RADLEY COLLEGE
Entrance Scholarships

MATHEMATICS II

March 2007

Time allowed 1 hour

Show all working.

You may use a calculator

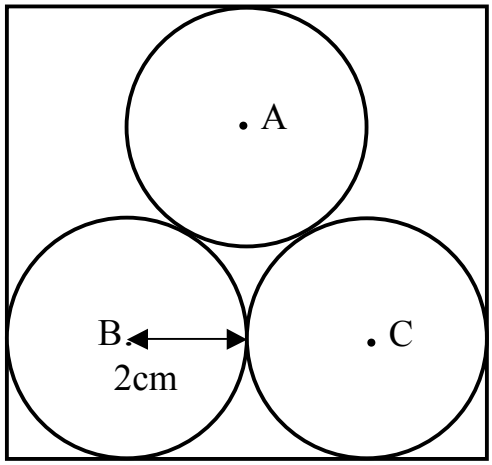
1. In a '*double discount*' sale the prices of all the items for sale in a shop are first reduced by 30%, and then reduced by a further 20% of that sale price.

   (a) A coat has a presale price of £254. Show that it will cost only £142.24 in the '*double discount*' sale.

   (b) Find the '*double discount*' sale price of a jacket which has a presale price of £122.50.

   (c) In the '*double discount*' sale I pay £41.72 for a pair of shoes. Calculate the presale price of that pair of shoes.

2.



The diagram shows three identical coins of radius 2cm which just fit a rectangle. The centres of the coins are at points A, B and C.

(a) Write down the width of the rectangle

(b) Calculate the height of the rectangle

(c) Calculate the area of the rectangle

Is it possible to fit the coins into a rectangle of smaller area, without overlapping them? Justify your answer.

3 (a) If $3a - 4b = 30$

and $5b - 2a = 452$

what is the value of $a + b$?

(b) If $x + y = 30$

and $x^2 + y^2 = 452$

what is the value of xy?

[Hint: the best solutions to these questions avoid explicitly solving each pair of simultaneous equations]

4. In a family there are three children, Bob, Charles and David. Bob is the youngest. Charles is three years older than Bob, and David is nine years older than Charles.

(a) Letting x be the age of Bob, write down expressions in terms of x for the ages of Charles and David.

(b) If you multiply together the ages of Bob and Charles the number you get is precisely half of David's age. Show that

$2x^2 + 5x - 12 = 0$

(c) Hence find the ages of the three children.

5. (a) Calculate $\frac{1}{2}+\frac{1}{2\times 1}$

(b) Calculate $\frac{1}{3}+\frac{1}{3\times 2}$

(c) Calculate $\frac{1}{4}+\frac{1}{4\times 3}$

(d) Calculate $\frac{1}{5}+\frac{1}{5\times 4}$

(e) Calculate $\frac{1}{100}+\frac{1}{100\times 99}$

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

(g) Justify your answer.

6. In a bag I have a large number of 1p, 2p and 5p coins.

(a) I owe a shopkeeper 10p. How many different combinations of coins are possible to make 10p?

(b) If instead I owe the shopkeeper 20p, and I wish to use more 5p coins than 1p coins, how many different combinations are possible?

(c) In another shop I spend £1. How many different combinations are possible if I don't use any 5p coins?