Chapter 2.
Percentages.

Situation One.

The workforce at a particular factory were all given the following letter:

XYZ Company
3A The Industrial Complex, Hope Lane.

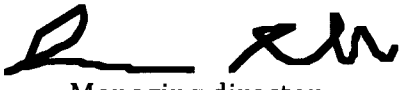
To all employees
It is with regret that as managing director I have to inform you that due to the recent political upheaval in a particular country our company no longer has the major supply contracts with this country that we have enjoyed for the past five years. These contracts have fuelled the expansion our company has experienced in recent years.
These lost contracts will have a significant impact on our company and as a consequence the factory will have to operate on a four day week, instead of its usual five day week. Hence, from the first Monday of next month, the factory will not operate on Fridays. For the period of time for which this four day week is necessary all employees will receive a reduced salary equal to their old salary less 20%.
We regret this course of action but feel it necessary for the company to survive financially with the reduced order book. Rest assured that every effort will be made to find replacement orders and when that occurs the factory will return to a five day week.
Yours sincerely

Managing director.

Some weeks later they received a second letter:

XYZ Company
3A The Industrial Complex, Hope Lane.

To all employees
Great news — Due to the hard work of our sales team we have won several new contracts recently and, in addition, the new government in the country that recently cancelled its long term orders with us has restored them. Hence we can return to our five day week as from next Monday.
The salary we have all been existing on in recent weeks will now be increased by 20% to take it back to what it was before the forced reduction.
I wish to pass on my thanks to you all for the understanding you have shown in the recent difficulties.
Yours sincerely



Managing director.

Write a note to the managing director regarding this second note.

Situation Two.

Mr Chan is very concerned to read in a newspaper article that a particular drug that his wife needs to take for a medical condition she suffers from has:

"... the potential to increase the likelihood of a person taking the drug from developing a particular form of cancer by up to 50% of the risk for someone not taking the drug."

The article also said that

"... for women not taking this drug there was a 1% chance of developing this cancer."

Mr Chan was very concerned to read that this latest research seemed to indicate that the risk to his wife could in fact be as high as 51%!

Is there anything that could be said to calm Mr Chan's worries?

We will now revise

- ☞ expressing an amount as a percentage of some total amount,

and ☞ finding a percentage of something.

It is anticipated you will have encountered both of these ideas before, as mentioned in the *Preliminary work* section at the beginning of this book.

Expressing an amount as a percentage of some total amount.

Example 1

Express each of the following as a percentage.

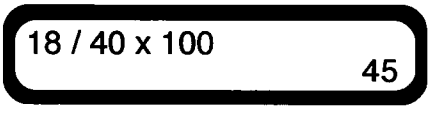
(a) 18 students out of a total of 40 students.

(b) \$3·60 out of \$45·00.

(c) \$34 out of a total of \$245.

(a) Express 18 out of 40 as a fraction: $\frac{18}{40}$

Find this fraction of 100: $\frac{18}{40} \times 100 = 45$



18 students out of 40 is 45%.

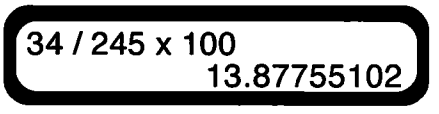
(b) Express \$3·60 out of \$45 as a fraction: $\frac{3·60}{45}$

Find this fraction of 100: $\frac{3·60}{45} \times 100 = 8$

\$3·60 out of \$45·00 is 8%.

(c) Express \$34 out of \$245 as a fraction: $\frac{34}{245}$

Find this fraction of 100: $\frac{34}{245} \times 100 \approx 13·9$



\$34 out of a total of \$245 is 13·9% (correct to 1 dp).

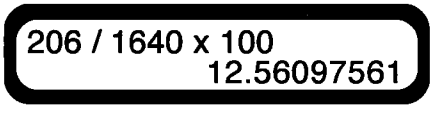
Expressing an increase or decrease as a percentage of something.
If asked to express an increase (or decrease) as a percentage increase (or decrease) give the increase (or decrease) as a percentage of the *original* amount.

