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

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

PAPER 4

Calculator Paper

Tuesday 8 June 2004

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. George collects shopping trolleys at the supermarket.

He earns £4.20 per hour for the first 36 hours he works in a week.

He is paid 'overtime rates' of £6.30 per hour when he works more than 36 hours a week.

(i) One week he works for a total of 38 hours.

How much does he earn in this week?

36 x 4.20 + 6.30 x 2

151.2 + 12.6 = 163.8

Answer: £ 163.80 ✓ (2)

(ii) Next week he earns £198.45

How many hours does he work this week?

198.45 ÷ 4.20 = 47.25

198.45 - 151.2 = 47.25

31.5 + 47.25

76.75

76.75/60

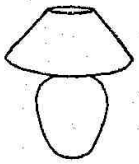
77.25

Answer: 77.25 ✗ hours (3)

/2

2. (a) Mr Albright buys a lamp for £90

He hopes to sell it at a 'special price', making a profit of 35%.



(i) For how much does he hope to sell the lamp?

10 = 9 × 3 = 27

1 9 × 2 = 4.5 = 31.5 + 90 = 121.5

(-1)

Answer: £ 121.50 (2)

Unfortunately nobody buys it, so he reduces the 'special price' by 10%.

(ii) What is the new price of the lamp?

25

14 + 4.5 22.5 + 90 = 112.5

(-1)

Answer: £ 112.50 (2)

He sells the lamp at the new price.

(iii) Express his profit as a percentage of his original cost price.

$\frac{112}{90} \times \frac{100}{1} = \frac{1120}{9} = 124.4$

90 → 112 × 100/1

9000 ÷ 112 = 80.4

Answer: 80.4 21.5 % (2)

(b) Air fares were increased by 10% on 1 January this year.

Mary now pays £990 for her 'round the world' air ticket.

How much would she have paid before 1 January?

110% 99 990 ÷ 99 = 891

990 = 110%

Answer: £ 891 (2)

/2

3. (a) The numbers of newspapers and magazines sold by a newsagent are in the ratio 9:2

(i) On Monday he sells 153 newspapers.
How many magazines does he sell?

N : M
×17 9 : 2 ×17
153 : 34

Answer: 34 ✓ (2)

(ii) On Saturday he sells a total of 242 newspapers and magazines.
How many newspapers does he sell?

N M
×22 9 : 2 ×22
198 : 44

242 ÷ 11 = 22

Answer: 198 ✓ (2)

(b) A map is drawn to a scale of 1:25 000
How many centimetres on the map represent 1 kilometre?

25 000 × 1000 = 25000000

1cm = 250m
4 = 1000m
4cm = 1km

4cm
Answer: 25000000 × cm (2)

4. The mass, in kilograms, of each of 5 boys is

42.8 45.9 40.3 48.7 43.8

(i) What is the median mass of the boys?

42·8 + 45·4 + 40·3

40·3, 42·8, 43·8, 45·9, 48·7

Answer: 43·8 ✓ kg (1)

(ii) What is the mean mass of the boys?

42·8
+ 45·9
+ 40·3
48·7
43·8
221·5 ÷ 5 = 44·3

Answer: 44·3 ✓ kg (2)

Another boy of mass 47.3 kg joins the group.

(iii) What is the new mean mass of the boys?

221·5 + 47·3 = 44·4

268·8 ÷ 6 = 44·8 ✓

Answer: 44·8 kg (2)

2 girls of identical mass then join the group.

The mean mass of the 8 children is now 44 kilograms.

(iv) What is the mass of each girl?

