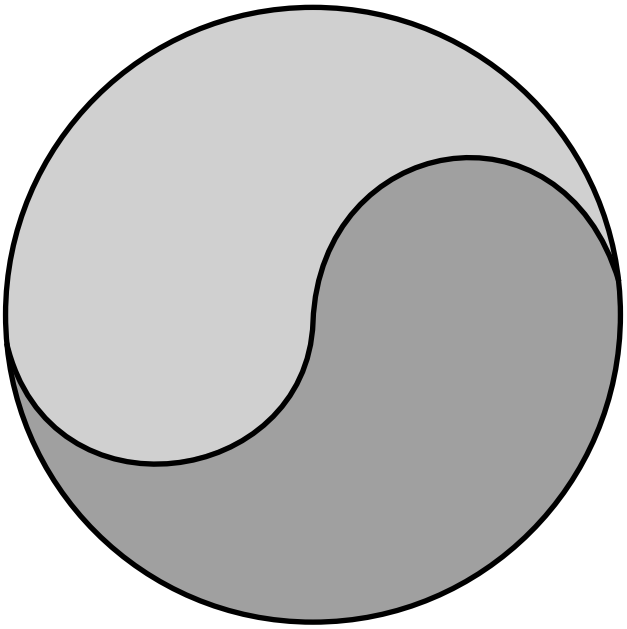
_____

Which two logos have **neither** rotation **nor** reflection symmetry?

_____

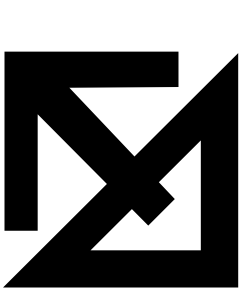
[3]

(d) This shape has been used in many logos.
It is made from one large circle and parts of two smaller circles.



Mark the centre of each circle with a cross. **[2]**

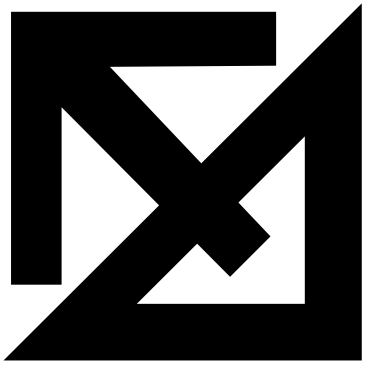
(e) Here are some more logos.



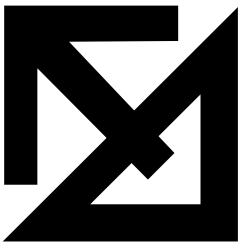
P

Q

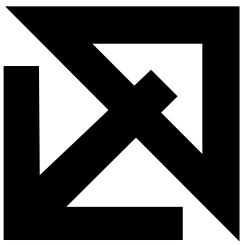
R



S



T

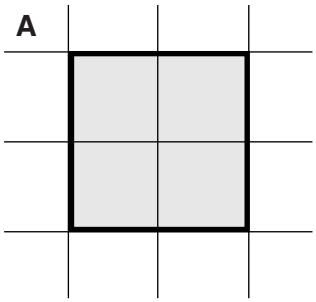


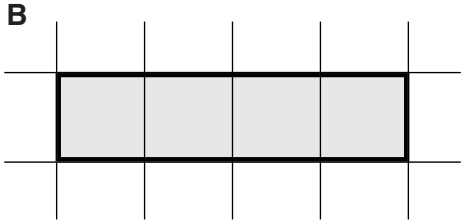
U

Which logos are congruent to logo P?

(e) _____ **[1]**

3 These two shapes are drawn on centimetre square paper.
They both have the same area ($4\,cm^2$).





There are methods to measure how compact a shape is.
Computers use these methods to analyse shapes.

Compactness is given the symbol *C*.
Here is one way to calculate *C*.

- calculate the square root of the shape's area
- multiply this by 1.8
- divide the result by the shape's perimeter
- the answer gives you *C*.

(All measurements must be in consistent units.)

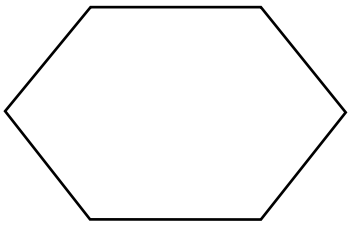
(a) Does shape **A** have a higher value of *C* than shape **B**?
You **must** show clearly with calculations how you decide.

_____

_____

_____ **[5]**

(b) The calculation below gives the value of C for a hexagon shaped like this.



Complete the calculation to find the value of C.

$$C = \frac{0.9\sqrt{3}}{1+\sqrt{5}}$$

(b) _____ **[2]**

(c) Here is a different method to calculate C.

> C is given by the area of the shape divided by the product of 0.6 and the square of the perimeter.

Write this as a formula.
State what the symbols you use represent.

_____

_____

_____ **[2]**

END OF QUESTION PAPER

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