

- 1** Find the set of values of the constant k for which the quadratic equation

$$3kx^2 + (k+8)x + 3 = 0$$

has two distinct real roots.

[4]

- 4 (a) Express $1 - 6x - x^2$ in the form $a - (x + b)^2$, where a and b are constants.

[3]

- (b) The graph of $y = x^2$ is transformed to the graph of $y = 1 - 6x - x^2$ by a reflection followed by a translation of $\begin{pmatrix} m \\ n \end{pmatrix}$. Give details of the reflection and determine the values of m and n . [3]

3 (a) Solve the equation $|2x - 3| = |5x + 2|$. [3]

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(b) Hence solve the equation $|2 \sec \theta - 3| = |5 \sec \theta + 2|$ for $\pi < \theta < 2\pi$. Give your answer correct to 3 significant figures. [3]

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7 The polynomial $p(x)$ is defined by

$$p(x) = 2x^4 + kx^3 + kx^2 + 17x + 18,$$

where k is a constant. It is given that $(x + 2)$ is a factor of $p(x)$.

(a) Find the value of k . [2]

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It is given that the equation $p(x) = 0$ has exactly two real roots, denoted by α and β , where α is an integer and β is not an integer.

(b) State the value of α and show that β satisfies the equation $x = \sqrt[3]{-2x - 4.5}$. [4]

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6

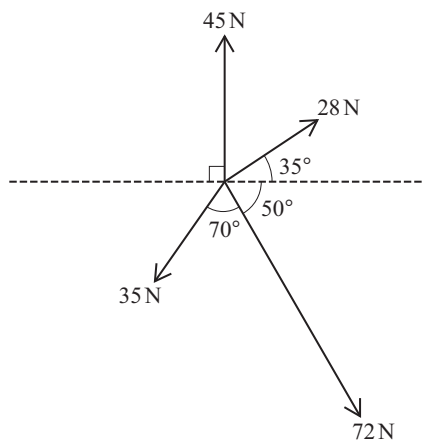
10 Let $f(x) = \frac{x^2 + 2x - 11}{(3+x)(2+x^2)}$.

- (a) Express $f(x)$ in partial fractions.

[6]

- (b) Hence obtain the expansion of $f(x)$ in ascending powers of x , up to and including the term in x^2 . [5]

[5]



Find, in either order, the magnitude and direction of the resultant force. [6]

9.

- (a) Find the acceleration of P when $t = 2$. [2]

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- (b) Find the total distance travelled by P in the first 3 seconds of its motion. [5]

[illegible]

(c) Determine whether P returns to O . [2]

3 The back-to-back stem-and-leaf diagram shows the annual salaries, in dollars, of 27 employees at each of two companies, Browns and Greens.

Browns											Greens									
(3)					9	8	4	30			6	8								(2)
(7)	8	8	5	3	3	1	0	31			2	4	5	8						(4)
(7)		9	7	6	4	2	2	0	32		3	6	6	7	9					(5)
(6)			8	7	5	5	3	1	33		1	1	3	7	8	8	9	9		(8)
(3)						4	2	2	34		0	2	3	5	6	9				(6)
(1)								7	35		3	7								(2)

Key: 6|32|7 means \$32 600 for Browns and \$32 700 for Greens.

(a) Find the median and interquartile range for the annual salaries of employees at Browns. [3]

The annual salary of an employee at Browns is denoted by x thousand dollars and the annual salary of an employee at Greens is denoted by y thousand dollars. It is given that, for the 27 employees at each of the companies,

$\Sigma x = 878.3, \Sigma x^2 = 28\,616.09, \Sigma y = 896.5, \Sigma y^2 = 29\,815.63.$

(b) Find the mean and standard deviation of the annual salaries of these 54 employees. [5]

A-Level Mathematics: 9709 Mathematics November 2025 Question Paper 61

1 The random variables X and Y have independent distributions $X \sim \text{Po}(3)$ and $Y \sim \text{Po}(2)$ respectively.

(a) Find $P(2 < X < 5)$.

[2]

(b) Find $P(X+Y > 2)$.

[3]

(c) The total of 100 random values of X and 150 random values of Y is denoted by T .

Use a suitable approximating distribution to find $P(T < 560)$.

[4]