

**TOOWOOMBA EDUCATION CENTRE**  
**MATHEMATICS TEAM CHALLENGE 2008**

**TEAM EVENT: Junior Secondary**

**Time: 45 mins**

***(Calculators are allowed)***

**Total: 150 points**

*Please write answers on the answer sheet.*

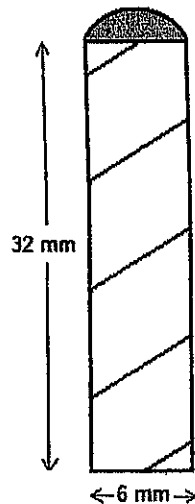
**T1. (10 points)**

Determine the exact value of the product below:

$$111,111,111 \times 111,111,111 = ?$$

**T2. (20 points)**

A child's crayon has a spiral drawn on the outside. The crayon has a diameter of 6 mm and the spiral is drawn over a vertical length of 32 mm. Assume the crayon has a cylindrical shape and determine the length of the spiral. [Note: The spiral starts at the bottom of the crayon in the middle and ends at the top of the crayon in the middle.]



**T3. (20 points)**

The numbers  $n$  and  $m$  are both perfect squares, and are both represented by four-digit numerals. The digits of these two numbers are the same but in reverse order. If the square root of  $n$  is divisible by the square root of  $m$ , find  $n$ .

**T4. (10 points)**

Find the units digit (last digit) of the following expression.

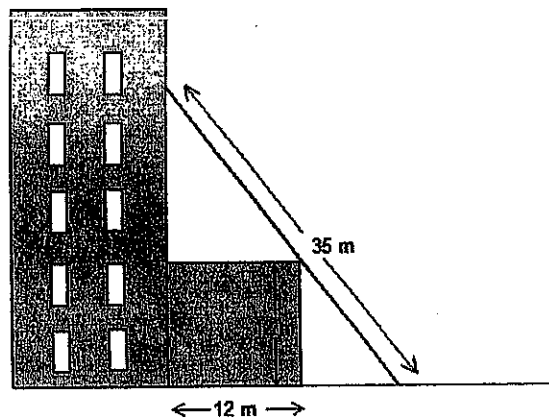
$$11^{11} + 14^{14} + 16^{16}$$

**T5. (15 points)**

An email contained a four digit number ( $abca$ ) instead of the expression  $a^b c^a$ . In one case  $abca = a^b \times c^a$ . Determine the value of  $abca$ .

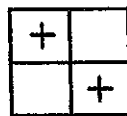
**T6. (20 points)**

A 35 metre ladder is placed against a unit block as shown below. The ladder touches a 12 metre by 12 metre section of the unit block and just reaches the fifth floor which is more than double the height of the 12 metre by 12 metre section. How high is the fifth floor?



**T7. (10 points)**

Two friends Lou and Ann play a game which involves throwing two darts at a  $2 \times 2$  grid. Assume both darts always land on the grid and no two darts occupy the same square. You win a prize when both darts lie on a diagonal. One winning example is shown below.



What is the probability of winning a prize?

**T8. (15 points)**

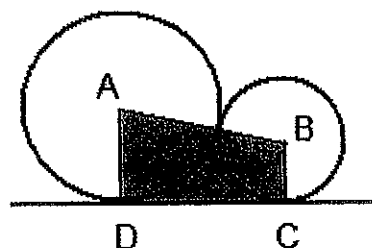
The numbers 1, 2, 3, ..., 1000 are written in a row. Mary started at 1 and circled every 24<sup>th</sup> number in red. Sam started at 1 and circled every 15<sup>th</sup> number in green. What is the smallest possible positive difference between a red number and a green number?

**T9. (15 points)**

The set  $P$  consists of all four-digit numbers that contain only the digits 2 and 4. (eg 2422, 2222, 2424... etc) Find the sum of all the numbers in  $P$ .

**T10. (15 points)**

Two circles just touch and lie on the line segment DC which is an external tangent. (The tangent touches each circle at one point, namely D and C). The radius of the larger circle AD = 16 cm and the radius of the smaller circle BC = 9 cm. Calculate the area of the shaded region ABCD.



**School Name:** \_\_\_\_\_

**Team 1:**

**Team 2:**

**2008 TOOWOOMBA MATHS TEAM CHALLENGE  
JUNIOR SECONDARY  
TEAM EVENT**

**ANSWER SHEET**

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

**Total      /150**

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**ANSWER SHEET**

<b>Question</b>	<b>Answers</b>	<b>Points</b>
<b>T1.</b> (10 points)	12345678987654321	
<b>T2.</b> (20 points)	81.91 mm	
<b>T3.</b> (20 points)	9801	
<b>T4.</b> (10 points)	3	
<b>T5.</b> (15 points)	2592	
<b>T6.</b> (20 points)	28 m	
<b>T7.</b> (10 points)	$\frac{1}{3}$	
<b>T8.</b> (15 points)	3	
<b>T9.</b> (15 points)	53328	
<b>T10.</b> (15 points)	300 cm <sup>2</sup>	