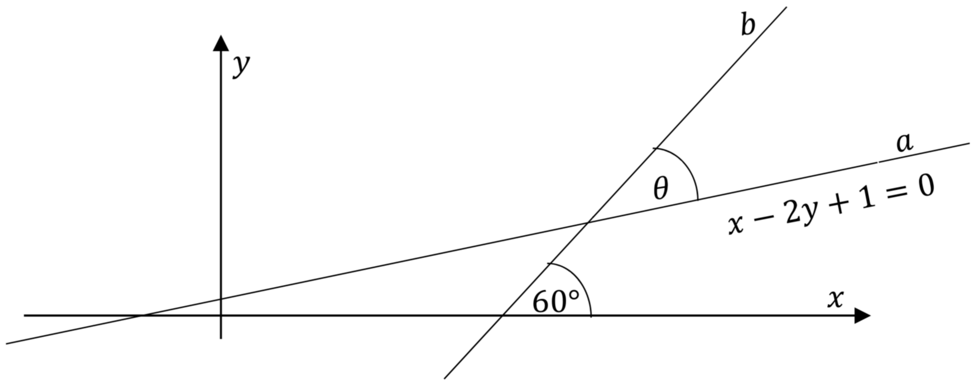
Question 1 **(25 marks)**

(a) The coordinates of three points are $A(2,-6)$, $B(6,-12)$, and $C(-4,3)$.
Find the perpendicular distance from A to BC.

Based on your answer, what can you conclude about the relationship between the points A, B, and C?

(b) The diagram below shows two lines a and b. The equation of a is $x-2y+1=0$.
The acute angle between a and b is θ. Line b makes an angle of $60°$ with the positive sense of the x-axis, as shown in the diagram.
Find the value of θ, in degrees, correct to 3 decimal places.



Q1	Model Solution – 25 Marks	Marking Notes
(a)	Slope of BC $m = \frac{3+12}{-4-6} = -\frac{3}{2}$ Equation BC $3x + 2y + 6 = 0$. Perp. Distance from A to line BC $\frac{3(2)+2(-6)+6}{\sqrt{3^2+2^2}} = \frac{6-12+6}{\sqrt{13}} = \frac{0}{\sqrt{13}} = 0$. Therefore A, B and C are collinear.	**Scale 15D (0, 4, 7, 11, 15)** *Low Partial Credit:* Slope formula with some substitution Equation of line formula with some substitution Effort at finding are of triangle ABC *Mid Partial Credit:* Equation of BC *High Partial Credit:* Perp. Distance formula with some substitution from relevant line Area of triangle $ABC = 0$ but perp. distance not explicit *Full credit* (*–1*) Distance $= 0$ but conclusion omitted Area of triangle $ABC = 0$ **and** perp. dist. $= 0$ but conclusion omitted

(b)	Slope of $a = \frac{1}{2}$ Slope of $b = \tan 60° = \sqrt{3}$ $\tan\theta = \pm\dfrac{\sqrt{3}-\frac{1}{2}}{1+\frac{\sqrt{3}}{2}} = \pm\dfrac{2\sqrt{3}-1}{2+\sqrt{3}}$ $= \pm\dfrac{(2\sqrt{3}-1)(2-\sqrt{3})}{(2+\sqrt{3})(2-\sqrt{3})}$ $= \pm(-8+5\sqrt{3})$ $\theta = \tan^{-1}(-8+5\sqrt{3})$ $\theta = 33{\cdot}435°$ **Or** $\theta + \tan^{-1}\frac{1}{2} + 120° = 180°$\` $\theta + 26{\cdot}565° + 120° = 180°$ $\theta = 33{\cdot}435°$	**Scale 10D (0, 3, 5, 8, 10)** *Low Partial Credit:* Slope of $a = \frac{1}{2}$ Slope of $b = \tan 60°$ *Mid Partial Credit:* Tan formula with some relevant substitution *High Partial Credit:* Tan formula fully substituted *Full credit* (–1) $\theta = +\tan^{-1}(-8+5\sqrt{3})$ **Scale 10D (0, 3, 5, 8, 10)** *Low Partial Credit:* Slope of $a = \frac{1}{2}$ 120° *Mid Partial Credit:* $\tan^{-1}\dfrac{1}{2} + 120°$ *High Partial Credit:* $\theta + 26{\cdot}565° + 120° = 180°$ and fails to finish