

14. [Financial Mathematics]

Skill 14.1 Minimising expenses - saving.

MM5.2 1 1 2 2 3 3 4 4
MM6.1 1 1 2 2 3 3 4 4

- Write number sentences from the information given.

Q. Kai's home content insurance direct debit is \$33.50 per month. How much does he save if he pays the up-front annual amount of \$340?

A. $\$33.50 \times 12 = \402

Calculate the total direct debit for 12 months.

$\$402 - \$340 = \$62$

Subtract the annual up-front amount from the total direct debit.

a) Litia saves \$5 per day for January. How much does she save the whole month?

January = 31 days

$31 \times 5 = \boxed{\$}$

b) Gerardo saves \$15 per day for November. How much does he save the whole month?

$\dots = \boxed{\$}$

c) How much can I save in 4 weeks if my pocket money is \$20 per week, and my expenses for 2 fortnights are as shown?

Expense	Cost
Sport	\$28
Entertainment	\$30
Clothes	\$15

$\dots = \boxed{\$}$

d) Which company has the cheapest car hire over 8 days?

Co.	Rates	Cost
A	Hire fee	\$75
	Daily rate	\$40
B	Hire fee	\$25
	Daily rate	\$60

$\dots = \boxed{\$}$

e) My car uses one litre of petrol every 10 km. Petrol costs me \$1.65 per litre. How much money would I save in one week, if I walk 2.5 km to and 2.5 km from work for 6 days?

$\dots = \boxed{\$}$

f) Lee buys 4 double and 2 single cones for \$16. The next day he buys 2 double and 4 single cones and pays \$14. How much is a double cone?

$\dots = \boxed{\$}$

g) Lu's home contents insurance direct debit is \$26.30 per month. How much does she save if she pays the up-front annual amount of \$250?

$\dots = \boxed{\$}$

h) Jo's car insurance direct debit is \$76.40 per month. How much does he save if he pays the up-front annual amount of \$820?

$\dots = \boxed{\$}$

Skill 14.2 Estimating outcomes.

MM5.2 1 1 22 33 44
MM6.1 1 1 22 33 44

- Round where appropriate to the nearest whole numbers or multiples of 10.
- Create an equation from the information given.
- Calculate, where necessary, the percentage of the given amount.
(see skills 6.3, page 61 and 6.4, page 62)

Q. A toothpaste box weighs 8.01 g. Estimate how many would be required to make 1 kg of recyclable waste?	A. $8.01 \approx 8$ $1000 \div 8$ $= 125$	Round 8.01 to 8 g. 1 kg = 1000 g It would take 125 toothpaste boxes to make 1 kg of recyclable waste.
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- a)** A dinner costs \$49.90. You tip 6%.
Estimate the size of the tip.

$$49.9 \approx 50 \text{ so } \frac{6}{100} \times \frac{50}{1} = \text{---Simplify: } \div 10$$

$$= 30 \div 10$$

$$= \boxed{\$}$$

- b)** You weigh 44.8 kg. If you gain 3% of your body weight, estimate your weight gain.

$$= \boxed{\text{kg}}$$

- c)** Advertising costs contribute 10% of the \$25 050 development. Estimate the cost of advertising.

$$= \boxed{\$}$$

- d)** Your backyard is 124.6 m² of which 12% is playground. Estimate the size of your playground.

$$= \boxed{\text{m}^2}$$

- e)** Concert tickets were \$149.95 until you found the internet discount of 12%. Estimate the savings if you buy online.

$$= \boxed{\$}$$

- f)** There are an estimated 8 000 000 species of insects in the world of which 24% are beetles. Estimate the number of beetle species.

$$= \boxed{}$$

- g)** Approximately two thirds of Julie's income of \$48 249 is spent on bills. Estimate the amount spent on bills.

$$= \boxed{\$}$$

- h)** A best-selling musician has sold 138.5 million albums. Estimate the number of albums that will need to be sold to reach 145 million.

$$= \boxed{}$$

- i)** At present, New Zealand has a passport possession rate of around 75% of the population. Estimate the number of New Zealand passports, if the population is about 4 500 000.

$$= \boxed{}$$

- j)** Dad donates half a round of golf. You pay the remaining \$19.85 for the round. Estimate the cost of a full round of golf.

$$= \boxed{\$}$$

Skill 14.3 Calculating percentages including GST and lay-bys.

