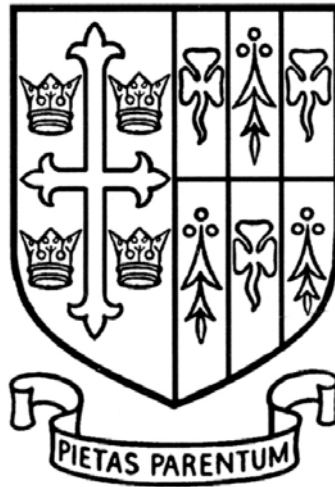# ST EDWARD'S OXFORD

13+ SCHOLARSHIP EXAMINATION
2011
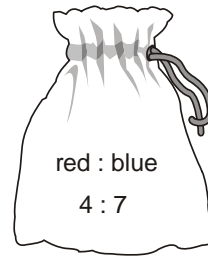
MATHEMATICS
Paper 2

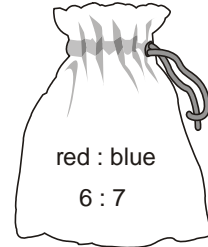### 1 hour

Name: _____

There are 60 marks available.

Calculators are allowed.

Write all answers, including your workings, in this booklet.

1.   In a bag, there are **red** and **blue** cubes in the ratio **4 : 7**

red : blue
4 : 7

I add **10 more red cubes** to the bag.   Now there are **red** and **blue** cubes in the ratio **6 : 7**

red : blue
6 : 7

How many **blue** cubes are in the bag?

....

2 marks

---

2.   (a)   Find the values of a and b when $p = 10$

$$a = \frac{3p^3}{2}$$

$a =$ ....

1 mark

$$b = \frac{2p^2(p-3)}{7p}$$

$b =$ ....

1 mark

(b)   Simplify this expression as fully as possible:

$$\frac{3cd^2}{5cd}$$

1 mark

(c) Multiply out and simplify these expressions:

   i) $3(x - 2) - 2(4 - 3x)$

1 mark

   ii) $(x + 2)(x + 3)$

1 mark

   iii) $(x + 4)(x - 1)$

1 mark

   iv) $(x - 2)^2$

1 mark

3. A shop has this special offer.

> Reduction of 10% when your bill is between £50 and £100
>
> Reduction of 20% when your bill is more than £100

Before the reductions, Marie's bill is £96 and Richard's bill is £108

After the reductions, who paid more?   You **must** show working to explain your answer.
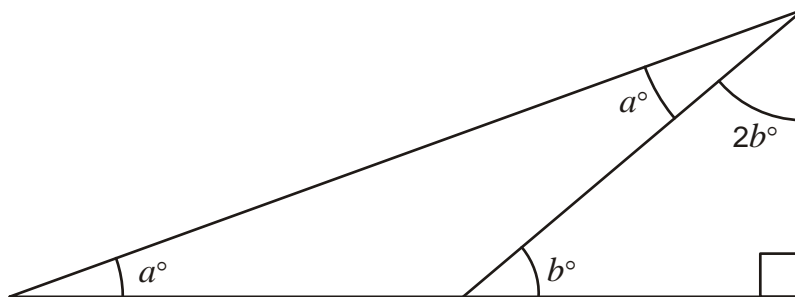
Tick (✔) the correct answer.

☐ Marie   ☐ Richard   ☐ Both paid the same

2 marks
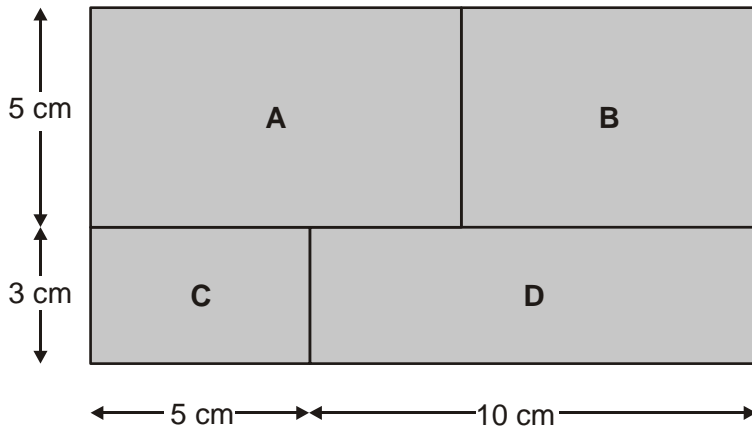
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4. Look at the triangle.

