SQA Past paper questions

2023 – Paper 2 – Question 9

(a) Express $7\cos x° - 3\sin x°$ in the form $k\sin(x+a)°$ where $k > 0$, $0 < a < 360$. 4

(b) Hence, or otherwise, find:

(i) the maximum value of $14\cos x° - 6\sin x°$ 1

(ii) the value of x for which it occurs where $0 \leq x < 360$. 2

Click here for video solution.

2022 – Paper 2 – Question 3

(a) Express $4\sin x + 5\cos x$ in the form $k\sin(x+a)$ where $k > 0$ and $0 < a < 2\pi$. 4

(b) Hence solve $4\sin x + 5\cos x = 5.5$ for $0 \leq x < 2\pi$. 3

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2019 – Paper 2 – Question 6

(a) Express $2\cos x° - 3\sin x°$ in the form $k\cos(x+a)°$ where $k > 0$ and $0 \leq a < 360$. 4

(b) Hence solve $2\cos x° - 3\sin x° = 3$ for $0 \leq x < 360$. 3

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2018 – Paper 2 – Question 8

(a) Express $2\cos x° - \sin x°$ in the form $k\cos(x-a)°$, $k > 0$, $0 < a < 360$. 4

(b) Hence, or otherwise, find

(i) the minimum value of $6\cos x° - 3\sin x°$ and 1

(ii) the value of x for which it occurs where $0 \leq x < 360$. 2

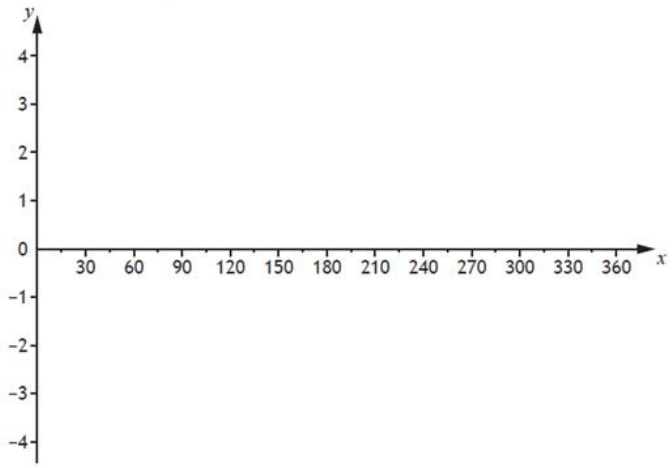
Click here for video solution.

2017 – Paper 1 – Question 14

(a) Express $\sqrt{3}\sin x° - \cos x°$ in the form $k\sin(x-a)°$, where $k > 0$ and $0 < a < 360$. 4

(b) Hence, or otherwise, sketch the graph with equation $y = \sqrt{3}\sin x° - \cos x°$, $0 \le x \le 360$.

Use the diagram provided in the answer booklet. 3



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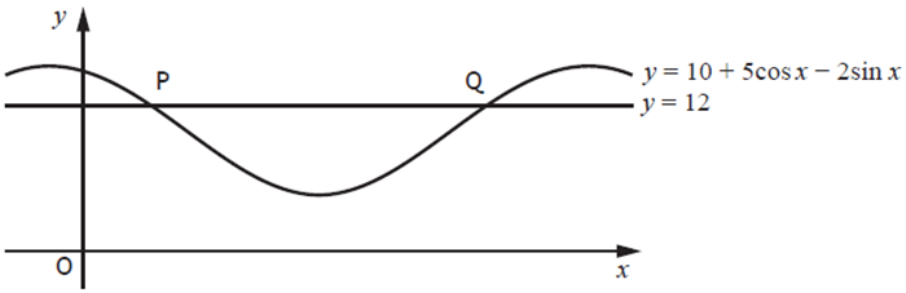
2016 – Paper 2 – Question 8

(a) Express $5\cos x - 2\sin x$ in the form $k\cos(x+a)$, where $k > 0$ and $0 < a < 2\pi$. 4

(b) The diagram shows a sketch of part of the graph of $y = 10 + 5\cos x - 2\sin x$ and the line with equation $y = 12$.

The line cuts the curve at the points P and Q.



Find the x-coordinates of P and Q. 4

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2015 – Paper 2 – Question 9

The blades of a wind turbine are turning at a steady rate.

The height, h metres, of the tip of one of the blades above the ground at time, t seconds, is given by the formula

$$h = 36\sin(1{\cdot}5t) - 15\cos(1{\cdot}5t) + 65.$$

Express $36\sin(1{\cdot}5t) - 15\cos(1{\cdot}5t)$ in the form

$$k\sin(1{\cdot}5t - a), \text{ where } k > 0 \text{ and } 0 < a < \frac{\pi}{2},$$

and hence find the two values of t for which the tip of this blade is at a height of 100 metres above the ground during the first turn. 8

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2013 – Paper 1 – Question 23

(a) The expression $\sqrt{3}\sin x° - \cos x°$ can be written in the form $k\sin(x - a)°$, where $k > 0$ and $0 \le a < 360$.

Calculate the values of k and a. 4

(b) Determine the maximum value of $4 + 5\cos x° - 5\sqrt{3}\sin x°$, where $0 \le x < 360$. 2

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2012 – Paper 1 – Question 22

(a) The expression $\cos x - \sqrt{3}\sin x$ can be written in the form $k\cos(x + a)$ where $k > 0$ and $0 \le a < 2\pi$.

Calculate the values of k and a. 4

(b) Find the points of intersection of the graph of $y = \cos x - \sqrt{3}\sin x$ with the x and y axes, in the interval $0 \le x \le 2\pi$. 3

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2011 – Paper 2 – Question 6

(*a*) The expression $3\sin x - 5\cos x$ can be written in the form $R\sin(x+a)$ where $R > 0$ and $0 \le a < 2\pi$.

