**RADLEY COLLEGE**
**Entrance Scholarships**

# MATHEMATICS II

**March 2008**

Time allowed 1 hour

***Show all working.***

***You may use a calculator***

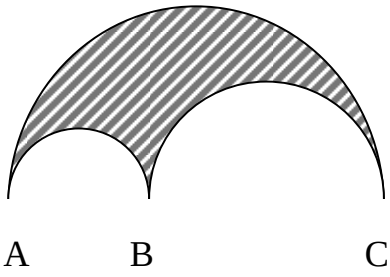
1. Supermarket A sells a pack of 24 cans of beer for £15.84. Each can contains 440ml.
Supermarket B sells a pack of 18 cans of beer for £8.37. Each can contains 300ml.
Supermarket C sells a supercan of beer for £19.20. A supercan contains 12 litres.

(a) Which Supermarket gives best value for money?

As a result of new legislation it is decided that Supermarkets A and C should charge the same price per litre as Supermarket B.

(b) Calculate the percentages by which Supermarkets A and C should raise or lower their prices.

2.




The diagram shows a logo which is made by cutting two smaller semicircles from a larger semicircle. The larger semicircle has diameter AC = 12cm.The smaller semicircles have diameters AB = 4cm, and BC = 8cm, respectively.

(a) Calculate the perimeter of the shaded region.

(b) Calculate the area of the shaded region.

[Note: the area of a circle is $\pi r^2$, and the circumference of a circle is $2\pi r$ ]

A similar logo has AB = 12cm, BC = 24cm and AC = 36 cm.

(c) Deduce the perimeter and area of this new logo.

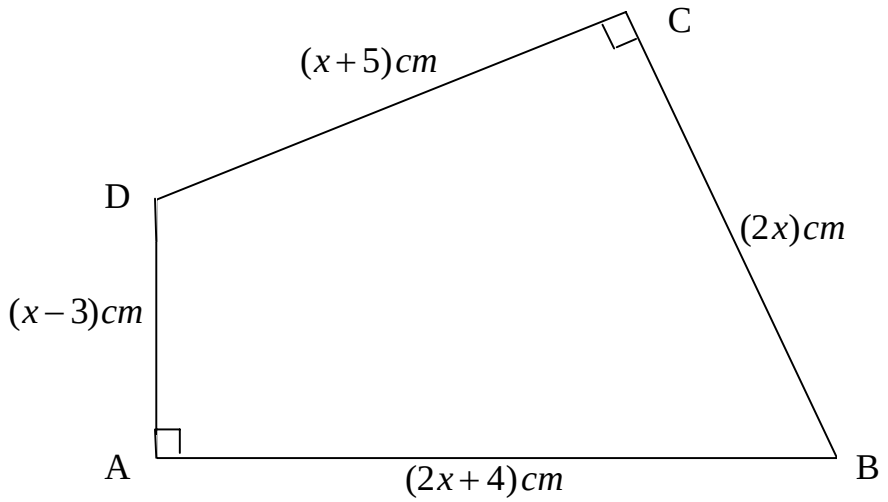
3 (a) Solve the simultaneous equations

$$3x-4y=7$$

$$7x-6y=18$$

(b) If three oranges, five apples and eight bananas cost £3.24, and one orange, three apples and six bananas cost £1.98, how much do I expect to pay for two apples, two oranges and two bananas?

4.




The above diagram shows a quadrilateral ABCD, with right angles at A and C.

(a) Given the perimeter of the quadrilateral is 100cm, calculate the value of $x$.

(b) If instead you are told that the area of the quadrilateral is $234cm^2$

(i) write down an expression for the area of triangle ABD

(ii) write down an expression for the area of triangle BCD

(iii) deduce the equation $x^2+2x-120=0$

(iv) hence find the lengths of the sides of the quadrilateral ABCD.

*Please turn over*

5. (a) Calculate $\frac{1}{6}\times(3^3-1^3)-\frac{1}{3}$

(b) Calculate $\frac{1}{6}\times(4^3-2^3)-\frac{1}{3}$

(c) Calculate $\frac{1}{6}\times(5^3-3^3)-\frac{1}{3}$

(d) Calculate $\frac{1}{6}\times(6^3-4^3)-\frac{1}{3}$

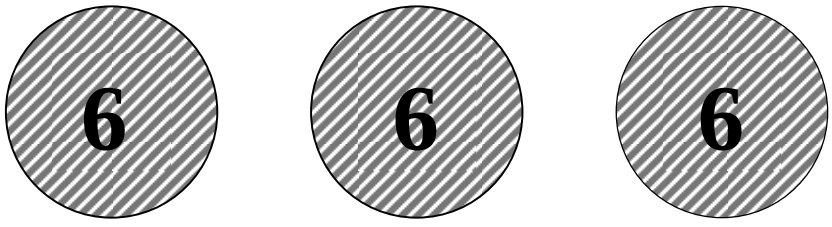
(e) Calculate $\frac{1}{6}\times(101^3-99^3)-\frac{1}{3}$

(f) What do you notice about all of your answers?

(g) Write down a general formula which summarises all of the above calculations.

(h) Justify your answer.

6. In a game there are three counters that have a number on each side. In order to play the game, a player throws the counters and adds up the numbers that land face up. For example, the diagram shows a player scoring 18.




(a) Which three numbers must be on the other sides of the counters in the diagram above in order for the possible scores in this game to be 18,19,20,21,23,24,25 and 26?

(b) If instead the possible scores are to be 13,14,16,17,18,19,21 and 22, which three numbers must now be on the other sides of the counters in the diagram above?