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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

PAPER 2

Non-Calculator Paper

Monday 27 February 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.
- 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) John paid a total of £5.15 for a jar of coffee, a carton of milk and a bag of sugar.

The jar of coffee cost £3.69 and the carton of milk cost 89 pence.

How much did the bag of sugar cost?

Answer: ..... p (2)

(b) What is the total cost of 25 stamps at 28 p each?

Answer: £ ..... (2)

(c) Jane shares 414 jelly beans equally between herself and two friends.

How many jelly beans does each person receive?

Answer: ..... (2)

2. A sum of money is shared between Peter, James and Mary where Peter receives 35% of the sum, James receives $\frac{1}{2}$ of the sum and Mary receives the rest.

Mary receives £45

(i) How much does Peter receive?

Answer: £ ..... (2)

James spends £45 of his share.

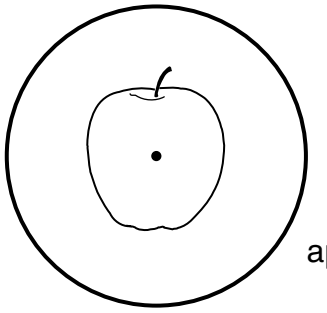
(ii) What percentage of his share does James spend?

Answer: ..... % (2)

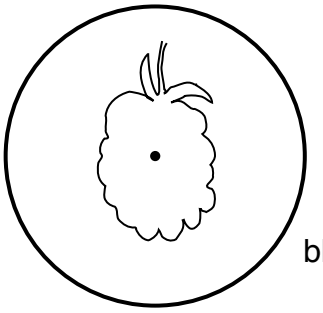
(iii) How much must Peter give to Mary so that Peter and Mary have the same amount of money?

Answer: £ ..... (1)

3. Adam buys an apple pie and Bella buys a blackberry pie from the local baker.
The pies are the same size.



apple



blackberry

Adam cuts up his apple pie. He takes $\frac{1}{3}$ of the pie and Bella takes $\frac{2}{5}$ of the pie.

(i) What fraction of the apple pie is taken altogether?

Answer: ..... (2)

Bella cuts up her blackberry pie. She takes $\frac{1}{5}$ of the pie and then Adam takes $\frac{3}{4}$ of what is left.

(ii) What fraction of the blackberry pie remains?

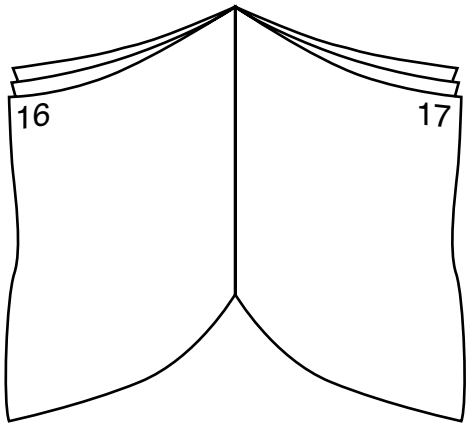
Answer: ..... (3)

Skip, the dog, eats the remaining pieces of the pies.

(iii) Find the ratio of apple pie to blackberry pie that Skip eats.
Give your answer in its simplest form.

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

4. The middle pages of a newspaper are shown below.



(i) How many pages are there in the newspaper altogether?

Answer: ..... (1)

The mean number of words on each single page is 2000

(ii) Estimate the number of words in the newspaper.

Answer: ..... (1)

The sports section takes up the last 25% of the newspaper.

(iii) What is the number of the first page of the sports section?

Answer: ..... (2)

The Sunday edition of the newspaper contained 56 pages.

(iv) What were the numbers of the middle pages?

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

5. (i) Write each of the following numbers as the product of its prime factors:

(a) 30

Answer: ..... (1)

(b) 54

Answer: ..... (1)

(ii) Using your answers to part (i), or otherwise, write down

(a) the largest factor of both 30 and 54

Answer: ..... (1)

(b) the smallest multiple of 30 and 54

Answer: ..... (2)

6. (a) Tommy cycled for $2\frac{1}{4}$ hours at 24 kilometres per hour.

(i) What distance did Tommy cycle?

Answer: ..... km (1)

He then cycled a further 60 kilometres at 16 kilometres per hour.

(ii) What was the total time that Tommy spent cycling?

Answer: ..... hours (2)

(iii) What was Tommy's average speed for the whole journey?

Answer: ..... km/h (2)

(b) Sound travels at 33 000 centimetres per second.
What is the speed of sound in kilometres per hour?

Answer: ..... km/h (3)

7. If $x = 3$ $y = -2$ and $z = -1$ find the value of

(i) $x + 2y$

Answer: ..... (1)

(ii) $2x^2$

Answer: ..... (1)

(iii) $(y + z)^2$

Answer: ..... (2)

(iv) $\frac{2x+3}{6}$

Answer: ..... (2)

(v) $\frac{y-x}{z-x}$

Answer: ..... (2)

8. (a) Solve the following equations:

(i) $1.6 - a = 0.9$

Answer: $a =$ ..... (1)

(ii) $\frac{2}{3}b - 2 = 6$

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

(iii) $2c + 2(3c - 1) = 18$

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

(b) (i) Solve the inequality $14 - 2d > 4$

Answer: ..... (2)

(ii) What is the largest odd number which satisfies the inequality in part (b) (i)?

