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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

PAPER 4

Calculator Paper

Practice Paper 2005–2006

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) Showing your working, estimate, to 1 significant figure, the value of the following calculation.

$$\frac{30.8+5.09}{0.98\times3.91}$$

30+5

35
1×4

35
4

35÷4=8·75

Answer: 9 (2)

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

$$\frac{30.8+5.09}{0.98\times3.91}$$

35·89
3·8318

Answer: 9.366355238 (1)

(c) Write your answer to part (i) (b) correct to 2 decimal places.

Answer: 9·37 (1)

(ii) Find the value of $\frac{4}{3}\times\pi\times(2.8)^3$

Give your answer correct to 3 significant figures.

1·3 × π × 21.952

Answer: 92·0 (2)

2. Sally is making porridge.

The amounts needed for a normal helping for one person are:

half a cup of porridge oats one and a quarter cups of milk

(i) What would be the amounts needed for normal helpings for nine people?

$\frac{1}{2} \times 9$ # $1\frac{1}{4} \times 9$

$4 \cdot 5$ # $11 \cdot 25$

Answer: 4·5 cups of oats

11·25 cups of milk (2)

(ii) Sally discovers that she has only 3 cups of porridge oats.

(a) How many cups of milk should she use?

$1\frac{1}{4} \times 6$

Answer: 7·5 cups (2)

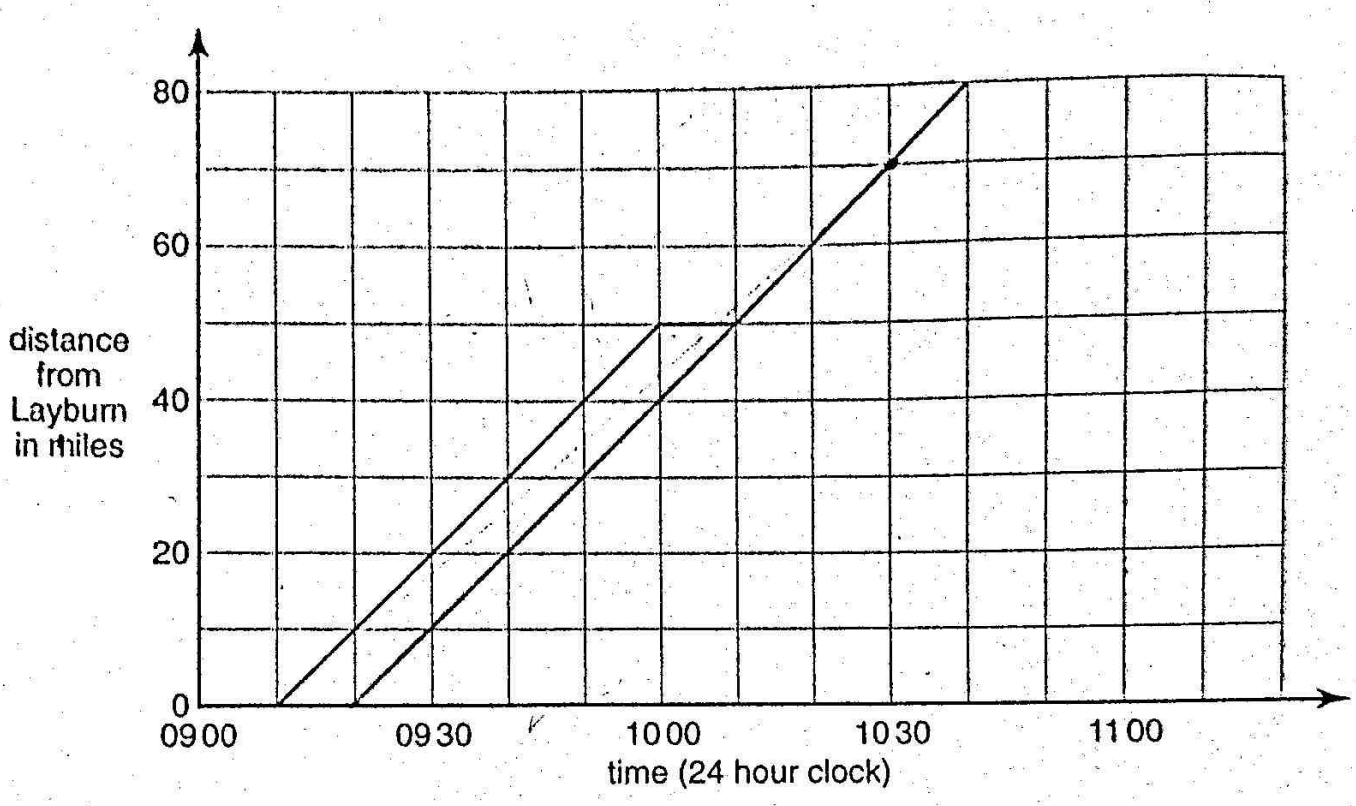
Sally shares the porridge equally between the nine people.

