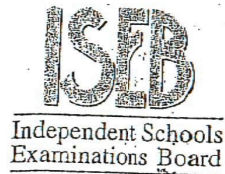


SURNAME FIRST NAME A
 (Block capitals, please) JUNIOR SCHOOL SENIOR SCHOOL



COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

PAPER 2

Non-Calculator Paper

Monday 28 February 2005

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.
- A completely correct answer may receive no marks unless you show all your working.
- Answers given as fractions should be reduced to their lowest terms.

1. (a) Fred buys a jar of coffee for £3.16, a tin of biscuits for £5.84 and a chunk of cheese for £4.37.
 What is the total cost?

$$\begin{array}{r} 3.16 \\ 5.84 \\ 4.37 \\ \hline 13.37 \end{array}$$

Answer: £ 13.37 (M1) (2) (A1)

- (b) John has £10.16 in his pocket.
 If he spends £1.89 on sweets, how much will he have left?

$$\begin{array}{r} 10.16 \\ - 1.89 \\ \hline 8.27 \end{array}$$

Answer: £ 8.27 (M1) (2) (A1)

- (c) A CD costs £8.95
 How much do five of these CDs cost?

$$\begin{array}{r} 8.95 \\ \times 5 \\ \hline 44.75 \end{array}$$

Answer: £ 44.75 (M1) (2) (A1)

- (d) A pack of six DVDs costs £53.94
 How much does each DVD cost?

$$\begin{array}{r} 53.94 \\ \hline 6 \overline{) 53.94} \\ 8.99 \end{array}$$

Answer: £ 8.99 (M1) (2) (A1)

2. (a) Find the value of

(i) 0.94×1000

Answer: 940 (A1) (1)

(ii) $71.6 \div 1000$

Answer: 0.0716 (A1) (1)

(iii) 2000×350

$35 \times 2 = 70$

$70 \times 10000 = 700,000$

Answer: 700,000 (A1) (1)

(iv) $480 \div 20$

$\frac{480}{20} = 24$

Answer: 24 (A1) (1)

(b) Express 0.54 metres in centimetres.

0.54×100

Answer: 54 cm (A1) (1)

(c) Express 1050 grams in kilograms.

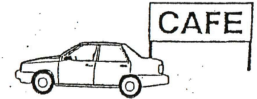
$1050 \div 1000$

Answer: 1.05 kg (A1) (1)

3. (a) (i) On a journey of 150 miles, Emma travels 66 miles before stopping for a cup of coffee.

How far does Emma still have to travel?

$$\begin{array}{r} 41 \\ 150 \\ - 66 \\ \hline 84 \end{array}$$



Answer: 84 miles (1)

(ii) What percentage of the journey does she still have to complete?

$\left(\frac{84}{100} \times 150\right)$

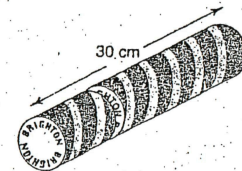
$\frac{28}{84} \times \frac{2}{100} = 56$

Answer: 56 % (2)

(b) A stick of rock at the seaside is 30 centimetres long.

William eats 18% of the stick of rock.

What length of the stick of rock does William eat?



$\frac{18}{100} \times 30 = \frac{27}{5} = 5.4 \text{ cm}$

$5 \overline{)27.0} = 5.4$

or 30% of 18

$10\% \text{ of } 18 = 1.8$

$\therefore 30\% \text{ of } 18 = 1.8 \times 3 = 5.4 \text{ cm}$

Answer: 5.4 cm (2)

4. Henrietta sleeps for $\frac{3}{8}$ of each 24-hour day and spends 1 hour eating meals.

(i) (a) How many hours does Henrietta spend either sleeping or eating?

Sleeps: $\frac{3}{8} \times 24 = 9 \text{ hours}$

Eating: $\frac{1 \text{ hour}}{10 \text{ hours}}$

Answer: 10 h (1) (M:1) (A:1)

(b) What fraction of each day remains?

Hours remaining: $24 - 10 = 14$

$\therefore \frac{14}{24} = \frac{7}{12}$

Answer: $\frac{7}{12}$ (2) (M:1 for 14) (A:24)

During the school term, lessons take up $\frac{3}{7}$ of the hours when Henrietta is neither sleeping nor eating.

