				N	ame:	
				Sc	hool:	
Mul	tiple Choice (70 Marks)				
Plac	e all answers in	the multiple choice	ce boxes on the	front page of the	he answer bookle	t.
Ques	stions 1-10 below	are worth:				
	marks for a corr mark for a blan					
	marks for an in					
(1)	If $(1/3)x = 15$,	then $(5/9)x =$				
()			(C) 25	(D) 5	(E) 9	
(2)	If $r = 1/9$ whi	ich of the followin	g has the larges	st value?		
(2)		(B) x^2		(D) $1/x$	(E) \sqrt{x}	-
(2)			•	. , ,	() •	
(3)		of x that makes			()	
	(A) -27	(B) -24	(C) -3	(D) 0	(E) 6	i
(4)	One angle of a angle, in degree	triangle is three tes, is	imes the second	l angle, and the	e third angle is 6	50°. The smallest
	$(A) \ 45 \qquad (B)$	60 (C) 20	(D) 30 (E)	15		
(5)	The value of $\sqrt{}$	$12 \times \sqrt{9}$ is				
(0)		(B) 4	(C) 6	(D) 9	(E) 12	
(6)	, ,	a h a d pro posit	ivo rool numbor	$a \rightarrow d + d + 1$	on which of the	following is NOT
(0)	$\frac{1}{b} = \frac{1}{d}$, where true?	a, b, c, d are posit	ive rear number	s, and $c \neq a$, or	ien which of the	ionowing is NO1
	$(A) \frac{b}{a} = \frac{d}{c}$	(B) $\frac{a+b}{b} = \frac{c+d}{d}$	(C) a^2d^2	$c^2 = b^2 c^2$	(D) $\frac{a}{d} = \frac{b}{c}$	$(E) \frac{a}{c} = \frac{b}{d}$
(7)		average score of time economics co				
	(A) 41	(B) 9	(C) 37	(D) 33	(E) 45	, ourse,
(0)	,	,	. ,	` '	,	2007 II
(8)	has its area inc	ncreased in size. I reased?	ts width is incr	eased by 10% a	ınd its lengtn by	30%. How much
	(A) 30%	(B) 31%	(C) 40%	(D)	43%	(E) 63%
(9)	The sum of seve	en consecutive po	sitive integers is	s 105. The larg	est of the intege	rs is
()	(A) 13	(B) 15	(C) 16	(D) 17	(E) 18	
(10)	The number of	solutions (x, y) to	the equation x	+3u = 100 w	here r and u are	positive integers
(10)	is		the equation w	109 100, 11	icic a and g are	positive integers
	(A) 33	(B) 35	(C) 50	(D) 100	(E) 34	

