

Percentages, decimals and fractions

6. 5.6 POPULATION OF 20 LARGEST URBAN AREAS AT SELECTED CENSUSES

Urban area	1936	1961	1986	1991
Auckland	226 366	448 365	821 647	885 571
Wellington	159 357	249 532	325 711	325 682
Christchurch	133 515	220 510	300 052	307 179
Hamilton	20 096	50 505	140 106	148 625
Dunedin	85 607	105 003	107 639	109 503
Palmerston North	24 372	43 185	67 405	70 951
Tauranga	5 808	24 659	63 254	70 803
Hastings	17 920	32 490	57 509	57 748
Rotorua	8 899	25 068	51 991	53 702
Napier	19 170	32 716	53 276	52 468
Invercargill	25 912	41 088	52 558	51 984
New Plymouth	18 597	32 387	47 384	48 519
Nelson	13 493	25 321	44 593	47 391
Whangarei	9 868	21 790	44 318	44 183
Wanganui	25 750	35 694	40 758	41 213
Gisborne	15 878	25 065	32 238	31 484
Timaru	18 771	26 424	28 676	27 637
Kapiti	5 367	12 305	23 203	27 380
Blenheim	5 036	11 956	22 681	23 637
Masterton	9 096	15 128	19 930	20 007

Source: NZ Official 1995 Year Book

- (a) Which urban area had the greatest increase in population from 1936 to 1991?
- (b) Which urban area had the greatest percentage increase in population from 1936 to 1991? What was the percentage increase?
- (c) Which urban area had the greatest percentage increase in population from 1986 to 1991? What was the percentage increase?
- (d) Which urban area had the greatest percentage decrease in population from 1986 to 1991? What was the percentage decrease?

Review 1 In 1975 there were 392 secondary schools in New Zealand. In 1993 there were 339. What percentage decrease is this?

Review 2

Marital status	1986 Census		1991 Census	
	Number	Percentage distribution	Number	Percentage distribution
Females				
Never Married	324 633	26.2	368 880	28.1
Married†	613 701	49.5	596 067	45.5
Remarried	66 126	5.3	74 406	5.7
Separated‡	48 132	3.9	59 187	4.5
Divorced	56 798	4.4	71 001	5.4
Widowed	132 516	10.7	140 976	10.8
Never Married	18 006	...	17 679	...
Total	1 257 912	100.0	1 328 196	100.0

† Includes persons who are still married but permanently separated.
‡ First marriage

Source: NZ Official 1995 Year Book

- (a) Which group of females had the greatest increase in numbers between 1986 and 1991?
- (b) Which group had the greatest percentage increase between 1986 and 1991? What was this percentage increase?
- (c) What was the percentage decrease in the number of married women from 1986 to 1991?

2. Find out the percentage increase or decrease of various animal or bird populations in the last 10 years. Which of these are in danger of becoming extinct? Which are becoming a pest?

The Department of Conservation or the World Wildlife Fund would be good sources of information.

3.

COUNTRY OF LAST PERMANENT RESIDENCE OF INTERNATIONAL VISITORS

<i>Country</i>	<i>Year Ended 31 March</i>			
	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>
Australia	343 299	341 098	361 995	369 482
United States	139 030	134 710	134 003	150 666
Japan	105 716	125 226	131 078	140 405
United Kingdom	87 963	92 900	96 809	110 720
Germany	32 171	38 064	51 279	59 440
Taiwan	11 049	19 473	31 622	48 140
Canada	33 545	28 941	25 978	28 398
Hong Kong	16 114	19 351	20 316	24 659
Singapore	15 251	18 067	19 277	24 746
Korea, Republic of	3 812	8 690	16 408	37 702
Switzerland	11 298	11 964	12 514	13 750
Thailand	5 980	7 271	11 253	17 859
Malaysia	9 783	9 101	11 011	13 477
Netherlands	7 624	8 428	10 134	11 407
Indonesia	4 898	5 917	8 787	10 784
Fiji	7 512	7 390	8 044	8 874
New Caledonia	4 471	5 244	7 297	7 654
Sweden	8 288	7 972	6 226	6 545
France	3 829	4 738	5 500	5 956
Tahiti (French Polynesia)	3 997	5 005	4 862	6 038
Austria	2 567	3 147	4 227	5 244

Source: NZ Official 1995 Year Book

Use the information given in this table to write a report giving recommendations to the government about the best places in the world to promote New Zealand. Make sure you include percentage increases and decreases in your report. You may use other sources of information as well.

991?

91?

different weeks. Calculate the

ONE NUMBER as a FRACTION or PERCENTAGE of ANOTHER

DISCUSSION EXERCISE 5:11

What percentage of cars passing the school have no passengers?

What percentage of students in Year 9 have part-time jobs?

What fraction of books in the library are non-fiction?

Each of the above involves finding one number as a percentage or fraction of another number. What numbers are involved in each of the above questions?

Discuss.

Think of more situations where you might want to find one number as a percentage of another number. **Discuss.**

Worked Example

*This mixture contains
150ml oil
50ml vinegar*

What fraction of this mixture is vinegar?

Answer In total there are $150 + 50 = 200\text{ml}$.
 50ml out of 200ml is vinegar.

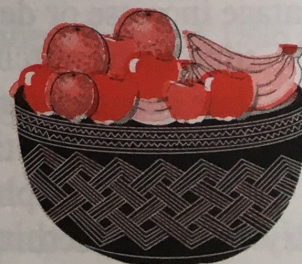
The fraction that is vinegar is $\frac{50}{200} = \frac{1}{4}$

$\frac{1}{4}$ of the mixture is vinegar.