Answer: ..... (1)

9. (i) Make an accurate drawing of triangle *ABC* with $AB = 10$ cm, $AC = 8$ cm and angle $BAC = 44°$. The point *A* is drawn for you.

(3)

(ii) Measure and write down the length of *BC*.

Answer: ..... cm (1)

(iii) (a) Draw the perpendicular from *C* to the line *AB*. (1)

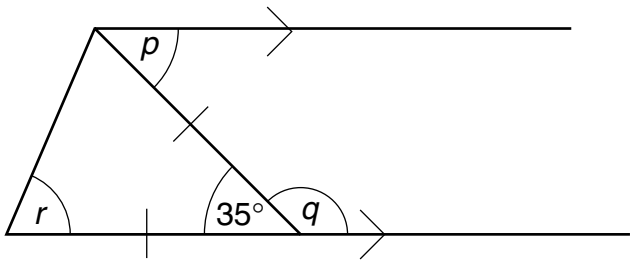
(b) Measure and write down the length of this perpendicular.

Answer: ..... cm (1)

(iv) Use your answer to part (iii) (b) to calculate the area of triangle *ABC*.

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

10. (a)



not to scale

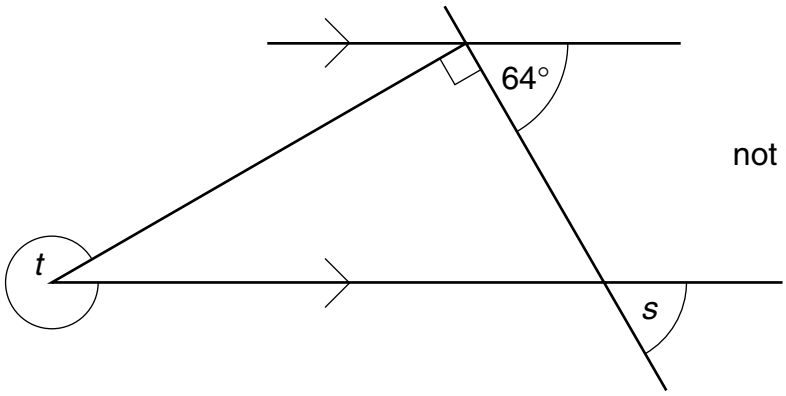
Calculate the size of each of the angles marked *p*, *q* and *r*.

Answer: *p* = ... ° (1)

q = ... ° (1)

r = ... ° (2)

(b)



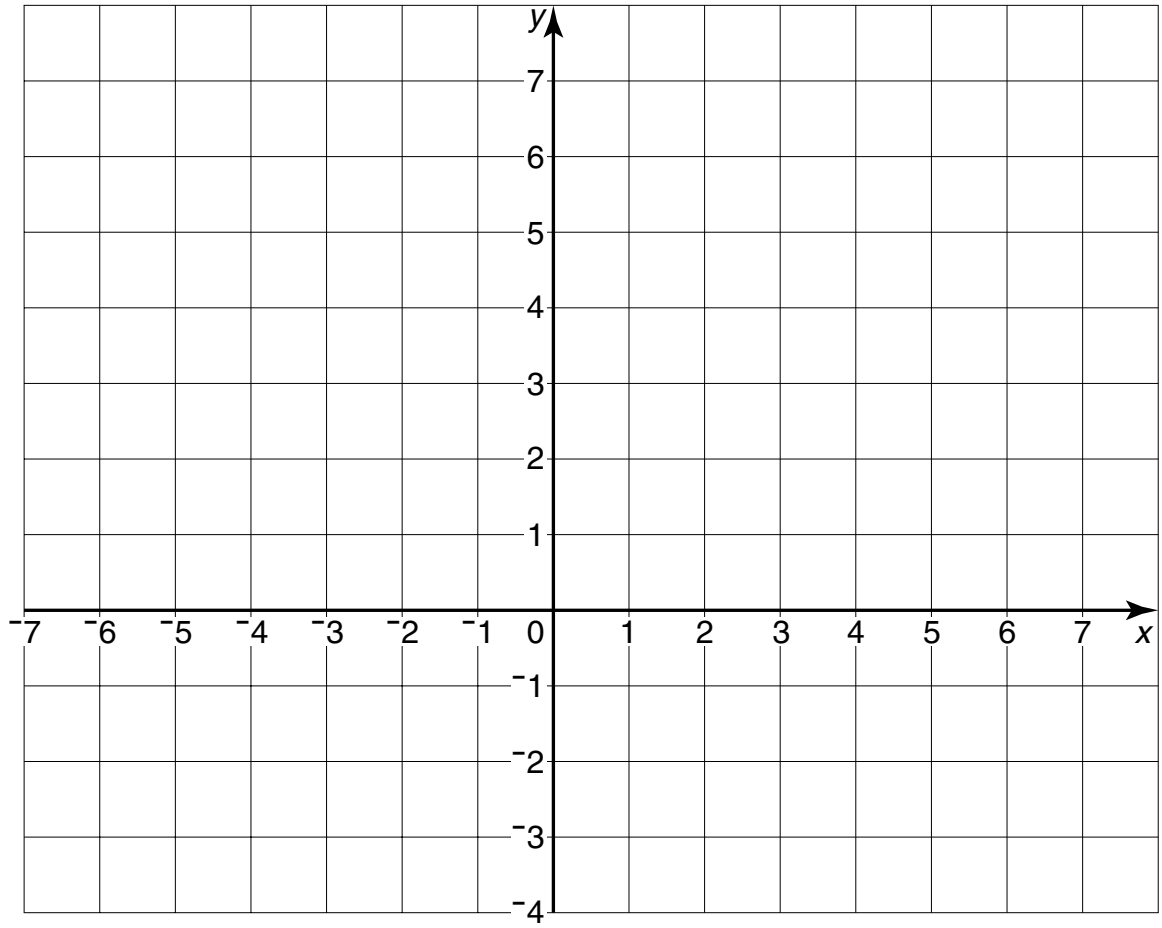
not to scale

Calculate the size of each of the angles marked *s* and *t*.

