Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Binomial expansion

Time allowed: 1 hour 30 minutes

Subject code **0606**

Additional Mathematics

Questions from Paper 1 and Paper 2

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
Questions 2, 4-7 (Paper 1): no calculator.
Questions 1, 3, 8-10 (Paper 2): calculator allowed.

Total marks

/ 57

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 57 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 Using the binomial theorem, expand $(1+e^{2x})^4$, simplifying each term. [2]

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2 **(a)** In the expansion of $(1+kx)^{15}$, where k is a constant, the coefficient of x^3 is $-29\,120$. Find the value of k. [2]

(b) Find the term independent of y in the expansion of $\left(8y^2-\frac{1}{2y}\right)^{12}$. [2]

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3 **(i)** Find, in the simplest form, the first 3 terms of the expansion of $(2-3x)^6$, in ascending powers of x. [3]

(ii) Find the coefficient of x^2 in the expansion of $(1+2x)(2-3x)^6$. [2]

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4 **(i)** Find the first 3 terms, in descending powers of x, in the expansion of $\left(x+\frac{2}{x^2}\right)^6$. [3]

(ii) Hence find the term independent of x in the expansion of $\left(2-\frac{4}{x^3}\right)\left(x+\frac{2}{x^2}\right)^6$. [2]

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5 Find the coefficient of x^2 in the expansion of $\left(x-\frac{3}{x}\right)\left(x+\frac{2}{x}\right)^5$. [5]

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6 The coefficient of x^2 in the expansion of $(2 + px)^6$ is 60.

(i) Find the value of the positive constant p. [3]

(ii) Using your value of p, find the coefficient of x^2 in the expansion of $(3 - x)(2 + px)^6$. [3]

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7 **(i)** Find, in ascending powers of x, the first 3 terms in the expansion of $\left(2-\frac{x^2}{4}\right)^6$. Give each term in its simplest form. [3]

(ii) Hence find the coefficient of x^2 in the expansion of $\left(2-\frac{x^2}{4}\right)^6\left(\frac{1}{x}+x\right)^2$. [4]

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8 The first three terms in the expansion of $(a+bx)^5(1+x)$ are $32-208x+cx^2$. Find the value of each of the integers a, b and c. [7]

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9 **(a)** In the expansion of $\left(x+x^2\right)^8$ in ascending powers of x, the 3rd and 6th terms are equal.

Find the value of x. [3]

(b) In the expansion of $\left(x+\frac{2}{x}\right)^n$ in decreasing powers of x, the 6th term is a constant.

(i) Find the value of the positive integer n. [2]

(ii) Find the value of the 6th term. [2]

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10 The first three terms, in descending powers of x, in the expansion of $\left(3x^2 - a\right)^n \left(1 + \frac{1}{x^2}\right)^2$ can be written as $729x^{12} + 972x^{10} + bx^8$, where a, b and n are constants.

Find the values of a, b and n. [9]

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