Year 9 Simple Interest Notes for Hearing Impaired Students

Where is Simple Interest used in the real world?

Well… that's a really good question!

Interest is the 'price' you pay for borrowing money from someone.

Basically, if you borrow money (for example, by taking out a loan or buying things on a credit card to pay back later), then you will be *charged* interest – an extra amount 'on top' of what you borrow – as the 'price' charged by whoever has lent you that money.

Similarly, if you put money in a savings or 'investment' account with a bank or other financial institution, essentially you are lending them money. (You may be surprised to learn that they actually take your money and then lend that out to other people – and charge them interest!) The interest you *earn* on a savings account is what the bank pays you for effectively lending them your hard-earned dollars.

However, not really too many places use **simple interest** to calculate interest charges or earnings in Australia today. Mostly, banks and other financial institutions charge – and pay – compound interest on their loans and savings or investment products.

However, they do say 'you have to walk before you can run' – so too is it a good idea to learn how **simple interest** works *before* looking at compound interest – which is a bit more complicated.

So, here we've just mentioned some of the different ways in which interest in general – either simple OR compound – is charged, or paid, in Australia.

(A) Loans from banks and other financial institutions.

Banks and other lenders charge interest on the loans they make to individuals – like you and I – as well as to other businesses. Interest is charged on those loans as a fee for the service of being provided the loan. Repayments of the loan usually include repayments of the 'principal' (the initial amount of the loan) as well as of the interest.

Loans from banks are for a wide range of things, including home loans ('mortgages'), business loans, loans for consumer items such as cars or new furniture as well as special banking products such as 'overdrafts' and other credit facilities.

(B) Credit cards and other credit facilities

A 'credit facility' is an arrangement with a lender to allow someone to purchase goods and services 'now' and pay for those goods and services later. Essentially, the provider of the credit facility is lending money to the purchaser – and so interest is charged on the amount of the purchase, and the outstanding balance until it is paid off in full.

Credit cards are perhaps the most common form of credit facility. When you spend money on a credit card, essentially you are taking out a loan and so you pay back that money you have spent with interest. Banks, finance companies and even companies can issue credit cards to people if they have a license to do so.

It's important to realise that money spent with a credit card is by no means 'free money' – it must be repaid later with interest – and often, the interest rates on credit cards can be quite high.

(C) Savings accounts with banks and financial institutions

On the flip side of borrowing money and paying interest, most people and businesses have accounts with banks and other financial institutions in which they deposit money (or have their earnings deposited). Many such accounts are called 'savings accounts' because they encourage people to accumulate money as savings in the accounts over time by paying them interest as a reward for doing so.

Banks use peoples' and business' savings by lending them out to other people as loans. They make their money by charging higher interest on the loans they provide than the interest they pay depositors for their savings; the difference in these interest rates is what gives them their profit.

Depositors can still withdraw their savings at any time because at any point in time there are fewer people withdrawing their funds from accounts than there are depositors making these funds available, and because in countries like Australia the government guarantees peoples' savings in banks to ensure a safe and stable banking system.

(D) Interest on Financial Investments

In addition to earning interest on deposits in savings accounts, people can earn interest by buying investment products issued by business firms and even governments like bonds, promissory notes and other special 'financial instruments'. Such products are sold in set amounts that are usually quite large such as in tens, thousands or even millions of dollars. They are paid back to investors after a set period, from 12 or 24 months to sometimes up to 10 years.

The money used to buy these investment products is usually used for very specific purposes such as paying for government spending or building a new factory, airline or hospital. When they finish or 'mature', the investor is paid back the full amount of their initial investment along with a guaranteed amount of interest which is known as the 'yield'.

Calculating Simple Interest

Simple interest is calculated using the formula $\boldsymbol{I = PRT}$ where:

- $\boldsymbol{I}$ is the amount of interest paid (or earned) in total;
- $\boldsymbol{P}$ is the principal, in other words, the amount of the initial loan or sum invested. Thus, for a loan of \$10,000, $\boldsymbol{P}$ = 10 000;
- $\boldsymbol{R}$ is the interest rate *per time period* (expressed as a fraction or decimal), derived from an interest rate (e.g. a '3.5% per annum' ('per year') interest rate would mean that $\boldsymbol{I}$ = 0.035 per annum); and
- $\boldsymbol{T}$ is the number of time periods in the loan.