Answer: *s* = ... ° (1)

t = ... ° (2)

11. (i) On the centimetre square grid, plot the points (0, 2), (3, 5) and (−2, 4).
Join the points to form a triangle. Label the triangle A. (2)



(ii) Rotate triangle A 90° anti-clockwise about the point (0, 1).
Label the image B. (2)

(iii) (a) Draw and label the line $y = x$. (1)

(b) Reflect triangle A in the line $y = x$ and label the image C. (1)

(iv) The length of the longest side of triangle A is $\sqrt{26}$ cm.
Calculate the lengths of the other two sides of triangle A.
Leave your answers as square roots.

Answer: ..... cm and ..... cm (3)

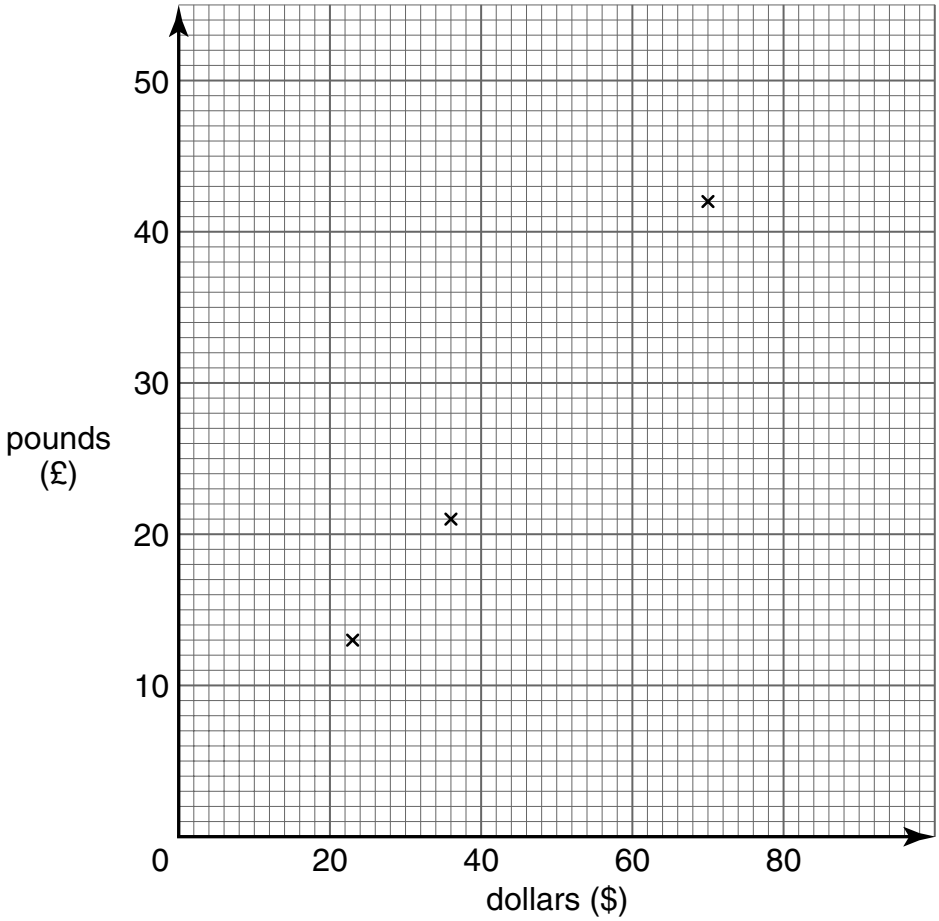
12. On a recent visit to the USA, I used my credit card to pay for several items in American dollars ($).

When I received my bill in England the items were charged in pounds (£).

The table below shows some of the amounts in dollars and in pounds.

dollars ($)	36	23	70	10	40	26	50	75
pounds (£)	21	13	42	6	23	15	29	45

(i) Plot the points on the grid below. The first three points are plotted for you. (3)



(ii) On your graph, draw the line of best fit. (1)

(iii) Showing clearly where you take your reading, use your graph to estimate the value of £10 in dollars.

Answer: $ ..... (2)

(iv) Use your answer to part (iii) to calculate the value of £20 000 in dollars.

Answer: $ ..... (1)

13.

NATIONAL AWARD SCHEME

first prizes of £100 each and second prizes of £60 each

The organisers awarded x first prizes and y second prizes.

(i) Write down an expression for the total value of the prizes awarded.

Answer: £ ..... (1)

The total value of the prizes was £1220

(ii) Write down an equation and show that it can be reduced to $5x + 3y = 61$

(2)

The first prizes were sent by special delivery costing £3 each, whilst the second prizes were sent by registered mail costing £1 each.

The total cost of postage was £27

(iii) Form an equation to show the total cost of postage.

Answer: ..... (1)

(iv) Solve the two equations simultaneously to find the values of x and y.

