TOOWOOMBA EDUCATION CENTRE
MATHEMATICS TEAM CHALLENGE 2004

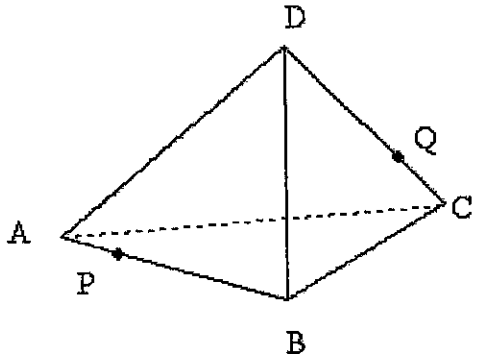
TEAM EVENT: Junior Secondary **Time: 45 mins**
(Calculators are allowed) **Total: 150 points**
Please write answers on the answer sheet.

T1. (10 points)
If the side of one square is the diagonal of a second square, what is the ratio of the area of the first square to the area of the second?

T2. (20 points)
Find a positive integral solution for n.

$$\frac{1+3+5+7+9+.....+(2n-1)}{2+4+6+8+10+....+2n} = \frac{115}{116}$$

T3. (20 points)
The edges of a regular tetrahedron with vertices A, B, C and D each have length one. Find the least possible distance between a pair of points P and Q, where P is on edge AB and Q is on edge CD.



T4. (15 points)
Each of the 117 crates in a supermarket contains at least 80 and at most 102 apples. This means that some crates will need to contain the same number of apples. What is the smallest possible number of crates that must contain the same number of apples?

T5. (10 points)
In a council election, 1000 votes are cast and there are three vacancies to be filled. Each of the 1000 voters casts a vote for one of the candidates only, and when counting is finished, the three candidates with the greatest number of votes are declared successful.

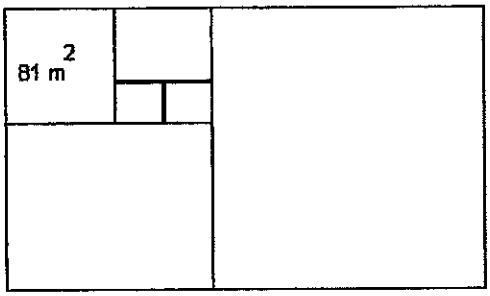
After all the votes have been cast, and the counting process has begun, several candidates are sitting at the table when an official writes some progressive results on a blackboard. It shows how many votes each candidate has already gained, with possibly more to come.

One candidate, Alex Mason, smiles and says, "Well I see that I've won one of the vacancies. It's not possible for me to miss out now, even if I receive no more votes."

If Alex is justified in being so confident, what is the smallest possible number of votes he could have received at that stage of counting?

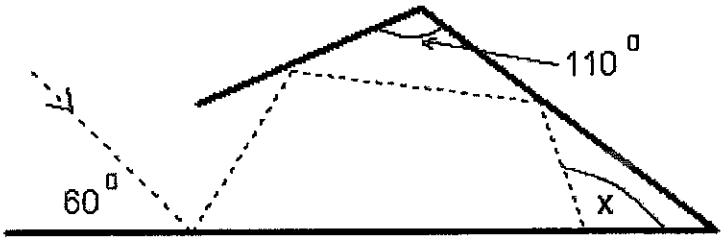
T6. (20 points)
You have an unmarked cube and six colours of paint. In how many different ways can you paint the cube if each face is to be painted a different colour?

T7. (10 points)
The field below is composed of six square plots. All square plots have dimensions in whole metres. What is the total area of the field if the top left hand plot has an area of $81 m^2$?



T8. (15 points)
A set of digits consists of one 1, two 9s, and one 7. A pair of these digits is randomly selected without replacement. What is the probability that the pair can be arranged to form a two-digit prime number?

T9. (10 points)
A light ray bounces off three flat mirrors. Find the measure of angle x in the diagram below. Remember that a light ray is reflected by a mirror at the same angle at which it hits it, that is, the angle of incidence equals the angle of reflection.



T10. (20 points)
A youngster cuts a three-by-three square from a calendar page. If the sum of the nine dates is divisible by 13, what is the date in the lower-left corner of the square?

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ANSWER SHEET

Question	Answers	Points
T1. (10 points)		
T2. (20 points)		
T3. (20 points)		
T4. (15 points)		
T5. (10 points)		
T6. (20 points)		
T7. (10 points)		
T8. (15 points)		
T9. (10 points)		
T10. (20 points)		

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ANSWER SHEET

Question	Answers	Points
T1. (10 points)	2 : 1	
T2. (20 points)	115	
T3. (20 points)	$\frac{\sqrt{2}}{2}$ *or* $\frac{1}{\sqrt{2}}$ *or* 0.7071...	
T4. (15 points)	6	
T5. (10 points)	251	
T6. (20 points)	30	
T7. (10 points)	936 m^2	
T8. (15 points)	$\frac{5}{6}$ or 0.833...	
T9. (10 points)	100°	
T10. (20 points)	19	