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

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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

LEVEL 3: NON-CALCULATOR PAPER

Monday 3 November 2014

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.
- You must show all your working or you may receive no marks.
- Answers given as fractions should be reduced to their lowest terms.

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1. Calculate

(i) $6.7 + 4.88$

Answer: ..... (1)

(ii) $6.7 - 4.88$

Answer: ..... (2)

(iii) 78×0.03

Answer: ..... (2)

(iv) $78 \div 0.03$

Answer: ..... (2)

2. (i) (a) Calculate 65% of £25

Answer: £ ..... (2)

(b) Giving your answer in grams, calculate $\frac{5}{6}$ of 3.3 kilograms.

Answer: ..... g (2)

(ii) (a) Write $\frac{4}{25}$ as a percentage.

Answer: ..... % (1)

(b) Write the following numbers in order of size, starting with the smallest:

$\frac{1}{5}$ **18%** $\frac{4}{25}$ **0.019**

Answer: ....., ..., ..., ... (2)

3. Work out the value of

(i) $6 - 21 \div 3 + 4 \times 2$

Answer: ..... (2)

(ii) $12 - 3^2 \times \sqrt[3]{8}$

Answer: ..... (2)

4. (i) Write the number 84 as a product of prime factors.

Answer: ..... (2)

(ii) Chris takes 84 seconds to complete each lap of a cycling track.
Mark takes 70 seconds to complete each lap of the same cycling track.

If they start together, after how many seconds will they next be together?

(*It may help you to know that* $70 = 2 \times 5 \times 7$)

Answer: ..... s (2)

5. When Sunil receives his electricity bill, the meter reading shown is 4360 units.
On his previous bill, the meter reading shown was 2760 units.

(i) How many units of electricity did Sunil use between his previous bill and his new bill?

Answer: ..... (1)

Sunil's electricity bill is £112

(ii) How many pence is Sunil paying for each unit of electricity?

Answer: ..... p (2)

Sunil is thinking of changing to a new method of calculating his bill.
With this new method, he would pay a fixed amount and then add on 5 pence for each unit of electricity he used.

(iii) If the overall bills are identical, how much is the fixed amount?

Answer: £ ..... (2)

6. Karen buys $\frac{3}{4}$ kg of grapes.

Susan buys $\frac{2}{5}$ kg of grapes.

(i) What is the difference, as a fraction of a kilogram, between the mass of grapes which Karen buys and the mass of grapes which Susan buys?

Answer: ..... kg (2)

Karen eats half of the grapes which she has bought.

(ii) (a) What fraction of a kilogram of grapes does Karen now have?

Answer: ..... kg (1)

(b) If 1 kilogram = 35.2 ounces how many ounces of grapes has Karen eaten?

Answer: ..... ounces (2)

7. (i) Hannah's horse eats $1\frac{3}{4}$ apples every day.

How many apples will Hannah's horse eat in 12 days?

Answer: ..... (2)

(ii) Colin's cat eats $\frac{4}{5}$ of a tin of cat food every day.

How many days will 20 tins of cat food last Colin's cat?

Answer: ..... (2)

8. (a) If $a = 5$ $b = 3$ and $c = -4$ find the value of

(i) $ab - c$

Answer: ..... (2)

(ii) $b^3 - c^2$

Answer: ..... (2)

(iii) $\frac{b + 2c}{a}$

Answer: ..... (2)