44·8 × 5 = 358·4 − 268·8 ÷ 2 = 44·9

4 × 44 − 252 − 268·8 ÷ 2 = 2 girls' mass = 41·6

Answer: 41·6 ✓ kg (3)

/8

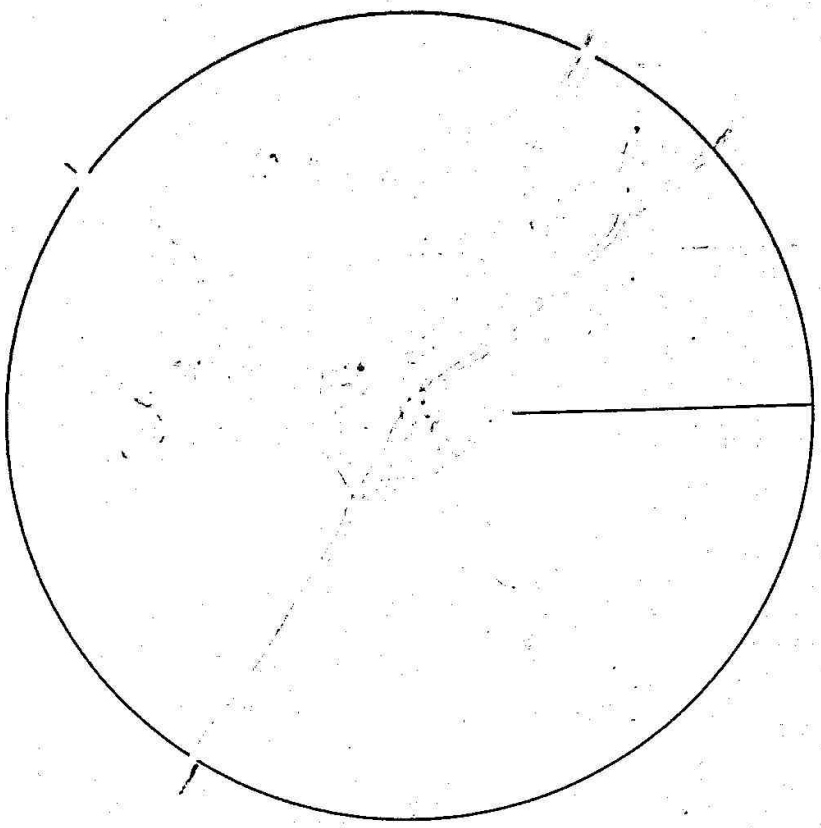
5. The Garden Centre sells boxes of bulbs.

Each box contains 90 bulbs of which $\frac{1}{15}$ are hyacinths and $\frac{1}{9}$ are tulips.

In addition there are twice as many crocuses as tulips, 2 dozen daffodils and the rest are snowdrops.

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

Mark each sector clearly with both angle and name of bulb.



√√√√

(5)

(b) In a different box of bulbs the angle representing tulips is 108°

What percentage of that box is tulips?

$T = \frac{108^\circ}{360} = 0.3 = 30\%$

Answer: ..... % (2)

/4

6. (a) The first 5 letters of the alphabet, A, B, C, D and E, are each written on a separate card and placed in a bag.

Another bag contains the vowels, A, E, I, O and U, each written on a separate card.

A card is drawn at random from each bag and the results recorded on a chart, part of which is filled in below.

first 5 letters \ vowels	A	E	I	O	U
A	AA				
B			BI		
C		CE			
D					DU
E				EO	

(i) Complete the chart above. (2)

(ii) What is the probability of

(a) drawing a pair of letters which are the same

Answer: $\frac{2}{25}$ ..... (2)

(b) drawing a pair of vowels?

$\frac{20}{25}$ $\frac{4}{5}$ $\frac{10}{25}=\frac{2}{5}$

Answer: $\frac{4}{5}$ ..... (2)

(b) The probability that a train is not late arriving at Frumpton Station is $\frac{13}{20}$