(ii) How many hours each day are spent in lessons?

(14 hours remain) $\frac{3}{7} \times 14 = 6 \text{ hours}$

Answer: 6 h (2) (M:1) (A:1)

$\frac{1}{4}$ of the lesson time is spent on mathematics.

(iii) What fraction of each day is spent on mathematics?

Maths: $\frac{1}{4} \times 6 = \frac{3}{2} \text{ hours}$
 $\therefore \frac{\frac{3}{2}}{24} = \frac{3}{48} = \frac{1}{16}$

Answer: $\frac{1}{16}$ (2) (M:1) (A:1)

5. (i) Express 300 as the product of prime factors using indices.

$$\begin{array}{r} 2 \overline{) 300} \\ \underline{200} \\ 100 \\ \underline{60} \\ 40 \\ \underline{20} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

Answer: $2^2 \times 3 \times 5^2$ (2) (M:1) (A:1)

(ii) Taking $\sqrt{3} = 1.73$ and your answer to part (i), or otherwise, find $\sqrt{300}$ correct to 3 significant figures.

$300 \rightarrow 2 \times \frac{15}{1} \times 5$
 $\rightarrow 2 \times \frac{15}{1} \times 5$

or $300 \div 3 = 100$
 $\therefore \sqrt{100} = 10$
 $1.73 \times 10 = 17.3$

$\therefore 2 \times \sqrt{3} \times 5$
 $= 2 \times 1.73 \times 5$
 $= 10 \times 1.73$
 $= 17.3$

Answer: 17.3 (2) (M:1) (A:1)

6. (a) A packet of 35 sweets is shared between Tim and Lucy in the ratio of 3:4

(i) How many sweets does Lucy receive?

T	L	T
3	4	7
$\times 5$	$\times 5$	$\times 5$
15	20	35



Answer: 20 (2) (M:1) (A:1)

Tim eats 3 of his sweets and Lucy eats 5 of her sweets.

(ii) What is the ratio of Tim's sweets : Lucy's sweets now?

Tim: $15 - 3 = 12$
 Lucy: $20 - 5 = 15$

\therefore T L
 $12 : 15$ (3)
 $4 : 5$

Answer: 4 : 5 (2) (M:1) (A:1)

(b) Every 80 grams of weedkiller powder are mixed with 9 litres of water.
This mixture will treat an area of 4 square metres of ground.

(i) What area of ground can be treated with the mixture containing 4 kilograms of weedkiller powder?

$$4 \text{ kilograms} = 4000 \text{ g}$$

$$\therefore 4000 \div 80 = 50$$

$$80 \text{ g treats } 4 \text{ m}^2$$

$$4 \text{ kilogram treats } 4 \times 50 = 200 \text{ m}^2$$



Answer: 200 m² (2) (M:1)
(A:1)

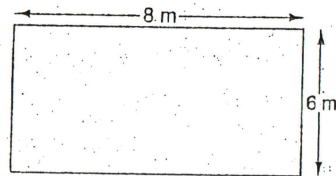
Daisy treats a rectangular area of ground measuring 6 m by 8 m.

(ii) What volume of water will she need to mix with the correct amount of weedkiller powder?

$$8 \text{ m} \times 6 \text{ m} = 48 \text{ m}^2$$

$$\therefore 48 \div 4 = 12$$

$$12 \times 9 = 108 \text{ L}$$



Answer: 108 litres (2) (A:1)
(A:1)

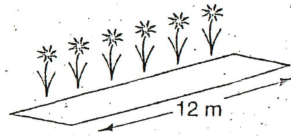
Mr Elder treats a rectangular path of length 12 m.
He uses 360 grams of weedkiller powder with the correct amount of water.

(iii) How wide is the path?

$$360 \text{ g} \div 80 \text{ g} = 4 \frac{1}{2}$$

$$4 \times 4 \frac{1}{2} = 18 \text{ m}^2$$

$$\therefore 18 \div 12 = 1 \frac{1}{2} \text{ m}$$



Answer: 1 1/2 m (3) (A:1 for 4 1/2)
(A:1 for 18 m²)
(A:1 for answer)

7. (a) Write down expressions for

(i) the sum of the square of x and the cube of y

Answer: $x^2 + y^3$ (1)

(ii) twice the product of m and n

Answer: $2mn$ (1)

(iii) the square root of the sum of p and q .