Answer: $x =$ .....

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

(v) What was the total value of the second prizes awarded?

Answer: £ ..... (1)

14. Study the pattern of positive even numbers below.

$2 + 4 = 2 \times 3$

$2 + 4 + 6 = 3 \times 4$

$2 + 4 + 6 + 8 = 4 \times 5$

(i) Write down the next two lines of the pattern.

Answer: ..... = ... (1)

..... = ... (1)

(ii) Find the sum of all the positive even numbers up to and including

(a) 20

Answer: ..... (2)

(b) 100

Answer: ..... (1)

(iii) When the sum of all the positive even numbers is 420, find the largest even number in the sequence.

Answer: ..... (2)

(Total marks: 100)

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COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

PAPER 4

Calculator Paper

Tuesday 28 February 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. 1 kilogram (kg) = 2.2 pounds (lb)

(i) Writing down all the figures shown on your calculator, calculate

(a) the number of pounds in 18 kilograms

Answer: ..... pounds (1)

(b) the number of kilograms in 18 pounds.

Answer: ..... kilograms (1)

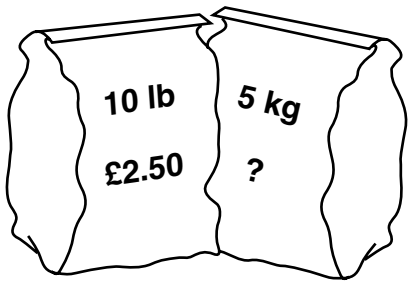
(ii) (a) Write your answer to part (i) (a) correct to the nearest pound.

Answer: ..... pounds (1)

(b) Write your answer to part (i) (b) correct to 1 decimal place.

Answer: ..... kilograms (1)

(iii) Find the cost of 5 kilograms of potatoes if 10 pounds of potatoes cost £2.50



Answer: £ ..... (2)

2. The mean rainfall during the first 5 days of a week was 4.3 millimetres per day.

(i) What was the total rainfall during these 5 days?

Answer: ..... mm (1)

After a wet day on the 6th day of the week, the total rainfall increased to 32.2 millimetres.

(ii) What was the rainfall on the 6th day?

Answer: ..... mm (1)

On the 7th day it rained 3 mm less than it did on the 6th day.

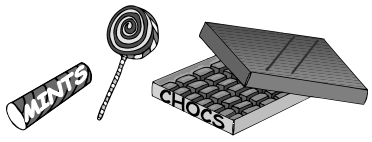
(iii) What was the mean daily rainfall for all 7 days?

Answer: ..... mm (2)

3. (a) The prices of a packet of mints, a lollipop and a box of chocolates are in the ratio of 4 : 1 : 20

The total cost of 1 packet of mints and 1 lollipop is £1.00

(i) What is the cost of a box of chocolates?



Answer: £..... (3)

(ii) If the cost of the mints goes up by $\frac{1}{4}$ and the cost of a lollipop goes down by $\frac{1}{4}$, how much will 1 packet of mints and 1 lollipop now cost?

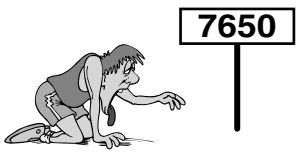
Answer: £..... (2)

(b) Find the total amount if £3.60 is increased by 17.5%.

Answer: £..... (2)

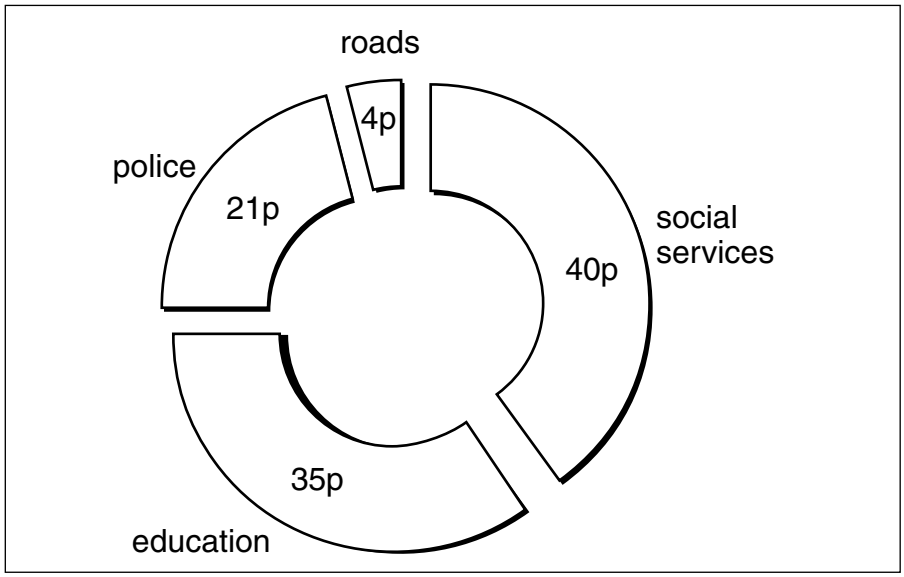
(c) In a 10 kilometre race, John completed 7650 metres before he was forced to drop out.

What percentage of the race still remained?



Answer: .....% (2)

4. The diagram below shows how each £1 is spent on different services by Shire District Council during a one-year period.



(i) Which service spends the most money?

Answer: ..... (1)

The total amount spent is £18m.

(ii) How much is spent on roads?

