Pure Year 1 exam questions (AS maths)-AQA

NOTE:
Please be aware that in the Year 12 collections, you will find questions from the A-Level (Year 13) papers. However, these questions are intentionally included because they align with Year 12 content and topics.
Happy studying!

Arancha Ruiz

Ch 9 Binomial expansion

June 2022 Question 3 Paper 1

3 Find the coefficient of the x^3 term in the expansion of $\left(3x+\frac{1}{2}\right)^4$

[3 marks]

ANSWER

Q	Marking instructions	AO	Marks	Typical solution
3	Expands at least one term correctly. PI Other terms: $(3x)^4$ + ${}_4C_2(3x)^2\left(\frac{1}{2}\right)^2$ + ${}_4C_3(3x)\left(\frac{1}{2}\right)^3$ + $\left(\frac{1}{2}\right)^4$ Condone use of coefficients only.	1.1a	M1	${}_4C_1\,(3x)^3\left(\frac{1}{2}\right)$
	Selects their x^3 term PI	1.1a	M1	Coefficient = 54
	States correct coefficient.	1.1b	A1	
	Total		**3**	

November 2021 Question 4 Paper 2

4 (a) Find the binomial expansion of $(1-2x)^5$ in ascending powers of x up to and including the term in x^2

[2 marks]

4 (b) Find the first two non-zero terms in the expansion of

$$(1-2x)^5+(1+5x)^2$$

in ascending powers of x.

[2 marks]

4 (c) Hence, use an appropriate value of x to obtain an approximation for $0.998^5+1.005^2$

[2 marks]

ANSWER

Q	Marking instructions	AO	Marks	Typical solution
4(a)	Expands, at least first term and one other term correct	1.1a	M1	$1+5\times(-2x)+\frac{5\times4}{2}(-2x)^2$ $=1-10x+40x^2$
	Expands with all terms correctly simplified	1.1b	A1	
	Subtotal		**2**	
4(b)	Correctly expands $(1+5x)^2$	1.1a	M1	$(1+5x)^2=1+10x+25x^2$ $2+65x^2$
	Obtains correct simplified expression for their $(1-2x)^5+(1+5x)^2$	1.1b	A1F	
	Subtotal		**2**	
4(c)	Obtains $x=0.001$ as the value to use	3.1a	M1	Use $x=0.001$ $2+65\times0.001^2$ $=2.000\,065$
	Obtains 2.000065 CSO	1.1b	A1	
	Subtotal		**2**	

November 2021 Question 4 Paper 3

4 (a) Show that the first three terms, in descending powers of x, of the expansion of

$$(2x-3)^{10}$$

are given by

$$1024x^{10}+px^{9}+qx^{8}$$

where p and q are integers to be found.

[3 marks]

4 (b) Find the constant term in the expansion of

$$\left(2x-\frac{3}{x}\right)^{10}$$

[2 marks]

ANSWER

Q	Marking instructions	AO	Marks	Typical solution
4(a)	Express at least one term correctly using binomial expansion **PI** by correct value of p or q or expression for x^8 and x^9 Condone sign error for –3	1.1a	M1	$(2x)^{10} + {}^{10}C_1(2x)^9(-3) + {}^{10}C_2(2x)^8(-3)^2$ $1024x^{10} - 15360x^9 + 103680x^8$
	Obtains correct value of p or q **PI** in the expression may be unsimplified	1.1a	M1	
	Completes argument with correct values of p and q to show the required result	2.1	R1	
	Subtotal		**3**	

Q	Marking instructions	AO	Marks	Typical solution
4(b)	Deduces the constant term comes from $(2x)^5\left(\pm\frac{3}{x}\right)^5$ **PI** by $(\ldots x)^5\ (\ldots x)^{-5}$	2.2a	M1	${}^{10}C_5 \times 2^5 \times (-3)^5 = -1959552$
	Obtains –1959552	1.1b	A1	
	Subtotal		**2**	

	Question Total		**5**	

Video solution:

https://youtu.be/D-Fvi1x6g1Y

November 2021 Question 4 Paper 3 (A-Level)

4 (a) Show that the first three terms, in descending powers of x, of the expansion of

$$(2x-3)^{10}$$

are given by

$$1024x^{10}+px^9+qx^8$$

where p and q are integers to be found.