Answer: $\sqrt{p+q}$ (1)

(b) Multiply out the brackets and simplify

$$3(2n - 1) - (5 - n)$$

$$6n - 3 - 5 + n$$

$$= 7n - 8$$

Answer: $7n - 8$ (2)

(c) Factorise completely

$$6a^2 + 4ab$$

$$2a(3a + 2b)$$

Answer: $2a(3a + 2b)$ (2) (M:1 for partial factor.)

8. (a). Solve the following equations:

$$\begin{aligned} (1) \quad 10 - 2p &= 3 \\ (+1p) \quad 10 &= 3 + 2p \\ (-3) \quad 7 &= 2p \\ (-2) \quad p &= 3\frac{1}{2} \end{aligned}$$

Answer: $p = 3\frac{1}{2}$ (2)

(ii) $18 = 6(q + 1)$

$$\begin{aligned} 18 &= 6q + 6 \\ (-6) \quad 12 &= 6q \\ (-6) \quad q &= 2 \end{aligned}$$

Answer: $q = 2$ (2)

(iii) $\frac{2}{3}r = \frac{1}{2}$

$$\begin{aligned} (\times 3) \quad 2r &= 1\frac{1}{2} \\ (-2) \quad r &= \frac{3}{4} \end{aligned}$$

Answer: $r = \frac{3}{4}$ (2)

(iv) $5(s + 1) = 3(1 - s)$

$$\begin{aligned} (+5s) \quad 5s + 5 &= 3 - 3s \\ (-5) \quad 8s + 5 &= 3 \\ (-5) \quad 8s &= -2 \\ (-8) \quad s &= -\frac{1}{4} \end{aligned}$$

Answer: $s = -\frac{1}{4}$ (3) (M:1 for A:1) $5s + 5 = 3 - 3s$

(b) (i) Solve the inequality

$$\frac{t-3}{2} < 3$$

$$\begin{aligned} (\times 2) \quad t-3 &< 6 \\ (+3) \quad t &< 9 \end{aligned}$$

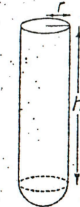
Answer: $t < 9$ (2) (M:1 A:1)

(ii) What is the largest prime number which satisfies part (b)(i)?

Answer: $t = 7$ (1) (A:1)

9. The volume of a test tube is calculated using the formula

$$V = \frac{2}{3}\pi r^3 + \pi r^2 h$$



(i) If $\pi = 3$, $r = 3$ and $h = 30$ calculate

(a) πr^3
 $3 \times 3 \times 3 \times 3$
 $= 81$

$3 \times 3 \times 3 \times 3$

Answer: 81 (1) (A:1)

(b) $r^2 h$

$$\begin{aligned} 3 \times 3 \times 30 \\ = 9 \times 30 \\ = 270 \end{aligned}$$

Answer: 270 (1) (A:1)

(c) V

$$\begin{aligned} V &= \frac{2}{3}\pi r^3 + \pi r^2 h \\ V &= \left(\frac{2}{3} \times 81\right) + (3 \times 270) \\ V &= 54 + 810 \\ V &= 864 \end{aligned}$$

Answer: 864 (2) (M:1 A:1)

(ii) If $\pi = 3$, $r = 2$ and $V = 160$ find the value of h .

$$\begin{aligned} V &= \frac{2}{3}\pi r^3 + \pi r^2 h \\ 160 &= \left(\frac{2}{3} \times 8\right) + (3 \times 2 \times 2 \times h) \\ 160 &= 16 + 12h \\ (-16) \quad 144 &= 12h \\ (-12) \quad h &= 12 \end{aligned}$$

Answer: $h = 12$ (2)

10. (i) On a scale of 1:2000, how many metres are represented by 1 centimetre?

$$1:2000$$

$$1\text{ cm to }2000\text{ cm}$$

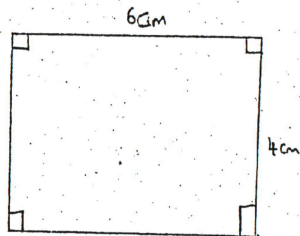
$$1\text{ cm to }20\text{ m}$$

Answer: 20 m. (1)

