SOUTH AFRICAN MATHEMATICS OLYMPIAD
2012 Junior Grade 8 Round 1
Solutions

1.	**E**	
2.	**D**	201,2 + 2, 012 = 201 + 2 + 0,2 + 0,012 = 203,212
3.	**A**	The sum is 8 + 9 = 17.
4.	**D**	The factors are 1, 2, 3, 6, 9, 18, so there are 3 even ones.
5.	**A**	$2x + 7^\circ + x - 1^\circ = 90^\circ$, so $3x = 84^\circ$ and $x = 28^\circ$
6.	**B**	$23 = 5 \times 4 + 3$, so you buy 5 sets of four and then three more bars; that means paying for three bars 5 times, and then for the last three bars: this is 18 bars paid for.
7.	**E**	Only the square roots of the perfect squares are whole numbers, and the perfect squares between 1 and 200 are 1, 4 … up to $196 = 14^2$. So there are 14 whole numbers in the list.
8.	**B**	If the number is divisible by 9 then the sum of its digits is divisible by 9, but that sum is $19 + x$. It follows that x must be 8.
9.	**E**	30 cm in 100 years is 300 mm in 5200 weeks and so $\frac{300}{5200} = \frac{3}{52} \approx \frac{6}{100}$ mm per week.
10.	**E**	The two primes could be 5+31, 7+29, 13+23, 17+19, with corresponding products 155, 203, 299, 323.
11.	**D**	If x was the number John said, Jane gets $2x$ and Rebecca gets $5x - 6$. These are equal so $2x = 5x - 6$ and thus $3x = 6$, i.e. $x = 2$.
12.	**D**	$3^* = 2\times3 + 1 = 7$, and $7^* = 2\times7 + 1 = 15$.
13.	**C**	He takes $\frac{8}{3}$ minutes per lap, and will cycle for 240 minutes. That will cover $\frac{240}{8/3} = 90$ laps.
14.	**D**	Using just one R5-coin I can pay amounts of R7, R9, R11, ... Using two R5-coins I can pay R12, R14, R16, ... Using three R5-coins I can pay R17, R19, R21, ... The smallest amount that occurs in two of these lists is R17 (either 1 × R5 + 6 × R2 or 3 × R5 + 1 × R2).
15.	**B**	M and N cannot both be odd because then (A) and (D) are both true. If M is odd and N is even then (A), (B) and (C) are true. If M is even and N is odd then (C) and (D) are true. Thus M and N must both be even and only (B) is true.
16.	**E**	Each exterior angle is $180^\circ - 156^\circ = 24^\circ$, and the number of sides is $360^\circ \div 24^\circ = 15$

17. **E** If Anne's age now is x, then three years before she was half as old it was $\frac{x}{2}-3$. So we have $x=3\left(\frac{x}{2}-3\right)$, which gives $2x = 3(x - 6)$ and then $x = 18$.

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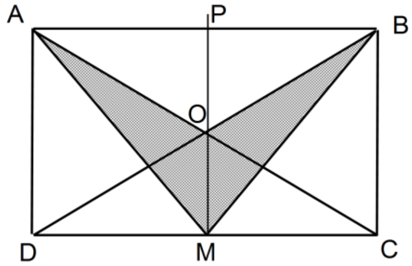
18. **C** Drawing the line MOP shows that Δ ADM = $\frac{1}{4}$ABCD, Δ BMC = $\frac{1}{4}$ABCD and of course Δ AOB = $\frac{1}{4}$ABCD. The shaded area is the remainder, and thus also $\frac{1}{4}$ABCD



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19. **C** We must have the last digit being odd, and also bigger than the first digit. If the last digit is 1 that is not possible, but if the last digit is 3 then the first can be 1 or 2, while the middle digit can be any one of the ten digits. Similarly if the last digit is 5, the first can be any of 1, 2, 3, 4 and the middle digit is not restricted. Continuing in this way we find the total number of possible three-digit numbers is $2\times10 + 4\times10 + 6\times10 + 8\times10 = 200$.

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20. **A** The squares from 1^2 to 3^2 use one digit each; those from 4^2 to 9^2 use two each; from 10^2 to 31^2 use three each. Writing all these squares would use $3\times1 + 6\times2 + 22\times3 = 81$ digits. Then we would write $32^2 = 1024$, the last digit of which is the 85th we write down.