[3 marks]

4 (b) Find the constant term in the expansion of

$$\left(2x-\frac{3}{x}\right)^{10}$$

[2 marks]

Arancha Ruiz

ANSWER

Q	Marking instructions	AO	Marks	Typical solution
4(a)	Express at least one term correctly using binomial expansion **PI** by correct value of p or q or expression for x^8 and x^9 Condone sign error for –3	1.1a	M1	$(2x)^{10} + {}^{10}C_1(2x)^9(-3) + {}^{10}C_2(2x)^8(-3)^2$ $1024x^{10} - 15360x^9 + 103680x^8$
	Obtains correct value of p or q **PI** in the expression may be unsimplified	1.1a	M1	
	Completes argument with correct values of p and q to show the required result	2.1	R1	
	Subtotal		**3**	

Q	Marking instructions	AO	Marks	Typical solution
4(b)	Deduces the constant term comes from $(2x)^5\left(\pm\frac{3}{x}\right)^5$ **PI** by $(\ldots x)^5\,(\ldots x)^{-5}$	2.2a	M1	${}^{10}C_5 \times 2^5 \times (-3)^5 = -1959552$
	Obtains –1959552	1.1b	A1	
	Subtotal		**2**	

November 2020 Question 4 Paper 1

4 In the binomial expansion of $(\sqrt{3}+\sqrt{2})^4$ there are two irrational terms.

Find the difference between these two terms.

[3 marks]

ANSWER

Q	Marking Instructions	AO	Marks	Typical Solution
4	Expands with correct binomial coefficients for at least the two terms required. Accept $^4C_2$ etc. PI	1.1a	M1	$(\sqrt{3})^4 + \mathbf{4(\sqrt{3})^3\sqrt{2}} + 6(\sqrt{3})^2(\sqrt{2})^2 + \mathbf{4\sqrt{3}(\sqrt{2})^3} + (\sqrt{2})^4$
	Correctly simplifies or evaluates at least one of the irrational terms PI by $20\sqrt{6}$	1.1b	B1	$4 \times 3\sqrt{3} \times \sqrt{2} - 4 \times \sqrt{3} \times 2\sqrt{2}$ $= 12\sqrt{6} - 8\sqrt{6}$
	Obtains ± correct answer Accept AWRT 9.8	1.1b	A1	$= 4\sqrt{6}$
	Total		**3**	

November 2020 Question 5 Paper 2 AQA

5 Joseph is expanding $(2 - 3x)^7$ in ascending powers of x.

He states that the coefficient of the fourth term is 15120

Joseph's teacher comments that his answer is almost correct.

Using a suitable calculation, explain the teacher's comment.

[4 marks]

ANSWER

Q	Marking Instructions	AO	Marks	Typical Solution
5	Chooses x^3 term (PI)	1.1b	B1	$(35)(2^4)(-3)^3x^3$ $-15120x^3$ Joseph has the right number but the wrong sign
	Uses correct coefficient formula, allow use of either ${}^7C_3$ or ${}^7C_4$ (OE)	1.1a	M1	
	Obtains -15120 or 22680 as the value of the coefficient (ignore any power of x if included as part of the coefficient)	1.1b	A1F	
	Obtains -15120 and explains how the error could have occurred or what the error is	2.4	R1	
	Total		**4**	

November 2020 Question 3 Paper 2 (A-Level)

3 Find the coefficient of x^2 in the binomial expansion of $\left(2x - \dfrac{3}{x}\right)^8$

[3 marks]

ANSWER

Q	Marking instructions	AO	Marks	Typical solution
3	Uses the product of $(2x)^5$ and $\left(\pm\dfrac{3}{x}\right)^3$ terms condone sign error and/or omission of ^nC_r term Or Obtains any two correct terms (unsimplified) term	3.1a	M1	$^8C_3(2x)^5 \times \left(-\dfrac{3}{x}\right)^3 = 56 \times 32 \times -27x^2$ $\therefore$ coefficient is -48384
	Multiplies their $(2x)^5$ and $\left(-\dfrac{3}{x}\right)^3$ by $^8C_3$ or $^8C_5$ or 56 OE For this mark condone $(2x)^3$ and $\left(-\dfrac{3}{x}\right)^5$	1.1a	M1	
	Obtains correct coefficient of x^2 -48384 condone inclusion x^2	1.1b	A1	
	Total		**3**	

June 2019 Question 2 Paper 3 (A-Level)

2 Find the value of $\frac{100!}{98! \times 3!}$

Circle your answer.