Example 2
The price of a commodity increases from \$1640 per tonne to \$1846 per tonne. Express the increase as a percentage increase.

Increase = \$1846 – \$1640
= \$206

As a fraction of the original amount: $\frac{\$206}{\$1640}$

Find this fraction of 100: $\frac{\$206}{\$1640} \times 100 \approx 12·56$



The price of the commodity has increased by 12·6%, correct to 1 decimal place.

Finding a percentage of something.
It is anticipated that you have previously encountered:

- finding percentages of amounts (see example 3 that follows),
- increasing or decreasing something by a given percentage (see example 4),
- working back to find an original quantity knowing how much it has become after a given increase or decrease (see example 5).

Example 3
Find 27% of \$60

Method 1
(Find 1% and then find 27%.)

$$1\% \text{ of } \$60 = \frac{\$60}{100}$$

$$\therefore \quad 27\% \text{ of } \$60 = \frac{\$60}{100} \times 27$$

$$= \$16{\cdot}20$$

Method 2
(Use the decimal equivalent of 27%.)

$$27\% \text{ of } \$60 = \$60 \times 0{\cdot}27$$

$$= \$16{\cdot}20$$

Example 4
Increase \$450 by 24%.

Method 1
(Find 24% then increase.)

$$1\% \text{ of } \$450 = \frac{\$450}{100}$$

$$\therefore \quad 24\% \text{ of } \$450 = \frac{\$450}{100} \times 24$$

$$= \$108$$

$$\$450 + \$108 = \$558$$

\$450 increased by 24% is \$558.

Method 2
(Use the decimal equivalent of 124%)

$$124\% \text{ of } \$450 = \$450 \times 1{\cdot}24$$

$$= \$558$$

Example 5
After the 10% goods and services tax (GST) has been added to an invoice the final amount payable is \$522·50. Determine the amount on the invoice prior to the GST being added.

Method 1. (Find 1% and then find 100%.)

After 10% has been added we have 110% of the pre GST invoice.

Thus $\quad 110\% \text{ of pre GST amount} = \$522{\cdot}50$

$$\therefore \quad 1\% \text{ of pre GST amount} = \frac{\$522{\cdot}50}{110}$$

Hence $\quad 100\% \text{ of pre GST amount} = \frac{\$522{\cdot}50}{110} \times 100$

$$= \$475$$

The amount on the invoice prior to the GST being added was \$475.

Method 2. (Use the decimal equivalent of a 10% increase.)

An increase of 10% gives us "1·1 times" the original amount.

Thus $\quad 1{\cdot}1 \times \text{pre GST amount} = \$522{\cdot}50$

$$\therefore \quad \text{Amount prior to GST} = \frac{\$522{\cdot}50}{1{\cdot}1}$$

$$= \$475$$

As before: The amount on the invoice prior to the GST being added was \$475.

Exercise 2A.

1. What number would you multiply an amount by so that your answer
   (a) is 10% of the amount,
   (b) is 30% of the amount,
   (c) is 25% of the amount,
   (d) is 4% of the amount,
   (e) is 12·5% of the amount,

   (f) has increased the amount by 40%,
   (g) has increased the amount by 10%,
   (h) has increased the amount by 23%,
   (i) has increased the amount by 4%,
   (j) has increased the amount by 12·5%,

   (k) has decreased the amount by 10%,
   (l) has decreased the amount by 8%,
   (m) has decreased the amount by 18%,
   (n) has decreased the amount by 60%,
   (o) has decreased the amount by 2·5%.

2. Express each of the following as a percentage.
   (Give your answer to the nearest 0·1% if rounding is necessary.)
   (a) 21 students out of a total of 50 students.
   (b) \$18 out of \$25.
   (c) \$2·25 out of a total of \$18.
   (d) 174 sheep out of a total of 1356 sheep.
   (e) 8·5 cm out of a total of 2·5 metres.
   (f) 35 metres out of a total of 5·832 kilometres.

