

Question	Scheme	Marks	AOs
9 (a)	117 tonnes	B1	3.4
		(1)	
(b)	1200 tonnes	B1	2.2a
		(1)	
(c)	Attempts $\{1200 - 3 \times (5 - 20)^2\} - \{1200 - 3 \times (4 - 20)^2\}$	M1	3.1a
	93 tonnes	A1	1.1b
		(2)	
(d)	States the model is only valid for values of n such that $n \leq 20$	B1	3.5b
	States that the total amount mined cannot decrease	B1	2.3
		(2)	

(6 marks)

Notes

Note: Only withhold the mark for a lack of tonnes, once, the first time that it occurs.

(a)

B1: 117 tonnes or 117 t.

(b)

B1: 1200 tonnes or 1200 t.

(c)

M1: Attempts $T_5 - T_4 = \{1200 - 3 \times (5 - 20)^2\} - \{1200 - 3 \times (4 - 20)^2\}$ May be implied by 525 - 432

Condone for this mark an attempt at $T_4 - T_3 = \{1200 - 3 \times (4 - 20)^2\} - \{1200 - 3 \times (3 - 20)^2\}$

A1: 93 tonnes or 93 t

(d)

For one mark

Shows an appreciation of the model

- States $n \leq 20$ or $n < 20$
- Condone for one mark $n \leq 40$ or $n < 40$ **with** "the mass of tin mined cannot be negative" oe
- Condone for one mark $n = 40$ **with** a statement that "the mass of tin mined becomes 0" oe
- after 20 years the (total) amount of tin mined starts to go down (n may not be mentioned and total may be missing)
- after 20 years the (total) mass reaches a maximum value. (Similar to above)
- States T_{max} is reached when $n = 20$

For two marks

States the limitation on n and explains fully. (Total mass, not mass must be used)

- States that $n \leq 20$ and explains that the total mass of tin cannot decrease.
- Alternatively states that n cannot be more than 20 and the total mass of tin would be decreasing
- $0 < n \leq 20$ as the maximum total amount of tin mined is reached at 20 years