(b) What fraction of a normal helping does each person receive?

$\frac{6}{9} = \frac{2}{3}$

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

3. (i) Anthony was driving on the motorway linking Layburn and Mayford.
The graph below represents his journey.



(a) At what time did Anthony pass Layburn?

Answer: 09 10 (1)

(b) What was his average speed before he met a hold-up at 1000?

10 mins per 10 miles

Answer: 60 miles per hour (2)

(ii) Brenda passed Mayford, 70 miles away from Layburn, at 1000
She travelled towards Layburn at a steady speed of 60 miles per hour without any hold-ups.

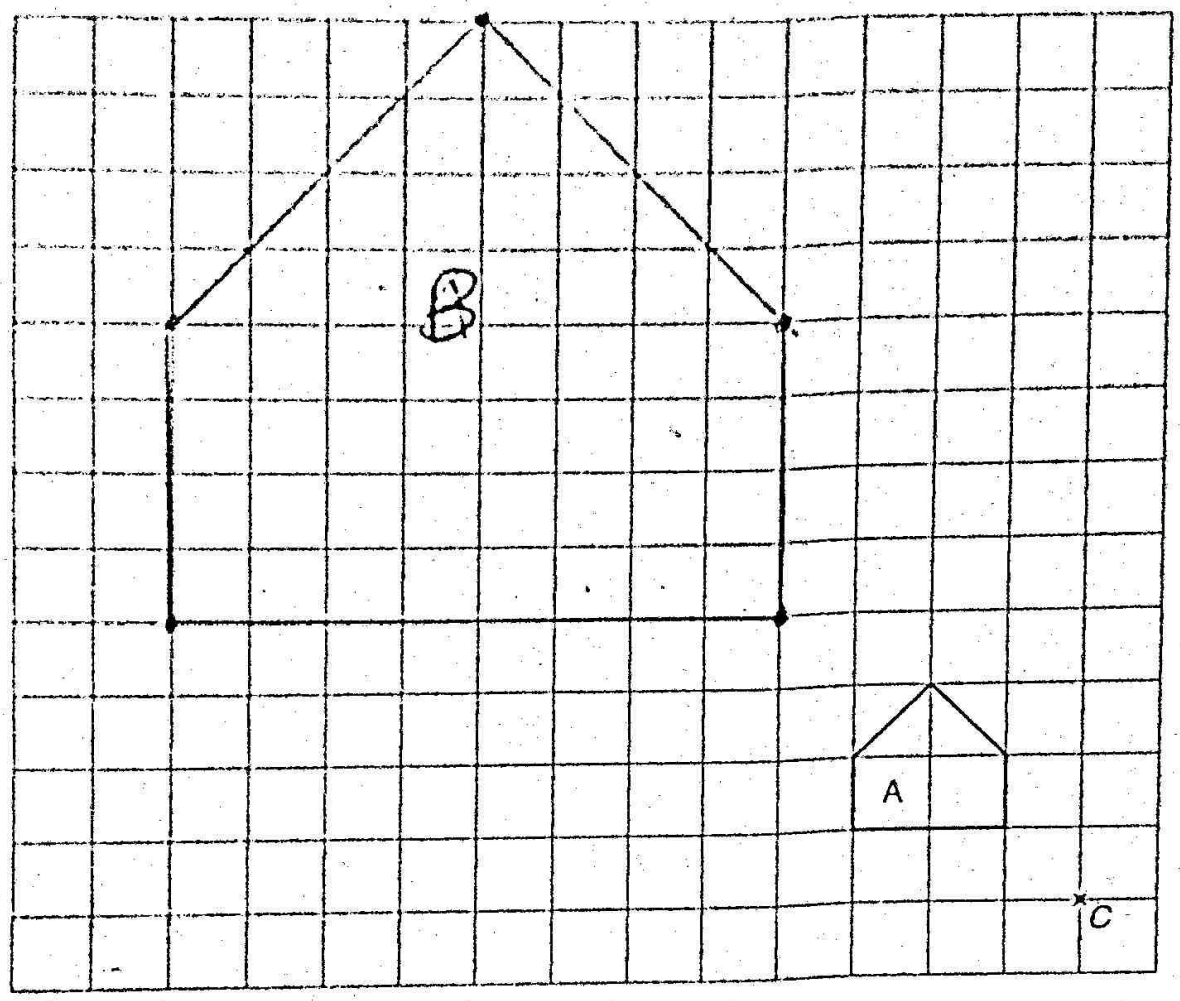
(a) Draw a line on the grid to represent Brenda's journey. (2)