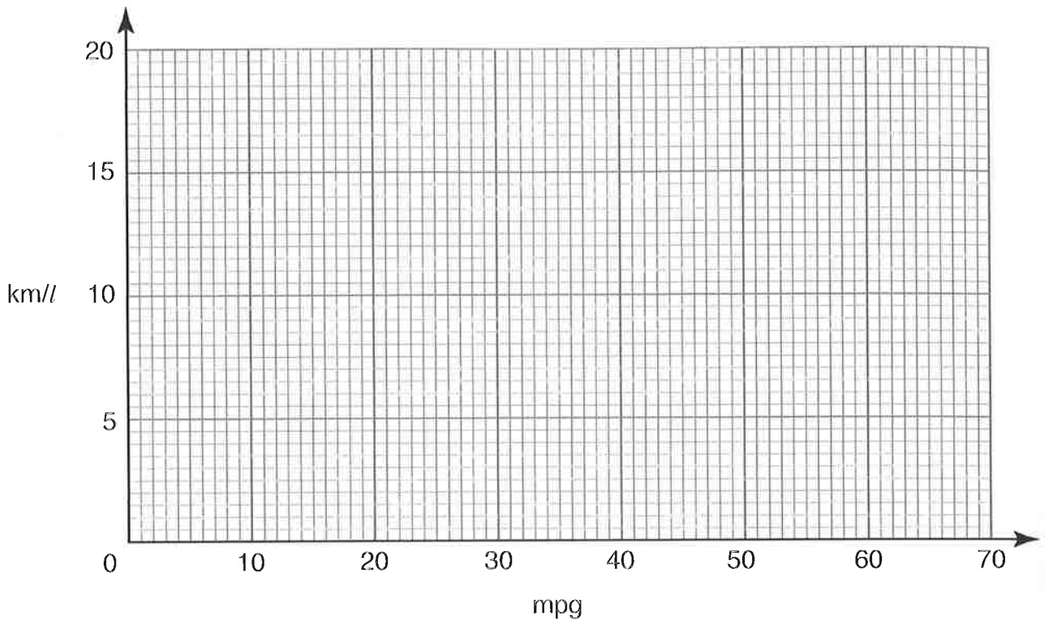
(b) If $v^2 = u^2 + 2as$ calculate the value of u when $v = 13$ $a = 5$ and $s = 12$

Answer: $u =$ ..... (2)

9. The fuel efficiency of a vehicle – how far it travels on a given amount of fuel – can be written as miles per gallon or as kilometres per litre.

45 miles per gallon (mpg) is equivalent to 16 kilometres per litre (km/*l*).

(i) Draw a straight line on the grid below to convert mpg to km/*l*.



(2)

(ii) **Showing clearly where you take your readings**, answer the following questions.

(a) The fuel efficiency of a motorcycle is 54 mpg.

Write this fuel efficiency in km/*l*.

Answer: ..... km/*l* (1)

(b) A lorry has a fuel efficiency of 6 km/*l*.

What is this fuel efficiency in mpg?