Note that if $\boldsymbol{T}$ is not a time period expressed in *years*, then the rate $\boldsymbol{R}$ should also not be expressed as a 'per annum' ('per year') interest rate.

For example, if a loan period $\boldsymbol{T}$ is given as '18 months' but at '3.5% per annum', then we need to convert that rate into a monthly rate to find $\boldsymbol{R}$. There are 12 months in a year, and so in this case:

T = 18, and

R = (0.035 ÷ 12) = 0.00291$\dot{6}$

Similarly, if a rate of interest is given as a 'per annum' rate and the time periods T are given in weeks, then R should be the annual rate (expressed as a decimal) divided by '52', because there are 52 weeks in a year.

Example 1:

Calculate the simple interest paid (I) on a $6,500 loan made over 30 months at 4.5% per annum.

Answer:

P = $6 500

R = (0.045 ÷ 12) = 0.00375

T = 30

$I = PRT$

= 6 500 x 0.00375 x 30

= $731.25

In many cases, we'll need to find variables other than I (the amount of interest) to solve a simple interest problem.

Because we have our formula $I = PRT$, we can find any of these other variables (P, R or T) simply by rearranging the $I = PRT$ equation and using some careful mathematical reasoning.

Let's look at our second example of calculating simple interest to see how this might be done.

Example 2:

Calculate the *per annum* rate of simple interest (R) I am earning on my savings account if I deposited $2,250 in my account on 1st February 2019, and on 31st May 2020 I had $2,317.50 in my account (without having made any other deposits).

Answer:

Firstly, we need to find out the amount of interest (I) this was. The intial deposit was $2,250 and so the total interest earned was

I = 2 317.50 – 2 250

= $67.50

Secondly, we need to know the number of months (T) the deposit was in the account.

1st Feb 2019 to 31st Jan 2020 is 12 months, then we have another 4 on top of this to take us to 31st May.

So, T = (12 + 4) = 16 months

Finally, our simple interest formula is $I = PRT$.

We know what I is, and so we need to rearrange this formula to find the rate we've earned, i.e. 'R'.

Rearranging by dividing both sides by P x T (or 'PT'), we get:

$$\frac{I}{PT} = \frac{PRT}{PT}$$

$$\therefore \quad R = \frac{I}{PT}$$

So, in this example,

$$R = \frac{67.50}{2250 \text{ x } 16} = (67.50 \div 36\,000) = 0.001875 \text{ (or } 0.1875\%)$$

Note that this rate R is a monthly rate – and were asked for an annual rate (or 'rate per annum).

So, per annum R = 0.001875 x 12

0.0225

Thus, the rate earned was 2.25% per annum.

Apply the simple interest formula to solve problems related to investing money at simple interest rates

In this section, we'll apply the simple interest formula to solve problems such as finding the total value of a simple interest investment after a given time period, or calculating the principal or time needed to earn a particular amount of (simple) interest.

In the questions that follow, you'll need a calculator, some working paper and a pencil or pen for working out.

If you don't get the correct answer, just review your working carefully and, if necessary, go back over the 'Calculating Simple Interest' section.

Simple Interest – The Quiz!

Q1: $2000 is invested at 6.75% p.a. simple interest for three years. How much interest will be earned over the three year period?

- ○ $1,000.00
- ○ $405.00
- ○ $135.10
- ○ $450.80

Q2: Tick the statements below that are TRUE:

- ☐ A bond is a type of financial investment product usually made at a fixed interest rate and for a set period of time.
- ☐ Most banks and financial institutions use simple interest to calculate loans and savings products.
- ☐ In simple interest calculations the interest rate 'per time period' must match the time period over which the interest is calculated (e.g. days, months or years).
- ☐ Banks pay higher interest on savings and investment accounts than they charge for loans.