(b) At what time did Brenda pass Layburn?

Answer: 09 20 (1)

4. Polygon A is drawn on a centimetre square grid.

(i) With centre *C*, enlarge polygon A by scale factor 4 and label the image B. (2)



A = 4
B = 48

(ii) How many times longer is the perimeter of B than the perimeter of A?

Answer: ..... 4 ..... times (1)

(iii) How many times larger is the area of B than the area of A?

Answer: ..... 16 ..... times (1)

(iv) Find the area of polygon B.

Answer: ..... 48 ..... cm^2 (2)

5. (a) Solve the equations

(i) $\frac{3a}{4} = 12$

$3a = 48$

$a = 16$

Answer: $a =$ 16 (2)

(ii) $2(b - 6) = b - 20$

$2b - 12 = b - 20$

$b - 12 = -20$

$b = 8$

Answer: $b =$ 8 (2)

(b) (i) Solve the inequalities

(a) $3x - 6 < 8 - x$

$4x - 6 < 8$

$4x < 14$

$x < \frac{14}{4}$

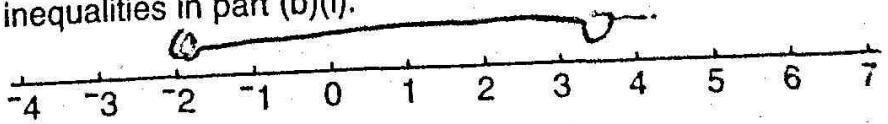
Answer: $x < \frac{7}{2}$ (2)

