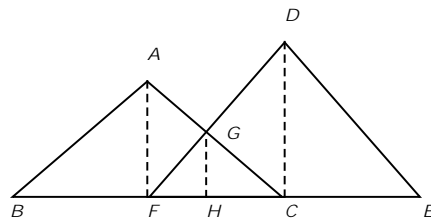


MATHEMATICS ENRICHMENT CLUB.
Problem Sheet 1, May 7, 2016

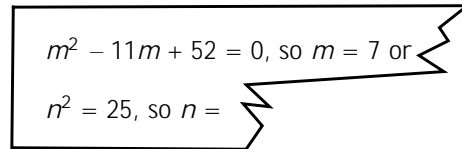
1. Prove that one of the digits 1;2 and 9 must appear in the base-ten expression of n or $3n$ for any positive integer n .
2. How many numbers between 100 and 500 that are divisible by 7 but not by 21.
3. Let ABC and DEF be right-angled triangles, with AF and DC their respective altitudes; see figure 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

$$\sum_{n=1}^{\infty} \frac{1}{n^2 + 3n + 2} := \frac{1}{1^2 + 3} - \frac{1}{1 + 24}.$$

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:

A rectangular piece of paper with jagged, torn edges on the right side. It contains two lines of text.
$$m^2 - 11m + 52 = 0, \text{ so } m = 7 \text{ or}$$
$$n^2 = 25, \text{ so } n =$$

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

Senior Questions

1. Let $f(x)$