3. Find
   (a) 20% of \$100
   (b) 30% of \$200
   (c) 10% of \$60
   (d) 25% of \$88
   (e) 16% of 250 kg
   (f) 55% of \$23
   (g) 12% of 5 metres
   (h) 45% of 3 tonnes

4. Increase
   (a) \$40 by 50%
   (b) \$80 by 20%
   (c) 160 kg by 10%
   (d) 55 metres by 40%
   (e) \$23·45 by 80%
   (f) \$500 by 17%
   (g) 60 litres by 5%
   (h) \$250 by 12·5%

5. Decrease
   (a) \$80 by 50%
   (b) \$18 by 25%
   (c) 540 kg by 25%
   (d) 6 metres by 2%
   (e) 6·5 metres by 20%
   (f) \$23 by 90%
   (g) \$88 by 12·5%
   (h) 160 tonnes by 45%

6. (a) Find 23% of \$124·60 giving your answer to (i) the nearest cent, (ii) the nearest five cents, (iii) the nearest ten cents.
   (b) Increase \$1260 by 14·5% giving your answer to the nearest dollar.
   (c) Decrease \$1260 by 14·5% giving your answer to the nearest dollar.

7. (a) 1% of an amount is \$13·45, find the amount.
   (b) 15% of an amount is \$60, find the amount.
   (c) 45% of an amount is \$117, find the amount.
   (d) 28% of an amount is \$44·38, find the amount.
   (e) 11·8% of an amount is \$1479·72, find the amount.
   (f) After a 10% price rise an item has a price of \$268·40. What was the price of the item before the rise?
   (g) After a 4% rise in the value of some shares the shares were worth \$1348·15. To the nearest dollar what were they worth before the 4% rise?
   (h) In a sale all normal prices are reduced by 15%. Find the normal price of an item with a sale price of \$39·95.
   (i) In a sale all normal prices are reduced by 12·5%. Find the normal price of an item with a sale price of \$112·00.
   (j) After a pay rise of 5% Joe's weekly pay rises to \$876·75. What was Joe's weekly pay before the rise?
   (k) A 10% monthly drop in sales saw the number of new cars sold by a particular manufacturer fall to 2106 in one month. How many cars did this manufacturer sell in the previous month?

8. The price of a commodity increases from \$796 per m^3 to \$873 per m^3. Express the increase as a percentage increase.

9. The share price for a particular company falls from \$72·54 to \$67·92. Express this decrease as a percentage decrease.

10. Approximately 46% of a class of 26 students are boys. How many girls are in the class?

11. The 14 girls in a class of students form approximately 44% of the students in the class. How many students are there in the class?

12. In earlier years legal documents required an official government "stamp" to be attached to them, or impressed upon then, to make the document legal. Modern documents often do not require this but the government may still charge a "stamp duty" to register the document. Suppose the stamp duty payable on the transfer of a property sold for \$650 000 is charged at \$11200 + 4·7% of the amount the sale price exceeds \$360 000. How much stamp duty is payable?

13. Copy and complete the following table:

	Number of items	Cost per item	Sub total	GST (10%)	Total
e.g.	15	\$16·40	\$246·00	\$24·60	\$270·60
(a)	23	\$17·50			
(b)	131	\$16·40			
(c)	18	\$15·90			
(d)	24		\$420·00		
(e)		\$19·85	\$119·10		
(f)	15		\$1129·50		
(g)	26			\$20·80	
(h)		\$6·75		\$9·45	
(i)		\$3·40			\$463·76
(j)	18				\$767·25

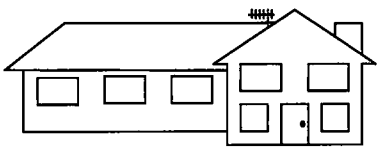
14. A factory increased its annual output of new cars from 1219 in one year to 1317 in the next. Express this increase as a percentage increase.

15. A person is given a 4·8% pay rise. If the person was earning \$1971·15 per fortnight before the rise what will they earn per fortnight after the rise?