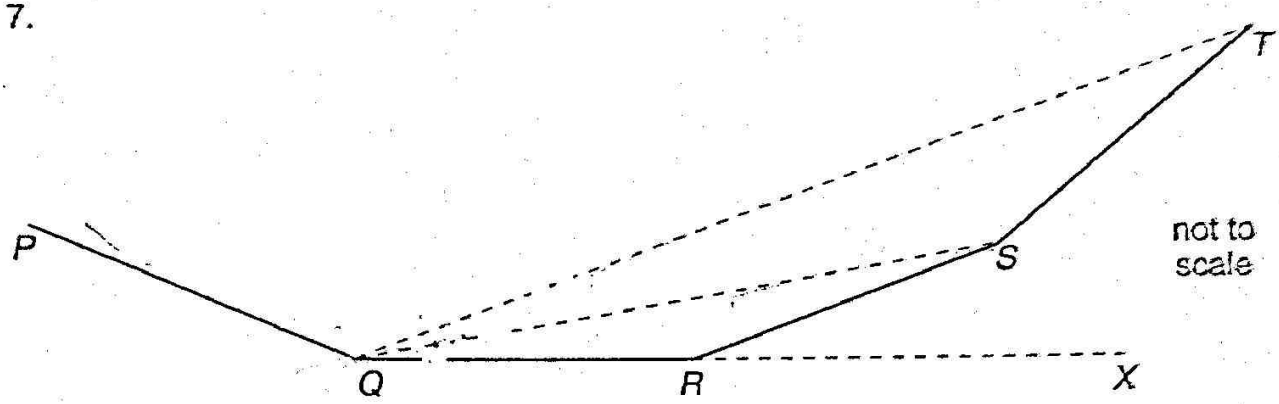
How many of the 60 trains which arrive at Frumpton each week would you expect to be late?

$13\times3=39$ $\frac{39}{60}=\frac{21}{60}$

$\frac{21}{60}$ 21

Answer: ..... (2)

7.



PQRST shows part of a regular 20-sided polygon.

QR is produced to *X*.

(i) What is the sum of the interior angles of a regular 20-sided figure?

Ex = 18
In = 162

162 × 20 = 3240

Answer: 3240 ✓ ° (2)

(ii) Calculate the size of angle *SQR*.

✓

Answer: 9 ° (2)

(iii) Calculate the size of angle *PQT*.

144°

Answer: 162 x ° (2)

(iv) Which type of figure is *QRST*?

✓

Answer: trapezium (1)

/5

8. (a) When $a = 14.6$ $b = 9.7$ $c = -5.4$ find the value of

(i) $\dfrac{a+b}{b-c}$

$14.6 + 9.7$ $\quad \dfrac{24.3}{15.1} = 1.6$

$9.7 - -5.4$

Answer: 15.1 ✓ (2)

(ii) $\dfrac{(2b)^3}{ca^2}$

$19.4^3 = 7301.384$ ✓

$-5.8, 4.4$ $\quad \dfrac{7301.384}{6215.745} = 1.17$ ✗

$-1,151.3064$

$14.6^2 \times c$

Answer: 1.17 -6.3 ✗ (3)

