Pure Year 1 exam questions Edexcel

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Ch. 8: The Binomial Expansion

June 2023 Question 14

14. Find, in simplest form, the coefficient of x^5 in the expansion of

$$\left(5+8x^2\right)\left(3-\frac{1}{2}x\right)^6$$

(5)

ANSWER

Question	Scheme	Marks	AOs
14	Attempts the term in x^3 or the term in x^5 of $\left(3-\frac{1}{2}x\right)^6$ Look for ${}^6C_3 3^3\left(-\frac{1}{2}x\right)^3$ or ${}^6C_5 3^1\left(-\frac{1}{2}x\right)^5$	M1	3.1a
	Correct term in x^3 or correct term in x^5 of $\left(3-\frac{1}{2}x\right)^6$ $-\frac{135}{2}x^3$ **or** $-\frac{9}{16}x^5$	A1	1.1b
	Attempts one of the required terms in x^5 of $\left(5+8x^2\right)\left(3-\frac{1}{2}x\right)^6$ Either $5\times{}^6C_5 3^1\left(-\frac{1}{2}x\right)^5$ **or** $8x^2\times{}^6C_3 3^3\left(-\frac{1}{2}x\right)^3$	M1	1.1b
	Attempts the sum of $5\times{}^6C_5 3^1\left(-\frac{1}{2}x\right)^5$ and $8x^2\times{}^6C_3 3^3\left(-\frac{1}{2}x\right)^3$	dM1	2.1
	Coefficient of x^5 $=-\frac{45}{16}-540=-\frac{8685}{16}$	A1	1.1b
		(5)	
			(5 marks)

June 2022 Question 6

6. (a) Find the first 4 terms, in ascending powers of x, of the binomial expansion of

$$\left(3-\frac{2x}{9}\right)^8$$

giving each term in simplest form.

(4)

$$\mathrm{f}(x)=\left(\frac{x-1}{2x}\right)\left(3-\frac{2x}{9}\right)^8$$

(b) Find the coefficient of x^2 in the series expansion of $\mathrm{f}(x)$, giving your answer as a simplified fraction.

(2)

ANSWER

Question	Scheme	Marks	AOs
6(a)	3^8 or 6561 as the constant term	B1	1.1b
	$\left(3-\frac{2x}{9}\right)^8=...+{}^8C_1(3)^7\left(-\frac{2x}{9}\right)+{}^8C_2(3)^6\left(-\frac{2x}{9}\right)^2+{}^8C_3(3)^5\left(-\frac{2x}{9}\right)^3+...$ $=...+8\times(3)^7\left(-\frac{2x}{9}\right)+28\times(3)^6\left(-\frac{2x}{9}\right)^2+56(3)^5\left(-\frac{2x}{9}\right)^3$	M1 A1	1.1b 1.1b
	$=6561-3888x+1008x^2-\frac{448}{3}x^3+...$	A1	1.1b
		(4)	
(b)	Coefficient of x^2 is $\frac{1}{2}\times\text{"}1008\text{"}-\frac{1}{2}\times\text{"}-\frac{448}{3}\text{"}$	M1	3.1a
	$=\frac{1736}{3}$ (or $578\frac{2}{3}$)	A1	1.1b
		(2)	
			(6 marks)

Video solution:
https://youtu.be/jDXn-OKC4I8

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November 2021 Question 8

8. $\quad g(x) = (2 + ax)^8 \qquad$ where a is a constant

Given that one of the terms in the binomial expansion of $g(x)$ is $3402x^5$

(a) find the value of a.

(4)

Using this value of a,

(b) find the constant term in the expansion of

$$\left(1 + \frac{1}{x^4}\right)(2 + ax)^8$$

(3)

ANSWER

Question	Scheme	Marks	AOs
8 (a)	$(2+ax)^8$ Attempts the term in $x^5 = {}^8C_5 2^3 (ax)^5 = 448a^5x^5$	M1 A1	1.1a 1.1b
	Sets $448a^5 = 3402 \Rightarrow a^5 = \dfrac{243}{32}$	M1	1.1b
	$\Rightarrow a = \dfrac{3}{2}$	A1	1.1b
		(4)	
(b)	Attempts either term. So allow for 2^8 or ${}^8C_4 2^4 a^4$	M1	1.1b
	Attempts the sum of both terms $2^8 + {}^8C_4 2^4 a^4$	dM1	2.1
	$= 256 + 5670 = 5926$	A1	1.1b
		(3)	
			(7 marks)

November 2020 Question 6

6. (a) Find the first 4 terms, in ascending powers of x, in the binomial expansion of

$$(1 + kx)^{10}$$

where k is a non-zero constant. Write each coefficient as simply as possible.