16. The rainfall total for a particular region for the year 2007 was 11% down on the total for 2006. The 2006 total was 254 mm. What was the rainfall total for this region in 2007, to the nearest mm?

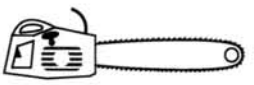
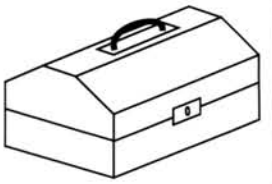
17. (a) The child dose of a particular medicine is 50% of the adult dose. If the adult dose is 20 milligrams what is the child dose?
    (b) The child dose of a particular medicine is 40% of the adult dose. If the child dose is 5 millilitres what is the adult dose?

18. Toni bought a house for \$315 200 and sold it some years later for \$475 600.
What was the percentage increase in the cost of the house in this time?



19. A person is earning \$1432·23 per fortnight. What percentage increase in earnings is required to take this fortnightly pay to at least \$1500·00? (Give your answer to 1 decimal place).

20. A hardware shop advertises "15% off all marked prices".
With this reduction what should you expect to pay for each of the following with marked prices as indicated?

Drill	Chain saw	Sander	Tool box
			
Marked price $125·00	Marked price $327·00	Marked price $36·00	Marked price $28·00

21. The table below shows one scheme for determining how the income tax payable could be worked out from a person's taxable income.

Taxable Income	Income tax to pay.
\$0 → \$19 400	Nil
\$19 401 → \$37 000	19% of the taxable income over \$19 400
\$37 001 → \$80 000	\$3 344 + 33% of the taxable income over \$37 000
\$80 001 → \$180 000	\$17 534 + 37% of the taxable income over \$80 000
\$180 001 and over.	\$54 534 + 45% of the taxable income over \$180 000

According to this table how much income tax will each of the following people be required to pay?

Aimee, taxable income	\$17 900	Brittney, taxable income	\$34 400
Chris, taxable income	\$38 700	Devi, taxable income	\$63 000
Emily, taxable income	\$97 200	Frank, taxable income	\$213 400

Megan pays \$27 006 income tax. Calculate Megan's taxable income.

Allen pays \$9 878 income tax. Calculate Allen's taxable income.

22. A particular region of Australia produced approximately 146 000 kg of apples in one year. This total was 10% up on the number of kilograms produced the previous year which was in turn 8% up on the number produced the year before that.
How many kilograms of apples did the region produce in each of these two previous years?

23. A certain tax rate was increased from 10% of the pre-tax amount to 12·5% of the pre-tax amount. For one item this increased the tax on the item by 440 cents. Determine the pretax amount for this item.

Inflation.

Inflation is the rise in the price of goods over a period of time. Inflation is usually quoted as an annual percentage rate based on the increase in the price of a "package" of goods and services as typically used by a household. If, for example, this package were to increase in price during a twelve month period by 3·1% then the annual inflation rate would be quoted as 3·1%.

If the rate at which a person's wage increases is below the inflation rate then the wage is not "keeping up with inflation".

In an inflationary environment each dollar earned has less "purchasing power" than a dollar earned a year earlier. For example, because of the inflation over the last 50 years the quantities of things like meat and vegetables that could be bought for $1 fifty years ago could not be bought for just $1 now. The $1 has lost purchasing power.

Using internet resources as appropriate find recent inflation rates for Australia and four other countries of your choosing..

Exercise 2B.

1. If we assume that the annual rate of inflation were to remain steady at 3·4%, and a particular item costs $45 now, what would this suggest we would be paying for the same item in (a) one year, (b) two years, (c) three years?
   If the current rate of inflation was indeed 3·4% how accurate do you feel the predictions you have just calculated are likely to be?

2. Over a five year period, a country experiences annual inflation rates as follows:
   Yr 1: 3·2% Yr 2: 4·3% Yr 3: 5·1% Yr 4: 4·1% Yr 5: 3·3%
   Noticing that these rates add up to 20% Jamie concludes that goods that cost $100 at the start of this five year period would cost $120 at the end of the five years. Is Jamie correct in his conclusion?