(b) $A = \frac{1}{2}h(a + b)$

Find the value of h when $A = 38.7$ $a = 10.7$ $b = 6.9$

$38.7 = \frac{1}{2}h(10.7 + 6.9)$ ✓

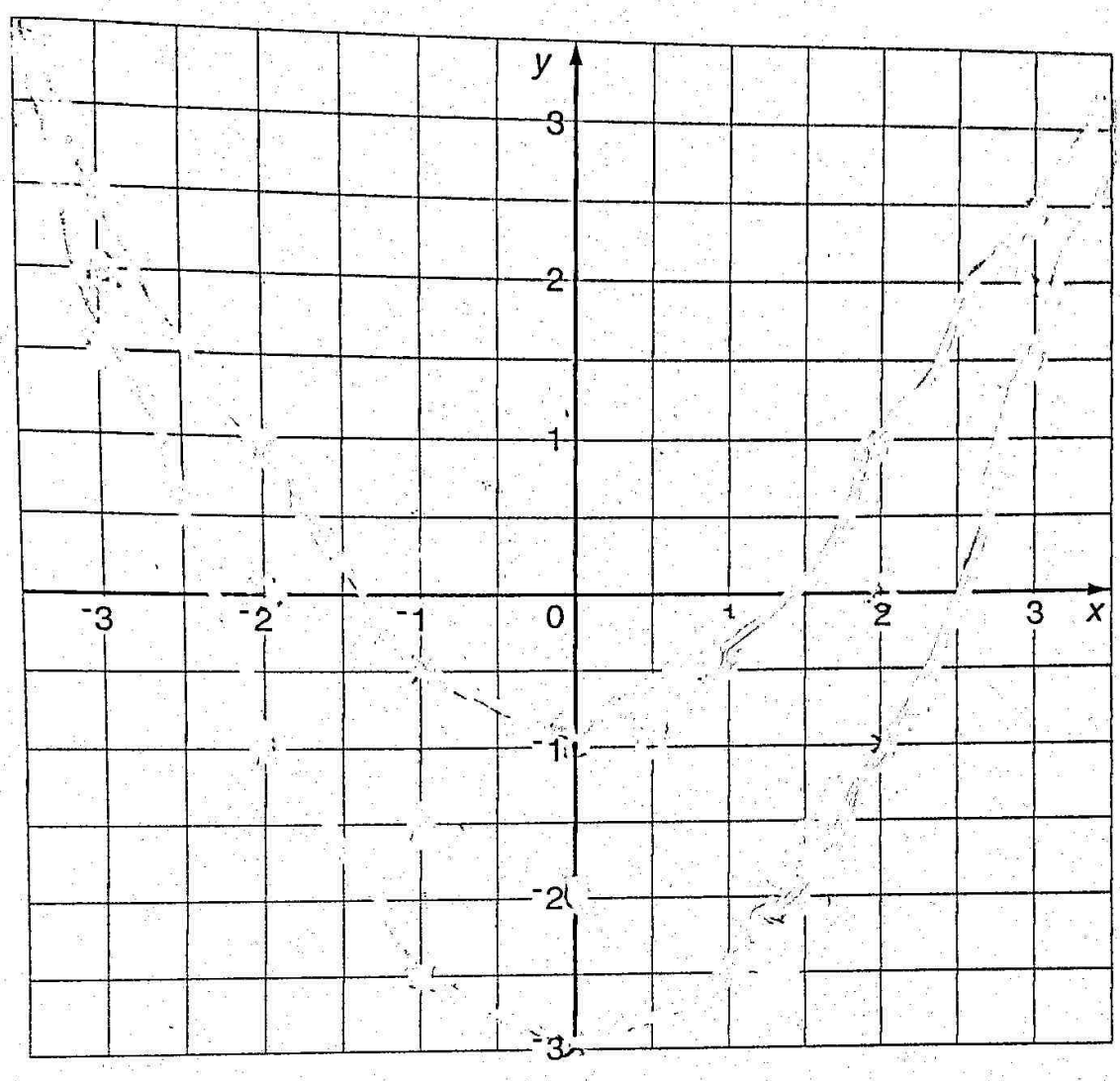
$38.7 = \frac{1}{2}h \times$

$\dfrac{38.7}{34}$ $\quad 5.094$

✗

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

/4

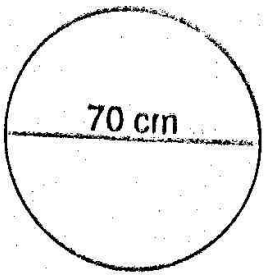


(iv) Circle each point with integer co-ordinates which lies entirely inside the region bounded by $y = \frac{1}{2}x^2 - 3$ and $y = \frac{1}{2}x - 1$ (1)

(v) Which point, circled in part (iv), has co-ordinates (x, y) where the value of $x - y$ is largest?

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

10. (i)



not to scale

The diameter of the circle is 70 cm.

(a) Calculate the circumference of the circle.

