Question Number	Scheme	Marks
2 (a)	$(2-5x)^8 = 2^8 + {}^8C_1(2)^7(-5x)^1 + {}^8C_2(2)^6(-5x)^2 + {}^8C_3(2)^5(-5x)^3 + \ldots$	
	Constant term 2^8 OR 256	B1
	Correct form for terms 3 or 4: ${}^8C_2(2)^6(\pm 5x)^2$ or ${}^8C_3(2)^5(\pm 5x)^3$	M1
	Correct un-simplified expansion for 2 out of 3 terms from terms 2, 3 and 4: $\ldots + 8(2)^7(-5x)^1 + 28(2)^6(-5x)^2 + 56(2)^5(-5x)^3 + \ldots$	A1
	Correct simplified expansion $256 - 5120x + 44800x^2 - 224000x^3 + \ldots$	A1
		(4)
(b)	-0.01	B1
		(1)
		(5 marks)

(a)

B1: Correct constant term, 2^8 OR 256. It must be on its own and not as ${}^8C_8 2^8$ for example

M1: Correct form for term 3 or term 4. Allow with C notation (o.e).
Examples of correct forms include:
For term three ${}^8C_2(2)^6 \times (-5x)^2$ and $28 \times 64 \times \pm 25x^2$
For term four $\binom{8}{3} \times (2)^5 \times -125x^3$ and $\pm 224000x^3$
Condone a missing sign or bracket. So, allow terms such as ${}^8C_2(2)^6 \times 5x^2$ and $56 \times (2)^5 \times 125x^3$
Look for the correct binomial coefficient, the correct power of 2 and the correct power of x on $5x$

A1: Two out of three correct un-simplified (or simplified) terms from terms 2, 3 or 4
$\ldots + 8(2)^7(-5x)^1 + 28(2)^6(\pm 5x)^2 + 56(2)^5(-5x)^3 + \ldots$
The binomial coefficient must now be numerical.

A1: $256 - 5120x + 44800x^2 - 224000x^3 + \ldots$ which must be in simplest form.
Accept $256 + -5120x + 44800x^2 + -224000x^3 + \ldots$ or a list $256, -5120x, 44800x^2, -224000x^3$.
Withhold this mark if they decide to divide by 4 for example, but condone the sight of extra terms, for example in x^4 or higher.

(b)

B1: -0.01 o.e. such as $-\frac{1}{100}$. This must be clearly stated and not embedded in the $(2-5x)^8$
Ignore any attempts to calculate the result

Alt to (a) via a common factor

B1: Takes out a common factor of 2, scored for $2^8(1\pm kx)^8$

M1: Correct "form" for terms 3 or 4 in expansion of $\left(1-\frac{5}{2}x\right)^8$. Look for $\frac{8\times 7}{2}\left(\pm\frac{5}{2}x\right)^2$ or $\frac{8\times 7\times 6}{3!}\left(\pm\frac{5}{2}x\right)^3$

As with the main method, condone missing brackets etc. Condone with C notation as in main scheme.

A1: Correct simplified or unsimplified expansion of $\left(1-\frac{5}{2}x\right)^8$ FYI it is $1-20x+175x^2-875x^3+...$

A1: $256-5120x+44800x^2-224000x^3+....$ Accept as a list.

Question Number	Scheme		Marks
	OPEN TOPPED	**CLOSED CONTAINER**	
3.(a)	$120=3x^2y \Rightarrow y=\dfrac{40}{x^2}$	$120=3x^2y \Rightarrow y=\dfrac{40}{x^2}$	M1, A1
	$A=3x^2+8xy$	$A=6x^2+8xy$	
	$=3x^2+8x\times\dfrac{40}{x^2}=3x^2+\dfrac{320}{x}$	$=6x^2+8x\times\dfrac{40}{x^2}=6x^2+\dfrac{320}{x}$	dM1, A1
			(4)
(b)	$\dfrac{\mathrm{d}A}{\mathrm{d}x}=6x-\dfrac{320}{x^2}$	$\dfrac{\mathrm{d}A}{\mathrm{d}x}=12x-\dfrac{320}{x^2}$	M1, A1ft
	$\dfrac{\mathrm{d}A}{\mathrm{d}x}=6x-\dfrac{320}{x^2}=0$	$\dfrac{\mathrm{d}A}{\mathrm{d}x}=12x-\dfrac{320}{x^2}=0$	
	$\Rightarrow x^3=\dfrac{160}{3}\Rightarrow x=$ awrt 3.76	$\Rightarrow x^3=\dfrac{80}{3}\Rightarrow x=$ awrt 2.99	dM1, A1
			(4)
(c)	Attempts $\left.\dfrac{\mathrm{d}^2A}{\mathrm{d}x^2}\right\|_{x=3.76}=6+\dfrac{640}{x^3}$	Attempts $\left.\dfrac{\mathrm{d}^2A}{\mathrm{d}x^2}\right\|_{x=2.99}=12+\dfrac{640}{x^3}$	M1
	$=6+\dfrac{640}{3.76^3}=..$	$=12+\dfrac{640}{2.99^3}=..$	
	$\left.\dfrac{\mathrm{d}^2A}{\mathrm{d}x^2}\right\|_{x=3.76}=$ awrt $18>0$ MINIMUM*	$\left.\dfrac{\mathrm{d}^2A}{\mathrm{d}x^2}\right\|_{x=2.99}=$ awrt $36>0$ MINIMUM*	A1*
			(2)
			(10 marks)

Note that candidates may be confused regarding open topped or closed container so both cases can potentially score full marks if the case is consistently applied.

(a)

M1: Sets $120=k\,x^2y$ o.e such as $120=k\,x\times x\times y$

A1: $y=\dfrac{40}{x^2}$ or $xy=\dfrac{40}{x}$ or equivalent such as $y=\dfrac{120}{3x^2}$

It can be scored from an embedded expression within an attempt at A.

It can be implied following a correct $120=3x^2y$ o.e. and a correct expression for A in terms of x

dM1: Achieves an expression of the form $(A=)\,px^2+qxy,\ p,q>0$ **AND** substitutes in their y or xy of the form $y=\dfrac{K}{x^2}$ or $xy=\dfrac{K}{x}$ which may be implied by a correct expression for A in terms of x

A1: Achieves the answer of Area / $A=3x^2+\dfrac{320}{x}$ **or** Area/ $A=6x^2+\dfrac{320}{x}$

Open Container *Closed Container*

The LHS A = or an equivalent such as 'Area =' must appear at some point.
Condone A appearing, for example, as SA or S or Area (of sheet metal) or other but a LHS must be seen.