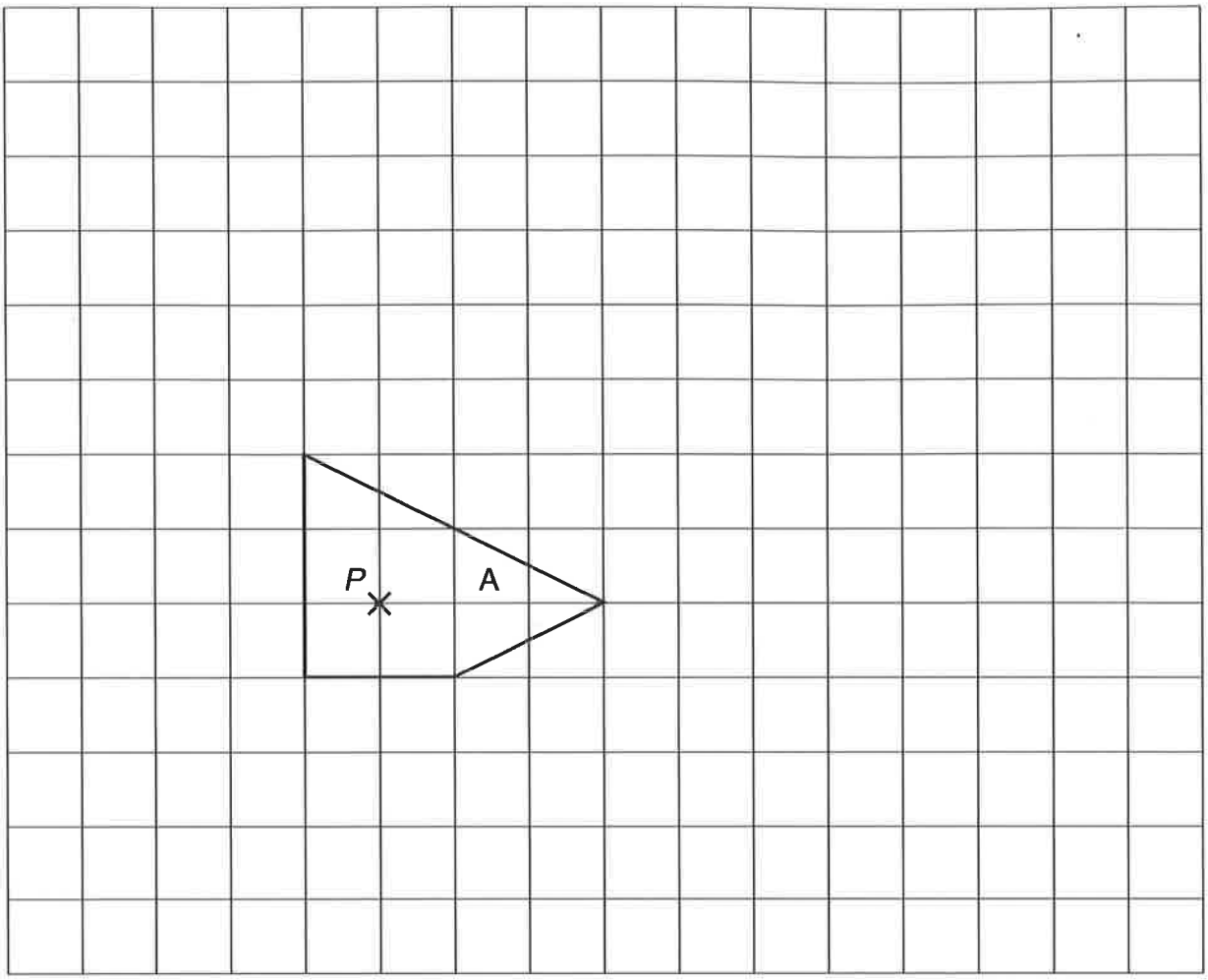
Answer: ..... mpg (1)

(c) A car has a fuel efficiency of 41 mpg.
A van has a fuel efficiency of 13.5 km/*l*.

Which vehicle has the greater fuel efficiency and by how many mpg?

Answer: ..... by ..... mpg (2)

10. Shape A is drawn on the centimetre-square grid below.



(i) Enlarge shape A with centre *P* and scale factor 3
Label the image B. (2)

(ii) Shape B has perimeter 35.1 cm.

What is the perimeter of shape A?

Answer: ..... cm (1)

(iii) Shape A has area 7 cm^2.

What is the area of shape B?

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

11. (i) A curve has the equation $y = 9 - x^2$

(a) Complete the table of values below for the curve $y = 9 - x^2$

x	-4	-3	-2	-1	0	1	2	3
y		0			9		5	

(2)

(b) Draw and label the curve $y = 9 - x^2$ on the grid opposite. (2)

