SURNAME ..... FIRST NAME .....

JUNIOR SCHOOL ..... SENIOR SCHOOL .....

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

LEVEL 3: CALCULATOR PAPER

Tuesday 26 January 2010

Please read this information before the examination starts.

- This examination is 60 minutes long.
- **All** questions should be attempted.
- A row of dots ..... denotes a space for your answer.
- Where answers are not exact, they should be given to **three significant figures**, unless specified otherwise.
- The π button on your calculator should be used for calculations involving π.

1. (i) (a) Rewrite the following calculation, rounding each number correct to 1 significant figure.

$$\frac{19.1}{481.4 \times 2.09}$$

Answer: $\frac{\ldots\ldots}{\ldots\ldots \times \ldots\ldots}$ (2)

(b) Work out the value of your answer to part (i) (a).

0

Answer: ..... (1)

(ii) (a) Writing down all the figures shown on your calculator, find the value of

$$\frac{19.1}{481.4 \times 2.09}$$

Answer: ..... (1) 0

(b) Write your answer to part (ii) (a) correct to

(i) 3 decimal places

Answer: ..... (1)

(ii) 3 significant figures

Answer: ..... (1)

2. For this question, you are told that

1 mile = 1.61 kilometres
1.76 pints = 1 litre
11 pounds = 5 kilograms

Katie is going on a hiking expedition.
She plans to walk 30 miles.

(i) Use the information in the box to write this distance in kilometres.

Answer: ..... km (1)

When walking, Katie is advised to drink 5 pints of water each day.

(ii) Use the information in the box to write this amount in litres.

Answer: ..... *l* (2)

When packed, her rucksack has a mass of 25 pounds.

(iii) Use the information in the box to write this mass in kilograms.

Answer: ..... kg (2)

Katie takes 22 minutes to walk the first mile.

(iv) If Katie continues at this speed, how long after she started does she reach the 5-km mark?

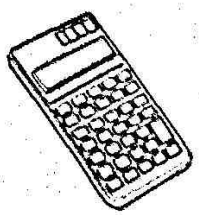
Give your answer to the nearest minute.

Answer: ..... min (2)

3. Miss Venn sells calculators in the school Maths shop.

Each calculator costs her £3.72

During 2008, she sold these calculators for £5.50 each.



(i) How much profit did she make on each calculator?

Answer: £ ..... (1)

(ii) Calculate this profit as a percentage of the price she pays.

Give your answer correct to 1 decimal place.

0

Answer: ..... % (2)

In 2009, she decided that she would only make 25% profit on each calculator.

(iii) Calculate the price she charged during 2009.

Answer: £ ..... (2)

In 2008, she sold a total of 32 calculators at £5.50 each.

By reducing her selling price in 2009, she sold more calculators.

0

(iv) Complete the table below.

	profit, per calculator	number of calculators sold	total profit
2008	£	32	£ .....
2009	£	.....	£129.27

(2)

4. (a) In this number sequence, the next term is obtained by adding the two previous terms.

For example, $4 + 5 = 9$

1 4 5 9 14 23 37 ...

(i) Write down the next two terms after 37

Answer: ..... and ..... (1)

(ii) How many prime numbers less than 100 are there in the sequence?

Answer: ..... (2)

(b) Another sequence follows the rule: *halve the number, then add 1*

(i) Write down the second and third terms if the first term is 62

Answer: second term = ...

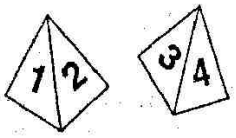
third term = ... (2)

Using the same rule with a different first term, Suzie noticed that the third term in her sequence was larger than the second term.

(ii) Write down a number she could have used as the first term.

Answer: ..... (1)

5. Tim rolls two fair tetrahedral dice, both numbered from 1 to 4



(i) Complete the table below to show all the possible outcomes.

first die \ second die	1	2	3	4
1	1, 1	1, 2	1, 3	
2		2, 2		
3				3, 4
4				

(2)

(ii) Use your table to write down the probability that

(a) both dice show the same number

Answer: ..... (1)

(b) the total of the two numbers is 6

Answer: ..... (1)

Both dice show different numbers.

