

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@shiro.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

4) What is the 'cost of impatience' (in Q3) as a percentage of the loan?

BUT WHAT IF YOU COULD WAIT 5 YEARS?

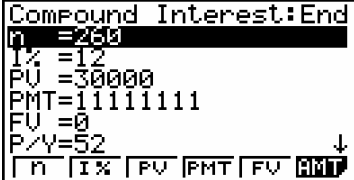
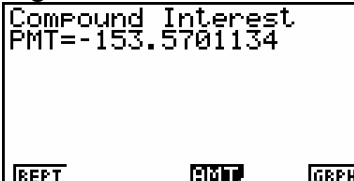
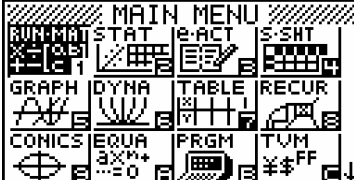
(Let's assume that in 5 years time an equivalent car will cost \$32000)

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 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

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

Press EXE then VARS key then  (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).

Fig4




Fig5




Fig6

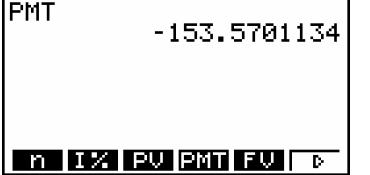
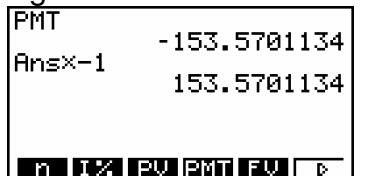


Fig7



You would have \$45 451 after 5 years (Fig13)

Q6 cont) The amount saved in addition to \$32 000:

Press MENU 1 VARS \leftarrow (F6) TVM (F4) FV (F5) - 32000 EXE (Fig14)

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

Q7) **Press \div 32000 x 100 EXE**

ANSWER: 42% !!(Fig15)

Q8) Total 'Cost of Impatience' is \$23 379 !!! (Fig16)

Fig13

```
Compound Interest
FU =45451.29913

[REPT]      [AMT]      [GRPH]
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Fig14

```
FU-32000      13451.29913

[n] [I%] [PV] [PMT] [FV]  $\leftarrow$ 
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Fig15

```
FU-32000      13451.29913
Ans+32000x100  42.03530978

[n] [I%] [PV] [PMT] [FV]  $\leftarrow$ 
```

Fig16

```
FU-32000      13451.29913
Ans+32000x100  42.03530978
9928+13451      23379

[n] [I%] [PV] [PMT] [FV]  $\leftarrow$ 
```

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).

Fig17

Ans+32000×100	13451.29913
9928+13451	42.03530978
Ans+30000×100	23379
	77.93
n	I%
PV	PMT
FV	▢