

Question	Scheme	Marks	AOs
7(a)	$P = -175^2 + 260 \times 175 - 16450$	M1	3.4
	$= -1575 \therefore$ not sensible as the company would make a loss	A1	2.4
		(2)	
(b)	$-x^2 + 260x - 16450 = 200$ $\Rightarrow x^2 - 260x + 16650 = 0 \Rightarrow x = \dots$	M1	3.1b
	$(114.19 <) x < 145.81$	dM1	1.1b
	Maximum Price = £145.81	A1	3.2a
		(3)	
(c)	$-x^2 + 260x - 16450 = -(x \pm k)^2 \pm \dots$ or $b = -1$	B1	1.1b
	$-x^2 + 260x - 16450 = -(x - 130)^2 \pm \dots$ or $b = -1$ and $c = -130$	M1	1.1b
	$(P =) 450 - (x - 130)^2$	A1	1.1b
		(3)	
(d)(i) (ii)	States maximum profit = £450 000	B1	3.2a
	States selling price £130	B1	2.2a
		(2)	

(10 marks)

Notes:

Look for answers written in the question or on Figure 3

(a)

M1: Substitutes $x = 175$ into $P = -x^2 + 260x - 16450$ to find a value for P .

This is implied by an answer of -1575 .

Alternatively attempts to find the solutions of $-x^2 + 260x - 16450 = 0$ usual rules apply so a method must be seen or the correct roots stated (these are 108.78... and 151.21...) and compares with 175 which may be implied.

A1: Finds $P = -1575$ and states that $P < 0$ which may be implied **and** explains that the company would make a loss/negative profit, the profit is negative, the company will not make any money.

Condone suggestions that the loss is £1575 rather than £1 575 000

or obtains the larger root as awrt 151, compares $175 > 151$ and states that $P < 0$ which may be implied **and** explains that the company would make a loss/would not make a profit.

Explanations that are incomplete or incorrect score A0 e.g.

- the profit **cannot** be negative (because it can)
- they **might** make a loss (because they will make a loss)
- **it** is negative (without saying what **it** is)

You may ignore any misconceptions or reference to the price of the chair being too cheap for this mark.

Attempts to find the turning point score no marks unless there is some consideration of the profit when $x = 175$

(b)

M1: Uses $P \dots 200$ where \dots is any inequality or $=$ with $P = -x^2 + 260x - 16450$ and proceeds to at least one value for x via a correct method which may be via calculator (you may need to check) and may be inexact.

dM1: Award for solving to find two **positive** values for x . Allow decimal answers or surds.

FYI correct answers are $\frac{260 \pm \sqrt{1000}}{2}$ or $130 \pm 5\sqrt{10}$ or 114/146

or if only one value of x is seen, this must be the higher value for their quadratic which must have 2 positive solutions (you may need to check).

e.g. for the correct quadratic $130 + 5\sqrt{10}$ or 145.81/145.82/145.8/146

A1: Deduces that the maximum price is £145.81 with units. Allow £145.81p
£145.82 is not acceptable and if both values are given score A0.

There must be some evidence of the correct equation being solved but condone incorrect inequalities appearing in their working.

(c) Allow to score anywhere in the question.

Note that some candidates use $200 = -x^2 + 260x - 16450$ in (c) and attempt to complete the square on this. In these cases allow the B mark and the M mark as defined below.

B1: Achieves $-(x \pm k)^2 \pm \dots$ or states that $b = -1$

M1: Achieves $-(x - 130)^2 \pm \dots$ or states $b = -1$ and $c = -130$

A1: $\{P =\} 450 - (x - 130)^2$ or e.g. $\{P =\} -(x - 130)^2 + 450$ or e.g. $\{P =\} 450 - 1(x - 130)^2$

Must be simplified e.g. not $\{P =\} -16450 + 16900 - (x - 130)^2$

Note that this may be done in a variety of ways including equating with the expanded form of $a + b(x + c)^2 = bx^2 + 2bcx + bc^2 + a$

Correct answer only scores full marks. If there is incorrect/muddled working, mark their final answer.

If there is no labelling in (d), mark in the order presented.

(d)(i)

B1: Maximum profit = £450 000 with units. Accept 450 thousand pounds or £450k
This is an independent mark so could follow incorrect work in (c).

(d)(ii)

B1: Selling price = £130 with units.
This is an independent mark so could follow incorrect work in (c).

Note: Missing units from an otherwise correct answer should only be penalised **once** in (b) or (d) and penalise it the first time it occurs.