(b) $x + 4 \geq 2$

$x \geq -2$

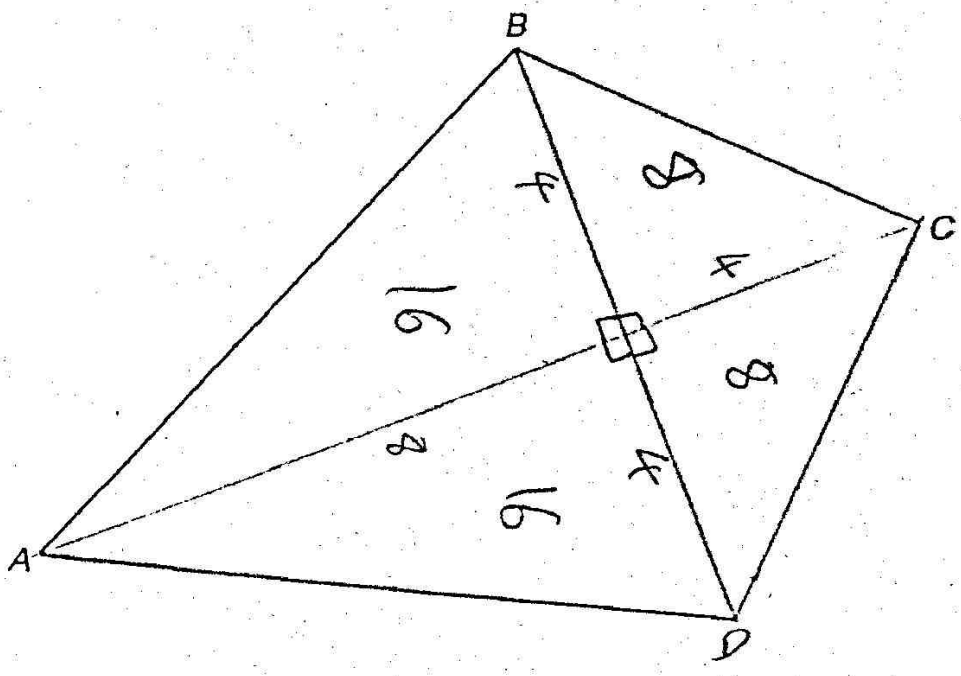
Answer: $x \geq -2$ (1)

(ii) Circle on the number line all the integers which satisfy both inequalities in part (b)(i).



(1)

6. (i) Two sides of a kite *ABCD* are shown below.



(a) Complete the drawing of the kite. (2)

(b) Measure angle *ABC*. Answer: $A\hat{B}C$ = 108.5° (1)

(c) Draw and measure the diagonals of the kite.

Answer: *AC* 12.1 cm *BD* 8 cm (2)

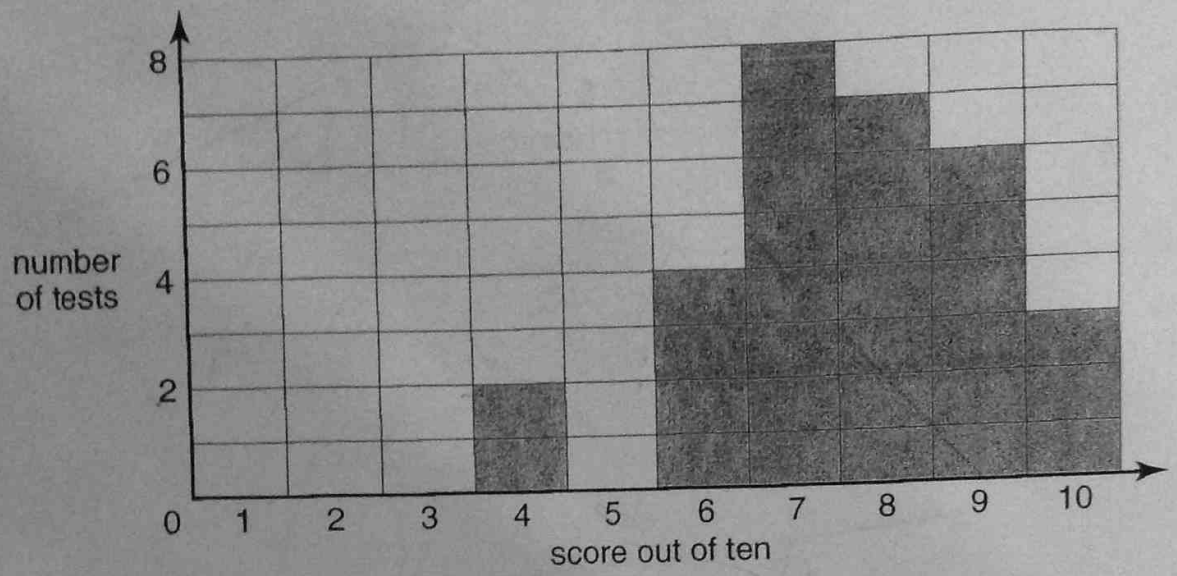
(ii) *ABCD* is a scale drawing of a field. The scale is 1 cm to 10 m.

