

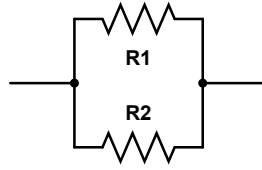
# PAT MINI MOCK

1. Sketch  $\frac{x^2+2}{1-x^2}$ , and hence or otherwise find the values of  $x$  for which  $\frac{x^2+2}{1-x^2} > -2$

[6]

2. Two resistors,  $R_1$  and  $R_2$ , are placed in parallel.

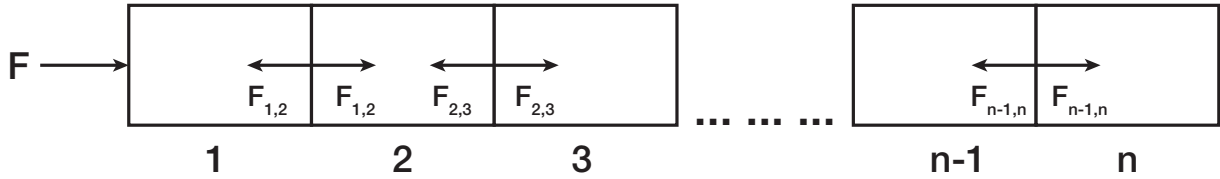
[1]



Is their total combined resistance

- A** Larger than either  $R_1$  or  $R_2$
- B** Between  $R_1$  and  $R_2$
- C** Smaller than either  $R_1$  or  $R_2$
- D** Impossible to say without knowing  $R_1$  and  $R_2$

3. A row of  $N$  blocks, each of mass  $m$ , are placed against one another. A force  $F$  is applied to the leftmost block, and the row of blocks accelerates. The contact force between the  $i^{\text{th}}$  and  $(i + 1)^{\text{th}}$  is denoted  $F_{i,i+1}$ .



- (a) i. What is the net force on each block? [1]  
 ii. Using this, find an expression for  $F_{i,i+1}$ , the contact force between the  $i^{\text{th}}$  and  $(i + 1)^{\text{th}}$  blocks. [5]
- (b) Plot  $F_{i,i+1}$  against  $i$  ( $i$  can only take integer values, but pretend it is a continuous number for this plot, i.e draw a smooth plot). [2]
- (c) Suppose  $N$  is very large, and the blocks are very small. Then what object does the row of blocks begin to resemble? What do our results tell us about the forces in this object if we push it? [2]