(iii) What is the probability that the product of the numbers is prime?

Answer: ..... (2)

(iv) If Tim rolls the two dice 80 times, how many times would he expect to get a 3 on one die and a 4 on the other?

Answer: ..... (2)

6. Simplify the following expressions:

(i) $4a^2 + 6a^2$

Answer: ..... (1)

(ii) $2a^2 \times -3a^3$

Answer: ..... (2)

(iii) $(2a^3)^4$

Answer: ..... (2)

7. (a) Multiply out any brackets and simplify

(i) $10 - 3(4x - 5)$

Answer: ..... (2)

(ii) $x(2x + 1) - 2x + 1$

Answer: ..... (2)

(b) (i) Factorise completely $12y^2 + 3y$

Answer: ..... (2)

(ii) Simplify $\frac{12y^2+3y}{3y}$

Answer: ..... (1)

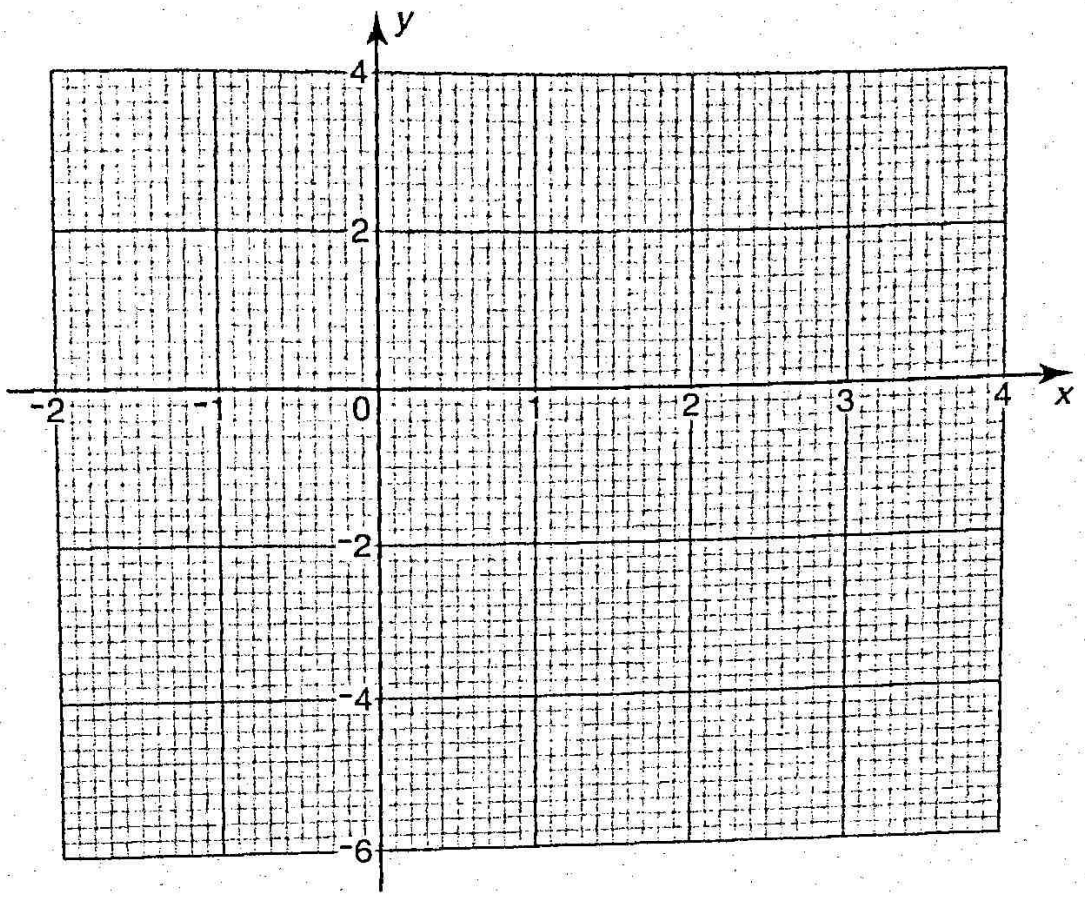
8. (i) A straight line has the equation $y = 2 - x$

