Percentages

Exercise A

1. Calculate:
   (a) 30% of £50
   (b) 45% of 2000 kg
   (c) 4% of $70
   (d) 2·5% of 5000 people

2. In a sale, a jacket costing £40 is reduced by 20%.
   What is the sale price?

3. The charge for a telephone call costing 12p is increased by 10%.
   What is the new charge?

4. In peeling potatoes 4% of the mass of the potatoes is lost as 'peel'.
   How much is *left* for use from a bag containing 55 kg?

5. Write down the missing number, as a *decimal*.

   (a) 53% of 650 = ☐ × 650
   (b) 3% of 2600 = ☐ × 2600

   (c) 8·5% of 700 = ☐ × 700
   (d) 122% of 285 = ☐ × 285

6. Work out, to the nearest penny:
   (a) 6·4% of £15·95
   (b) 11·2% of £192·66
   (c) 8·6% of £25·84
   (d) 2·9% of £18·18

7. Find the total bill:
   5 golf clubs at £18·65 each
   60 golf balls at £16·50 per dozen
   1 bag at £35·80
   V.A.T. at $17\frac{1}{2}$% is added to the total cost.

8. In 1994 a club has 250 members who each pay £95 annual
   subscription. In 2000 the membership increases by 4% and the
   annual subscription is increased by 6%. What is the total income
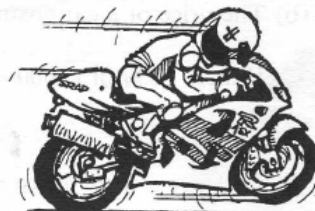   from subscriptions in 2000?

9. The cash price for a car was £7640. Mr Elder bought the car on the
   following hire purchase terms: 'A deposit of 20% of the cash price
   and 36 monthly payments of £191·60'. Calculate the total amount
   Mr Elder paid.

10. A quarterly telephone bill consists of £19·15 rental plus 4·7p for
    each dialled unit. V.A.T. is added at $17\frac{1}{2}$%. What is the total bill for
    Mrs Jones who used 915 dialled units?

11. A motor bike costs £820. After a 12% increase the new price is
    112% of £820. The 'quick' way to work this out is as follows:

    $$\text{New price} = 112\% \text{ of } £820$$
    $$= 1\cdot12 \times 820$$
    $$= £918\cdot40$$

    Use this quick method to find the new price of a lorry costing £6500
    when the price is increased by 5%.

(Question 12 is on the next page)

12. Find the new price of the following items

Item	Old price	Price change
Video	£190	6% increase
House	£150 000	11% increase
Boat	£2500	8% increase
Tree	£210	5% decrease
Phone	£65	15% decrease

13. Over a period of 6 months, a colony of rabbits increases in number by 25% and then by a further 30%. If there were originally 200 rabbits in the colony how many were there at the end?

14. In the last two weeks of a sale, prices are reduced first by 30% and then by a *further* 40% of the new price. What is the final sale price of a shirt which originally cost £15?

15. Work out the following:
- (a) 8% of 3·2 kg   (answer in grams)
- (b) 16% of £4·50   (answer in pence)
- (c) 28% of 5 cm   (answer in mm)
- (d) 5% of 10 hours   (answer in minutes)
- (e) 12% of 2 minutes   (answer in seconds)

16. A 12% increase in the value of N, followed by a 12% decrease in value can be calculated as $1 \cdot 12 \times N \times 0 \cdot 88$. Copy and complete:
- (a) An 8% increase in the value of P, followed by a 10% decrease in value can be calculated as ⬚ .
- (b) A ⬚ increase in the value of X, followed by a further ⬚ increase in value can be calculated as $1 \cdot 15 \times X \times 1 \cdot 06$.
- (c) A 25% increase in the value of Q, followed by a 5% decrease in value can be calculated as ⬚ .

Exercise B

1. The first figure is the cost price and the second figure is the selling price. Calculate the percentage profit or loss in each case.
- (a) £20, £25
- (b) £400, £500
- (c) £60, £54
- (d) £9000, £10 800
- (e) £460, £598
- (f) £512, £550·40
- (g) £45, £39·60
- (h) 50p, 23p

2. A car dealer buys a car for £500, gives it a clean, and then sells it for £640. What is the percentage profit?
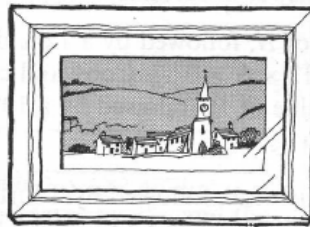
3. A damaged carpet which cost £180 when new, is sold for £100. What is the percentage loss?

4. During the first four weeks of her life, a baby girl increases her weight from 3·2 kg to 4·7 kg. What percentage increase does this represent? (Give your answer to 3 sig. fig.)

5. When V.A.T. is added to the cost of a car tyre, its price increases from £16·50 to £18·48. What is the rate at which V.A.T. is charged?

6. In order to increase sales, the price of a Concorde airliner is reduced from £30 000 000 to £28 400 000. What percentage reduction is this?

7. A picture has the dimensions shown.

10 cm

20 cm

Calculate the percentage increase in the area of the picture after both the length and width are increased by 20%.

8. A box has a square base of side 30 cm and height 20 cm. Calculate the percentage increase in the volume of the box after the length and width of the base are both increased by 10% and the height is increased by 5%.

9. The rental for a television set changed from £80 per year to £8 per month. What is the percentage increase in the yearly rental?

10. If an employer reduces the working week from 40 hours to 35 hours, with no loss of weekly pay, calculate the percentage increase in the hourly rate of pay.

