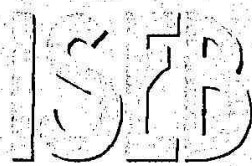


SURNAME FIRST NAME

JUNIOR SCHOOL SENIOR SCHOOL



Independent Schools
Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

PAPER 4: Calculator Paper

Tuesday 27 January 2009

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 to 1 significant figure:

$$\frac{63.1 - 29.8}{309 \times 1.82}$$

Answer:

$$\frac{\dots\dots\dots - \dots\dots\dots}{\dots\dots\dots \times \dots\dots\dots}$$

(2)

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

0

Answer:

(1)

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

$$\frac{63.1 - 29.8}{309 \times 1.82}$$

Answer:

(2)

0

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

- (i) 2 decimal places

Answer:

(1)

- (ii) 2 significant figures

Answer:

(1)

2. In this question you are told that

1 litre is equivalent to 1.76 pints

A tub holds 15 litres of water.

(i) How many pints does the tub hold?

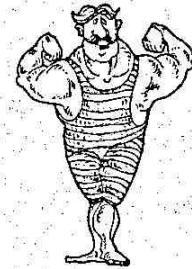


Answer: pints (2)

The human body contains approximately 9 pints of blood.

(ii) Write this amount in litres.

Give your answer correct to 1 decimal place.

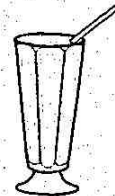


Answer: litres (2)

Sarah's Serious Smoothies are sold at a price of £3.50 per litre.

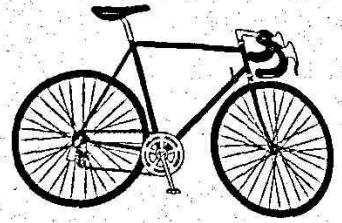
(iii) Calculate the price of a $\frac{1}{2}$ pint of Sarah's Serious Smoothies.

Give your answer to the nearest penny.



Answer: pence (2)

3. Julian is training for a 40-kilometre bicycle race.
On his first attempt, he cycles 40 kilometres in 96 minutes.



- (i) Write this time in hours as a decimal.

Answer: h (1)

- (ii) Calculate his average speed in kilometres per hour.

Answer: km/h (2)

He works out that he needs to increase his speed by 28% in order to win the race.

- (iii) At what speed does he need to cycle to win the race?

Answer: km/h (2)

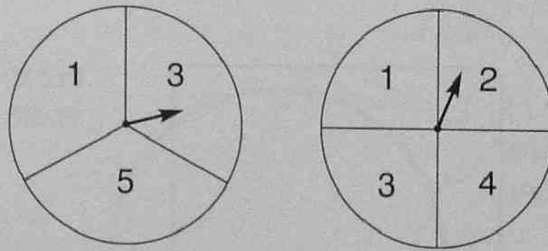
- (iv) How long, in minutes, would it take him to cycle 40 kilometres at this new speed?

Answer: min (2)

- (v) Find the percentage decrease in the time taken to cycle 40 kilometres.

Answer: % (2)

4. Dan has 2 fair spinners.



Dan spins both spinners.

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

	1	2	3	4
1				
3		3, 2		
5				

(2)

(ii) What is the probability that

(a) the two numbers are both prime numbers?

Answer: (1)

(b) the two numbers have a total of less than 6?

Answer: (2)

(iii) Complete this sentence.

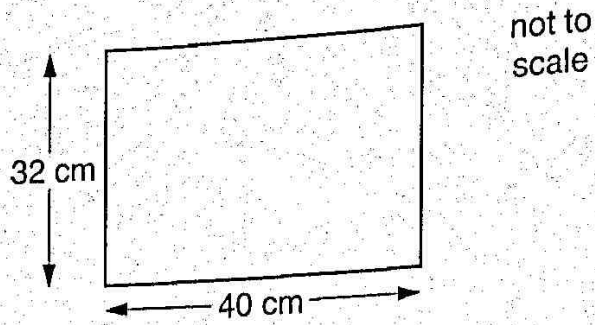
The probability that the total of the two numbers is at least is $\frac{1}{6}$ (1)

Both spinners show **odd** numbers.