(ii) A straight line has the equation $y = 6 - 2x$

(a) Complete the table of values below for the line $y = 6 - 2x$

x	-1	0	3
y			

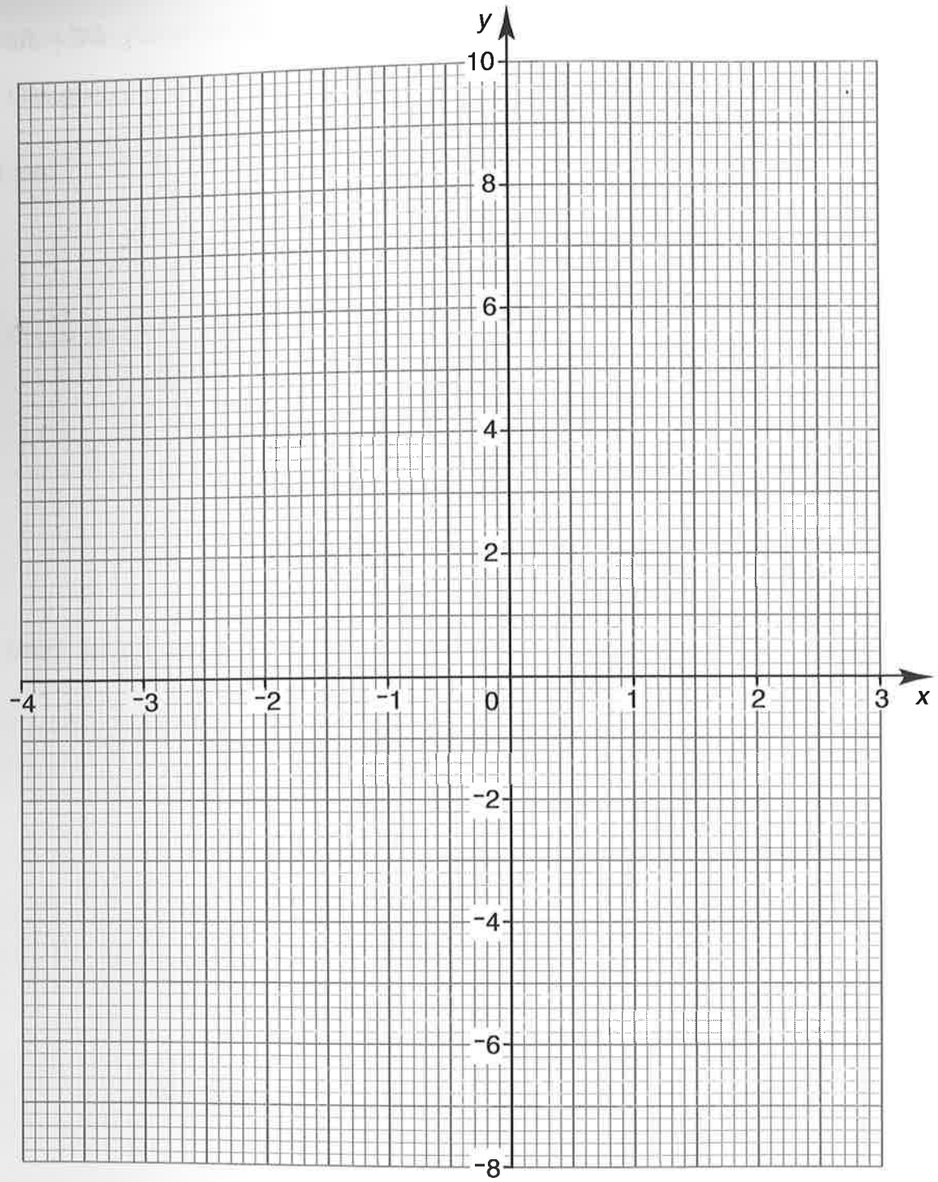
(2)

(b) Draw and label the line $y = 6 - 2x$ on the grid opposite. (1)

(iii) Draw the reflection of the line $y = 6 - 2x$ in the line $x = 1$
Label the new line **m**. (1)

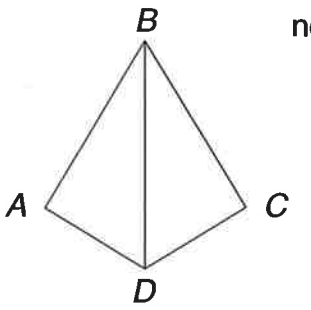
(iv) Write down the x value of each of the two points where the line **m** and the curve $y = 9 - x^2$ intersect.

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



12. (i) Using ruler and compasses, construct triangle *BCD* in which $BC = 8\,\text{cm}$, $DC = 6\,\text{cm}$ and $BD = 10\,\text{cm}$.

(The line BD is drawn for you.)



not to scale



(2)

(ii) Construct triangle *BAD*, the reflection of triangle *BCD* in the line *BD*. (1)

(iii) Prove that angle $BCD = 90°$.

.....

.....

..... (2)

(iv) Calculate the area of triangle *BCD*.

Answer: ..... cm^2 (1)

The line joining A to C meets BD at E.

(v) Calculate the length CE.