MM5.2 1 1 2 2 3 3 4 4
MM6.1 1 1 2 2 3 3 4 4

- Write a number sentence from the information given.
- Calculate the percentage of the given amount. (see skills 6.3, page 61 and 6.4, page 62)

Q. The computer cost \$3450 including GST. If the GST is 15%, how much GST was included in the cost?

A. $GST = 15\%$
 $cost\ including\ GST = 100\% + 15\% = 115\%$
 $\Rightarrow \$3450 = 115\%$
 $\Rightarrow GST = \$3450 \div 11.5 = \300
 $\Rightarrow cost\ excluding\ GST = \$3450 - \$300$
 $= \$3150$

a) A TV was repaired for \$200, then a 15% GST was added to the price. What was the total cost of the TV repairs?

$$\frac{15}{100} \times \frac{200}{1} = 30 \quad \text{--- Simplify: } \div 100$$

$$200 + 30 = \$ \boxed{}$$

b) Archie leaves an extra 5% of the restaurant bill as a tip. The bill was \$150. How much was the tip?

$$ = \$ \boxed{}$$

c) Jean pays a 20% deposit to put a trampoline on lay-by. If the trampoline costs \$1200, how much does he have left to pay?

$$ = \$ \boxed{}$$

d) Fairy puts up 20% as a lay-by deposit on a shuttle board table. The table costs \$380. She will then make 4 equal payments of the balance. What will the last payment be?

$$ = \$ \boxed{}$$

e) The plumbing repair cost \$690 including GST. If the GST is 15%, how much GST was included in the cost?

$$ = \$ \boxed{}$$

f) The cost of a car service was \$1150 including GST. If the GST is 15%, how much GST was included in the service?

$$ = \$ \boxed{}$$

g) The house painting costs \$9200 including GST. If the GST is 15%, how much is the cost excluding GST?

$$ = \$ \boxed{}$$

h) Before adding the GST of 15%, the phone costs \$660. Find the total cost of the phone including GST.

$$ = \$ \boxed{}$$

i) Lena buys a bag online for \$85. If shipping and handling are an additional 40% of the price, how much will she pay altogether?

$$ = \$ \boxed{}$$

j) Jai put a \$300 lay-by deposit on a \$1500 computer as the store demanded. What percentage of the sale price does the store expect on lay-by?

$$ = \boxed{}\%$$

Skill 14.4 Calculating percentages including commissions, profit and loss. MM5.2 1 1 2 3 3 4 4
MM6.1 1 1 2 2 3 3 4 4

- Write a number sentence from the information given.
- Calculate the percentage of the given amount. (see skills 6.3, page 61 and 6.4, page 62)

$$\text{Commission} = \% \times \text{Selling price}$$

Q. Jai sells a property for \$118 000 and earns 3% commission. How much is Jai's commission?

$$\begin{aligned} \text{A. } \frac{3}{100} \times \frac{118000}{1} &= \text{Simplify: } \div 100 \\ &= 3 \times 1180 \\ &= \mathbf{\$3540} \end{aligned}$$

a) Breanna pays \$18 000 for a car and sells it for 15% less. Calculate the loss.

$$\begin{aligned} \frac{15}{100} \times \frac{18000}{1} &= \\ = 15 \times 180 &= \boxed{\$} \end{aligned}$$

b) Kim pays \$14 000 for a diamond ring and sells it for 5% more. Calculate the profit.

$$= \dots = \boxed{\$}$$

c) A surfboard costing \$700 is sold at a loss of 12%. Calculate the selling price.

$$= \boxed{\$}$$

d) An antique chest costing \$1200 is sold at a profit of 15%. Calculate the selling price.

$$= \boxed{\$}$$

e) David sells a house for \$450 000. If his commission is 3%, how much is David's commission?

$$= \boxed{\$}$$

f) Kate sells a car for \$84 000. If her commission is 2%, how much is Kate's commission?

$$= \boxed{\$}$$

g) Shane bought a second-hand car for \$9500. He then sold it for 40% less. What is the selling price of the car?

$$= \boxed{\$}$$

h) Ian bought a house for \$340 000 and renovated it. He then sold it, making a profit of 30%. What was the selling price of the house?

$$= \boxed{\$}$$

i) A pair of skates is marked up 20%. If the sale price is \$150, what profit is made?

$$= \boxed{\$}$$

j) A coffee table is marked up 25%. If the sale price is \$350, what profit is made?

$$= \boxed{\$}$$

Skill 14.5 Calculating wages.

