EXAM PAPERS PRACTICE

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Practice questions created by actual examiners and assessment experts

Detailed mark scheme

Suitable for all boards

Designed to test your ability and thoroughly prepare you

Time allowed

Score	Percentage
/	%

Maths

Mark Scheme

AQA
AS & A LEVEL

3.5 D: Sequences and series

5(a)	$150 = 200p + q$	M1		Either equation
	$120 = 150p + q$	A1		Both (condone embedded values for the M1A1)
		m1		Valid method to solve two simultaneous eqns in p and q to find either p or q
	$p = 0.6$	A1		AG (condone if left as a fraction)
	$q = 30$	B1	5	
(b)	$u_4 = 102$	B1F√	1	Ft on $(72 + q)$
(c)	$L = pL + q$; $L = 0.6L + 30$	M1		
	$L = \frac{q}{1-p}$	m1		
	$L = 75$	A1F√	3	Ft on $2.5q$
	Total		**9**	

3(a)	(Tenth term) $= a + (10-1)d$	M1		
	..... $= 1 + 9(6) = 55$	A1	2	NMS or rep. addn. B2 CAO SC if M0 award B1 for $6n-5$ OE
(b)(i)	$S_n = \frac{n}{2}[2 + (n-1)6]$	M1		Formula for $\{S_n\}$ with either $a = 1$ or $d = 6$ substituted
	$\frac{n}{2}[2 + 6n - 6] = 7400$	A1		Eqn formed with some expansion of brackets
	$3n^2 - 2n = 7400 \Rightarrow 3n^2 - 2n - 7400 = 0$	A1	3	CSO AG
(ii)	$(3n + 148)(n - 50) = 0$	M1		Formula/factorisation OE
	$\Rightarrow n = 50$	A1	2	NMS single ans. 50.. B2 CAO NMS 50 and –49.3(3…) B1 CAO
	Total		**7**	

4(a)	$(1-2x)^4=(1)^4+4(1)^3(-2x)+$ $6(1^2)(-2x)^2+[4(1)(-2x)^3+(-2x)^4]$	M1		Any valid method as far as term(s) in x and term(s) in x^2.
	$=[1]-8x+24x^2+[-32x^3+16x^4]$	A1		$p=-8$ Accept $-8x$ even within a series.
		A1	3	$q=24$ Accept $24x^2$ even within a series.
(b)	x term is $\binom{9}{1}2^8x$	M1		OE
	Coefficient of x term is $=9\times2^8=2304$ $(=k)$	A1	2	Condone $2304x$
(c)	$(1-2x)^4(2+x)^9=(1+px+..)(2^9+kx...)$	M1		Uses (a) and (b) oe (PI)
	$=$ ...			
	$=$ .....$+kx+px(2^9)+$	M1		Multiply the two expansions to get x terms
	Coefficient of x is $k+512p$			
	$=2304-4096=-1792$	A1ft	3	ft on candidate's values of k and p. Condone $-1792x$ SC If 0/3 award B1ft for $p+k$ evaluated
	Total		**8**	

5(a)	$ar=48;\quad ar^3=3$	B1		For either. OE
	$\Rightarrow 16r^2=1$	M1		Elimination of a OE
	$r^2=\frac{1}{16}\Rightarrow r=-\frac{1}{4}$	A1		CSO AG Full valid completion. SC Clear explicit verification (max B2 out of 3.)
	or $r=\frac{1}{4}$	B1	4	
(b)(i)	$a=-192$	B1	1	
(ii)	$\frac{a}{1-r}=\frac{a}{1-\left(-\frac{1}{4}\right)}$	M1		$\frac{a}{1-r}$ used
	$S_\infty=\frac{-768}{5}\ (=-153.6)$	A1ft	2	Ft on candidate's value for a. i.e. $\frac{4}{5}a$ SC candidate uses $r=0.25$, gives $a=192$ and sum to infinity $=256$. (max. B0 M1A1)
	Total		**7**	

7(a)	$(1+2x)^8$ $=1+\binom{8}{1}(2x)^1+\binom{8}{2}(2x)^2+\binom{8}{3}(2x)^3+$	M1		Any valid method. PI by correct value for a, b or c
	$=1+16x+112x^2+448x^3+\ldots.$	A1A1		A1 for each of a, b, c
	$\{a=16,\ b=112,\ c=448\}$	A1	4	
(b)	x^3 terms from expn. of $\left(1+\frac{1}{2}x\right)(1+2x)^8$			
	are cx^3 and $\frac{1}{2}x(bx^2)$	M1		Either
	$cx^3+\frac{1}{2}x(bx^2)$	A1		b, c or candidate's values for b and c from (a)
	Coefficient of x^3 is $c+0.5\,b=504$	A1ft	3	Ft on candidate's $(c+0.5b)$ provided b and c are positive integers >1
	Total		7	

2(a)	$u_1=12$	B1		
	$u_2=3\times4^2=48$	B1	2	CSO AG (be convinced)
(b)	$r=4$	B1	1	
(c)(i)	$\{S_{12}=\}\frac{a\left(1-r^{12}\right)}{1-r}$	M1		OE Using a correct formula with $n=12$
	$=\frac{12\left(1-4^{12}\right)}{1-4}$	A1ft		Ft on answer for u_1 in (a) and r in (b)
	$=\frac{12\left(1-4^{12}\right)}{-3}=-4(1-4^{12})=4^{13}-4$	A1	3	CAO Accept $k=13$ for 4^{13} term
(ii)	$\sum_{n=2}^{12}u_n=(4^{13}-4)-u_1$ $=67108848$	B1	1	
	Total		7	

4(a)	$\{S_{29} =\}\frac{29}{2}[2a+28d]$	M1		Formula for S_n with $n = 29$ substituted and with a and d
	$29\,(a+14d) = 1102$	m1		Equation formed then some manipulation
	$a+14d = \frac{1102}{29} \Rightarrow a+14d = 38$	A1	3	CSO AG
(b)	$u_2 = a+d \quad u_7 = a+6d$	B1		Either expression correct
	$u_2+u_7 = 13 \Rightarrow 2a+7d = 13$	M1		Forming equation using u_2 & u_7 both in form $a + kd$
	e.g. $21d = 63;\ 3a = -12$	m1		Solving $a+14d = 38$ with candidate's '$2a + 7d = 13$' to at least stage of elimination of either a or d
	$a = -4 \quad d = 3$	A1	4	Both correct
	Total		7	