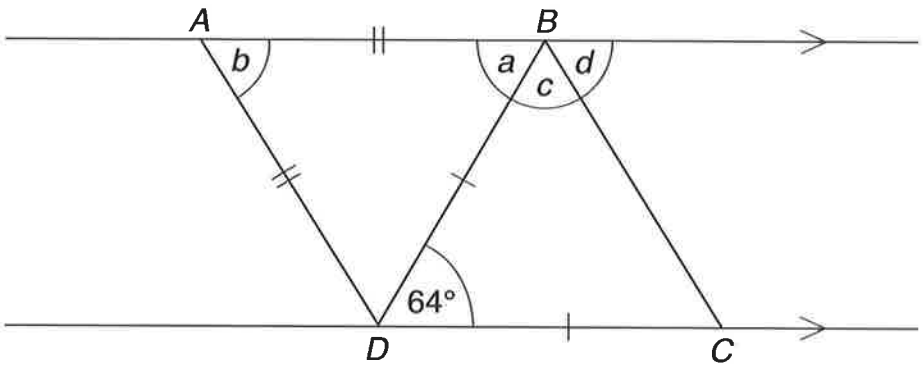
Answer: CE = ... cm (2)

(vi) Given that $3.6^2 = 12.96$, prove that $DE = 3.6\,\text{cm}$.

.....

..... (2)

13. (i) Work out the size of each of the angles marked a, b, c and d in the diagram below.



not to scale

Answer: a = ... ° (1)

b = ... ° (2)

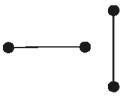
c = ... ° (2)

d = ... ° (1)

(ii) Give a reason why quadrilateral $ABCD$ is **not** a rhombus.

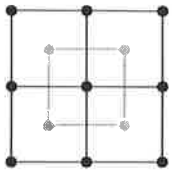
.....

..... (1)

14. The patterns below are made up of dark and light dots and lines 



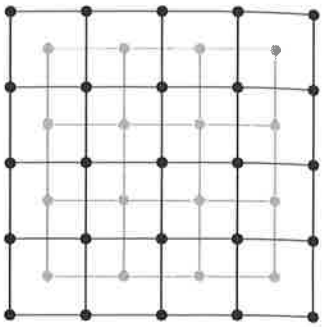
pattern 1



pattern 2



pattern 3



pattern 4

(i) (a) Complete the table below to show the number of dark and light dots in the patterns.

pattern	1	2	3	4
dark dots	4	9	16	
light dots	1	4		
total number of dots	5	13		

(2)

(b) How many dark dots are there in pattern 6?

Answer: ..... (1)

(c) What is the total number of dots in pattern 7?

Answer: ..... (2)

(ii) (a) Complete the table below to show the number of dark and light 1-centimetre lines in the patterns.

pattern	1	2	3	4
dark lines	4			40
light lines	0	4		
total number of lines	4		36	64

(2)

(b) How many dark lines are there in pattern 5?

Answer: ..... (1)

(c) What is the total number of lines in pattern 6?

Answer: ..... (1)

The total number of dots (D) can be worked out using the formula $D = 2n^2 + 2n + 1$ where n is the pattern number.

(iii) Use trial and improvement to find the number of the pattern in which the total number of dots is 265

n	n^2	$2n^2 + 2n + 1$
5	25	61

Answer: n = ... (2)

TURN OVER FOR QUESTION 15

15. Isabel is buying some pencils and crayons from the school shop.
The price of 1 pencil is x pence and the price of 1 crayon is y pence.
The total cost of 3 pencils and 5 crayons is 87 pence.

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

Answer: ..... (1)

The total cost of 6 pencils and 9 crayons is £1.62

(ii) Write down a second equation, in terms of x and y, to show this information.

Answer: ..... (1)

(iii) Solve the two equations to find the value of x and the value of y.

Answer: $x =$ .....

$y =$ ..... (4)

The number of crayons Isabel buys is equal to the number of pencils she buys.
Altogether she spends £2.10

(iv) How many pencils does Isabel buy?

Answer: ..... (1)

(Total marks: 100)