(iv) What is the probability that their product is a square number?

Answer: (2)

5. Bob is making a circular mousemat.
He has a rectangular piece of foam which measures 32 cm by 40 cm.



- (i) What is the radius of the largest circle which he could cut from the foam?

Answer: cm (1)

He decides to cut out a mousemat with radius 12 cm.

- (ii) Calculate the area of the mousemat.

Answer: cm² (1)

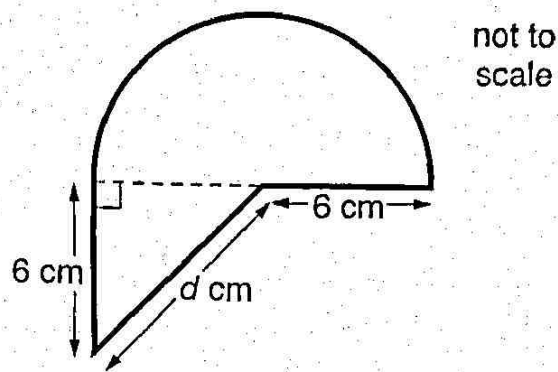
He throws away the remainder of the rectangle.

- (iii) What percentage of the rectangle does he throw away?

Answer: % (2)

Bob designs a logo for his mousemat, consisting of a right-angled isosceles triangle and a semicircle with radius 6 cm.

Here is his sketch:



(iv) Calculate the length d of this logo.

Answer: cm (2)

(v) Calculate the perimeter of this logo.

Answer: cm (3)

6. Simplify the following expressions:

(i) $3ab \times -a^3$

Answer: (2)

(ii) $\frac{4e^2 - 2}{2}$

Answer: (2)

7. (a) Multiply out the brackets and simplify

(i) $2p - (4 - p)$

Answer: (2)

(ii) $2(q + 1) - 3(5 - 3q)$

Answer: (3)

(b) Factorise completely $21w^2 + 7w$

Answer: (2)

(c) Here are some algebra cards:

$$6d^2$$

$$5d^4$$

$$5d^2$$

$$5 + d^2$$

$$6d^6$$

(i) Write down the card which has the same value as $2d^2 + 3d^2$

Answer: (1)

(ii) Which 2 cards multiply together to make $30d^8$?

Answer: and (1)

8. (a) A regular polygon has an exterior angle of 120° .

(i) Sketch this polygon.

(1)

(ii) Write down the full mathematical name of this polygon.

Answer: (1)

(b) Calculate the total of all the interior angles of a regular pentagon.

Answer: (2)

9. Denise, the dentist, asked 20 people how many fillings they have.
Here are the results:



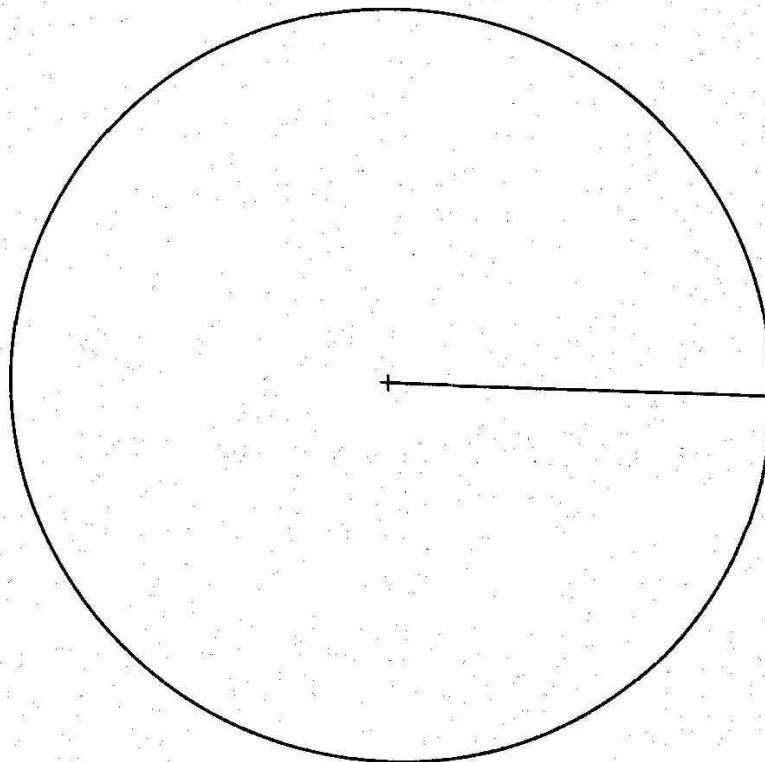
number of fillings	number of people
0	10
1	6
2	2
3	1
5	1
total	20

She draws a pie chart to show her results.

