1. In the diagram, $D$ and $E$ are the midpoints of $AB$ and $BC$ respectively.

(a) Determine an equation of the line passing through the points $C$ and $D$.
(b) Determine the coordinates of $F$, the point of intersection of $AE$ and $CD$.
(c) Determine the area of $\triangle DBC$.
(d) Determine the area of quadrilateral $DBEF$.

2. A set $S$ consists of all two-digit numbers such that:
   • no number contains a digit of 0 or 9, and
   • no number is a multiple of 11.

(a) Determine how many numbers in $S$ have a 3 as their tens digit.
(b) Determine how many numbers in $S$ have an 8 as their ones digit.
(c) Determine how many numbers are in $S$.
(d) Determine the sum of all the numbers in $S$.

3. Positive integers $(x, y, z)$ form a Trenti-triple if $3x = 5y = 2z$.

(a) Determine the values of $y$ and $z$ in the Trenti-triple $(50, y, z)$.
(b) Show that for every Trenti-triple $(x, y, z)$, $y$ must be divisible by 6.
(c) Show that for every Trenti-triple $(x, y, z)$, the product $xyz$ must be divisible by 900.
4. Let $F(n)$ represent the number of ways that a positive integer $n$ can be written as the sum of positive odd integers. For example,

- $F(5) = 3$ since
  
  \[
  5 = 1 + 1 + 1 + 1 + 1 \\
  = 1 + 1 + 3 \\
  = 5
  \]

- $F(6) = 4$ since
  
  \[
  6 = 1 + 1 + 1 + 1 + 1 + 1 \\
  = 1 + 1 + 1 + 3 \\
  = 3 + 3 \\
  = 1 + 5
  \]

(a) Find $F(8)$ and list all the ways that 8 can be written as the sum of positive odd integers.
(b) Prove that $F(n + 1) > F(n)$ for all integers $n > 3$.
(c) Prove that $F(2n) > 2F(n)$ for all integers $n > 3$. 