Answer: £..... (2)

A quarter of the education budget is spent on nursery education.

(iii) Calculate the size of the remainder of the education budget.

Answer: £..... (2)

(iv) If 5% of the social services budget is transferred to the police budget, what would be the total police budget now?

Answer: £..... (2)

5. Richard has a bag of 27 coloured sweets – red ones, yellow ones and orange ones.

The probability that, at random, he picks out a red sweet is $\frac{1}{3}$

(i) How many red sweets are there in the bag?

Answer: ..... (1)

Richard eats all the red sweets.

He then finds there are 4 more yellow sweets than there are orange ones.

(ii) (a) How many yellow sweets are there?

Answer: ..... (1)

(b) If he picks out one sweet at random, what is the probability that it is yellow?

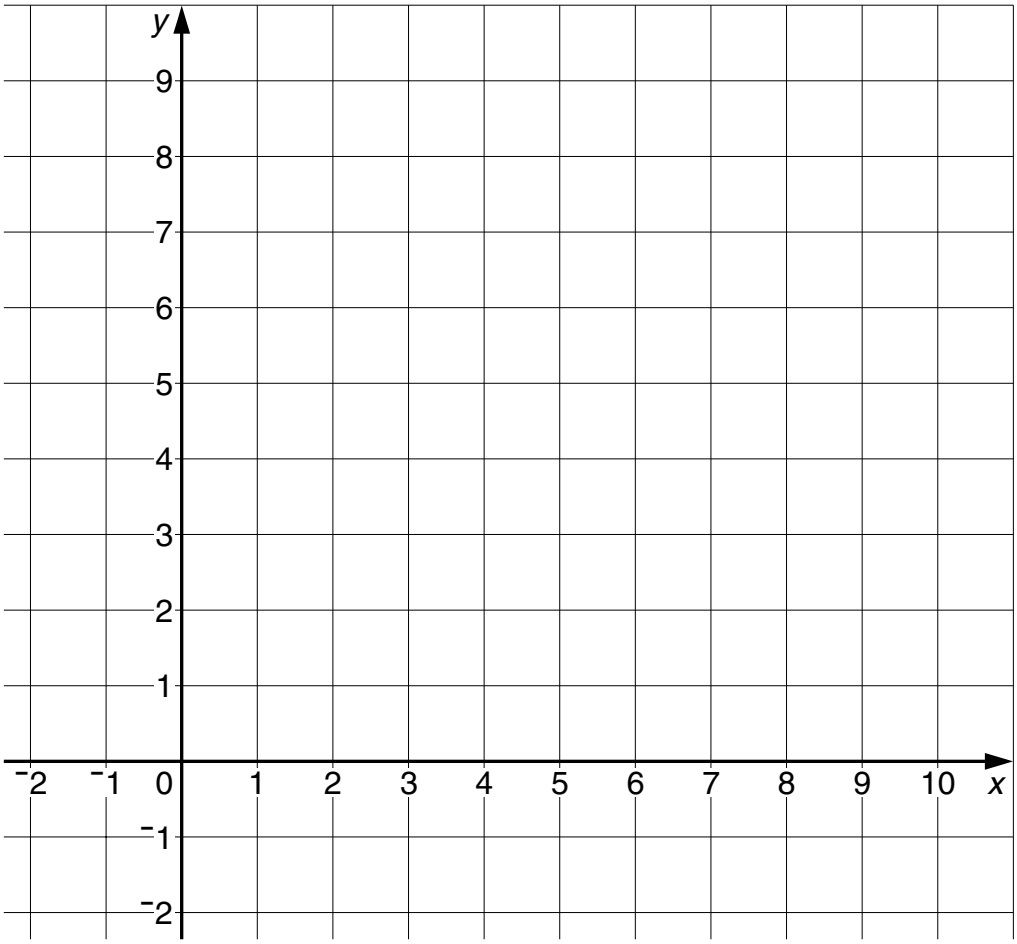
Answer: ..... (1)

He picks a yellow sweet and eats it.

(iii) If he picks another sweet at random, what is the probability it is not yellow?

Answer: ..... (1)

6.



(i) On the co-ordinate grid, plot the points (1, 2), (4, 1), (3, 4) and (1, 4).
Join the points to form a kite and label it A. (1)

(ii) With centre ($^-$1,1) enlarge the kite by scale factor 2
Label the enlarged shape B. (3)

(iii) The area of A is 6 cm^2. What is the area of B?

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

(iv) C is a different enlargement of A.
If the area of C is 54 cm^2, what is the scale factor of this enlargement?

Answer: ..... (2)

7. (a) Simplify

(i) $2a^2 - a^2 + 3a^2$

Answer: ..... (2)

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

Answer: ..... (3)

(iii) $4d \times d^4$

Answer: ..... (1)

(iv) $\dfrac{2e^3 \times 3e^2}{5e^6}$

Answer: ..... (2)

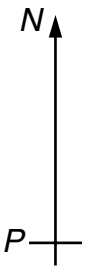
(b) Factorise completely

$4pq + 6q^2$

Answer: ..... (2)

8. Captain Kirk sails from port, *P*, on a bearing of 060° towards a fishing boat, *F*, which is 5 kilometres away.

(i) Using a scale of 1:100 000, draw the course that Captain Kirk takes from *P* to the fishing boat and label the position of the fishing boat, *F*. (2)



Captain Kirk then tows the fishing boat back to harbour, *O*, a distance of 8 kilometres on a bearing of 200° from *F*.