MM5.2 1 1 2 2 3 3 4 4
MM6.1 1 1 2 2 3 3 4 4

- Write a number sentence from what you are given.
- Consider the dollar amount and the time it takes to earn that.

NB: In Australia employers pay 9% of their employees' base income into a superannuation fund.

Q. Goldie earns \$238 for 17 hours work.
What is her hourly rate?

A. $\$238 \div 17 h =$
 $= \$14/h$

$$\begin{array}{r} 14 \\ 17 \overline{) 238} \\ \underline{- 17} \\ 68 \\ \underline{- 68} \\ 0 \end{array}$$

a) Sean is an apprentice, and he earns \$7.20 per hour for a 40 hour week. His pay this fortnight is \$595. By how much was Sean overpaid?

$40 \times 2 = 80$

$\$7.20 \times 80 = \$576/\text{fortnight}$

$\$595 - \$576 =$

b) Joey earns \$192 for 16 hours work. What is his hourly rate?

$=$

c) Tamara works from 9 pm to 2 am at a rate of \$13.50/h after tax. From midnight however, the pay rate doubles. What is this shift worth to Tamara?

$=$

d) Today Prue and Trudy together earn \$600 for standard hair cuts. They share 15 customers. If Prue cuts 9 heads of hair, how much does Trudy earn?

$=$

e) If Gary's tax for the year is \$3500, and his pay each fortnight is \$750, how much is his yearly wage before tax? [Hint: There are 26 fortnights in a year.]

$=$

f) Kay is paid \$15/hour for a 20 hour week. Her pay this fortnight is \$485. By how much is Kay underpaid?

$=$

g) On a base income of \$30 000 how much superannuation will Rory be paid when the guarantee reaches 12%?

$=$

h) When the superannuation guarantee was 9%, how much did John's employer pay annually into his superannuation if his annual wage, before tax, was \$65 000?

$=$

Skill 14.6 Calculating net and gross income and tax payable on income.

MM5.2 11 22 3 4 4
MM6.1 11 22 3 3 4 4

- Write a number sentence from what you are given.
- Consider the dollar amount and the time it takes to earn that.

$$\text{Net wage} = \text{Gross wage} - \text{Total deductions}$$

- Q.** Ali's gross wage is \$2200 per fortnight. He pays 20% of the gross wage in tax and contributes 9% of the gross wage to his superannuation fund. Calculate Ali's net wage per fortnight.

[net wage = gross wage – total deductions]

- A.** $\text{total deductions} = \text{tax} + \text{superannuation}$

$$\text{tax} = \frac{20}{100} \times \frac{2200}{1} = \$440 \quad \leftarrow \text{Simplify: } \div 100$$

$$\text{superannuation} = \frac{9}{100} \times \frac{2200}{1} = \$198$$

$$\text{total deductions} = \$440 + \$198 = \$638$$

$$\text{net wage} = \$2200 - \$638 = \mathbf{\$1562}$$

- a)** Sam's gross wage is \$2700 per fortnight. She pays 20% of the gross wage in tax and contributes 9% of the gross wage to her superannuation fund. Calculate Sam's net wage per fortnight.

[net wage = gross wage – total deductions]

$$\text{Net wage} = \text{Gross wage} - \text{Total deductions} = \boxed{}$$

- b)** Hal's pay cheque is \$3000 per fortnight. Hal's tax for the year is \$17 000. How much is his yearly gross income?

[Assume 26 fortnights in a year.]

$$\text{Yearly gross income} = \text{Pay cheque} \times 26 = \boxed{}$$

- c)** Part of Carrie's fortnightly payslip is shown. Calculate Carrie's total deductions and net wage for the fortnight.

[net wage = gross wage – total deductions]

Gross wage	\$943.15
Income tax	\$317.22
Superannuation	\$80.65
Union fees	\$19.00

$$\text{Total deductions} = \boxed{}$$

$$\text{Net wage} = \boxed{}$$

- d)** Carrie's taxable income is \$60 000. What is the amount of tax payable on her income?

Taxable income	Tax on this income
\$0 to \$14 000	10.5%
\$14 001 to \$48 000	17.5%
\$48 001 to \$70 000	30%
from \$70 000	33%

*Personal income tax rates for the 2014-2015 year

$$\text{Tax payable} = \boxed{}$$

- e)** Caleb's taxable income is \$80 000. What is the amount of tax payable on his income?

