The Cost of Impatience
A note to teachers:

This is a simple, fascinating financial mathematics investigation, the results to which many students find 'shocking'. Of most surprise is the actual cost of a loan.

It is also an investigation that can be enormously enjoyable for the teacher to deliver. For this reason a teacher-directed delivery may be most appropriate.

If you are not yet familiar with TVM mode you may like to first work through 'Self-Guided_9860_TVM' which is at www.casioed.net.au

NOTE: If you desire to modify this activity and therefore desire the original word document you may request it by emailing casio.edusupport@shriro.com.au.
The Cost of Impatience!

Financial Investigation  A 5 year car loan

It is late 2009. You left school in 2008, have been working for a year and you really want a car. Not just an old 'bomb'. You want something a little impressive without being too expensive. You really want a second hand Alfa Romeo 147 GTA Hatch (Pictured). You have found one for $30 000. The bank will loan you the money as long as someone trustworthy will be a guarantor for the loan. After some convincing talk your … ('father', 'mother', 'uncle', etc) has agreed to be your guarantor.

The conditions of the loan are:

- **Loan:** $30 000
- **Interest:** 12% pa compounding weekly
- **Duration:** 5 years
- **Repayments:** weekly
You get your loan and collect your Alfa Romeo. You are a happy camper!!
When answering these questions you are to show full working. When using TVM you need to write down the entire screen and indicate in each case which value you are calculating.

1) Using TVM, calculate the size of your weekly repayments.

2) Using VARS to transfer you PMT into RUN mode, calculate the amount of interest you will have paid over the duration of the loan.

3) You finally pay off the car in 2014. How much more have you paid for the car compared to paying $30 000 cash for it in 2009. ie How much has your impatience cost you?
4) What is the 'cost of impatience' (in Q3) as a percentage of the loan?

BUT WHAT IF YOU COULD WAIT 5 YEARS?
(Let’s assume that in 5 years time an equivalent car will cost $32000)

5) Use TVM to calculate the amount needed to save per week at 6% pa interest compounding weekly for 5 years to accumulate $32 000? (The 'future' cost of the car)
6) What if you invested the original loan repayment amount ($150 pw) for 5 years, and then bought a similar car (of cost $32 000). How much would have you have saved in addition to the $32 000 required for the car? ie How much has PATIENCE saved you in this case? (use VARS to copy the new FV across to RUN for the last calculation)

7) Express the saving (calculated in Q6) as a percentage of the cost of the car ($32 000).

8) By comparing the 'extra cost' of taking out the 5 year loan (answer Q3) to the saving incurred through investing the $150 pw for 5 years (answer 6) calculate the total 'cost of impatience'.

9) Calculate the total 'cost of impatience' as a percentage of the original cost of the car (to 3sf).
10) Discuss with the class the extra costs associated with saving for the car when compared to buying the car with a loan (and vice-versa).

### The Cost of Impatience – Screenshot Instructions and Solutions

<table>
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<tr>
<th>Instructions</th>
<th>Screenshots</th>
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<tr>
<td><strong>NOTE:</strong> these screenshots are generated in Linear Input mode. To ensure your calculator is in <strong>Linear Input mode</strong> Go to RUN (MENU then 1) then SET UP (SHIFT MENU). The cursor will be at Input Mode. <strong>Press F2</strong> (Linear)</td>
<td><img src="image1" alt="Fig1" /></td>
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<tr>
<td>Refer to 'Self-Guided_9860_TVM' for detailed TVM instructions if necessary.</td>
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<tr>
<td>Q1) <strong>Enter the values into TVM as per Fig1.</strong> NOTE: The '11111111' entry for PMT mean that the number appearing at PMT is irrelevant - because it will be over-written by the solution.</td>
<td><img src="image2" alt="Fig2" /></td>
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<tr>
<td><strong>Press PMT (F4)</strong> (Fig2) The weekly payments are $153.57</td>
<td><img src="image3" alt="Fig3" /></td>
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<td><strong>NOTE:</strong> The RUN screenshots display the Linear (not Math) Input Mode. To set RUN to Linear: <strong>Enter RUN (MENU 1), go to SET UP (SHIFT MENU), press Linear (F2).</strong></td>
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<td>Q2) Total interest paid: <strong>Press MENU, arrow to RUN</strong> (Fig3).</td>
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Press EXE then VARS key then \( \text{\textbullet} \) (F6) (Fig4)

Press TVM (F4) then press PMT (F4) (fig5)

Press EXE (Fig6). The payment value has been transferred into RUN.

To change the negative value to a positive, multiply by -1 (Fig7).
To calculate the interest, **multiply the weekly payments by 'n' (F1)** (ie 260 weeks) and **subtract PV (F3)** (the value of the loan) **Press EXE** (Fig8).

Total interest paid = $9928.23

Q3) ANS = the amount interest ie $9928.23

Q4) The cost of impatience as a percentage of the loan: **divide by PV (F3)** (ie 30 000) x 100

ANS = 33.1% !! (Fig9)

Q5) **Return to TVM mode and enter the values as per Fig10** NOTE: The PMT value exists from the last calculation. It is irrelevant now.

**Press PMT (F4)** (Fig11)

Weekly payments = $105.61 pw

Q6) **Press EXIT. Change PMT to -150** (Fig12) Press FV (F5).
You would have $45 451 after 5 years (Fig13)

Q6 cont) The amount saved in addition to $32 000:
Press MENU 1 VARS (F6) TVM (F4) FV (F5) - 32000 EXE (Fig14)

ANSWER: This is $13 451 more than $32 000 !!!

Q7) Press ÷ 32000 x 100 EXE
ANSWER: 42% !!!(Fig15)

Q8) Total 'Cost of Impatience' is $23 379 !!! (Fig16)
9Q) Cost of Impatience as a percentage of the original cost of the car = 77.9% !! (Fig 17)

Q10) If saving for the car: public transport costs (but no running costs).
If buying the car with a loan: running costs of the car – fuel, registration, insurance, servicing, tyres (but no public transport costs).

Footnote: Some teachers question whether the extra cost of the loan (Q3) can technically be added to the extra money saved through investing (Q6) to make up the 'Total Cost of Impatience'; that each should only be compared to paying cash for the car. However, the rationale for combining the two lies with assuming the buyer cannot pay cash for the car thereby generating the 'Total Cost of Impatience' by comparing the impatient scenario (loan) to the patient scenario (investing).