

ADDITIONAL MATHS : ALGEBRA ASSIGNMENT

1 Solve the simultaneous equations

$$\begin{aligned}2x + y &= 1, \\4x^2 + y^2 &= 5.\end{aligned}\quad [4]$$

2

Find the range of values of x for which $2(x^2 - 2) > 7x$. [3]

3

Find, in terms of a , the coefficient of x^2 in the expansion of $(1 - 3x)(1 + ax)^6$.

Given that the coefficient of x^2 is 24 and that a is positive, evaluate

- (i) a ,
(ii) the coefficient of x in the expansion.

[6]

4

Find the range of values of k for which the graph of $y = x^2 + (k - 4)x + 1$ lies entirely above the x -axis. [4]

5

(a) Find the remainder when $2x^4 + 5x^2 - 7$ is divided by $x + 3$. [2]

(b) Given that

$$2x^3 + 5x^2 - 6x - 5 \equiv (Ax - 3)(x + B)(x + 1) + C,$$

for all values of x , find the value of each of A , B and C . [6]

(c) The expressions $7x^2 + 35$ and $44x - 2x^3$ leave the same remainder when divided by $x - p$. Find

- (i) the three possible values of p ,
(ii) the largest of the three corresponding remainders.

[8]

6

(a) Write down the full expansions of $(1 - x)^5$ and $(1 + 2x)^5$ in ascending powers of x . Hence, by considering the terms of these expansions up to the terms in x^3 , find the expansion of $(1 + x - 2x^2)^5$ in ascending powers of x as far as the term in x^3 . [8]

(b) Find the middle term in the expansion of $\left(\frac{2}{x} + \frac{x}{2}\right)^{10}$. [3]

(c) Find the coefficient of x^5 in the expansion of $\left(2x - \frac{3}{x^2}\right)^8$. [3]

7. (a) Solve the simultaneous equations

$$\frac{1}{x} + \frac{1}{y} = \frac{3}{2}, \quad x - 3y + 5 = 0.$$

[7]

- (b) The expression $ax^3 + bx + c$ has remainder 21 when it is divided by $(x - 2)$ and remainder -19 when it is divided by $(x + 2)$. Find the value of c .

[3]

8.

- Find the coordinates of the points of intersection of the line $2y = 3x - 3$ with the curve $xy = 3$.

[4]

9.

- (a) Find the range of values of x for which

$$x^2 + 3x - 4 > 5x - 1.$$

[3]

- (b) Find the range of values of c , given that, for all values of x ,

$$x^2 - 5x + c > 2.$$

[4]

10.

- (a) In the expansion of $(1 - ax)^{13}$, where a is a positive constant, the coefficient of x^2 is 702.

(i) Find the value of a .

(ii) Evaluate the coefficient of x^3 .

[4]

- (b) Find the term independent of x in the expansion of $\left(x + \frac{1}{2x}\right)^8$.

[3]

11. Solve the simultaneous equations

$$\begin{aligned} y &= 2x + 1, \\ 6xy &= 2x + y + 3. \end{aligned}$$

[4]

12.

- The coefficient of x^2 in the expansion of $(2 + x)(1 - ax)^5$ is zero. Find the positive value of a .

[4]

13.

- (i) Find the range of values of x for which $x^2 + 7x - 9 < 8x - 3$.

[3]

- (ii) Find the range of values of c for which $x^2 + 7x - 9 > 8x + c$, for all values of x .

[3]

$$y^2 = 3x^2 + xy - 1,$$
$$y = 2x - 3.$$

[6]

- (b) The expression $2x^3 + ax^2 + ax$ has the same remainder when divided by $x - 2$ as when divided by $2x - 1$. Find this remainder. [5]
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15.

- (a) The binomial expansion of $(a + bx)^4$ is $p + 96x + qx^2 + rx^3 + 81x^4$. Given that $b > 0$, calculate the values of b, a, p, q and r . [6]
- (b) Write down the first four terms in the expansion of $(1 - x)^{20}$. Hence evaluate 0.99^{20} , showing your working and giving your answer to 3 decimal places. [5]
- (c) Find the term independent of x in the expansion of $\left(x - \frac{2}{x}\right)^6$. [3]
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16. (PROBABILITY)

- (a) The probability that a male student at a large university is studying for a science degree is 0.3. Find the probability that, in the university football team of 11 male students,
- (i) exactly 3 members of the team are studying for a science degree, [3]
 - (ii) fewer than 2 members of the team are studying for a science degree, [3]
 - (iii) the goalkeeper and 2 other members are studying for a science degree. [3]
- A particular group consists of n male students. Find
- (iv) the smallest value of n for which the probability of at least one of the students studying for a science degree is greater than 0.99. [4]
- (b) In the same university, on average 3 out of every 8 students are female. At the final degree ceremony degrees are presented to groups of 40 students. Find the mean and standard deviation of the number of female students in each group. [3]