Taxable income	Tax on this income
\$0 to \$14 000	10.5%
\$14 001 to \$48 000	17.5%
\$48 001 to \$70 000	30%
from \$70 000	33%

*Personal income tax rates for the 2014-2015 year

$$\text{Tax payable} = \boxed{}$$

- f)** Scarlet's taxable income is \$30 000. What is the amount of tax payable on her income?

Taxable income	Tax on this income
\$0 to \$14 000	10.5%
\$14 001 to \$48 000	17.5%
\$48 001 to \$70 000	30%
from \$70 000	33%

*Personal income tax rates for the 2014-2015 year

$$\text{Tax payable} = \boxed{}$$

Skill 14.7 Calculating simple interest.

MM5.2 1 1 2 2 3 3 4 4
MM6.1 1 1 2 2 3 3 4 4

- Write an equation from the word problem.
- To find the total investment, after interest, add the interest to the principal.

$$\text{Simple Interest} = \text{Principal} \times \text{Rate} \times \text{Time} \quad \text{OR} \quad SI = PRT$$

- Q.** Darcy invests \$1000 at a simple interest rate of 12% per year. What did the investment equal at the end of 2 years?

A. $SI = PRT$

$$= 1000 \times \frac{12}{100} \times 2 \quad \text{Simplify: } \div 100$$

$$= 10 \times 12 \times 2 = 240$$

$$1000 + 240 \quad \text{investment} = \text{principal} + \text{interest}$$

$$= \mathbf{\$1240}$$

- a)** How much interest would Sean pay on his credit card after 2 years if he owed \$1500 at an interest rate of 8% per year?

$$SI = PRT = 1500 \times \frac{8}{100} \times 2 \quad \text{Simplify: } \div 100$$

$$= 15 \times 8 \times 2 = \boxed{}$$

- b)** Simple Interest = Principal \times Rate \times Time
Paula invests \$100 for 1 year. If the interest rate is 14% per year, how much interest would Paula get?

$$SI =$$

$$= = \boxed{}$$

- c)** Simple Interest = Principal \times Rate \times Time
A bank account of \$1000 earns 11% simple interest. How much interest is earned after 1 year?

$$SI =$$

$$= = \boxed{}$$

- d)** How much interest is paid on a loan of \$500 at a simple interest rate of 10% after 2 years?

$$SI =$$

$$= = \boxed{}$$

- e)** Pedro invested \$1500 at 5% simple interest for 2 years. How much interest did he earn?

$$SI =$$

$$= = \boxed{}$$

- f)** How much interest would Carey pay on his credit card after 3 years if he owed \$1200 at an interest rate of 12% per year?

$$SI =$$

$$= = \boxed{}$$

- g)** Guy borrowed \$200 for 3 years at a simple interest rate of 7% per year. How much does Guy owe at the end of 3 years?

$$SI =$$

$$= $$

$$\text{Total} = = \boxed{}$$

- h)** Marcie invests \$750 for 4 years at a simple interest rate of 8% per year. How much does Marcie get back?

$$SI =$$

$$= $$

$$\text{Total} = = \boxed{}$$

- Write a number sentence from the information given.

Q. A 30% increase followed by a 10% decrease on the same item is greater than (>), less than (<) or equal to a 20% increase of the original value?

A.

$$\frac{30}{100} \times \frac{40}{1} = 12$$

$$40 + 12 = 52$$

$$\frac{10}{100} \times \frac{52}{1} = 5.2$$

$$52 - 5.2 = 46.8$$

$$\frac{20}{100} \times \frac{40}{1} = 8$$

$$40 + 8 = 48$$

$$\$6.80 < \$8.00$$

Assume an amount e.g. 40

a) A 40% increase followed by a 30% decrease on the same item is >, < or = a 10% increase of the original value?

.....
..... =

b) A 60% increase followed by a 20% decrease on the same item is >, < or = a 40% increase of the original value?

.....
..... =

c) A book was discounted by 40% to \$15. How much was the book before the discount?

.....
..... =

d) Ollie's iPhone is now worth \$210 or 30% of its original cost. How much did Ollie originally pay for the iPhone?

.....
..... =

e) Last year Sandra invested \$5000 in shares. In the past 12 months they lost 25% of their value. What is the value of her investment?

.....
..... =

f) You get 15% off your car insurance (cost = \$350) and house insurance (cost = \$450) if you combine the two payments. What would the joint payment be?

.....
..... =

g) A toy was discounted by 25% to \$60. How much was the toy before the discount?