Use your answers to part (i) (c) to calculate the area of the field in square metres.

8 + 8 + 16 + 16 =

Answer: 48 m² (3)

7. Tom recorded his score in 30 spelling tests.



(i) What is the range of Tom's scores?

Answer: 6 (1)

(ii) What is the modal score?

Answer: 7 and 8 (1)

(iii) What is the median score?

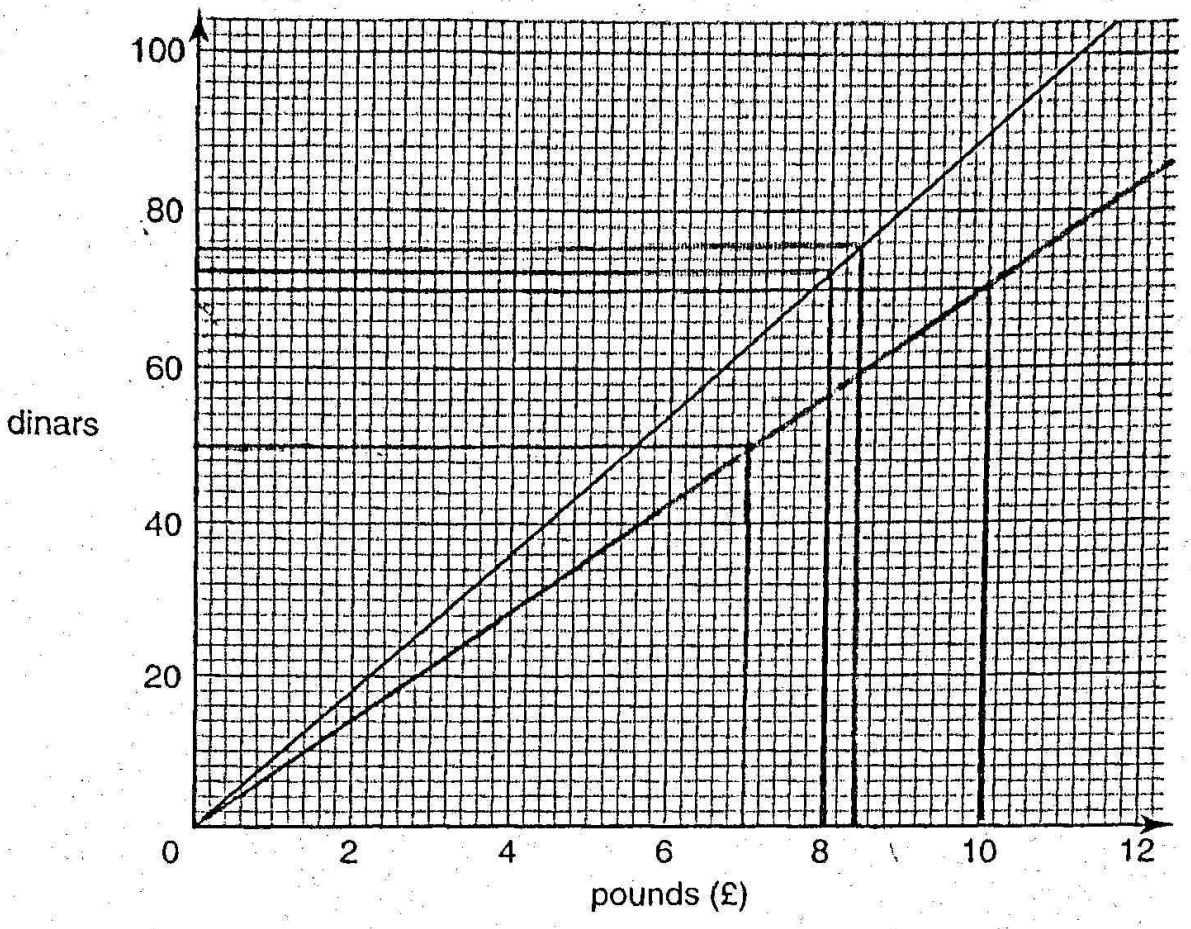
Answer: 8 (2)

(iv) Calculate the mean score.

