

SCHOOL:

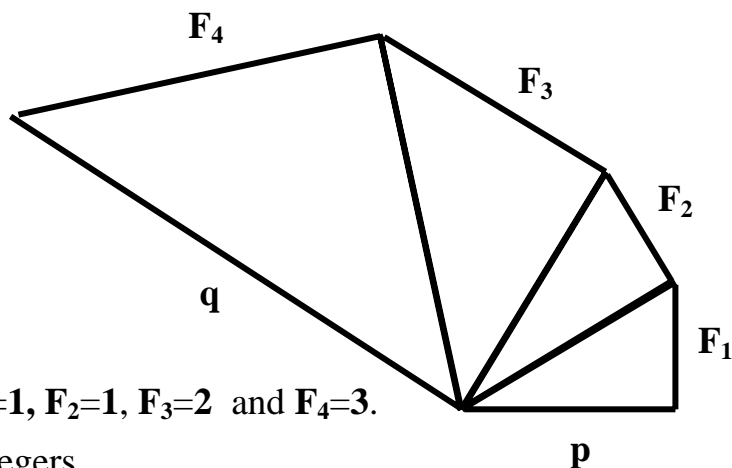
Eastern Area Challenge Final 2010

Round 2 Problem Solving Answers 40 marks

Task A: (Total 12 marks)

(i)

The diagram shows four right angled triangles joined edge to edge.



The opposite sides are numbers

in the Fibonacci sequence. For example $F_1=1$, $F_2=1$, $F_3=2$ and $F_4=3$.

The lengths of sides p and q are positive integers.

Find the possible values of p and q .

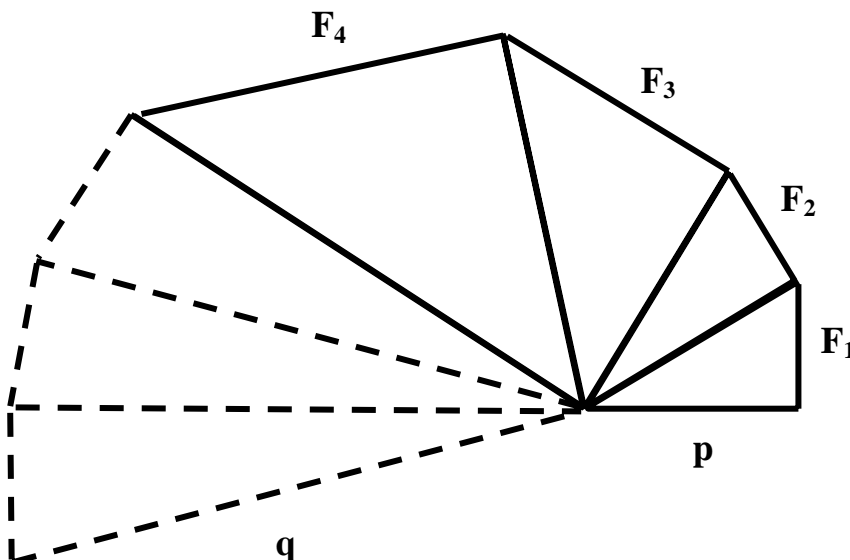
ANSWERS:

Either $p = 1$ and $q = 4$
 (2 marks)

or $p = 7$ and $q = 8$
 (2 marks)

(ii)

The diagram is then extended by adding further right angle triangles until the length of the opposite side is F_7 .



Find the possible values of p and q . Once again p and q are positive integers.

ANSWERS:

Either $p = 136$ and $q = 137$
 or $p = 16$ and $q = 39$

or $p = 44$ and $q = 47$
 or $p = 4$ and $q = 17$

(again 2 marks for each pair)

SCHOOL:

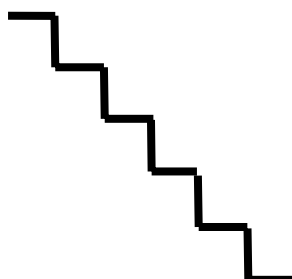
Eastern Area Challenge Final 2010

Round 2 Problem Solving Answers (40 marks)

Task B: (Total 8 marks)

The Dusty Staircase

- Four friends are racing side by side down a dusty staircase.
- Frodo goes down two steps at a time, Gimli three, Legolas four and Aragorn five.
- The only steps with all four's footprints are at the top and the bottom.



How many steps are there altogether?

61 steps (4 marks)

How many steps have just one footprint?

20 steps (4 marks)

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Round 2 Problem Solving Answers (40 marks)

Task C:

Striking Clocks

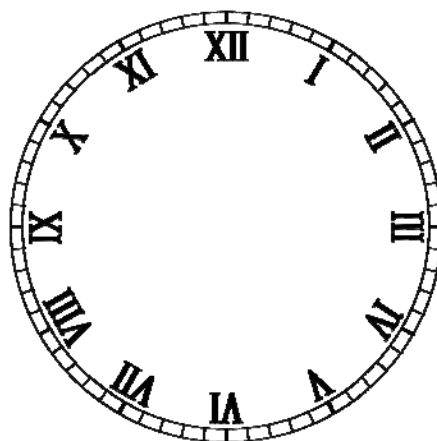
- (i) If a grandfather clock strikes the number of hours at each hour, how many strikes would there be in a day?



156 strikes (3 marks)

- (ii) Roman striking clocks have two bells. Each I is struck on the high bell and each V on the low one. X counts as two V's and on this kind of clock 4 always appears as IV and not IIII.

How many strikes a day would you hear?



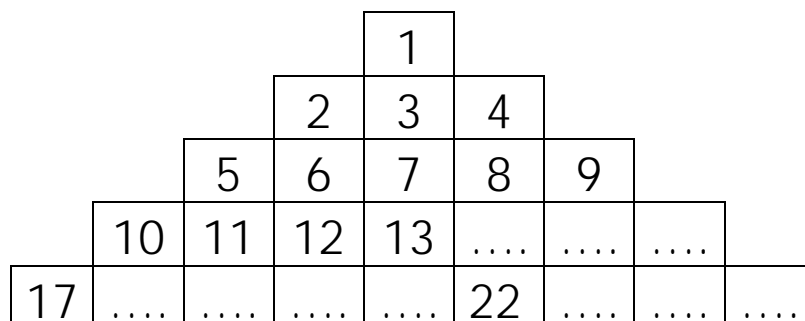
60 strikes (3 marks)

SCHOOL:

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Round 2 Problem Solving Answers (40 marks)

Task D



The diagram above shows the first five rows of a ‘continuing’ pyramid in which consecutive positive integers are written.

- (i) Which number is directly below 15? 23 (1 mark)
- (ii) Which number is directly above 20? 12 (1 mark)
- (iii) Which number is directly below 22? 32 (2 marks)
- (iv) Which number is directly below 400? 440 (2 marks)
- (v) In which row does 626 appear? 26th row (2 marks)
- (vi) Which is the first row to contain exactly two triangle numbers? 4th row (2 marks)
- (vii) What will be the 10th number in the centre column? 91 (2 marks)
- (viii) Find the expression for the nth term in the centre column? $n^2 - n + 1$ (2 marks)