(a) For this straight line, complete the table of values below.

x	-2	2	4
y	4		

(1)

(b) On the grid opposite, draw and label the graph of $y = 2 - x$ (1)



(ii) (a) When $y = 3x - x^2$ complete the table of values below.

x	-1	0	1	1.5	2	3	4
y		0		2.25		0	

(2)

(b) On the grid above, draw and label the graph of $y = 3x - x^2$ (2)

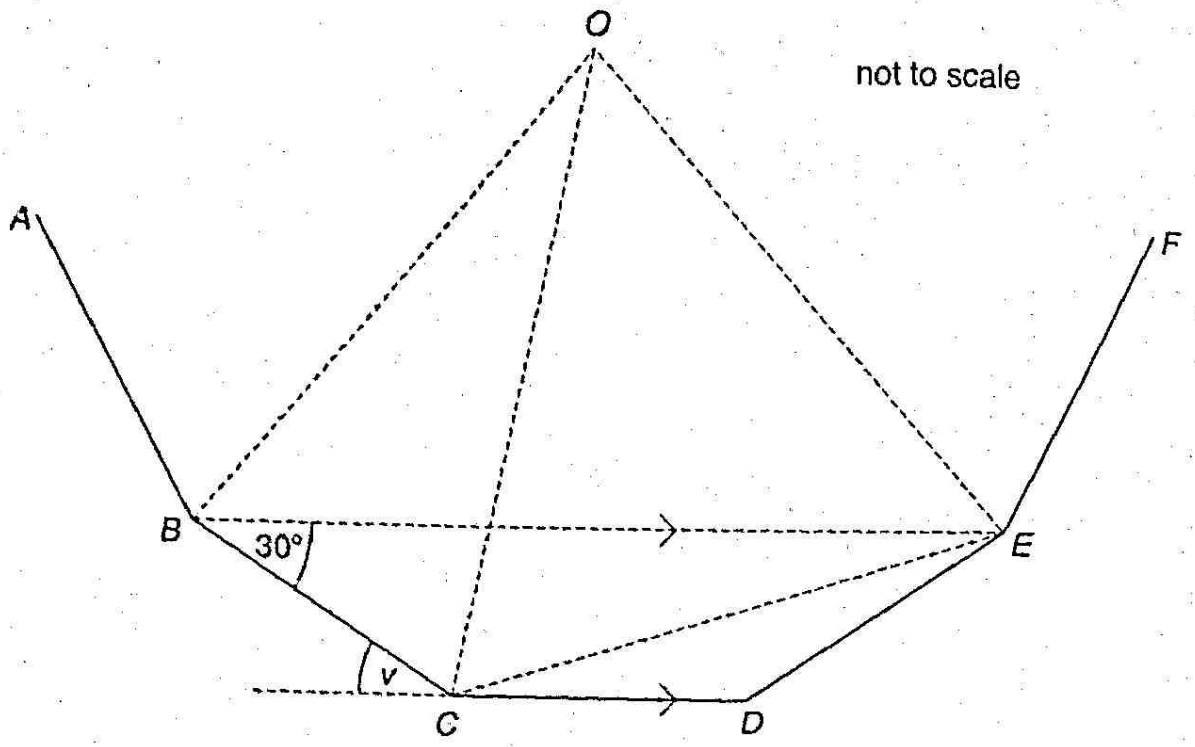
(c) Write down the equation of the line of symmetry of the graph of $y = 3x - x^2$

Answer: ..... (1)

(iii) From your graph, find the two values of x where $3x - x^2 = 2 - x$

Answer: $x =$ ..... and ..... (2)

9. *ABCDEF* is part of a regular polygon. *O* is the centre of the polygon.