(ii) Using a scale of 1:2000, draw the outline of a rectangular field measuring 120 metres by 80 metres.

$$120 \div 20 = 6\text{ cm}$$

$$80 \div 20 = 4\text{ cm}$$



(iii) Calculate the perimeter of the rectangle which you have drawn.

$$6 + 6 + 4 + 4$$

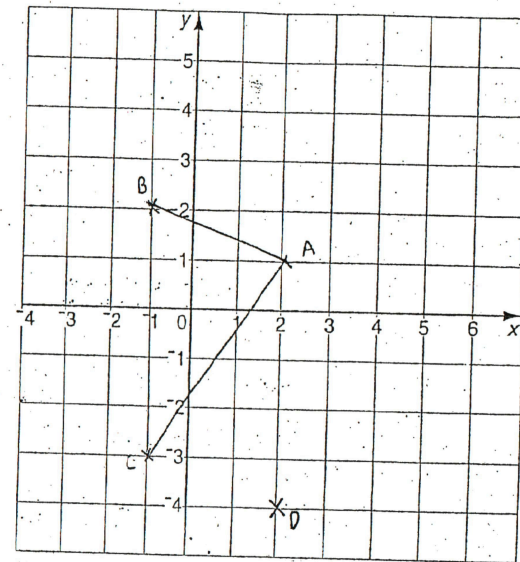
Answer: 20 cm (1) (A:1)

(iv) Calculate the area of the field in square metres:

$$120 \times 80$$

Answer: 9600 m² (1) (A:1)

11:



(i) On the 1 cm square grid above, plot and label the following points:

A(2, 1) B(-1, 2) C(-1, -3)

Join the points.

(ii) Calculate the area of the triangle ABC.

$$\frac{1}{2} \times 5 \times 4$$

$$= \frac{1}{2} \times 5 \times 3$$

$$= 7\frac{1}{2}$$

Answer: 7½ cm² (2)

(iii) Mark the point D so that the quadrilateral ABCD is a parallelogram.

(iv) Give the co-ordinates of the point D.

Answer: D (..... 2 - 4)

(v) Write down the ratio of the area of triangle ABC to the area of the parallelogram ABCD.

$$\text{Area of parallelogram} = b \times h$$

$$= 5 \times 3$$

$$= 15$$

$$\frac{7\frac{1}{2}}{15} : 15$$

$$1 : 2$$

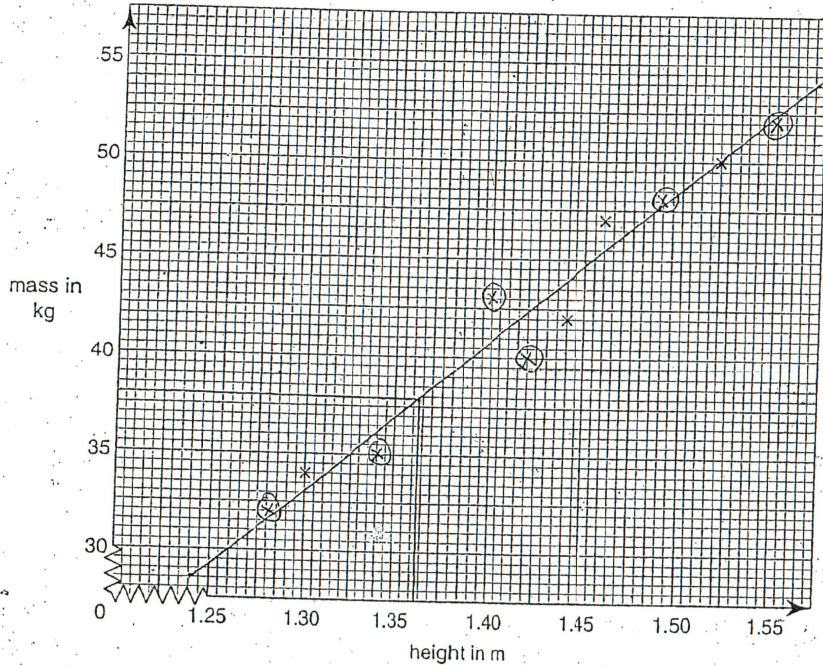
Answer: 1 2 (1)

12. 10 children each record their height in metres and their mass in kilograms.

height in m	1.30	1.44	1.46	1.52	1.34	1.28	1.49	1.40	1.42	1.55
mass in kg	34	42	47	50	35	32	48	43	40	52

(A:3)

(i) Plot these values on the graph below. The first 4 have been plotted for you. (3)



(ii) Do the results indicate a positive or a negative correlation?