3. We would generally expect that something costing $100 in the year 2000 would have cost more by the year 2010 (unless changes in availability and manufacturing had made producing the item cheaper). The expected 2010 cost of something costing $100 in 2000 can be calculated using what is called the *Consumer Price Index* (CPI for short) for each year and by evaluating:
   $$\$100 \times \frac{\text{CPI for the year 2010}}{\text{CPI for the year 2000}}.$$
   Given the following CPI figures: $\text{CPI}_{1950} = 7{\cdot}85$ $\text{CPI}_{1990} = 103{\cdot}175$
   $\text{CPI}_{2000} = 128{\cdot}4$ $\text{CPI}_{2010} = 172{\cdot}6$
   According to these figures what, to the nearest dollar, was the cost in 2010, of
   (a) something costing $400 in 1950
   (b) something costing $50 in 1990,
   (c) something costing $1 700 in 2000.

To compare a worker's purchasing power in different countries one suggestion is to use the amount of time it takes a worker, earning that countries average wage, to earn enough to purchase a Big Mac at their local McDonald's store.
Research this *Working time Big Mac Index* on the internet.

Goods and Services Tax.

When the goods and services tax (GST) was first introduced into Australia business owners and company accounts personnel had to familiarise themselves with the various forms and procedures that accompanied its introduction.

Goods and services tax is added at the rate of 10%. Businesses were told that if they knew the total amount received from selling goods on which 10% GST had been added they had to divide this total by 11 to determine the amount of GST included. This amount had then to be forwarded to the government tax office after any allowable deductions had been made.

Government advisers who were assisting businesses to become familiar with the various requirements associated with the new system reported that a number of people were querying the division by 11, feeling sure it was an error and that as the GST rate was 10% (i.e. one tenth, not one eleventh) they should be dividing by 10 to determine the GST amount in their total takings and not dividing by 11.

Write a letter that could be sent out in response to any such queries explaining why the division by 11 is correct.

Discount.

A discount is a reduction of the usual price for some reason and is usually stated as a percentage of the usual price. This discount might be due to a sale, as was the case in some of the questions of an earlier exercise, or due to customer loyalty, bulk purchases, damaged goods, cash purchases etc.

Example 6

A shop offers 5% discount on all goods purchased with cash rather than credit cards.

(a) What is the cash discount price for a jacket usually costing \$85·00?

(b) If a computer game has a discounted price of \$159·60 for cash what is the usual price of the computer game without the discount for cash?

(a) With a 5% discount for cash the cash price will be 95% of the usual price.

Hence: Cash price $= 0{\cdot}95 \times \$85{\cdot}00$

$= \$80{\cdot}75$

With the discount for cash the price of the jacket is \$80·75.

(b) With a 5% discount for cash the cash price will be 95% of the usual price.

Hence $0{\cdot}95 \times$ Usual price $= \$159{\cdot}60$

$\therefore$ Usual price $= \dfrac{\$159{\cdot}60}{0{\cdot}95}$

$= \$168{\cdot}00$

The price of the computer game without the discount for cash is \$168·00.

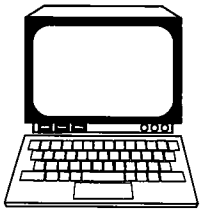
Commission.

The fees charged by some businesses for selling an item is sometimes based on the sale price achieved.

Similarly the amount of pay some people receive is sometimes based on the quantity of sales they achieve.

These *commissions* are often a percentage of the value of the sales.

For example, when a real estate agency sells a property they may receive a commission equal to 2·5% of the amount the property sells for. Thus for selling a property for \$640 000 the agency receives 0·025 × \$640 000, i.e. \$16 000.



For a computer sales person who is paid commission of 15% of the value of the sales they make in a month, monthly sales of \$17 650 would produce earnings for that month of 0·15 × \$17 650, i.e. \$2 647·50

In some cases the commission may be "stepped". Consider for example the real estate agency that charges commission on the sale of a house on the following stepped basis:

Commission:	3%	of the first	\$100 000
	2·5%	of the next	\$150 000
	2%	of the next	\$150 000
	1%	thereafter.	