11. Given that $G = ab$, find the percentage increase in G when both a and b increase by 10%.

12. The formula connecting P, a and n is $P = an^3$.
    (a) Calculate the value of P when $a = 200$ and $n = 5$.
    (b) Calculate the percentage increase in P when a is increased by 2% and n is increased by 20%.
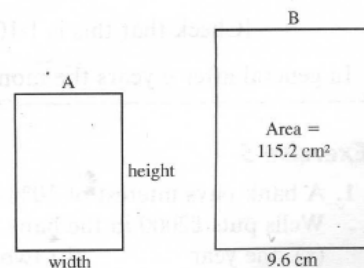

Exercise C

1. After an increase of 8%, the price of a car is £6696. Find the price of the car before the increase.

2. After a 12% pay rise, the salary of Mr Brown was £28 560. What was his salary before the increase?

3. Find the missing prices.

Item	Old price	New price	% change
(a) Jacket	?	£55	10% increase
(b) Dress	?	£212	6% increase
(c) CD player	?	£56·16	4% increase
(d) T.V.	?	£195	30% increase
(e) Car	?	£3960	65% increase

4. Between 1990 and 1997 the population of an island fell by 4%. The population in 1997 was 201 600. Find the population in 1990.

5. After being ill for 3 months, a man's weight went down by 12%. Find his original weight if he weighed 74·8 kg after the illness.
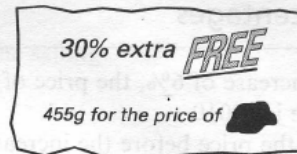
6. The diagram shows two rectangles. The width and height of rectangle B are both 20% greater than the width and height of rectangle A.

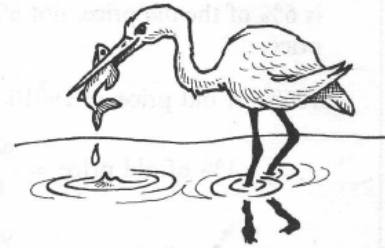Use the figures given to find the width and height of rectangle A.

A

height

width

B

Area = 115.2 cm²

9.6 cm

7. The label on a carton of yoghurt is shown.
The figure on the right is smudged out.
Work out what the figure should be.

30% extra FREE

455g for the price of ▬

8. A television costs £376 including $17\frac{1}{2}$% V.A.T.
How much of the cost is tax?

9. During a Grand Prix car race, the tyres on a car are reduced in
weight by 3%. If they weigh 388 kg at the end of the race, how
much did they weigh at the start?

10. A heron has discovered Sergio's goldfish pond. Sergio lost
70% of his collection of goldfish. If he has 60 survivors,
how many did he have originally?

11. The average attendance at Everton football club fell by
7% in 2000. If 2030 fewer people went to matches in 2000,
how many went in 1999?

12. When heated an iron bar expands by 0·2%. If the increase in length
is 1 cm, what is the original length of the bar?

13. An oven is sold for £600, thereby making a profit of 20% on the
cost price. What was the cost price?

14. In 1999 Corus plc had sales of £516 000 000 which was $7\frac{1}{2}$% higher
than the figure for 1998. Calculate the value of sales in 1998.

Exercise D

1. A bank pays interest of 10% on money in deposit accounts. Mrs
Wells puts £2000 in the bank. How much has she after:
   (a) one year   (b) two years   (c) three years?

2. A bank pays interest of 12%. Mr Olsen puts £5000 in the bank.
How much has he after:
   (a) one year   (b) three years?

3. A computer operator is paid £10 000 a year. Assuming her pay is
increased by 7% each year, what will her salary be in four years time?

4. Mrs Bergkamp's salary in 2000 is £30 000 per year. Every year her
salary is increased by 5%.
   In 2001 her salary will be $30\,000 \times 1\cdot05$ $= £31\,500$
   In 2002 her salary will be $30\,000 \times 1\cdot05 \times 1\cdot05$ $= £33\,075$
   In 2003 her salary will be $30\,000 \times 1\cdot05 \times 1\cdot05 \times 1\cdot05 = £34\,728\cdot75$
   And so on.
   (a) What will her salary be in 2004?
   (b) What will her salary be in 2006?

5. The price of a house was £90 000 in 1998. At the end of each
year the price has increased by 6%.
   (a) Find the price of the house after 1 year.
   (b) Find the price of the house after 3 years.
   (c) Find the price of the house after 10 years.

6. Assuming an average inflation rate of 8%, work out the
probable cost of the following items in 10 years:
   (a) car £6500·   (b) T.V. £340   (c) house £50 000

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7. A new car is valued at £15 000. At the end of each year its value is reduced by 15% of its value at the start of the year. What will it be worth after 3 years?

8. Twenty years ago a bus driver was paid £50 a week. He is now paid £185 a week. Assuming an average rate of inflation of 7%, has his pay kept up with inflation?

9. The population of an island increases by 10% each year. After how many years will the original population be doubled?

10. A bank pays interest of 11% on £6000 in a deposit account. After how many years will the money have trebled?

*11. (a) Draw the graph of $y = 1.08^x$ for values of x from 0 to 10.
   (b) Solve approximately the equation $1.08^x = 2$.
   (c) Money is invested at 8% interest. After how many years will the money have doubled?

12. A tree grows in height by 21% per year. It is 2 m tall after one year. After how many more years will the tree be 20 m tall?

13. Which is the better investment over ten years:

   £20 000 at 12% compound interest
   or   £30 000 at 8% compound interest?