$\frac{228}{30}$

Answer: 7.6 (2)

8. Gemma uses the conversion line below to convert pounds (£) into dinars before her holiday.



(i) (a) Showing clearly where you take your reading, convert £8 into dinars.

Answer: ..... 72 ..... dinars (1)

(b) What is the exchange rate?

£8 = 72 dinars

£1 = 9

Answer: £1 is worth ..... 9 ..... dinars (1)

During Gemma's holiday the exchange rate alters so that she now gets 2 fewer dinars for every pound.

£10 = 70

(ii) (a) Draw a conversion line on the grid using the new exchange rate. (2)

At the end of her holiday she has 75 dinars left.

£1 = 7 dinars

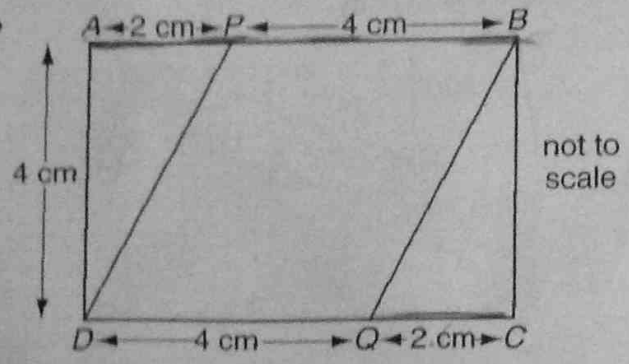
£7 = 49 dinars

(b) Showing clearly where you take your reading, use the new line to convert this into pounds.

Answer: £ ..... 8.40 ..... (2)

9. In the diagram below *ABCD* is a rectangle.

(i) What is the area of *ABCD*?



Answer: 24 cm² (1)

(ii) (a) Which type of quadrilateral is *PBQD*?

Answer: Rectangle Parallelogram (1)

(b) What is the area of *PBQD*?

Answer: 16 cm² (1)

(iii) What fraction of the area of *ABCD* is the area of *PBQD*?

$\frac{16}{24} = \frac{2}{3}$

Answer: ..... (1)

10. *ABCDEF* is a regular hexagon, drawn inside a circle centre *O* of radius 6 cm.

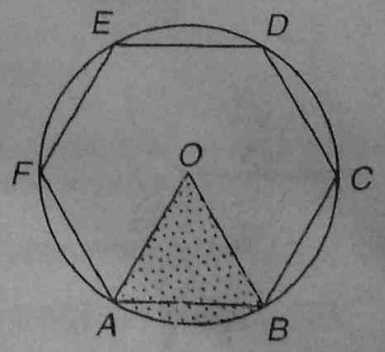
(i) Calculate the area of the sector *OAB*.

360 ÷ 6 = angle O

equilateral triangle

360 ÷ 6 = 60

180 − 60 = 120

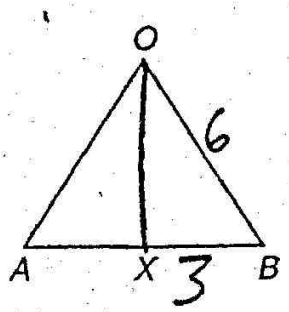


not to scale

Answer: ..... cm² (2)

(ii) X is the mid-point of the line AB.

(a) Write down the length AX.



not to scale

Answer: ..... 3 ..... cm (1)

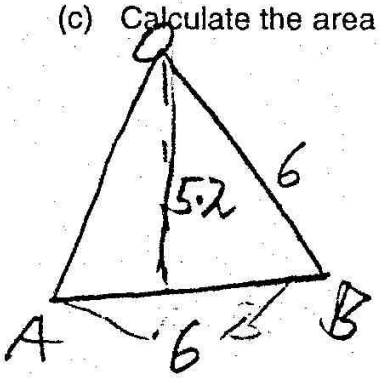
(b) Use Pythagoras' theorem to calculate the distance OX.