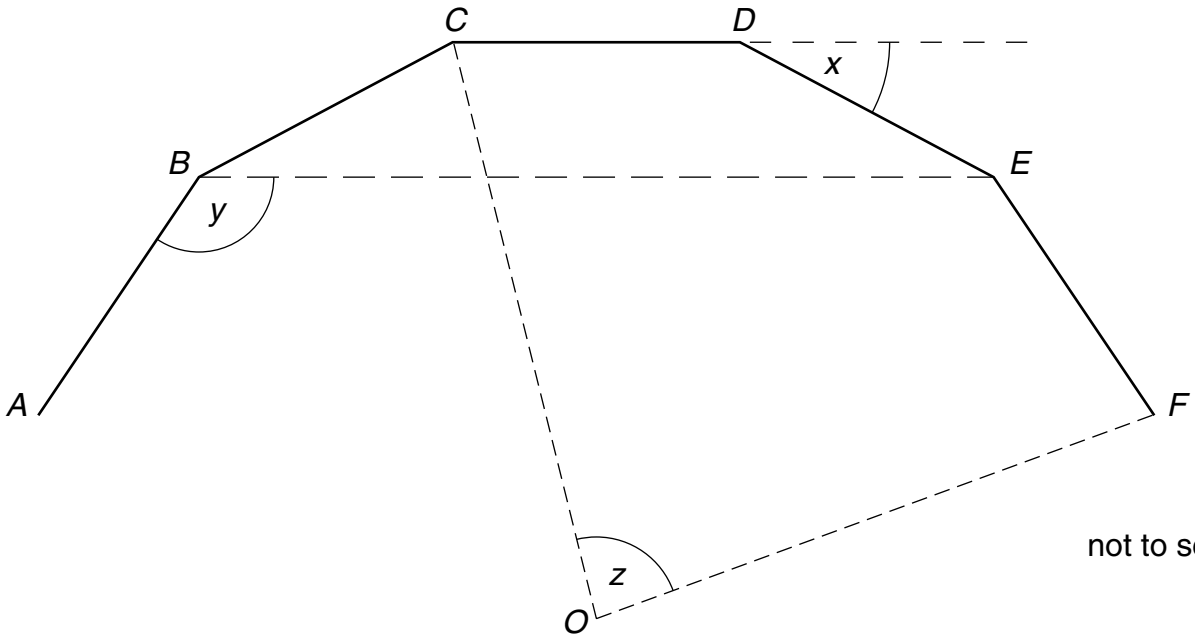
(ii) Draw the course of the boats to the harbour, *O*. (2)

(iii) Measure and write down the distance and bearing of *O* from *P*.

Answer: distance ..... km (1)

bearing ..... ° (2)

9. *ABCDEF* shows part of a regular polygon, centre *O*, with interior angles equal to 156°.



not to scale

(i) Calculate the size of the exterior angle *x*.

Answer: x = ... ° (1)

(ii) How many sides has the regular polygon?

Answer: ..... (1)

(iii) What is the sum of the interior angles of the regular polygon?

Answer: ..... ° (1)

(iv) Calculate the size of the angle marked *y*.

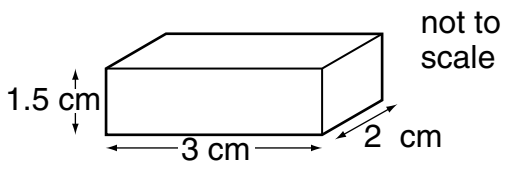
Answer: y = ... ° (2)

(v) Calculate the size of the angle marked *z*.

Answer: z = ... ° (2)

10. A toy brick is in the shape of a cuboid measuring 3 cm by 2 cm by 1.5 cm.

(i) What is the volume of the brick?



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

Each cubic centimetre of the brick has a mass of 2.3 grams.

(ii) What is the mass of one brick?

Answer: ..... g (1)

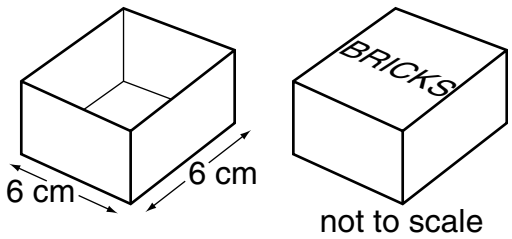
The bricks are to be painted.

(iii) What is the total surface area of one brick?

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

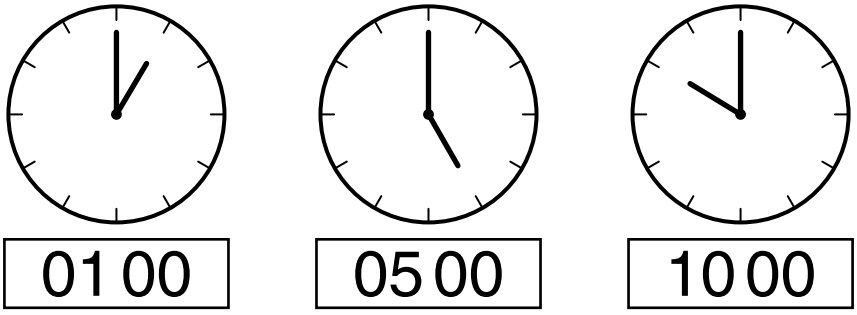
A set of 24 bricks completely fills a box with a square base of side 6 cm.

