MATHEMATICS PRIZE. 1971

PTCC

1. Fill in the missing digits in the following division sum;

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7 * * ) 5 2 * * 1 ( * 2
        * * 1 *
        -------
          1 * 1 *
          * * * *
          -------
            1 * 9
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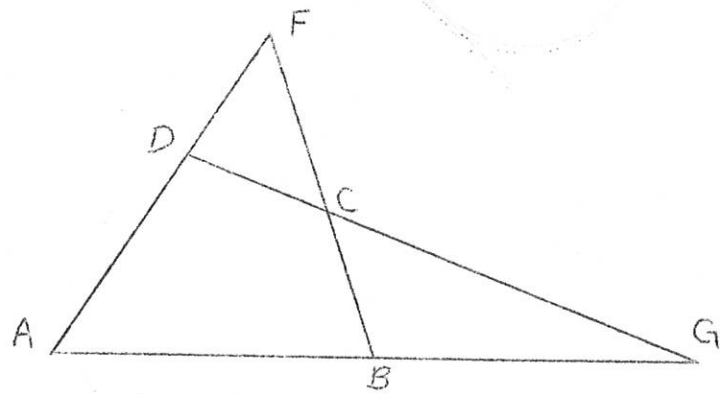
2. What conclusion can you draw from the following propositions?

   a) No kitten that loves fish is unteachable.
   b) No kitten without a tail will play with a gorilla.
   c) Kittens with whiskers always love fish.
   d) No teachable kitten has green eyes.
   e) No kittens have tails unless they have whiskers.

3. A bookseller bought from a publisher twenty books at a certain price, and a few days later ten other books paying two shillings, ten new pence, less for each book. He noticed that the two accounts were expressed by the same two digits in pounds, but reversed in order. What was the price of the more expensive book?

4. The figure below is a complete quadrilateral. Prove that the midpoints of the three diagonals AC, BD, FG are collinear.



5. Here are nine eights; 8 8 8 8 8 8 8 8 8 . Copy them and insert mathematical signs in such a way that the expression is then equal to 1000.

PTO

6. Prove that if: $\dfrac{ac - b^2}{a - 2b + c} = \dfrac{bd - c^2}{b - 2c + d}$

then these are both equal to $\dfrac{ad - bc}{a - b - c + d}$.

7. Snow begins to fall in the morning and falls at a constant rate all day. At twelve noon a snow-plough starts to clear a railway line. It clears one mile in the first hour, and half-a-mile in the second. When did the snow start to fall?

8. Three circles and the common outside tangents to each of the three pairs are as shown. Prove that A, B, C are collinear.