	or a correct ans a blank answor or an incorrect	er			
Determine th	e number of di	ifferent pairs (x, y)) that satisfy both	x + 2y = 4 a	and $x + y^2 = 3$.
(A) 0	(B) 1	(C) 2	(D) 3	(E) 4	
The fourth pe	ower of $\sqrt{1+\frac{1}{2}}$	$\sqrt{1+\sqrt{1}}$ is			
(A) 5	(B) 7	(C) $\sqrt{2} - \sqrt{2}$	$\overline{3}$ (D) 2	$-\sqrt{3}$	(E) $3 + 2\sqrt{2}$
(13) A square is said to be inscribed in a circle if its four corners lie on the circle. A so circumscribe a given circle if its sides are each tangent to the circle (the circle fits the square, touching all sides). Given a circle, what is the ratio of the side length square to that of a circumscribing one?				cle fits tightly insid	
(A) $\frac{1}{\sqrt{2}}$	(B) $\sqrt{3}$	(C) $\sqrt{6}$	(D) $\frac{1}{\sqrt{3}}$	(E	E) $2\sqrt{2}$
One morning, three aardvarks set out in different directions to raid ant hills. At the end of the day, they meet again, and, comparing notes, find that they have pillaged 14 ant hills between them. Which of the following statements must be true? (A) An aardvark raided exactly three ant hills. (B) An aardvark raided fewer than three ant hills. (C) An aardvark raided more than four ant hills. (D) An aardvark raided more than five ant hills. (E) Two of the aardvarks each raided at least three ant hills.					
has 35 teeth.	How many co	mplete revolution			
(A) 3	(B) 5	(C) 7	(D) 21	(E) 735	
		(C) $f(4^{\circ})$	(D) $f(f($	$(5)) \qquad \qquad (1$	E) f(f(f(3)))
A triangle ha	s integer sides	and perimeter 23	. What is the larg	est possible l	ength of any side?
(A) 6	(B) 7	(C) 11	(D) 13	(E) 21	
A snail at the bottom of a well 20 metres deep starts slithering up towards the top. During the day, the snail gets two metres closer to the top, but then slides one metre back down during the night. How many days does it take to get to the top of the well?					
(A) 17	(B) 18	(C) 19	(D) 20	(E) 2	21
How many positive integers no larger than 1000 are multiples of 3, but not multiples of 4?					
(A) 250	(B) 166	(C) 333	(D) 666	(E) 83	
(A) 250 Four points a	re located on a	a line. The distan	ces between pairs	of points are	all positive integers, lue of $a+b+c+d+e$?
	Determine the (A) 0 The fourth per (A) 5 A square is say circumscribe the square, to square to that (A) $\frac{1}{\sqrt{2}}$ One morning day, they me them. Which (A) An aardy (C) An aardy (E) Two of the their original (A) 3 If $f(x) = 2^x$, (A) $f(f(3))$ A triangle had (A) 6 A snail at the day, the snail night. How mentions are selected as a simple content of the c	Determine the number of displayed (A) 0 (B) 1 The fourth power of $\sqrt{1+\frac{1}{2}}$ (A) 5 (B) 7 A square is said to be inscricircumscribe a given circle if the square, touching all side square to that of a circumsc (A) $\frac{1}{\sqrt{2}}$ (B) $\sqrt{3}$ One morning, three aardvarday, they meet again, and, them. Which of the following (A) An aardvark raided exact (C) An aardvark raided morning (E) Two of the aardvarks earlies are in continuous again (A) 3 (B) 5 If $f(x) = 2^x$, then 16^8 is (A) $f(f(3))$ (B) $f(12^3)$ A snail at the bottom of a standard the snail gets two metricipals. How many days does are in the snail gets two metricipals.	Determine the number of different pairs (x,y) (A) 0 (B) 1 (C) 2 The fourth power of $\sqrt{1+\sqrt{1+\sqrt{1}}}$ is (A) 5 (B) 7 (C) $\sqrt{2}-\sqrt{2}$ A square is said to be inscribed in a circle if it circumscribe a given circle if its sides are each the square, touching all sides). Given a circle square to that of a circumscribing one? (A) $\frac{1}{\sqrt{2}}$ (B) $\sqrt{3}$ (C) $\sqrt{6}$ One morning, three aardvarks set out in diffeday, they meet again, and, comparing notes, them. Which of the following statements must (A) An aardvark raided exactly three ant hills (C) An aardvark raided more than four ant hills (E) Two of the aardvarks each raided at least Two gear wheels are in contact. One of them has 35 teeth. How many complete revolutions their original positions again? (A) 3 (B) 5 (C) 7 If $f(x) = 2^x$, then 16^8 is (A) $f(f(3))$ (B) $f(12)$ (C) $f(4^5)$ A triangle has integer sides and perimeter 23 (A) 6 (B) 7 (C) 11 A snail at the bottom of a well 20 metres deady, the snail gets two metres closer to the tonight. How many days does it take to get to	Determine the number of different pairs (x,y) that satisfy both (A) 0 (B) 1 (C) 2 (D) 3 The fourth power of $\sqrt{1+\sqrt{1+\sqrt{1}}}$ is (A) 5 (B) 7 (C) $\sqrt{2}-\sqrt{3}$ (D) 2 A square is said to be inscribed in a circle if its four corners lie circumscribe a given circle if its sides are each tangent to the other square, touching all sides). Given a circle, what is the ratio square to that of a circumscribing one? (A) $\frac{1}{\sqrt{2}}$ (B) $\sqrt{3}$ (C) $\sqrt{6}$ (D) $\frac{1}{\sqrt{3}}$ One morning, three aardvarks set out in different directions to day, they meet again, and, comparing notes, find that they have them. Which of the following statements must be true? (A) An aardvark raided exactly three ant hills. (B) An aardvark (C) An aardvark raided more than four ant hills. (D) An aardvark (E) Two of the aardvarks each raided at least three ant hills. Two gear wheels are in contact. One of them, Wheel A, has 25 has 35 teeth. How many complete revolutions must Wheel B in their original positions again? (A) 3 (B) 5 (C) 7 (D) 21 If $f(x) = 2^x$, then 16^8 is (A) $f(f(3))$ (B) $f(12)$ (C) $f(4^8)$ (D) $f(f(4^8))$ (D) $f(f(4^8))$ (D) $f(f(4^8))$ (D) 13 A snail at the bottom of a well 20 metres deep starts slithering day, the snail gets two metres closer to the top, but then slides night. How many days does it take to get to the top of the well sight.	Determine the number of different pairs (x,y) that satisfy both $x+2y=4$ (A) 0 (B) 1 (C) 2 (D) 3 (E) 4 The fourth power of $\sqrt{1+\sqrt{1+\sqrt{1}}}$ is (A) 5 (B) 7 (C) $\sqrt{2}-\sqrt{3}$ (D) $2-\sqrt{3}$ A square is said to be inscribed in a circle if its four corners lie on the circle circumscribe a given circle if its sides are each tangent to the circle (the circumscribe a given circle if its sides are each tangent to the circle (the circumscribe a circumscribing one? (A) $\frac{1}{\sqrt{2}}$ (B) $\sqrt{3}$ (C) $\sqrt{6}$ (D) $\frac{1}{\sqrt{3}}$ (E) One morning, three aardvarks set out in different directions to raid ant hill day, they meet again, and, comparing notes, find that they have pillaged them. Which of the following statements must be true? (A) An aardvark raided exactly three ant hills. (B) An aardvark raided fewer (C) An aardvark raided more than four ant hills. (D) An aardvark raided more (E) Two of the aardvarks each raided at least three ant hills. Two gear wheels are in contact. One of them, Wheel A, has 21 teeth. The has 35 teeth. How many complete revolutions must Wheel B make before their original positions again? (A) 3 (B) 5 (C) 7 (D) 21 (E) 735 If $f(x) = 2^x$, then 16^8 is (A) $f(f(3))$ (B) $f(12)$ (C) $f(4^8)$ (D) $f(f(5))$ (D) A triangle has integer sides and perimeter 23. What is the largest possible 1 (A) 6 (B) 7 (C) 11 (D) 13 (E) 21 A snail at the bottom of a well 20 metres deep starts slithering up towards day, the snail gets two metres closer to the top, but then slides one metre bright. How many days does it take to get to the top of the well?