$6^2 - 3^2 = 27$

$\sqrt{27}$

Answer: ..... 5.20 ..... cm (2)

(c) Calculate the area of triangle OAB.



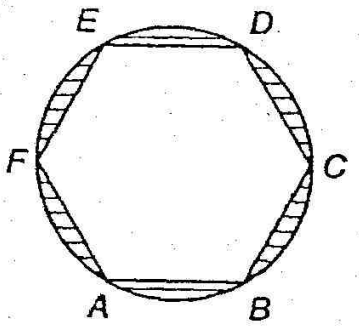
$3 \times 5.2 = 15.6$

Answer: ..... 15.6 ..... cm^2 (2)

(iii) What percentage of the circle is shaded?

Give your answer to the nearest whole number.

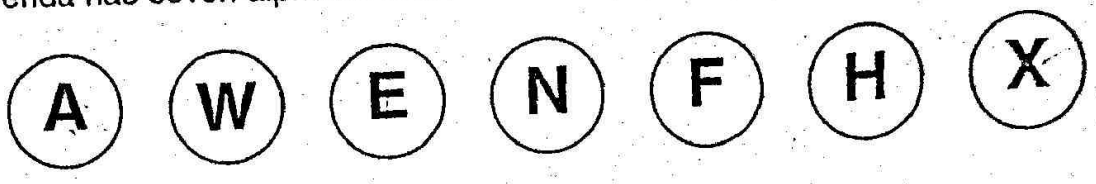
Area of circle = 113.



not to scale

Answer: ..... % (3)

11. Brenda has seven alphabet biscuits.



(i) List the biscuits which have

(a) no symmetry

Answer: F, N (1)

(b) rotational symmetry only

Answer: ..... (1)

(c) both rotational symmetry and line symmetry.

Answer: ..... (1)

Brenda closes her eyes and takes a biscuit at random.

(ii) What is the probability that she takes

(a) a vowel

Answer: 2/7 (1)

(b) the letter K?

Answer: 0 (1)

Brenda takes the letter F and eats it.
She now takes another biscuit at random.

(iii) What is the probability that this letter has one and only one line of symmetry?

Answer: ..... (1)

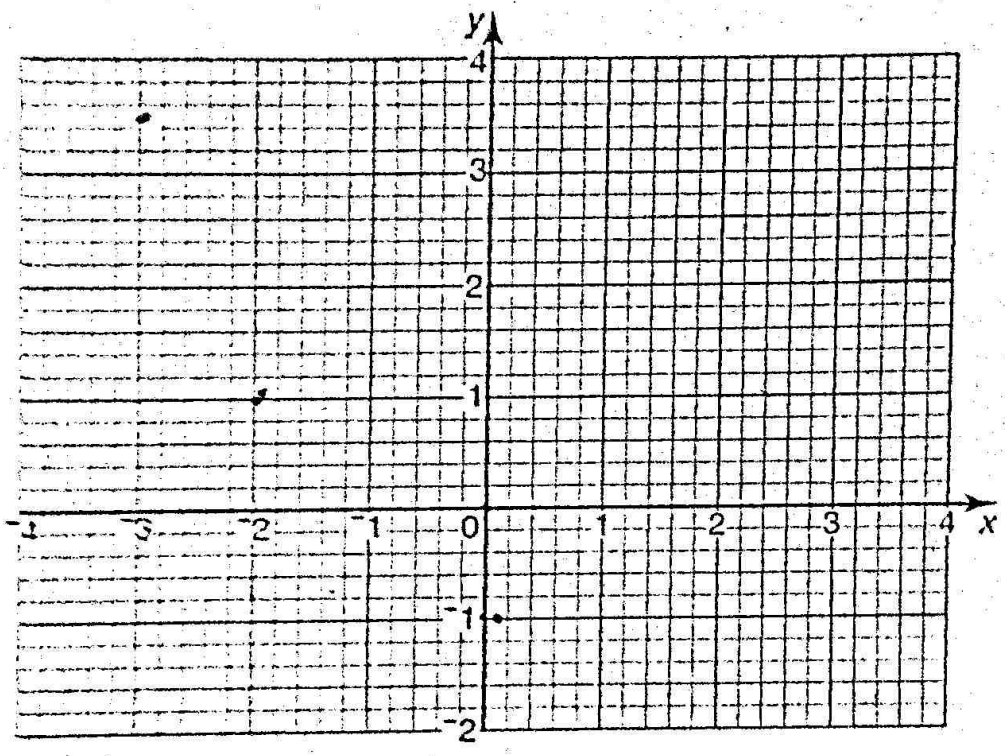
12. (i) A function has the equation $y = \frac{1}{2}x^2 - 1$