- (i) How many degrees represent one person?

Answer: (1)

- (ii) Draw a fully-labelled pie chart to represent this information.



(3)

(iii) Calculate the total number of fillings which these 20 people have.

Answer: (2)

(iv) Calculate the mean number of fillings per person.

Answer: (1)

(v) Calculate the median number of fillings per person.

Answer: (2)

10. The difference in size between the largest and smallest angles in a triangle is 48° .
The sum of these angles is 120° .

(i) Write the ratio of the three angles of the triangle in its simplest form.

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

Bob enlarges the triangle with scale factor 2

(ii) Write down the size of the smallest angle in the enlarged triangle.

Answer: (1)

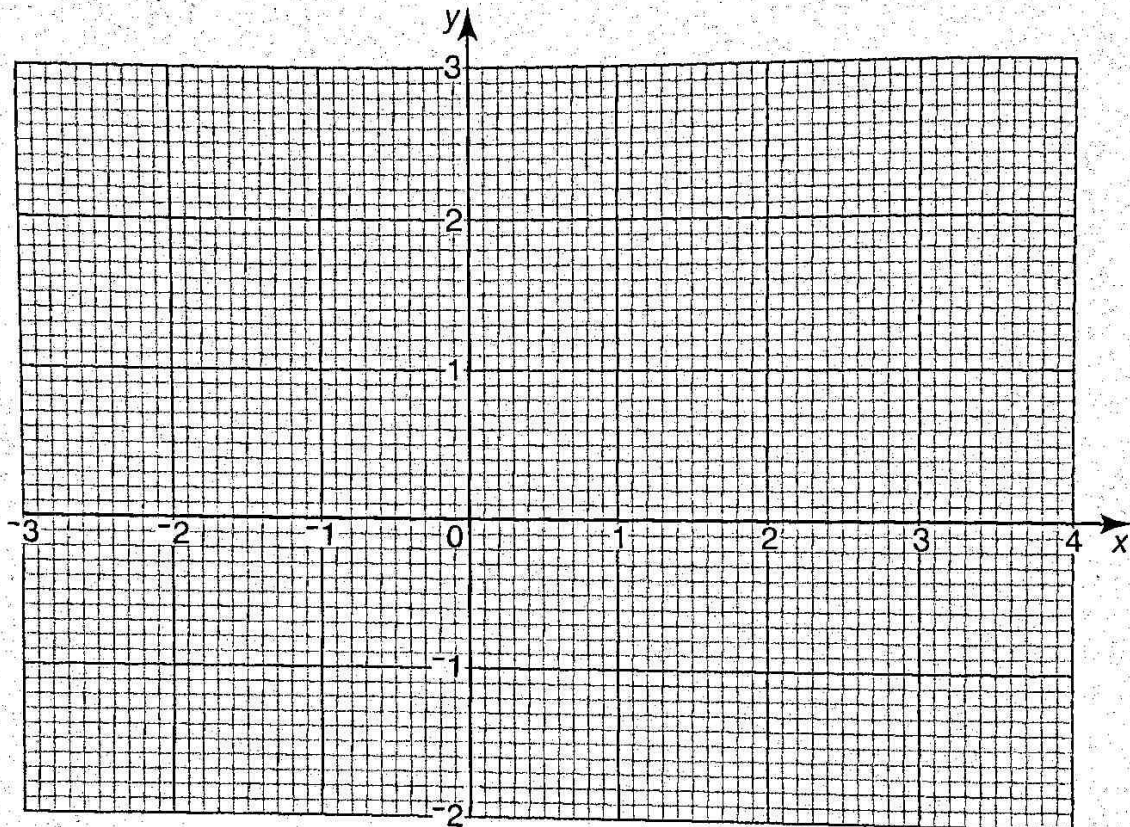
11. (i) A straight line has the equation $2y = x + 3$