(iv) What is the height of the box?



Answer: ..... cm (2)

11. The international airport clocks show the following information simultaneously:



Mr M E Grant flies from London to New York. The flight time is $6\frac{1}{2}$ hours.

(i) If the aircraft leaves London at 10 00, at what time (local time) does he arrive in New York?

Answer: ..... (2)

After a 3 hour wait in New York, Mr Grant travels on to Vancouver where the time is 4 hours behind the time in New York.

(ii) Mr Grant lands in Vancouver at 15 30 local time.

(a) How long is the flight from New York to Vancouver?

Answer: ..... hours (2)

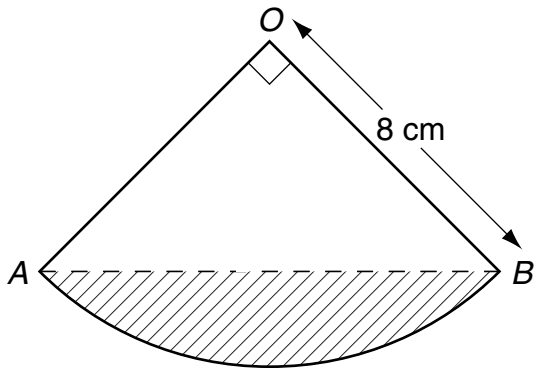
(b) What is the time in London when Mr Grant lands in Vancouver?

Answer: ..... (2)

(iii) How long after leaving London does Mr Grant arrive in Vancouver?

Answer: ..... h ..... min (1)

12. (i)



not to scale

OAB is a quarter of a circle with centre *O* and radius 8 centimetres.
Calculate

(a) the length of the arc *AB*

Answer: ..... cm (2)

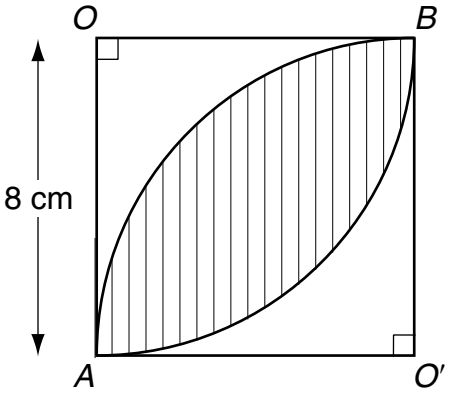
(b) the area of the sector *OAB*

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

(c) the area of the triangle *OAB*.

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

(ii) The figure shows a square formed by two overlapping quarter circles.
Calculate the shaded area.



not to scale

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

13. The number y is 3 greater than the number x.

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

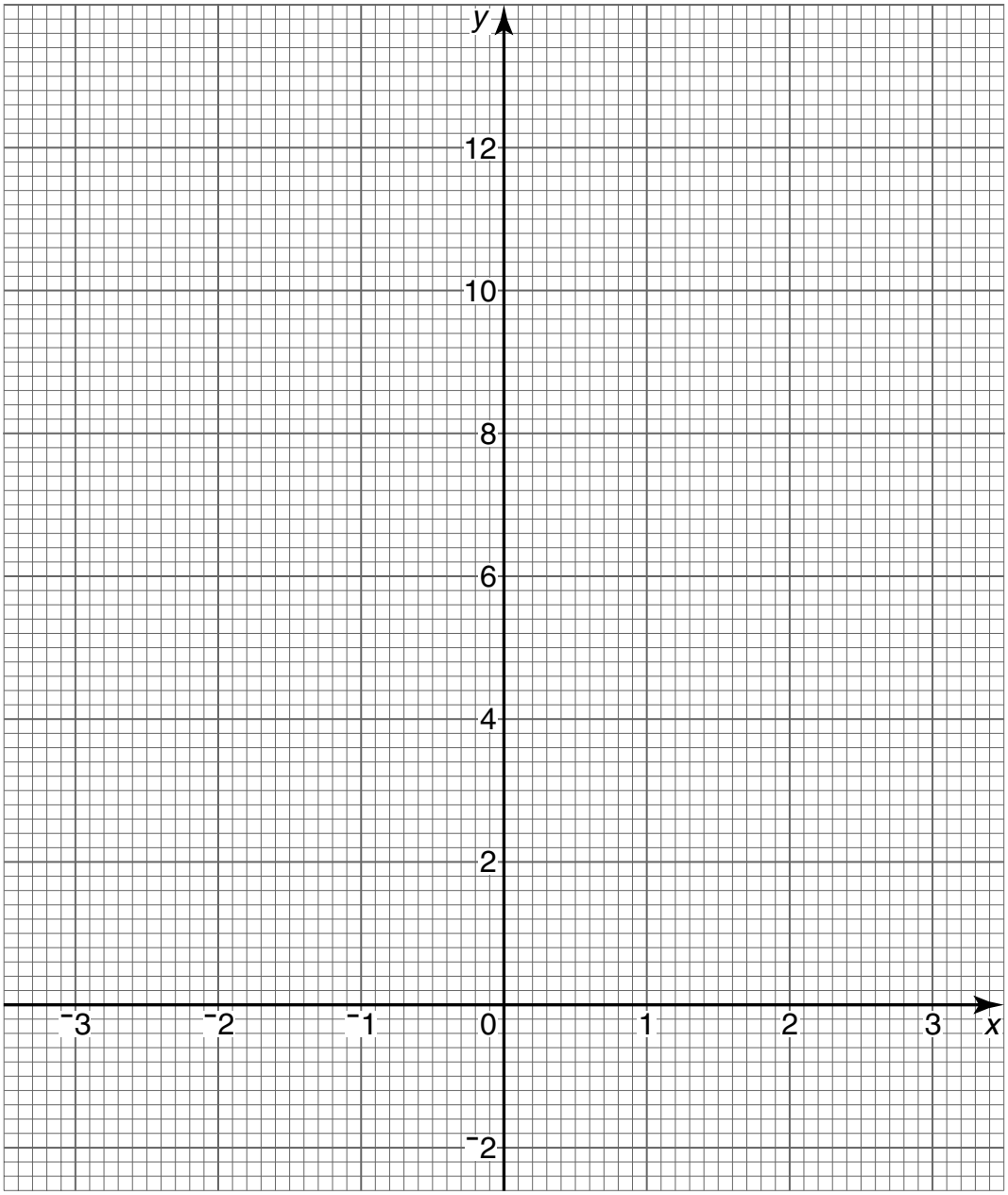
Answer: ..... (1)

