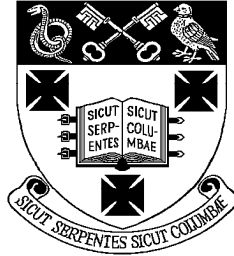


**RADLEY COLLEGE  
Entrance Scholarships**



**MATHEMATICS II**

**March 2007**

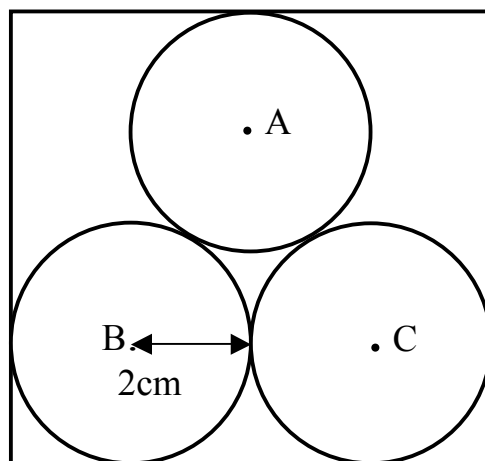
Time allowed 1 hour

*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.

*Please turn over*



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?