Name: _	
School: _	

Full Solutions (30 Marks)

Place your solutions to these questions in the space provided. Each question is worth 10 marks.

You must show sufficient work to receive full marks, but if you do not completely answer a question you may still receive partial marks for showing work. So **show your work!**

^{1.} We have four concentric circles as shown. If each of the labelled regions has the same area, and the radius of the outermost circle is 50 m, what is the radius of the innermost circle?

Name:	
School:	

- 2. (a) A positive integer n will be said to be *super* if whenever n = a + b, with a and b positive integers, then either a or b has at least one digit in common with n. (For example, 82 is not super, since 82 = 43 + 39, and neither 43 nor 39 has an 8 or a 2 in it.) Show that 2010 is super.
- (b) A positive integer n will be said to be *superduper* if, whenever we write n as a sum of two or more positive integers, at least one of the integers in the sum has a digit in common with n. (For example, 2010 is not superduper since $2010 = 5 + 5 + 5 + \cdots + 5$, a sum of 402 fives, and none of these numbers in the sum contains a 0,1 or 2.) Find a superduper number that is larger than 10000 but smaller than 100000. Be sure to explain why it is superduper. (No credit will be awarded for a guess.)

Name:	
School:	

. How many 5-digit numbers consist of 5 different digits, and include the digit 3? (Note that the first digit may not be zero, but the others could be.)