(3)

Given that in the expansion of $(1 + kx)^{10}$ the coefficient x^3 is 3 times the coefficient of x,

(b) find the possible values of k.

(3)

ANSWER

Question	Scheme	Marks	AOs
6 (a)	$(1+kx)^{10} = 1+\binom{10}{1}(kx)^1+\binom{10}{2}(kx)^2+\binom{10}{3}(kx)^3 \ldots$	M1 A1	1.1b 1.1b
	$=1+10kx+45k^2x^2+120k^3x^3 \ldots$	A1	1.1b
		(3)	
(b)	Sets $120k^3 = 3\times 10k$	B1	1.2
	$4k^2 = 1 \Rightarrow k = \ldots$	M1	1.1b
	$k = \pm\frac{1}{2}$	A1	1.1b
		(3)	
			(6 marks)

June 2019 Question 8

8. (a) Find the first 3 terms, in ascending powers of x, of the binomial expansion of

$$\left(2+\frac{3x}{4}\right)^6$$

giving each term in its simplest form.

(4)

(b) Explain how you could use your expansion to estimate the value of 1.925^6
You do not need to perform the calculation.

(1)

ANSWER

Question	Scheme	Marks	AOs
8(a)	2^6 or 64 as the constant term	B1	1.1b
	$\left(2+\frac{3x}{4}\right)^6 = \ldots + {}^6C_1 2^5\left(\frac{3x}{4}\right)^1 + {}^6C_2 2^4\left(\frac{3x}{4}\right)^2 + \ldots$ $= \ldots + 6\times 2^5\left(\frac{3x}{4}\right)^1 + \frac{6\times 5}{2}\times 2^4\left(\frac{3x}{4}\right)^2 + \ldots$	M1 A1	1.1b 1.1b
	$= 64 + 144x + 135x^2 + \ldots$	A1	1.1b
		(4)	
(b)	$\frac{3x}{4} = -0.075 \Rightarrow x = -0.1$ So find the value of $64+144x+135x^2$ with $x=-0.1$	B1ft	2.4
		(1)	
			(5 marks)

November 2020 Question 4 Paper 2 (A-Level)

4. In the binomial expansion of

$$(a + 2x)^7 \qquad \text{where } a \text{ is a constant}$$

the coefficient of x^4 is 15 120

Find the value of a.

(3)

ANSWER

Question	Scheme	Marks	AOs
4	${}^7\mathrm{C}_4 a^3 (2x)^4$	M1	1.1b
	$\frac{7!}{4!3!}a^3 \times 2^4 = 15120 \Rightarrow a = \ldots$	dM1	2.1
	$a = 3$	A1	1.1b
		(3)	
			(3 marks)

June 2018 Question 11

11. (a) Find the first 3 terms, in ascending powers of x, of the binomial expansion of

$$\left(2 - \frac{x}{16}\right)^9$$

giving each term in its simplest form.

(4)

$$f(x) = (a + bx)\left(2 - \frac{x}{16}\right)^9, \text{ where } a \text{ and } b \text{ are constants}$$

Given that the first two terms, in ascending powers of x, in the series expansion of $f(x)$ are 128 and $36x$,

(b) find the value of a,

(2)

(c) find the value of b.

(2)

ANSWER

Question	Scheme	Marks	AOs
11(a)	$\left(2-\frac{x}{16}\right)^9 = 2^9 + \binom{9}{1}2^8.\left(-\frac{x}{16}\right) + \binom{9}{2}2^7.\left(-\frac{x}{16}\right)^2 + \ldots$	M1	1.1b
	$\left(2-\frac{x}{16}\right)^9 = 512 + \ldots$	B1	1.1b
	$\left(2-\frac{x}{16}\right)^9 = \ldots -144x + \ldots$	A1	1.1b
	$\left(2-\frac{x}{16}\right)^9 = \ldots + \ldots + 18x^2 \ (+\ldots)$	A1	1.1b
		(4)	
(b)	Sets $'512'a = 128 \Rightarrow a = \ldots$	M1	1.1b
	$(a =)\frac{1}{4}$ oe	A1 ft	1.1b
		(2)	
(c)	Sets $'512'b + '-144'a = 36 \Rightarrow b = \ldots$	M1	2.2a
	$(b =)\frac{9}{64}$ oe	A1	1.1b
		(2)	
			(8 marks)