[1 mark]

$\frac{50}{147}$ 1650 3300 161 700

ANSWER

Q	Marking instructions	AO	Mark	Typical solution
2	Circles the correct response	1.1b	B1	1650
	Total		**1**	

June 2018 Question 4 Paper 1

4 (a) Find the first three terms in the expansion of $(1 - 3x)^4$ in ascending powers of x.

[3 marks]

4 (b) Using your expansion, approximate $(0.994)^4$ to six decimal places.

[2 marks]

ANSWER

Q	Marking Instructions	AO	Marks	Typical Solution
4(a)	Expands $(1 - 3x)^4$ showing a 1, a $(\pm 3x)$ term and a $(\pm 3x)^2$ term	AO1.1a	M1	$1 + 4(-3x) + 6(-3x)^2$ $1 - 12x + 54x^2$
	Uses correct coefficients, 4 & 6 (PI by correct answer, ignore sign errors)	AO1.1b	A1	
	Obtains totally correct expansion Ignore extra terms	AO1.1b	A1	
(b)	Selects value to use for x and substitutes it in their expansion. Correct value, or solves $1 - 3x = 0.994$	AO2.2a	M1	Need $x = 0.002$ $1 - 12 \times 0.002 + 54 \times 0.002^2$
	Evaluates expression 0.976216 CAO for three terms or 0.976215 CAO for four or five terms used and shown	AO1.1b	A1	=0.976216
	Total		**5**	

June 2018 Question 10 Paper 2

10 In the binomial expansion of $(1+x)^n$, where $n \geq 4$, the coefficient of x^4 is $1\frac{1}{2}$ times the sum of the coefficients of x^2 and x^3

Find the value of n.

[5 marks]

ANSWER

Q	Marking Instructions	AO	Marks	Typical Solution
10	The 3 appropriate ${}_nC_r$ seen (ignore any extras) (PI by 55, 165 and 330 OE)	AO3.1a	M1	${}_nC_2 \quad {}_nC_3 \quad {}_nC_4$
	Forms a correct equation, accept $\frac{3}{2}({}_nC_2 + {}_nC_3) = {}_nC_4$ Allow $\binom{n}{r}$ notation (condone x terms in equation)	AO1.1a	M1	$\frac{3}{2}\left(\frac{n!}{(n-2)!\,2!}+\frac{n!}{(n-3)!\,3!}\right) = \frac{n!}{(n-4)!\,4!}$
	Obtains completely correct equation in terms of factorials. Reaching second line of typical solution scores M1 M1 A1	AO1.1b	A1	$\frac{3}{2}\left(\frac{n(n-1)}{2}+\frac{n(n-1)(n-2)}{6}\right) = \frac{n(n-1)(n-2)(n-3)}{24}$ $18+6n-12 = n^2-5n+6$ $0 = n^2-11n = n(n-11)$ $n = 11$
	Reduces to a quadratic or solves the quartic (may involve calculator functions)	AO1.1a	M1	
	Chooses the correct solution. (The correct value of n scores 5/5 may be found by trial and error)	AO3.2a	A1	
	Total		**5**	

June 2018 Question 2 Paper 3 (A-Level)

2 Find the value of $\dfrac{100!}{98! \times 3!}$

Circle your answer.

[1 mark]

$\dfrac{50}{147}$ 1650 3300 161 700

ANSWER

Q	Marking instructions	AO	Mark	Typical solution
3	Circles the correct response	2.2a	B1	$u_n = 2 - 0.9^{n-1}$
				$u_n = 2 - 0.9^{n-1}$
	Total		1	