Not drawn accurately

Work out the value of *a*

a = ...

3 marks

5. The diagram shows a shaded rectangle.

It is divided into four smaller rectangles, labelled A, B, C and D.

5 cm

3 cm

A

B

C

D

Not drawn accurately

5 cm

10 cm

The ratio of area **C** to area **B** is **1 : 2**

Calculate area A.

.... cm^2

2 marks

6. Solve these simultaneous equations using an algebraic method.   You **must** show your working.

$4x + 3y = 21$

$2x + \quad y = \quad 8$

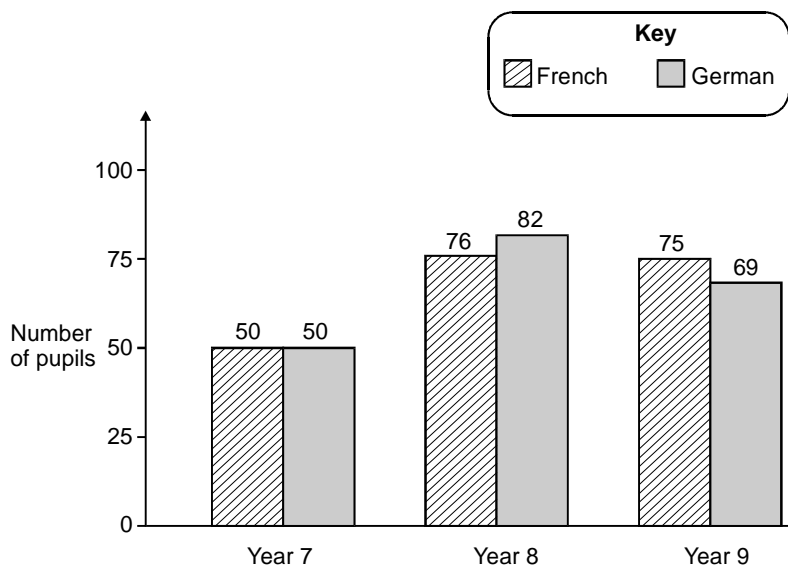$x = $ .... $y = $ ....

3 marks

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7. Pupils at a school learn French, German or both.   The chart shows information about pupils in Years 7, 8 and 9

Key

French   German

Alice say,

"More of these pupils learn French than German"

Show calculations to explain that Alice is **not** correct.

Number of pupils

| | | |
| Year 7 | Year 8 | Year 9 |

50 50   76 82   75 69

1 mark

(b)   Ben says:

> There are **104 pupils** in **Year 8**, so I can work out from the diagram that **54** of them must learn both French and German.

Ben is correct.   Explain how he worked it out.

1 mark

(c)   Altogether, **76** pupils in **Year 8** learn French.   How many pupils in Year 8 learn French but do not learn German?

....

1 mark

---

8.   In one week Jamal watched television for **26 hours**.   In that week:

> He watched television for the **same** length of time
> on Monday, Tuesday, Wednesday and Thursday.
>
> On each of Friday, Saturday and Sunday,
> he watched television for **twice as long** as on Monday.