.....
..... =

h) A pen was discounted by 30% to \$35. How much was the pen before the discount?

.....
..... =

Skill 14.9 Calculating compound interest.

MM5.2 1 1 2 2 3 3 4 4
MM6.1 1 1 2 2 3 3 4 4

- Write an equation for the word problem.
 - Calculate the amount of interest each year on that year's principal.
- Hint: Deal with each year separately because in each year there will be a new balance or principal which includes all previous interest.*

$$\text{yearly interest} = \text{principal} \times \text{rate}$$

- Q.** Luke invests \$2000 at a compound interest rate of 15% per year. After 3 years, how much does Luke have?

A.

$$2000 + \frac{15}{100} \times \frac{2000}{1} =$$

$$= 2000 + 300 = 2300$$

Year 1

$$2300 + \frac{15}{100} \times \frac{2300}{1} =$$

$$= 2300 + 345 = 2645$$

Year 2

$$2645 + \frac{15}{100} \times \frac{2645}{1} =$$

$$= 2645 + 396.75 =$$

$$= \$3041.75$$

Year 3

Luke starts with \$2000

After year 1: Principal is \$2000 plus 15% of \$2000 = \$2300

The next year's interest is paid on the new balance of \$2300.

After 2 years: Principal is \$2300 plus 15% of \$2300 = \$2645

After 3 years: Principal is \$2645 plus 15% of \$2645 = \$3041.75

- a)** What is the total amount of interest repaid on a loan of \$800 after 2 years at a compound interest rate of 6%?

Year 1

$$\frac{6}{100} \times \frac{800}{1} = 48$$

Interest after year 1

$$800 + 48 = 848$$

New principal after year 1

Year 2

$$\frac{6}{100} \times \frac{848}{1} = 50.88$$

Interest after year 2

$$\text{Yr 1} + \text{Yr 2} = 48 + 50.88 =$$

Total Interest after 2 years

- b)** Jim borrowed \$10 000 for 2 years at a compound interest rate of 6%. How much did Jim pay back?

Year 1

Year 2

- c)** April invests \$5000 at a compound interest rate of 20% per year. What is the total amount of interest April gets after 3 years?

Year 1

Year 2

Year 3

- d)** What is the total amount of interest repaid on a loan of \$12 000 after 3 years at a compound interest rate of 5%?

Year 1

Year 2

Year 3

Skill 14.10 Calculating compound growth and depreciation.

MM5.2 11 22 33 44
MM6.1 11 22 33 44

- Write an equation for the word problem.
- Calculate the amount of growth or depreciation each year on that year's value.
Hint: Deal with each year separately because in each year there will be a new value which includes all previous growth or depreciation.

<p>Q. A computer depreciates in value at an annual rate of 20%. If it costs \$4000 when new, calculate its value after 3 years.</p>	<p>A. $4000 - \frac{20}{100} \times \frac{4000}{1} =$</p> <p>$= 4000 - 800 = 3200$</p>	Year 1	<p>New computer costs \$4000.</p> <p>After year 1: Value is \$4000 minus 20% of \$4000 = \$3200</p>
	<p>$3200 - \frac{20}{100} \times \frac{3200}{1} =$</p> <p>$= 3200 - 640 = 2560$</p>	Year 2	<p>The next year's depreciation starts from the new value of \$3200.</p> <p>After 2 years: Value is \$3200 minus 20% of \$3200 = \$2560</p>
	<p>$2560 - \frac{20}{100} \times \frac{2560}{1} =$</p> <p>$= 2560 - 512 =$</p> <p>\$2048</p>	Year 3	<p>After 3 years: Value is \$2560 minus 20% of \$2560 = \$2048</p>

- a)** A car depreciates in value at an annual rate of 10%. If it costs \$45 000 when new, calculate its value after 2 years.

Year 1
.....
.....

Year 2
.....
.....

- b)** The population of a town compounded annually at a rate of 10% per year. Initially 1000 people, what was the population after 2 years?

Year 1
.....
.....

Year 2
.....
.....

- c)** The population of a town compounded annually at a rate of 10% per year. The population was initially 20 000. What was the population after 3 years?

Year 1
.....
.....

Year 2
.....
.....

Year 3
.....
.....

- d)** A printer depreciates in value at an annual rate of 20%. If it costs \$400 when new, calculate its value after 3 years.

Year 1
.....
.....

Year 2
.....
.....

Year 3
.....
.....