For selling a house for \$365 000 the agency receives:

0·03 × \$100 000 +
0·025 × \$150 000
0·02 × \$115 000
A total of \$9050.

For a sales person whose wage consists entirely of commission earned, a poor month of sales can result in a low wage that month and possible problems trying to meet their other financial commitments such as the food bill, rent payments, phone bill etc. To avoid this situation a person may be paid a fixed wage, or *retainer*, and then a commission "on top".

For example, suppose that Jin, a salesperson of new cars, is paid a monthly retainer, equal to \$2 780, plus commission of 2% of monthly sales.

In a month when Jin's monthly sales total \$181 200 Jin receives:

\$2 780 + 0·02 × \$181 200 = \$6 404.

Profit and loss.

If we sell something for more than we paid for it we make a **profit** and if we sell something for less than we paid for it we make a **loss**.

If we buy something for \$40 and sell it for \$70 our profit is \$30. Similarly, if we buy something for \$300 and sell it for \$330 we make a profit of \$30. However, in the first case we made our profit on an initial outlay of just \$40 compared to an initial outlay of \$300 in the second case. To compare the two we could express each as a **percentage profit**, a term explained on the next page.

$$\text{Percentage profit} = \frac{\text{Profit made when you sell the item}}{\text{Amount you paid for the item}} \times 100$$

and similarly:

$$\text{Percentage loss} = \frac{\text{Loss made when you sell the item}}{\text{Amount you paid for the item}} \times 100$$

Thus: Buying for \$40 and selling for \$70: $\text{Percentage profit} = \frac{30}{40} \times 100 = 75\%$

Buying for \$300 and selling for \$330: $\text{Percentage profit} = \frac{30}{300} \times 100 = 10\%$

Buying for \$250 and selling for \$180: $\text{Percentage loss} = \frac{70}{250} \times 100 = 28\%$

Exercise 2C

Discount.

1. An office furniture shop offers 8% discount on all cash sales. Find the discounted price on each of the following, rounding to the nearest 5 cents if rounding is necessary.

			
Usual price \$50·00	Usual price \$67·30	Usual price \$72·40	Usual price \$86·90

2. After a discount of 15% an item is priced at \$108·80. Determine the price of the item before the discount.

3. What percentage discount is needed to see a normal price of \$75 reduced to \$67·50?

4. A company offers an 8% discount on all items ordered on-line from its website ordering facility. What will be the discounted price of an item usually costing \$48·50?

5. A company offers a discount of 6% off the total amount, on all orders over \$500. Under this scheme what would be the price of each of the following orders?

Order One.	Order Two.	Order Three.
26 items at \$72·80 each, 58 items at \$67·40 each, 137 items at \$17·50 each.	1 item at \$72·80 each, 2 items at \$67·40 each, 13 items at \$17·50 each.	3 items at \$72·80 each, 5 items at \$67·40 each, 21 items at \$17·50 each.

6. A manufacturer normally sells a particular item for \$56 each. However, to encourage shopkeepers to buy the item and sell them in their shops the manufacturer offers any shopkeeper buying 200 of these items a 20% discount for "bulk", i.e. a discount for the large number purchased. If a shopkeeper buys 200 at the bulk discounted price and then sells each item at the normal price of \$56 how much profit will the manufacture make (a) on each item,
   (b) on the sale of the entire 200?
   (c) The shopkeeper is concerned that he may not sell all of the 200 items. How many does the shopkeeper need to sell to cover what the 200 cost him?

Commission.

7. A real estate agency charges commission of 2·5% of the sale price of any property it sells. What commission does this agency charge for the sale of a property for \$520 000?

8. A salesperson is paid purely on commission, earning 18% of the total value of the goods he sells. How much does this person earn for a month in which his total sales are \$17 800?