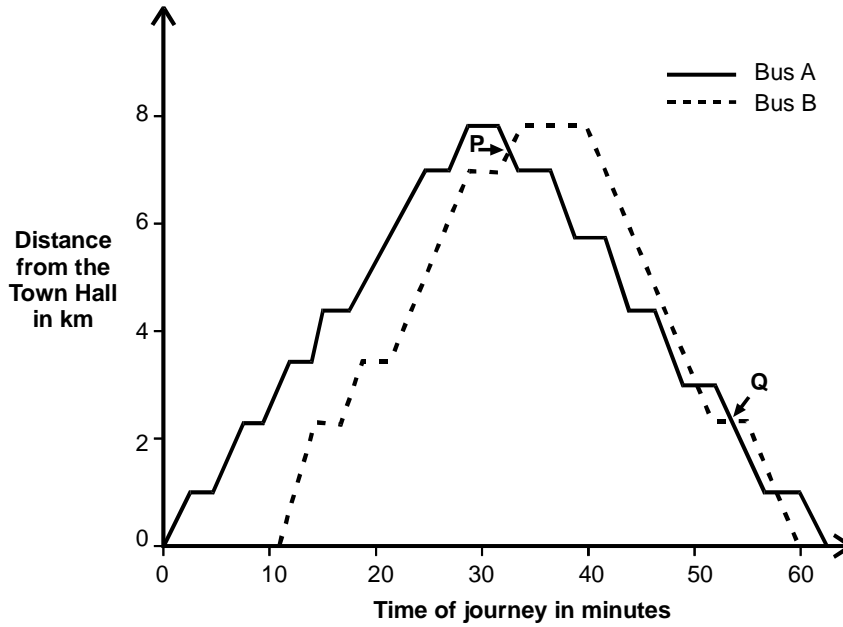How long did he spend watching television on **Saturday**?

Write your answer in hours and minutes.

.... hours   ....minutes

2 marks

9.   Two buses travel along the same route from the Town Hall to the Red Lion, 8km away, and back again.

This simplified graph shows the journeys.
P and Q mark two points on the graph.

(a)   Describe briefly what happened at point P.

1 mark

(b)   Describe briefly what happened at point Q.

1 mark

Bus A took 27 minutes to get to the Red Lion.

(c)   Work out the average speed in km per hour.

.... km per hour

1 mark

(d) Bus A stopped several times on the way to the Red Lion.
The average time for a stop was 2 minutes.

Work out the average speed using **only** that amount of **time** during which the bus was **moving** in your calculation.

Show your working.

.... km per hour

(e) Bus B went at an average speed of 21.5 km per hour back to the Town Hall.
Work out the average speed in **miles per hour**.

Show your working.

.... miles per hour

---

10. A newspaper printed this information about the world's population.

> If the world was a village of 100 people,
>
> **6 people** would have **59%** of the total wealth.
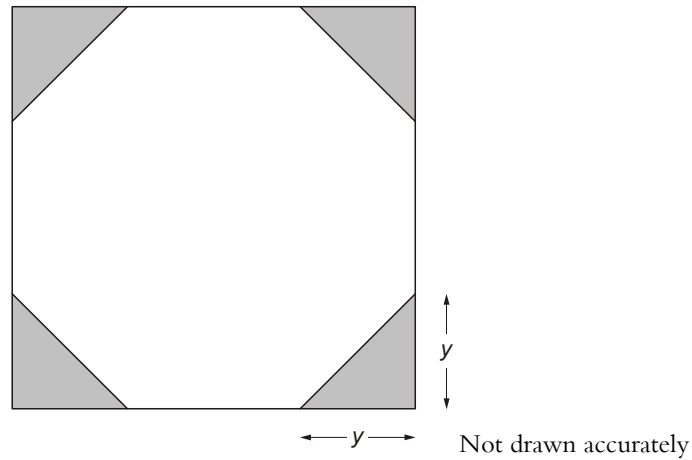>
> The other 94 people would have the rest.

On average, **how many times** as wealthy as one of the other 94 people would one of these 6 people be?

....

11.   I have a square piece of card.

I cut a triangle from each corner so that the remaining card is in the shape of a **regular octagon**.

y

$\longleftarrow y \longrightarrow$ Not drawn accurately

The **perimeter** of the regular octagon is **32cm**.   Work out length y

$y = \text{.....................}$ cm

2 marks

---

12.   Look at the table:

	Earth	Mercury
Mass (Kg)	5.98×10^{24}	3.59×10^{23}
Atmospheric pressure (N/m^2)		2×10^{-8}

(a)   The atmospheric pressure on Earth is **5.05×10^{12} times** as great as the atmospheric pressure on Mercury.

Calculate the atmospheric pressure on Earth.

$\text{.......................}$ N/m^2

1 mark

(b)   What is the **ratio** of the mass of Earth to the mass of Mercury?