Q3: Mali has taken out a business loan from a finance company for $12,000 repayable over a 36 month period at a rate of 8.5% p.a. simple interest. How much interest will she pay in the first year of the loan?

- ○ $3,060.00
- ○ $12,240.00
- ○ $4,080.00
- ○ $1,020.00

Q4: I have placed $1,500 in my *'no fees, no charges'* Super Saver account with the AussieTrust Credit Union. This account is paying a simple interest rate of 2.5% per annum.

If I leave it there with no further deposits and no withdrawals, what will be the amount in my account in 15 months time?
Round your answer to the nearest cent.

$ _____

Q5: Which of the following equations represents a formula for finding the value of T *(the number of time periods over which a loan or investment is made)*, for any given values of R *(simple interest rate)*, P *(Principal sum)* and I *(total interest earned / owed)*?

- $T = PRI$
- $T = I / PR$
- $T = IR / P$
- $T = P / [(R+1) \times 12]$

Q6: Find the principal borrowing amount P in each of these simple interest loans: (Match the answers to the questions by drawing connecting lines) the

Interest of $3,500 at 7% over 10 years	**$ 15,000 loan**
Interest of $4,320 at 4.8% over 6 years	**$ 5,000 loan**
Interest of $3,593.75 at 5.75% over 5 years	**$ 12,500 loan**

Q7: Scout has received $168,000 in total simple interest payments on an investment of $400,000 that she made six years ago. What per annum rate of simple interest has the investment firm been providing? *Round your answer to two decimal places if needed.*

[ ] % p.a.

Q8: Tamara cuts up her credit card but she has a remaining balance of $8,400.

If she pays the balance and the interest off over an 18 month period and the effective simple interest rate has been 6.85% per annum, how much per month has she been paying?

- $ 466.67
- $ 47.95
- $ 514.62
- $ 575.40

Q9: Max intends to live on the interest on an investment with the bank that as a fixed simple interest rate of 4.5%. He will receive $81,000 simple interest every year from the investment.

How much money must he have invested?

- $ 1,800,000
- $ 1,650,755
- $ 21,600,000
- $1,084,645

Q10: A bond is a type of fixed-term financial investment.

Use a calculator and complete the table below by matching up the simple interest rates, time periods and dollar amounts into the correct cell.

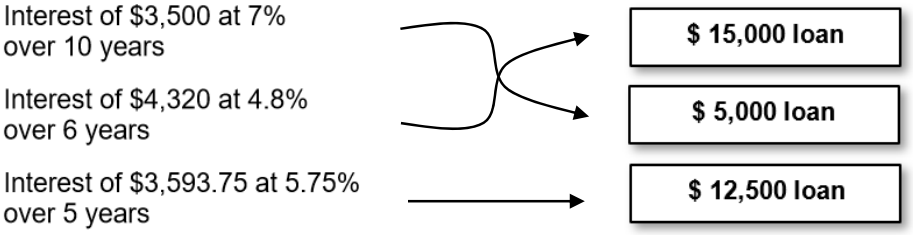
Principal Bond Value	Simple Interest Rate	Time Invested	Total Interest Earned
$120,000	7.5%	2 years	
$ 50,000		18 months	$ 4,125
$ 1,000,000		7 years	$ 612,500
$80,000	6.25%		$ 25,000
	4.8%	36 months	$ 2,880
$ 5,000	3.45%		$431.25

5.5% | 8.75% | 30 months | 5 years | $20,000 | $ 18,000

Quiz Answers:

1. (b) $405.00
2. Only the **first** and **third** statements are true.

   In the second statement, most banks and financial institutions usually use compound interest, not simple interest, for loans and savings accounts.

   In the fourth statement, the reverse is true, that is, banks pay lower interest on savings and investment accounts than they charge for loans – and in this way, they make a profit.
3. (d) $1,020.00
4. $1,546.88
5. (b) $T = I / PR$
6. 

7. 7% p.a. (or 7.00% p.a.)
8. (c) $514.62
9. (d) $1,800,000
10.

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$ 5,000	3.45%	30 months	$431.25