(i) By considering the size of angle *v*, calculate the number of sides of the polygon.

Answer: ..... (1)

(ii) Calculate the size of

(a) angle *BOC*

Answer: $B\hat{O}C$ = ... ° (1)

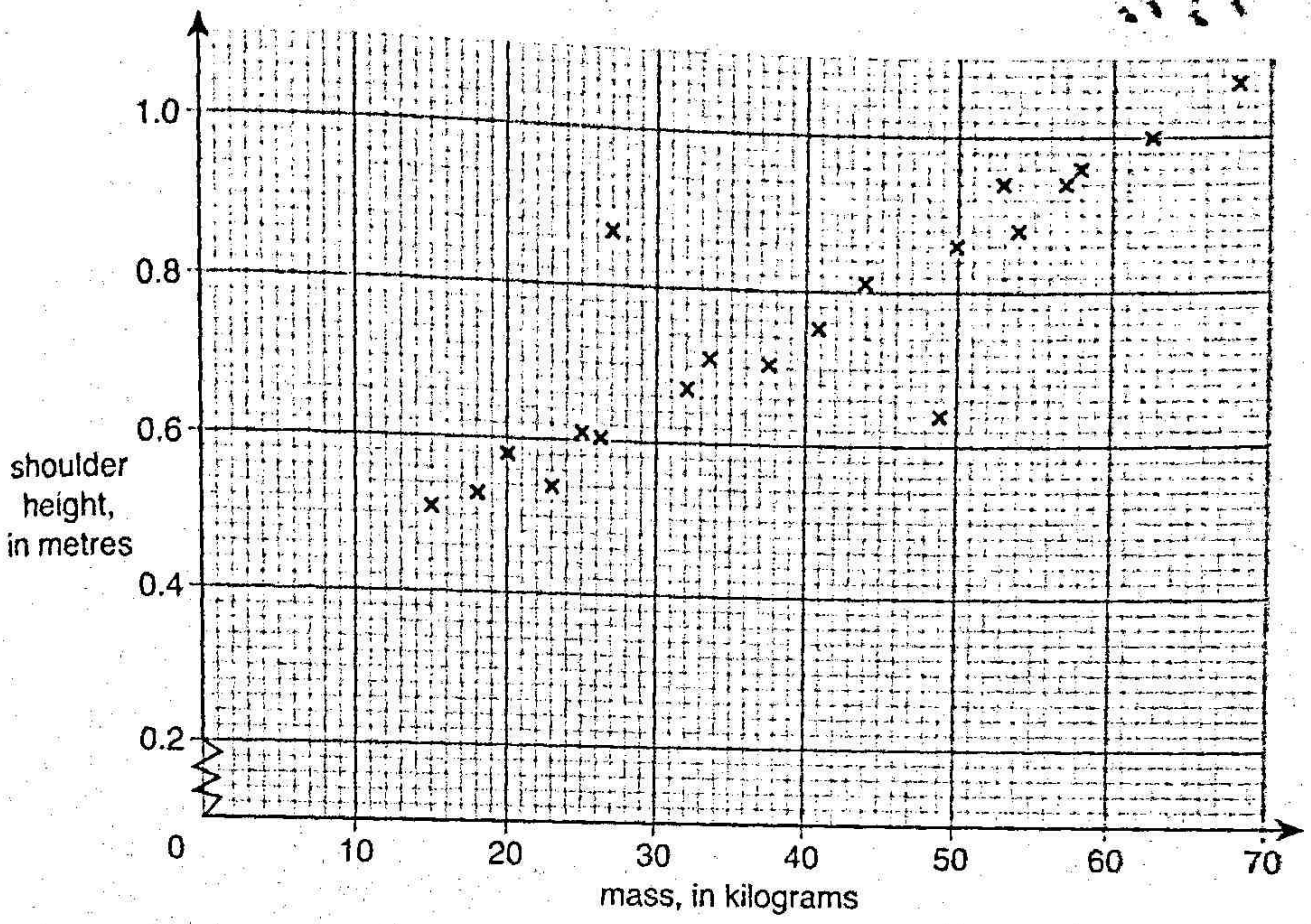
(b) angle *BCO*

Answer: $B\hat{C}O$ = ... ° (2)

(c) angle *BCE*

Answer: $B\hat{C}E$ = ... ° (2)

10. A zoo keeper weighs and measures each zebra in his zoo.
A scatter graph of the results is shown below.



(i) What type of correlation does the graph show?