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

x	-3	1	3
y		2	

(1)

(b) On the grid below, draw the graph of $2y = x + 3$



(1)

(ii) (a) When $y = 3 - \frac{1}{2}x^2$ complete this table of values:

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

(2)

(b) On the grid, draw the graph of $y = 3 - \frac{1}{2}x^2$

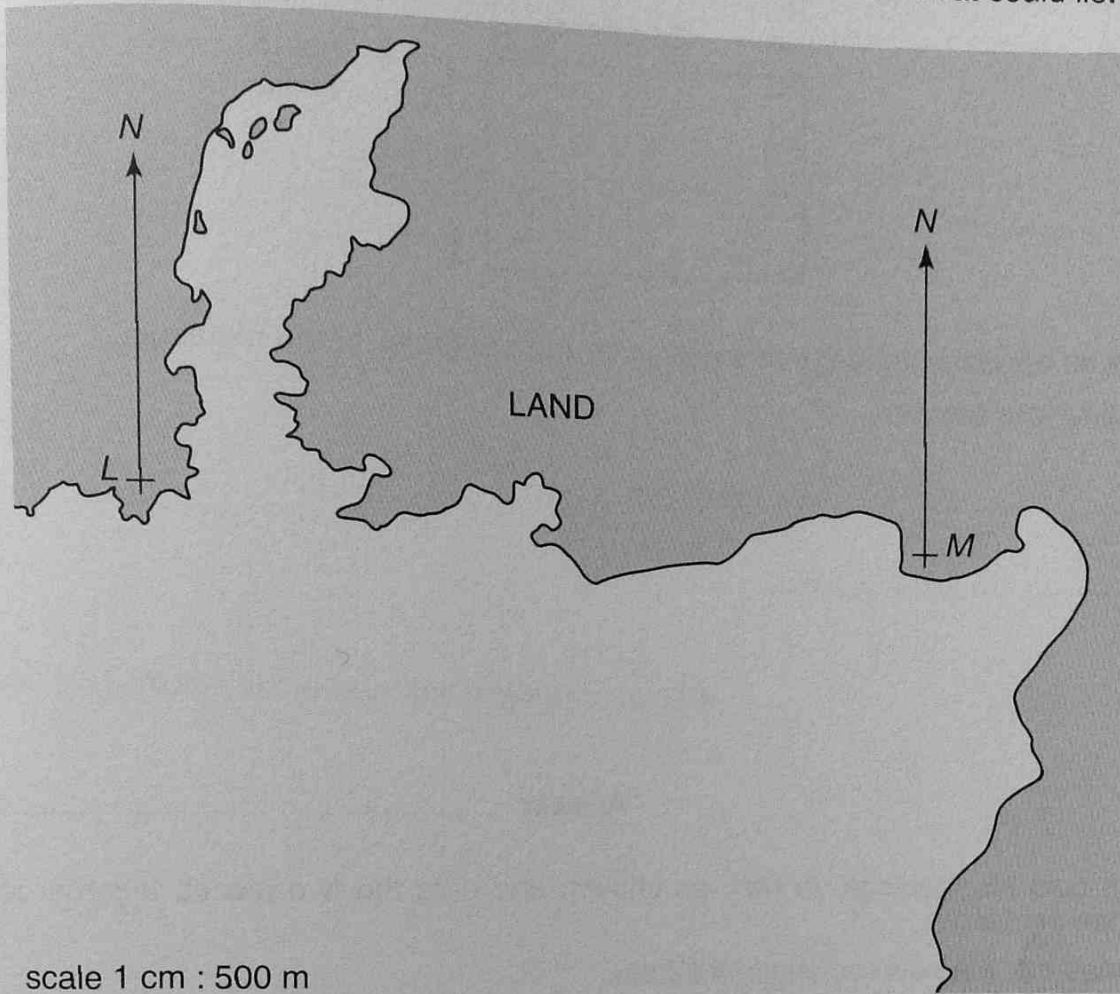
(2)

(iii) From your graph, find the two values of x where the line and curve intersect.