Write your answer in the form $x : 1$

.... : 1

(c)   The approximate volume, V, of a planet with radius r is given by

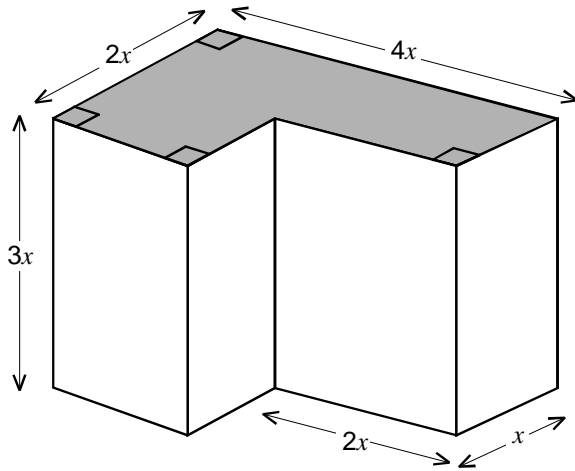$$V = \frac{4}{3}\pi r^3$$

Assume the radius of Mercury is 2400 km.

Calculate the volume of Mercury.
Give your answer, to **1 significant figure**, in standard **form**.

.... km^3

2 marks

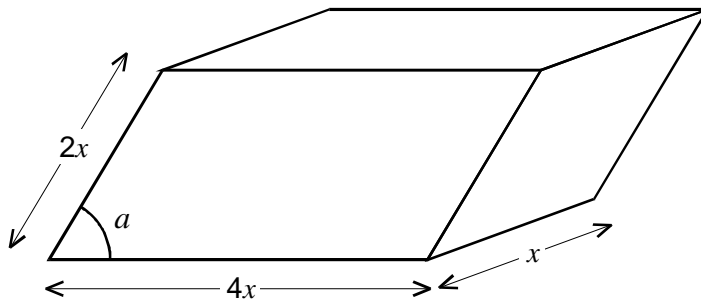**13.** (a) This solid is a prism, with height $3x$. The cross-section is shaded.

NOT TO SCALE

Write an expression for the **volume** of the solid.

Show your working and simplify your expression.

2 marks

The volume of this prism is given by the expression $8x^3 \sin a$

NOT TO SCALE

(b) What value of a would make the volume of the prism $8x^3$?

1 mark

$a =$ ....°

(c)   The prism has a volume of 500cm^3.   The value of a is 30°

What is the value of x?   Show your working.

$x =$ .... cm

2 marks

---

14.   Solve this equation.   Show your working.

$$\frac{5(2y-3)}{3y} = 3$$

$y =$ ....

2 marks

15. To change temperatures measured in °C to °F you can use an exact formula or an approximate formula.

Exact formula
F $\quad \dfrac{9C}{5}$ + 32

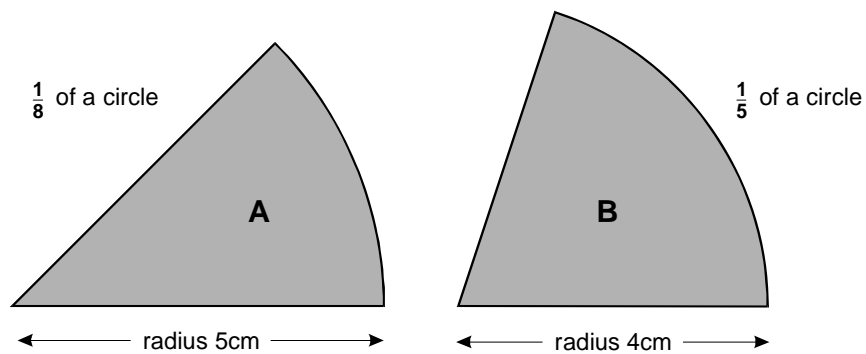| Approximate formula |
|---|
| F $\quad$ 2C + 30 |

F is the temperature in °F

C is the temperature in °C

At what temperature in °C do these formulae give an **equal** value for F?

You **must** show an algebraic method.