(ii) Complete the table of values for your equation in part (i).

x	$^{-}3$	0	2
y			5

(1)

(iii) Using the table in part (ii), plot points onto the grid below and draw a line through them. (1)



(iv) The number y is equal to 2 more than the square of x.

Form an equation, in terms of x and y, to show this information.

Answer: ..... (1)

(v) Complete the table of values for your equation in part (iv).

x	$^{-}3$	$^{-}2$	$^{-}1$	0	1	2	3
y		6			3	6	

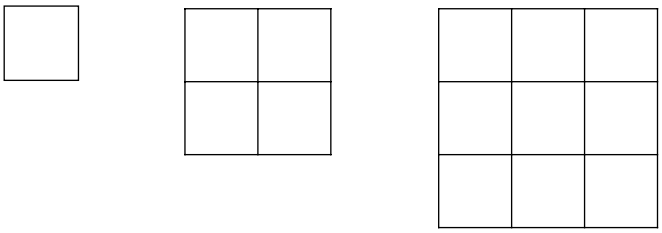
(2)

(vi) Using the table in part (v), plot points onto the grid opposite and draw the curve through them. (2)

(vii) Write down the co-ordinates of the point of intersection of the curve and line which lies in the 1st quadrant.

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

14. pattern 1 pattern 2 pattern 3 pattern 4



(i) Sketch pattern 4 in the space provided, (1)

(ii) Complete the table below to find the total number of squares in each of the patterns.

	pattern 1	pattern 2	pattern 3	pattern 4	pattern 5
number of 1 × 1 squares	1	4	9	.....	.....
number of 2 × 2 squares	0	1	4	.....	.....
number of 3 × 3 squares	0	0	.....	.....	.....
number of 4 × 4 squares	0	0	.....	.....	.....
number of 5 × 5 squares	0	0	.....	.....	.....
total number of squares	1	5	.....	.....	.....

(4)

(iii) By considering the sequence of numbers in the table above, calculate the total number of squares in an 8 × 8 square (pattern 8).

Answer: ..... (2)

(Total marks: 100)

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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

MENTAL ARITHMETIC TEST

27, 28 February, 1 or 2 March 2006

Please read this information before the examination starts.

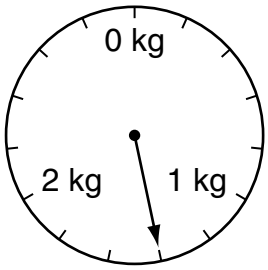
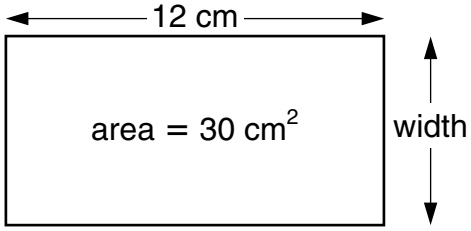
- Answers are to be written in the spaces provided on the answer sheet.
- You may use a pen or pencil.
- You may not use calculators, rulers, geometrical instruments etc.
- Erasers and correcting fluid are not permitted. If you wish to change an answer, you should cross it through and write the correction beside it.
- Write your name, the name of your junior school and the senior school for which you are entered at the top of the answer sheet.

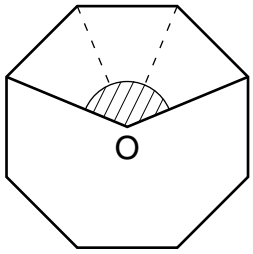
ANSWER	ROUGH JOTTINGS

Practice question

	38

1.		
2.		20
3.	£	31 5
4.	litres	9 72
5.		hexagon
6.		29 90

	ANSWER	ROUGH JOTTINGS
7.	minutes	19 30 21 10
8.	£	£2.20 10%
9.	grams	
10.		2 5
11.	goats : pigs	45 30
12.	kg	6 5.5 9.5
13.	cm	 not to scale

	ANSWER	ROUGH JOTTINGS
14.	days	$\frac{2}{3}$ 8
15.	°	
16.	pets	number of pets: 0, 1, 2, 3, 4 — frequency: 3, 4, 5, 2, 1
17.	pence	4 80 27
18.	x = °	x $2x$ $x + 20$°
19.		0.05 0.2
20.		24 $\frac{1}{4}$ $\frac{1}{3}$