Answer: $x = \dots\dots\dots$ and $\dots\dots\dots$ (2)

12. A boat (*B*) is on a bearing of 115° from a lighthouse (*L*).

(i) Draw a line on the scale drawing below to show where the boat could lie.



scale 1 cm : 500 m

(1)

(ii) Using the scale 1 cm : 500 m, how many centimetres will represent 3 kilometres?

Answer: cm (1)

The boat (*B*) is 3 km from a radio mast (*M*).

(iii) Use compasses to mark the exact position of the boat (*B*). (1)

(iv) What is the actual distance of the boat from the lighthouse in kilometres?

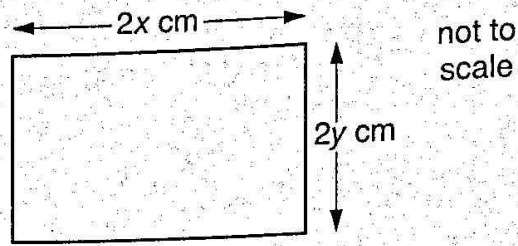
Answer: km (2)

(v) Write down the bearing of the boat (*B*) from the radio mast (*M*).

Answer: (2)

Turn over

13. Jack has been given a copy of this rectangle.
The perimeter of his rectangle is 40 centimetres.

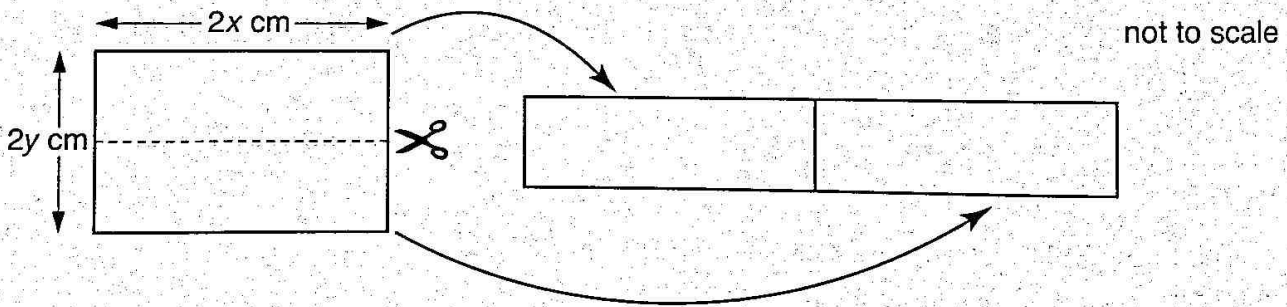


- (i) Write an equation, in terms of x and y , for the perimeter of the rectangle.
Simplify your answer.

Answer: (2)

Jack then cuts his rectangle in half, as shown, and puts the two pieces together to make a new rectangle.

The perimeter of the new rectangle is 62 cm.



- (ii) Write an equation, in terms of x and y , for the perimeter of his new rectangle.
Simplify your answer.

Answer: (2)

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

Answer: $x = \dots\dots\dots$

$y = \dots\dots\dots$ (3)

(iv) Write down the area of the original rectangle.

Answer: $\dots\dots\dots \text{cm}^2$ (1)

14. For each expression below, x , y and z each represent a **different** whole number from 1 to 9 inclusive.

For example, when $x = 3$ $y = 2$ $z = 6$

$$x(10y + z) = 3(10 \times 2 + 6) = 78$$

(i) Find values of x , y and z which give the **largest** value for each expression.

expression	value of x	value of y	value of z	largest value of expression
$x(10y + z)$				
$\frac{x}{y-z}$				

(4)

(ii) Find values of x , y and z which give the **smallest positive** value for $\frac{x}{y-z}$

Answer: $x = \dots\dots\dots$

$y = \dots\dots\dots$

$z = \dots\dots\dots$ (2)

-20 is a smaller number than -10

(iii) Find values of x , y and z which give the **smallest** value for $\frac{x}{y-z}$

Answer: $x = \dots\dots\dots$

$y = \dots\dots\dots$

$z = \dots\dots\dots$ (2)

(Total marks: 100)

