MATHEMATICS ENRICHMENT CLUB.
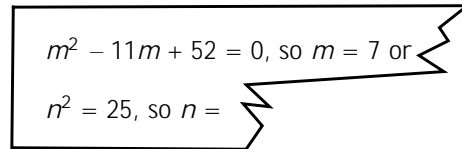## Problem Sheet 1, May 7, 2016

1. Prove that one of the digits $1, 2$ and 9 must appear in the base-ten expression of n or $3n$ for any positive integer n.

2. How many numbers between 100 and 500 that are divisible by 7 but not by 21.

3. Let ABC and DEF be right-angled triangles, with AF and DC their respective altitudes; see gure below. Point G is the intersection of AC and DF. Point H is such that GH is perpendicular to BC. Given $AF = 6$, $GH = 4$ and $FC = 9$.

   (a) Find the length of BC,

   (b) Find the area of the polygon $AGDEB$.
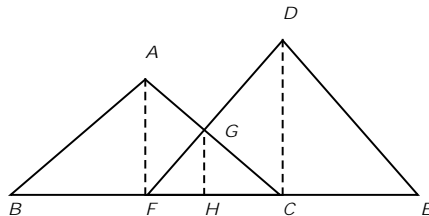
4. Solve

$$\sum_{n=1}^{\infty} \frac{1}{n^2 + 3n + 2} := \frac{1}{1^2 + 3 \cdot 1 + 2}$$

6. Ben attempts to pass a note to Megan during an English lesson. The note was torn into pieces before Megan managed to recover the following part:

$m^2 - 11m + 52 = 0$, so $m = 7$ or

$n^2 = 25$, so $n =$

Megan knows Ben likes to do maths in a di erent base than the usual base 10 she is accustomed to. What is on the missing part of the note?

Senior Questions

1. Let $f($