7. **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

(i) Solve, for $0 \leqslant \theta < 180°$, the equation

$$7\sin 2\theta = 5\cos 2\theta$$

giving your answers, in degrees, to one decimal place.

(4)

(ii) Solve, for $0 \leqslant x < 2\pi$, the equation

$$24\tan x = 5\cos x$$

giving your answers, in radians, to 3 decimal places.

(5)

(Total for Question 7 is 9 marks)

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8. A curve has equation $y = (x + 2)^2(4 - x)$

The finite region R is bounded by the curve and the x-axis.

(a) Using algebraic integration and showing each step of your working, find the exact area of R.

(5)

(b) Using the answer to part (a) and explaining your reasoning, find the area of the finite region bounded by the curve with equation $y = (3x + 6)^2\left(2 - \frac{1}{2}x\right)$ and the x-axis.

(2)

(Total for Question 8 is 7 marks)

9. **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

(i) A car has five gears. Given that

- the maximum speed of the car in first gear is $22\,\text{km}\,\text{h}^{-1}$
- the maximum speed in each successive gear forms a geometric sequence
- the maximum speed of the car in fifth gear is $130\,\text{km}\,\text{h}^{-1}$

find the maximum speed of the car in second gear, giving your answer, in $\text{km}\,\text{h}^{-1}$, to one decimal place.

(4)

(ii) The first two terms of an arithmetic sequence are 208 and 207.2

Given that S_n is the sum to n terms,

(a) find the maximum value of S_n

(4)

(b) Hence or otherwise state the smallest value of N such that $S_N < 0$

(1)

(Total for Question 9 is 9 marks)

