2007 UQ/QAMT Problem Solving Competition - Year 9 & 10 Paper

All questions have equal value.

Question 1
Insert parentheses into the following expression to make the largest possible number.
$$1 \div 2 \div 3 \div 4 \div 5 \div 6$$

Question 2
On an escalator moving at constant speed, a girl in a hurry walks up 9 steps as she travels from one floor to the next higher floor. A boy in an even greater hurry runs 25 steps up the same escalator and reaches the top in half the time that the girl took. Find the number of steps that the escalator has between the two floors.

Question 3
Find x such that $\sqrt{\sqrt{12} + \sqrt{28 - 4\sqrt{x}}} = 2$.

Question 4
A square of area 20 cm^2 fits inside a semicircle as shown. Find the area of the largest square that will fit inside the full circle.
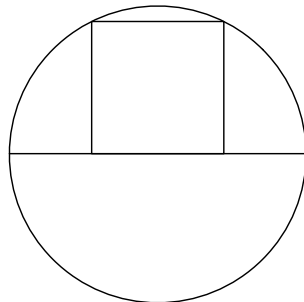
Question 5
Find all triples (x, y, z) of positive integers that are solutions of the equation
$$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = \frac{5}{6}$$
Assume that $x \leqslant y \leqslant z$.

Question 6
Two vertical flag poles, 20 and 80 metres high, stand apart on a horizontal plane. Find the height of the point of intersection of the lines from the top of each pole to the foot of the other.