πD

Answer: 220 ✓ cm (2)

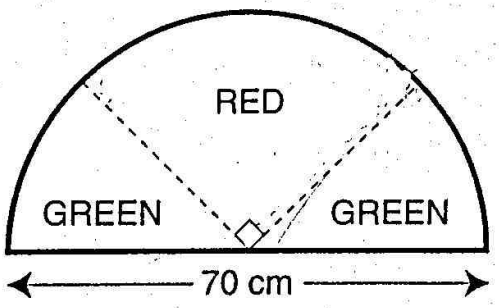
(b) Calculate the area of the circle.

$35^2 \times \pi = 3848$

✓

Answer: 3850 cm^2 (2)

(ii)



not to scale

A semi-circular window, diameter 70 cm, is made of 1 red and 2 identical green sectors.

(a) Calculate the perimeter of the semi-circular window.

$220 \div 2 = 110$

✓

Answer: $110 + 70 = 180$ cm (2)

/5

(b) Calculate the area of one green sector.

$\frac{45}{360} = \frac{1}{8}$ $\frac{3850}{8} = 481$

Answer: 481 cm^2 (2)

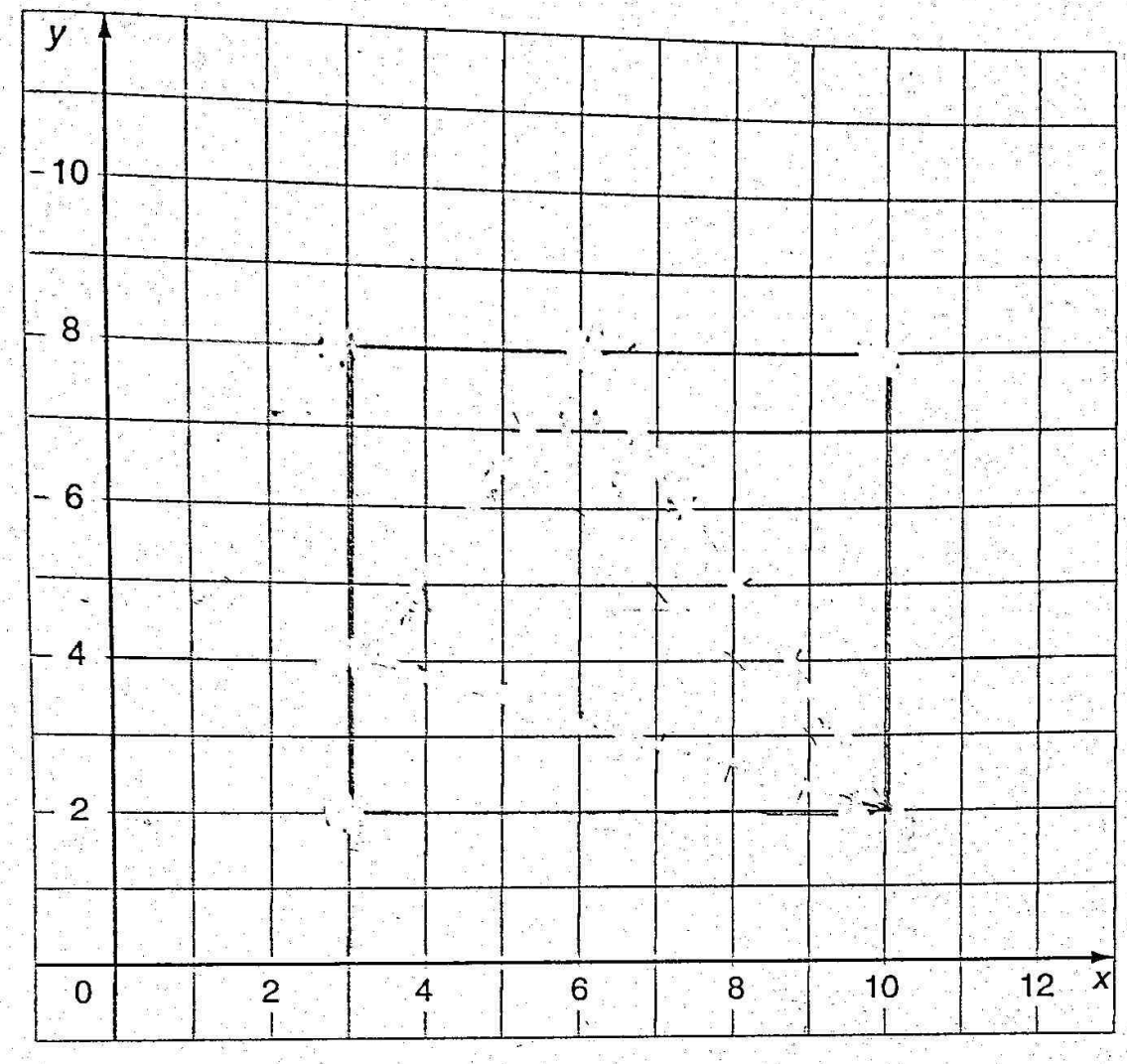
(c) The glass in the window is 4 millimetres thick.
Calculate the volume of the red glass in cm^3.

