Question Number	Scheme	Marks
6. (a)	Identifies $h = 3$	B1
	Area = $\frac{3}{2}\{0+0+2(1.52+2.74+3.12+3.08)\}$	M1
	$= 31.38$ m^2	A1
		(3)
(b)	Calculates $"31.38"\times 1.5\times 60$	M1
	= awrt 2800 m^3	A1
		(2)
(c)	Underestimate with valid reason, e.g. area of trapezia are smaller than cross sectional area	B1
		(1)
		(6 marks)

(a)

B1: Identifies $h = 3$. This may be stated or implied by the sight of $\frac{\mathbf{3}}{2}\{....+2(...+...+...)\}$

M1: Correct method of finding area using the trapezium rule. The form of the rule is given so look for the form $\frac{3}{2}\{0+0+2(1.52+2.74+3.12+3.08)\}$ but you can condone slips on the digits of the heights, e.g 3.21 for 3.12. You may not see the zeros or the trailing $\}$ which is fine. The bracketing may be hard to decipher but the correct answer implies the method. If they state another value of h e.g. $\frac{15}{6}=2.5$ then look for $\frac{2.5}{2}\{0+0+2(1.52+2.74+3.12+3.08)\}$ condoning slips. If h is not stated, then this mark can be implied by $\frac{...}{2}\{0+0+2(1.52+2.74+3.12+3.08)\}$ condoning slips.

Condone an attempt using two triangles and three trapezia. Use the same criteria for this award. The area of any triangle and the area of any trapezium must be found from a correct formula.

A1: Accept 31.38 or awrt 31.4 (m^2) following correct expression for area.

Units are not necessary. The exact fractional answer is $\frac{1569}{50}$ is also acceptable

As the area is below the axis, a minority of candidates are taking h or the y values to be negative. This is fine for the first two marks and all three marks provided the modulus is taken.

(b)

M1: Attempts their (a) $\times 1.5\times 60$ or equivalent such as their (a) $\times 90$

A1: AWRT 2800 m^3 Units are not necessary

(c)

B1: States **underestim**ate AND gives a **valid reason**.

The reason, in almost all cases, should explicitly compare the area of the trapezia with the shaded area.

All reasons must make some reference to 'trapezia' or 'area of a trapezium'

The Figure could be used to explain their reasoning so look carefully at what the candidate states

Condone 'the trapezia are smaller than the cross section'

'the bottom lines of the trapezia are above the curve'

'the curve is above the lines of the trapezia' (remember the y axis is pointing down)

Do not accept any reference to convex or concave without further clarification.

Merely stating " the area we get from the trapezium rule is less than the shaded area" is too vague. There needs to be some explanation of why it is an underestimate, not just the fact that it is.

Question Number	Scheme	Marks
7(a)	States or implies that gradient $XN = -\frac{2}{5}$	B1
	Uses $(4,-3)$ with a gradient of $\pm\frac{2}{5}$ to form equation of XN	M1
	$y+3=-\frac{2}{5}(x-4)$	
	$5y+15=-2x+8 \Rightarrow 2x+5y+7=0$ *	A1*
		(3)
(b)	(i) Solves $2x+5y+7=0$ and $y=\frac{5}{2}x-\frac{55}{2} \Rightarrow x=...,y=...$	M1
	$N=(9,-5)$	A1
	(ii) Attempts $("9"-4)^2+("-5"+3)^2$	M1
	Correct form of equation E.g. $(x-4)^2+(y+3)^2=("9"-4)^2+("-5"+3)^2$	M1
	$(x-4)^2+(y+3)^2=29$	A1
		(5)
		(8 marks)

(a) **This is a given answer so be careful of students who work backwards.**

B1: States or implies that gradient $XN = -\frac{2}{5}$ o.e such as -0.4

This cannot be scored from candidates who show you they are just working back from the given answer.

M1: Uses $(4,-3)$ with a gradient of $\pm\frac{2}{5}$ o.e. to form equation of XN

E.g $\pm\frac{2}{5}=\frac{y-(-3)}{x-4}$. If the form $y=mx+c$ is used look for $-3=\left(\pm\frac{2}{5}\right)\times 4+c$ leading to c = ...

A1*: Shows sufficient working and proceeds to $2x+5y+7=0$. There should be one correct line showing working between $y+3=-\frac{2}{5}(x-4)$ and $2x+5y+7=0$, for example $5y+15=-2x+8$

If $y=mx+c$ is used expect to see $c=-\frac{7}{5}$ and $y=-\frac{2}{5}x-\frac{7}{5}$ before $2x+5y+7=0$.

Note that this is a given answer so there cannot be incorrect work used leading to this answer.

(b)(i)

M1: Attempts to solve $2x+5y+7=0$ and $y=\frac{5}{2}x-\frac{55}{2}$ leading to $x=...,y=...$

Allow the values to be just written down, for example via use of a calculator

A1: $N=(9,-5)$ which may be written $x=9, y=-5$