Calculate the values of R and a. **4**

(*b*) Hence find the value of t, where $0 \le t \le 2$, for which

$$\int_0^t (3\cos x + 5\sin x)\, dx = 3.$$ **7**

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2010 – Paper 2 – Question 2

(*a*) $12\cos x° - 5\sin x°$ can be expressed in the form $k\cos(x + a)°$, where $k > 0$ and $0 \le a < 360$.

Calculate the values of k and a. **4**

(*b*) (i) Hence state the maximum and minimum values of $12\cos x° - 5\sin x°$.

(ii) Determine the values of x, in the interval $0 \le x < 360$, at which these maximum and minimum values occur. **3**

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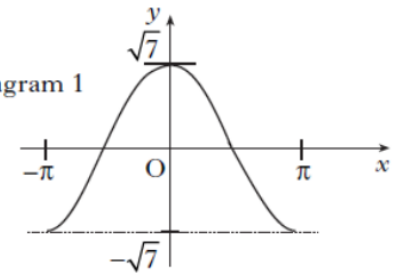
2008 – Paper 2 – Question 3

(*a*) (i) Diagram 1 shows part of the graph of $y = f(x)$, where $f(x) = p\cos x$.

Write down the value of p.

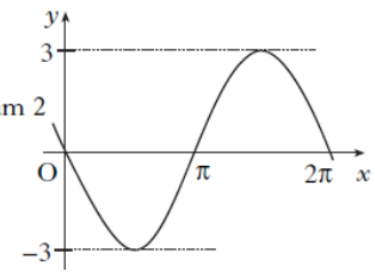
Diagram 1



(ii) Diagram 2 shows part of the graph of $y = g(x)$, where $g(x) = q\sin x$.

Write down the value of q. **2**

Diagram 2



(*b*) Write $f(x) + g(x)$ in the form $k\cos(x + a)$ where $k > 0$ and $0 < a < \frac{\pi}{2}$. **4**

(*c*) Hence find $f'(x) + g'(x)$ as a single trigonometric expression. **2**

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Specimen 1 – Paper 2 - Question 3

(a) Express $5\sin x° - 12\cos x°$ in the form $k\sin(x-a)°$ where $k > 0$ and $0 < a < 360$. 4

(b) Hence solve the equation $5\sin x° - 12\cos x° = 6{\cdot}5$ in the interval $0 < x < 360$. 3

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Specimen 2 – Paper 2 - Question 4

(a) Express $3\cos x° + 5\sin x°$ in the form $k\cos(x° - a°)$ where $k > 0$ and $0 \le a \le 90$. 4

(b) Hence solve the equation $3\cos x° + 5\sin x° = 4$ for $0 \le x \le 90$. 3

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2006 – Paper 2 - Question 10

A curve has equation $y = 7\sin x - 24\cos x$.

(a) Express $7\sin x - 24\cos x$ in the form $k\sin(x-a)$ where $k > 0$ and $0 \le a \le \frac{\pi}{2}$. 4

(b) Hence find, in the interval $0 \le x \le \pi$, the x-coordinate of the point on the curve where the gradient is 1. 3

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2005 – Paper 1 - Question 10

(a) Express $\sin x - \sqrt{3}\cos x$ in the form $k\sin(x-a)$ where $k > 0$ and $0 \le a \le 2\pi$. 4

(b) Hence, or otherwise, sketch the curve with equation $y = 3 + \sin x - \sqrt{3}\cos x$ in the interval $0 \le x \le 2\pi$. 5

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2004 – Paper 2 - Question 6

(a) Express $3\cos(x°) + 5\sin(x°)$ in the form $k\cos(x° - a°)$ where $k > 0$ and $0 \le a \le 90$. 4

(b) Hence solve the equation $3\cos(x°) + 5\sin(x°) = 4$ for $0 \le x \le 90$. 3

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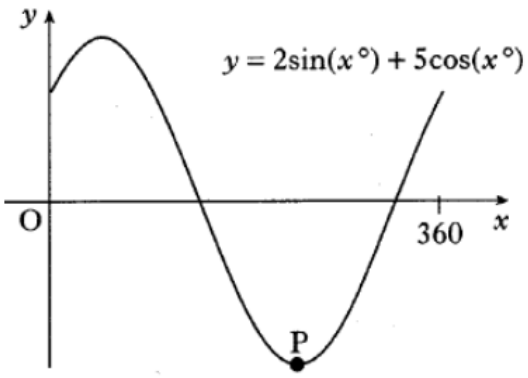
2003 – Paper 2 - Question 7

Part of the graph of $y = 2\sin(x°) + 5\cos(x°)$ is shown in the diagram.



(a) Express $y = 2\sin(x°) + 5\cos(x°)$ in the form $k\sin(x° + a°)$ where $k > 0$ and $0 \leq a < 360$. **4**

(b) Find the coordinates of the minimum turning point P. **3**

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2002 – Paper 2 - Question 9

(a) Write $\sin(x) - \cos(x)$ in the form $k\sin(x - a)$ stating the values of k and a where $k > 0$ and $0 \leq a \leq 2\pi$. **4**

(b) Sketch the graph of $y = \sin(x) - \cos(x)$ for $0 \leq x \leq 2\pi$, showing clearly the graph's maximum and minimum values and where it cuts the x-axis and the y-axis. **3**

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2000 – Paper 2 - Question 10

Find the maximum value of $\cos x - \sin x$ and the value of x for which it occurs in the interval $0 \leq x \leq 2\pi$. **6**

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