481×0.4 $1775 \times 0.4 = 385$

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

/0

11.



(i) On the 1 centimetre-squared grid

(a) draw rectangle *PQRS* where *P* is (3,2), *Q* is (10,2), *R* is (10,8) and *S* is (3,8) (1)

(b) draw triangle *ACQ* where *A* is (3,4) and *C* is (6,8). (1)

(ii) Calculate the area of the triangle *ACQ*.

$5 \times 8 = 25$ cm^2 $\quad 35 \div 2 = 17.5$

Answer: 17.5 ~~25~~ cm^2 (4)

(iii) Calculate the length of *AC*.

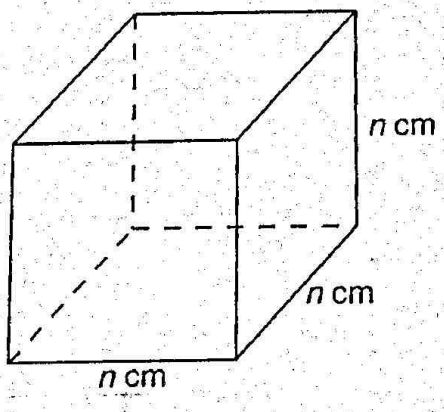
Work ?

Answer: ..... 5 ..... cm (3)

(iv) Calculate the perpendicular distance from *Q* to *AC*.

Answer: ..... 2.5 ..... cm (3)

12. (a) A cube, with edges *n* cm long, has a total surface area of 337.5 cm^2.
Calculate the value of *n*.

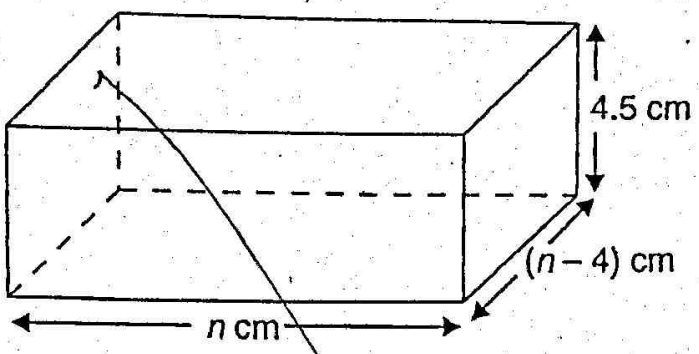


337.5 ÷ 3

$\sqrt{337.5} = 6.96$

Answer: n = ... 6.96 ..... (3)

(b)



not to scale

A cuboid is n cm long, $(n - 4)$ cm wide and 4.5 cm high.

(i) Show that the total surface area of the cuboid can be represented by the expression $2n^2 + 10n - 36$

(4)

The total surface area is 372 cm^2.

(ii) (a) Show that $n^2 + 5n - 204 = 0$

(1)

(b) By 'trial and improvement' find the value of n.

n	n^2	$5n$	$n^2 + 5n - 204$

Answer: n = ... (3)

(Total marks: 100)