9. A salesperson is paid a monthly retainer of \$3200 plus a commission of 4% of the total value of all goods sold in that month. How much do they earn in a month when sales total \$24 500?

10. A real estate agent is paid 0·8% commission on all sales. Determine the total amount the agent is paid for selling three properties:
    One for \$320 000, one for \$480 000 and one for \$540 000.

11. A salesperson is paid \$480 per fortnight plus 8% of the amount by which their total sales for the fortnight exceed \$5 000.
    In one fortnight the salesperson sold three items for \$4 280 each, one item for \$960 and four items for \$3 470 each.
    What was the salesperson total pay for this fortnight?

12. A person is paid a retainer of \$1230 per fortnight plus commission of 3·5% of all goods sold the previous fortnight. One fortnight the person was paid a total of \$1868·40. What was the total value of the sales the previous fortnight?

13. A financial adviser charges her clients for managing their share portfolios. The charge is on a commission basis dependent upon the total value of the portfolio and according to the following structure.
    For any portfolio with a total value under \$150 000: Fixed fee of \$3 000.
    For portfolios worth a total value of \$150 000 or more: 2% of first \$250 000
    1·5% of the next \$250 000
    1·2% of the next \$100 000
    1% thereafter.
    Determine the commission charged on portfolios with a total value of
    (a) \$140 000 (b) \$180 000 (c) \$475 000 (d) \$1 567 000

Profit and loss.

For numbers 14 to 25 copy and complete the table.

	What it cost.	What it was sold for.	Profit as percentage of cost.
14.	$100	$124	
15.	$400	$418	
16.	$100		18%
17.	$650		30%
18.		$135	8%
19.		$20 625	65%

	What it cost.	What it was sold for.	Loss as percentage of cost.
20.	$100	$84	
21.	$175	$105	
22.	$6500		6%
23.	$18·50		20%
24.		$29·25	10%
25.		$11 132	8%

26. Which shows the greater percentage profit:

Item A purchased for $56 and sold for $72

or

Item B purchased for $3210 and sold for a profit of $910 ?

27. Meta purchases an item and sells it on to Susan at a profit of 40%.
When Susan sells it to Chris for $1 155 she makes a profit of 10%.
How much did Meta pay for the item?

28. Toni purchases things at auction and then sells them in his antiques shop for a profit. The profit he makes on each item varies but he always attempts to make a profit in the 20% to 40% range. At one auction he purchases three items, one for $85, one for $155 and one for $2150. Given that when he sold each one he did make a profit in his desired range what price might he have sold each item for?

29. Jack purchases an item and sells it on to Steve at a profit of 10%.
Steve sells the item on to Nyuma at a profit of 20%.
Nyuma sells it on to Shan for $3 795 giving Nyuma a profit of 15%.
How much did Jack pay for the item?

Miscellaneous Exercise Two.

This miscellaneous exercise may include questions involving the work of this chapter, the work of any previous chapters, and the ideas mentioned in the preliminary section at the beginning of the book.

1. Find the value of each of the following expressions given that $x = 5$ and $y = 7$.

(a)	$x + y$	(b)	$y + x$	(c)	xy
(d)	$x + 2y$	(e)	$2x + y$	(f)	$2(x + y)$
(g)	$x + y^2$	(h)	x^2y	(i)	$(x + y)^2$
(j)	$x^2 + y^2$	(k)	$(x - y)^2$	(l)	$xy - 3x + y$

2. What number do we multiply an amount by if we wish to
   (a) increase the amount by 20%,
   (b) find 20% of the amount,
   (c) decrease the amount by 20%,
   (d) find 2% of the amount,
   (e) decrease the amount by 2%,
   (f) increase the amount by 2%.