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

x	$^-3$	$^-2$	$^-1$	0	1	2	3
y	.....	.....	$^-0.5$	.....	.....	.....	3.5

(2)

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



(ii) A straight line has the equation $y = 1 - \frac{1}{2}x$

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

x	$^-2$	0	2
y	2	.....	.....

(1)

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

(iii) What are the co-ordinates of the point of intersection in the first quadrant?

Answer: (..... , ...) (1)

13. (a) Willie is thinking of a two-digit number.

He gives his friends these clues:

- the units digit is larger than the tens digit
- the sum of the digits is 12

List all of the possible numbers which Willie might be thinking of.

Answer: ..... (2)

(b) Sam is thinking of a three-digit number.

She gives her friends these clues:

- the tens digit is one less than the units digit
- the hundreds digit is twice the units digit.

If x is the units digit,

(i) write down an expression, in terms of x, for the tens digit

Answer: ..... (1)

(ii) write down an expression, in terms of x, for the hundreds digit.

Answer: ..... (1)

Sam says that the sum of the three digits is 15

(iii) Form an equation, in terms of x, and solve it to find Sam's number.

Answer: Sam's number is ..... (3)

(c) Gloria is thinking of two numbers p and q. She gives these clues:

- the sum of the two numbers is 22
- p is 8 more than q.

(i) Form a pair of simultaneous equations in terms of p and q.

Answer: ..... (1)

..... (1)

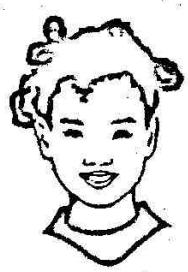
(ii) Solve the simultaneous equations from part (c) (i) to find Gemma's numbers.

Answer: $p =$ ..... and $q =$ ..... (3)

(d) Fantasia is thinking of a decimal number, f, between 2 and 4
She squares the number and then subtracts 3 times her original number.
The result is $^{-}0.81$ so she can write the equation

$$f^2 - 3f = {}^{-}0.81$$

By trial and improvement, find Fantasia's number.



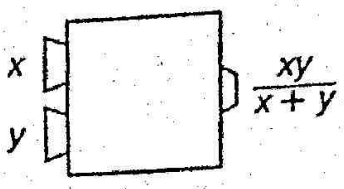
f	f^2	$3f$	$f^2 - 3f$
2	4	6	$^{-}2$

Answer: $f =$ ..... (3)

14. The machine below inputs two whole numbers, x and y, between 1 and 9 inclusive.

It finds the **product** xy and the **sum** $x + y$

It then outputs the **product** divided by the **sum**.



For example, if x is 2 and y is 3 the machine divides $xy = 6$ by $x+y = 5$ to give the output 1.2

(i) Calculate the output when

(a) x is 2 and y is 6

Answer: ..... (1)

(b) x is 7 and y is 7

Answer: ..... (1)

(ii) What is

(a) the largest possible output

Answer: ..... (2)

(b) the smallest possible output?

Answer: ..... (1)

(iii) List the pairs of numbers x and y which give a whole number output.

Answer: ..... (2)

(Total marks: 100)