Answer: ..... (1)

(ii) Draw a line of best fit on the graph. (1)

(iii) **Showing clearly where you take your readings**, use your line to estimate

(a) the shoulder height of a zebra with a mass of 30 kilograms

Answer: ..... m (1)

(b) the mass of a zebra with a shoulder height of 0.84 metres

Answer: ..... kg (1)

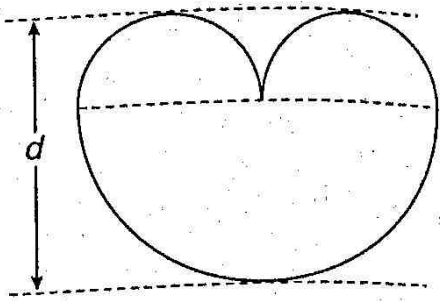
(iv) One of the zebras is very underweight.
Write down the shoulder height of this zebra.

Answer: ..... m (1)

11. A card company has designed some mathematical cards for Valentine's Day.

This design consists of two small semicircles with radius 4 centimetres and a larger semicircle.

not to scale



(i) Calculate the distance *d*.

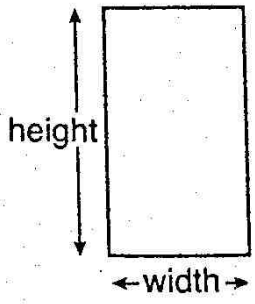
Answer: *d* = ... cm (1)

(ii) Calculate the total area of the design.

Answer: ..... cm^2 (3)

The card company also makes a rectangular card.

The ratio of the width to the height is 1 : 3 and the perimeter of the rectangle is 60 cm.



not to scale

(iii) Calculate the area of the rectangle.

Answer: ..... cm^2 (3)

12. When the time is 10 00 in London, it is 20 00 on the same day in Sydney, Australia.

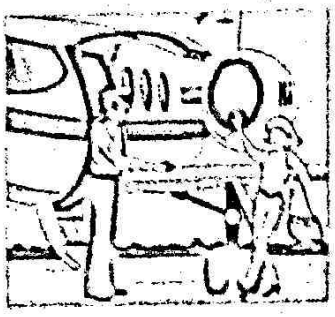
(i) Write down the time and day in Sydney when it is 15 00 on Monday in London.

Answer: ..... on ..... (2)

Kylie's journey from London to Sydney takes 22 hours and 30 minutes.

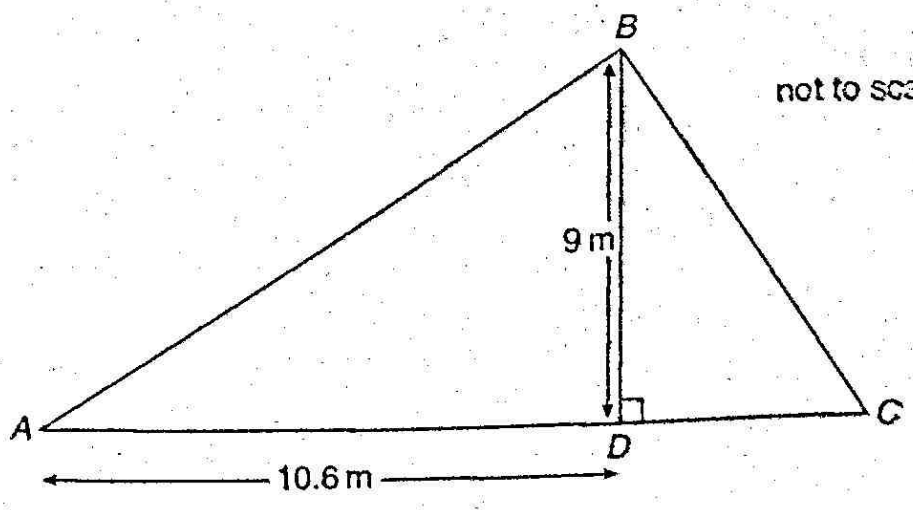
She arrives in Sydney at 19 15 on 1st December.