3. List each of the following amounts in order, largest first.

A:	35% of \$1500.	B:	\$800 increased by 5%.
C:	\$750 decreased by 20%.	D:	80% of \$560.
E:	\$360 increased by 95%.	F:	\$400 decreased by 10%

4. If a shopkeeper agrees to buy large quantities of an item from a supplier the shopkeeper may receive a "bulk discount" i.e. a discount due to the large quantity ordered. Suppose a particular item usually costs \$17·50 from the supplier but by purchasing 250 of these a shopkeeper is given a 20% bulk discount. If the shopkeeper then sells each of these at the manufacturer's usual price of \$17·50 what is the profit the shopkeeper is making on each item as a percentage of the amount each item cost him?
   If this question had been asked without the quantities "250" and "\$17·50" being given, i.e. only the 20% bulk discount being known, could the answer still have been determined?

5. A high school newsletter states that 18% of its students are in year 8.
   If the school has 1643 students altogether and the 18% is given to the nearest whole percentage how many year 8 students are there in the school?

6. A bookshop is charged \$15·40 for a particular book. The shopkeeper wishes to price the book such that his profit would be 30% of his selling price. What should be his selling price?

7. Will an annual inflation rate of 5% mean that in a ten year period the cost of living will rise by 50%? Explain your answer.

8. The table on the right shows the mother's age and the sex of the baby for 1247 babies born during one year at a maternity hospital.

		Age of Mother			
		Under 25	25 to 35	Over 35	Totals
Sex of Baby	Male	172	403	61	636
	Female	165	384	62	611
Totals		337	787	123	1247

(a) How many of the 1247 babies were males born to mothers aged 25 - 35?
(b) How many of the 1247 babies were born to mothers aged 25 and over?
(c) What percentage of babies born to mothers aged under 25 were girls?

9. (a) The amount of stamp duty that is payable is based on the "dutiable value" of an item. Let us suppose that the calculation of the amount payable is based on the following structure:

Dutiable Value			Stamp Duty Payable
$0	to	$120 000	1·9% of dutiable value.
$120 001	to	$150 000	$2 280 + 2·85% of dutiable value over $120 000
$150 001	to	$360 000	$3 135 + 3·80% of dutiable value over $150 000
$360 001	to	$720 000	$11 115 + 4·75% of dutiable value over $360 000
Over $720 000			$28 215 + 5·15% of dutiable value over $720 000

(Note how there are no "sudden jumps" when moving from one line to another.)

(i) Determine the stamp duty payable based on a dutiable value of $6 000.
(ii) Determine the stamp duty payable based on a dutiable value of $125 000.
(iii) Determine the stamp duty payable based on a dutiable value of $380 000.
(iv) Determine the stamp duty payable based on a dutiable value of $870 000.

(b) A similar system of stamp duty payments is to be set up according to the structure given below. Copy and complete the structure filling in the blanks with the appropriate figures.

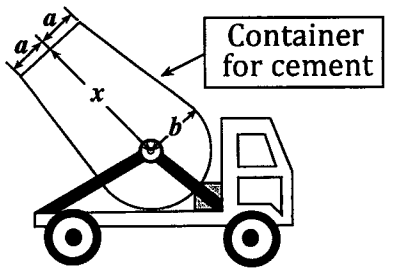
Dutiable Value			Stamp Duty Payable
$0	to	$150 000	1·5% of dutiable value.
$150 001	to	$300 000	$_____ + 2·8% of dutiable value over $150 000
$300 001	to	$500 000	$_____ + 3·5% of dutiable value over $300 000
$500 001	to	$750 000	$_____ + ___% of dutiable value over $500 000
Over $750 000			$23 950 + 5·1 % of dutiable value over $750 000

10. When a house purchased by Jack is sold to Jill, Jack makes a profit of 80%. Jill later sells the house to Samantha and this time Jill makes a profit of 140%. If Samantha paid $777 600 for the house how much did Jill and Jack pay for it ?

11. The truck shown sketched is used to transport cement. The container can safely be filled to 0·4V where V, the capacity of the container, is given by:

$$V = \frac{\pi}{3}(a^2x + b^2x + abx + 2b^3)$$

with a, b and x in linear units and V in those linear units cubed.



If a = 1 metre, b = 1·2 metres and x = 3 metres find V and state the units. What volume of cement can the container safely hold?