Answer: Positive (A:1)

(iii) What is the meaning of the correlation of these results?

Answer: Mass increases with height (or similar) (A:1)

(iv) On the graph, draw the line of best fit. ✓

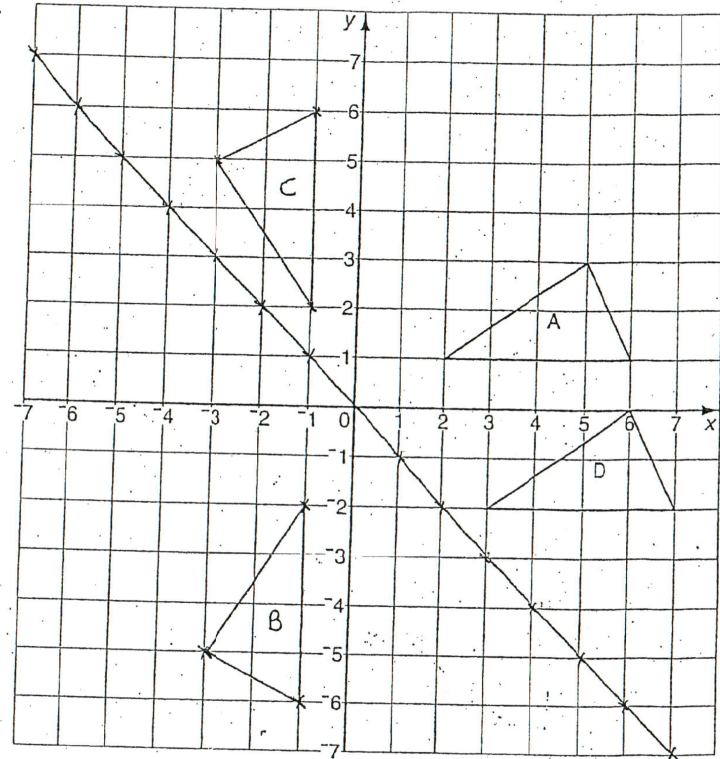
(A:1)

(v) Use your graph to estimate the height of a child of mass 38 kilograms. Show clearly where you take your reading.

Answer: 1.36 m (allow sensible answer)

Give marks if read from correctly from graph.

13.



(i) On the grid above, draw and label the line $y = -x$ (1) (A:1)

(ii) Reflect triangle A in the line $y = -x$

Label the image triangle B. ✓

(iii) Rotate triangle A through 90° anticlockwise about the origin.

Label the image triangle C. ✓

(iv) Describe fully the transformation which maps

(a) B onto C

Answer: Reflection in the x axis / $y = 0$ (1) (A:1)

(b) A onto D.

Answer: Translation $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$ or one to the right and three down (1) (A:1)

(A:1 for rotation about (0,0))
(A:1 for 90°)

14. I have forgotten my 4-digit PIN number.

However, I can remember the following facts:

- the first and last digits add up to 10
- the first digit is greater than the last digit
- the four digits add up to 16
- the difference between the last two digits is 2

(i) Make a list of the 7 possible 4-digit numbers which fit the facts above.

Answer: 6 0 6 4

..... 6 4 2 4

..... 7 1 5 3

..... 7 5 1 3

..... 8 2 4 2

..... 8 6 0 2

..... 9 3 3 1

(A: 1 for 1st + last = 10)

CA: 1 for sum = 16)

(A: 1 for (4) differ = 2)

CA: 1 for set of numbers)

I pick a number at random from my list.

(ii) What is the probability that the 4-digit number has two digits the same?

Answer: $\frac{4}{7}$ (1)

(iii) What is the probability that it is the correct PIN number?

Answer: $\frac{1}{7}$ (1)

It is not correct. I pick a different 4-digit number at random from my list. $7 - 1 = 6$

(iv) What is the probability that this also is not correct?

Answer: $\frac{5}{6}$ (1)

(Total marks: 100)