# Writing a cos x + b sin x as R cos(x – α)

Specification: AQA 7357: E6, E3 · Edexcel 9MA0: 5.6, 5.3

HOMEWORK

## Consolidation

**1** Write $9\cos x + 12\sin x$ in the form $R\cos(x - \alpha)$, where $R > 0$ and $0° < \alpha < 90°$.

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**2** Write $5\sin x - 3\cos x$ in the form $R\sin(x - \alpha)$, where $R > 0$ and $0° < \alpha < 90°$.

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**3** Write $\cos x + \sqrt{3}\sin x$ in the form $R\cos(x - \alpha)$, where $R > 0$ and $0 < \alpha < \frac{\pi}{2}$. Give exact values.

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**4** Write $2\sin 2x + \cos 2x$ in the form $R\sin(2x + \alpha)$, where $R > 0$ and $0° < \alpha < 90°$.

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**5** State the maximum and minimum values of $15\sin x - 8\cos x$.

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**6** Find the maximum and minimum values of $20 - 5\cos x - 12\sin x$.

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**7** Find the exact maximum value of $\dfrac{1}{3 + \sin x + \cos x}$.

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**8** Show that $7\cos x + 24\sin x \leq 25$ for all values of $x$.

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**9** Write $4\sin x + 4\cos x$ in the form $R\sin(x + \alpha)$. Give exact values.

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**10** Describe a sequence of two transformations that maps $y = \cos x$ onto $y = 3\cos x + 4\sin x$.

AQA E6 · Edexcel 5.6, AQA B9 · Edexcel 2.9

**11** *AQA-style.*

(a) Express $3\sin\theta - \sqrt{3}\cos\theta$ in the form $R\sin(\theta - \alpha)$, where $R > 0$ and $0 < \alpha < \frac{\pi}{2}$. Give exact values. [3 marks]

(b) Hence state the maximum value of $3\sin\theta - \sqrt{3}\cos\theta$ and the smallest positive value of $\theta$ at which it occurs. [2 marks]

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**12** *Edexcel-style.* $f(x) = 12\cos x - 9\sin x$.

(a) Express $f(x)$ in the form $R\cos(x + \alpha)$, where $R > 0$ and $0° < \alpha < 90°$. Give $\alpha$ to 2 decimal places. [4 marks]

(b) State the maximum value of $f(x)$ and the smallest positive value of $x$ at which it occurs. [2 marks]

(c) $g(x) = \dfrac{4}{20 + f(x)}$. Find the maximum value of $g(x)$. [2 marks]

AQA E6 · Edexcel 5.6 · Edexcel-style