(ii) What was the time and date when she left London?



Answer: ..... on ..... (3)

13.



(i) Calculate the length *AB*.

Answer: *AB* = ... m (2)

The area of triangle *ABC* is 72 m^2.

(ii) Calculate the length *AC*.

Answer: *AC* = ... m (2)

(iii) Write down the length *CD*.

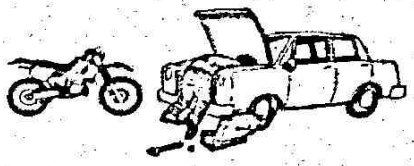
Answer: *CD* = ... m (1)

(iv) Calculate the perimeter of triangle *ABC*.

Answer: ..... m (2)

14. Mike the mechanic has c cars and m motorbikes in his workshop waiting to be serviced.

Altogether there are 14 vehicles.



(i) Write down an equation, in terms of c and m, to show this information.

Answer: ..... (1)

Each car has 4 tyres and each motorbike has 2 tyres.

He counts that there is a total of 38 tyres on the vehicles.

(ii) Write down an equation, in terms of c and m, to show this information.

0

Answer: ..... (1)

(iii) Solve your two equations to find the values of c and m.

0

Answer: c = ...

m = ... (3)

Mike charges £120 to service each car and £80 to service each motorbike.

(iv) How much does he charge altogether for servicing these 14 vehicles?

Answer: £ ..... (2)

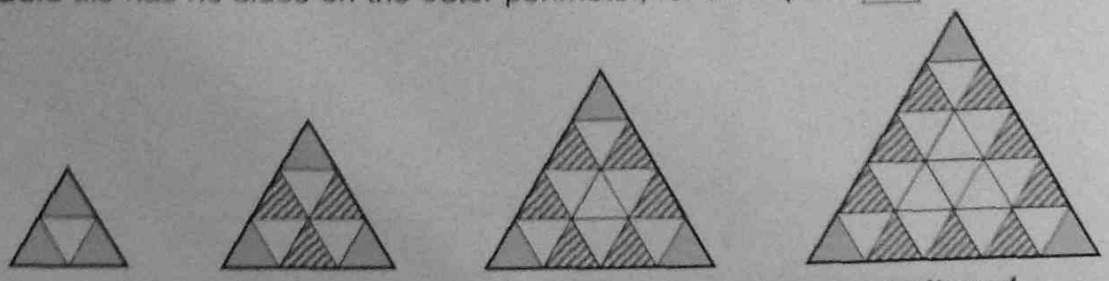
TURN OVER FOR QUESTION 15

15. Harry is making patterns from triangular tiles with three different types of tile.

A **corner** tile has two sides on the outer perimeter, for example 

An **edge** tile has one side on the outer perimeter, for example 

A **middle** tile has no sides on the outer perimeter, for example 



pattern 1 pattern 2 pattern 3 pattern 4

(i) Complete the table to show the number of different types of tile in each pattern.

	pattern 1	pattern 2	pattern 3	pattern 4
corner tiles	3	3		
edge tiles	0	3		
middle tiles	1	3		
total	4	9		

(2)

(ii) How many edge tiles are there in pattern 10?

Answer: ..... (1)

(iii) What is the total number of tiles in pattern 10?

Answer: ..... (1)

(iv) Write an expression for the number of edge tiles in pattern *n*.

Answer: ..... (2)

(v) If there is a total of 400 tiles in a pattern, how many of them are middle tiles?

Answer: ..... (2)

(Total marks: 100)