.... °C

2 marks

---

16. The diagram shows parts of two circles, sector A and sector B

$\frac{1}{8}$ of a circle

A

radius 5cm

$\frac{1}{5}$ of a circle

B

radius 4cm

(a) Which sector has the **bigger area**? Show working to explain your answer.
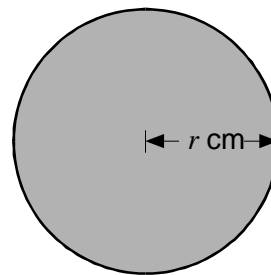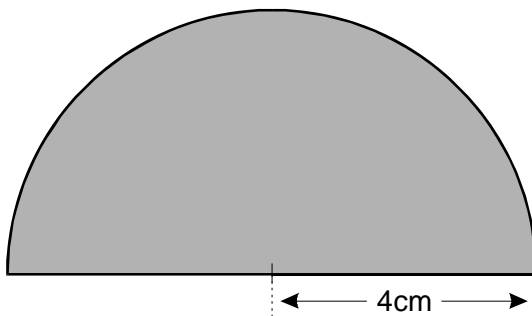
2 marks

(b)   The perimeter of a sector is made from two straight lines and an arc.

Which sector has the **bigger perimeter**?

Show working to explain your answer.

(c)   A semi-circle, of radius 4cm, has the **same area** as a complete circle of radius r cm.

Not drawn
accurately

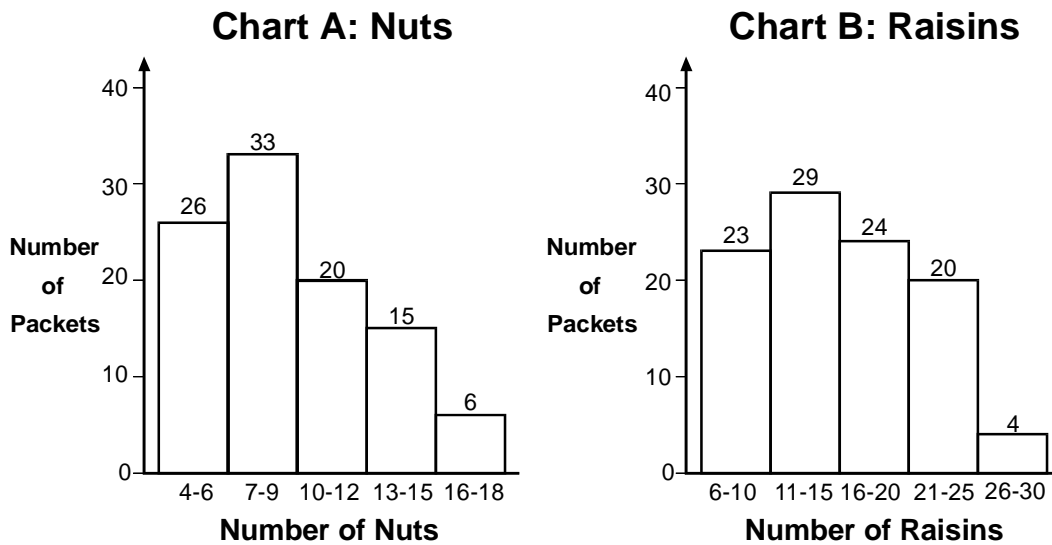What is the radius of the complete circle?

Show your working.

$r =$ .... cm

17. A company makes breakfast cereal containing nuts and raisins.

They counted the number of nuts and raisins in 100 small packets.

Chart A: Nuts

Chart B: Raisins

(a) Calculate an estimate of the **mean** number of **nuts** in a packet.

Show your working.

You may complete the table below to help you with the calculation.

Number of nuts	Mid–point of bar (x)	Number of packets (f)	fx
4 − 6	5	26	130
7 − 9	8	33	
10 − 12	11	20	
13 − 15	14	15	
16 − 18	17	6	
		100	

.... nuts

2 marks

(b) Calculate an estimate of the **number** of packets that contain **24 or more raisins**.

.... packets

2 marks

(c)   Which of the two charts shows the **greater range**?

Explain your answer.

(d)   A packet is chosen at random

Calculate the probability that it contains **9 nuts or fewer.**

End of Exam