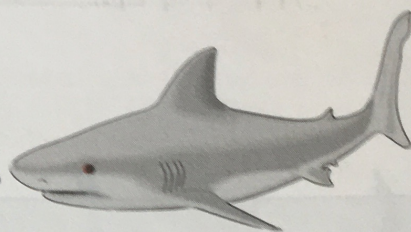
EXERCISE 5:12

1. A bowl of fruit had 9 apples, 3 oranges and 8 bananas.

What fraction of the fruit was bananas?



2. In an office of 27 people, 9 are women.
What fraction are men?
3. In a play there were 12 adults, 3 teenagers and 3 children.
What fraction were children?
4. Leanne sprinted 500m, jogged 1500m and walked 3000m each day. On Tuesday she hurt her ankle after 1000m.
What fraction of her exercise had she still to complete?
5. Basking sharks grow to be about 12m long.
A young shark 8m long was found.
What fraction did it still have to grow to be full length?



Review A healthy adult should sleep about 8 hours each day.
What fraction of the day should be spent awake?

To find a given number as a percentage of another number proceed as follows.

Step 1 Write the given number as a fraction of the other number.

Step 2 Rewrite this fraction as a percentage.

Worked Example Reitu's family had a total income of \$54,000.
This family paid a total of \$1100 in rates.
What percentage of their total income was this?

Answer Fraction of income paid in rates = $\frac{\text{rates}}{\text{income}}$

$$= \frac{1100}{54000}$$

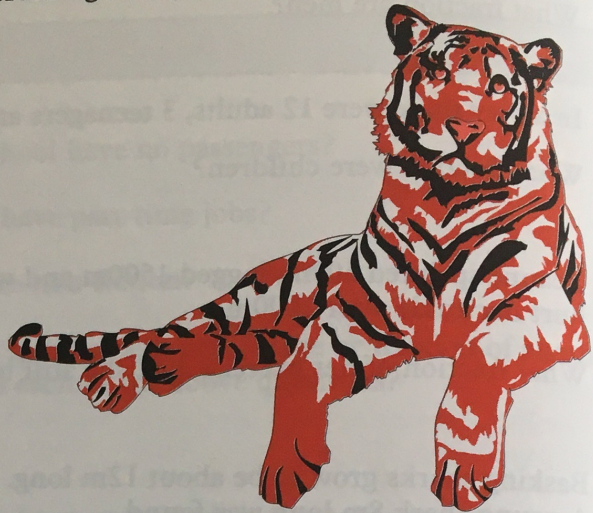
$$\begin{aligned} \% \text{ of income} &= \frac{1100}{54000} \times 100\% \\ &= 2\% \text{ (to the nearest percentage)} \end{aligned}$$

Worked Example There are seven species of tiger left in the world. One species, the Bali tiger, is extinct. What percentage of species are not extinct?

Answer 7 out of 8 species are not extinct.

$$\text{Fraction not extinct} = \frac{7}{8}$$

$$\begin{aligned} \text{\% not extinct} &= \frac{7}{8} \times 100\% \\ &= 87.5\% \end{aligned}$$



EXERCISE 5:13

Round your answers sensibly in this exercise.

1. Of the 50 houses in Melville Street, 40 are two-storeyed.

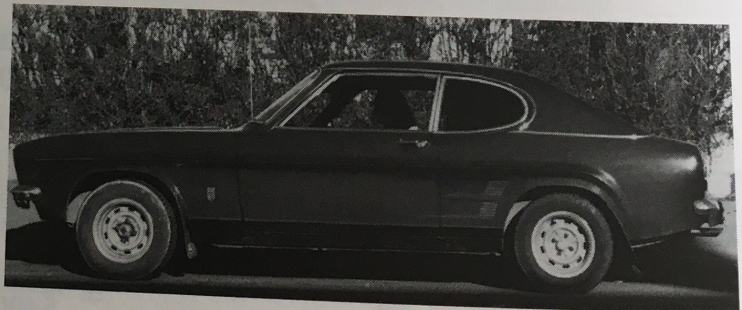
What percentage of houses in Melville Street are two-storeyed?

2. At a meeting, 58 out of 85 people voted in favour of a motion.

What percentage of these people voted in favour of the motion?

3. Sue was doing a survey on cars.
Of 150 cars that went past her, 3
were sports cars.

What percentage of the cars, that
went past Sue, were sports cars?



4. The results of Nathan's survey on sport showed that 4 out of 50 students played no sport.

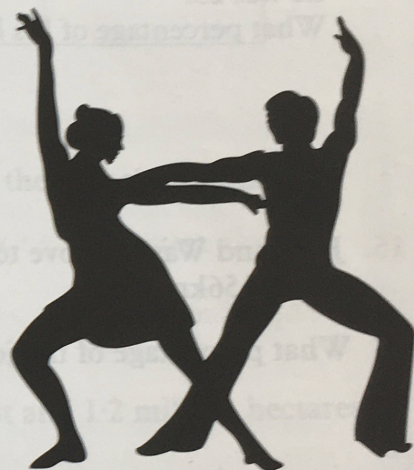
What percentage of the students, that Nathan surveyed, played sport?

5. Annette kept a table of the amount she earned, and the amount she saved, for each of the first six months of last year. Her table is shown below.

	Earnings	Savings	% saved
Jan.	\$50	\$25	
Feb.	\$80	\$20	
March	\$66	\$66	
April	\$104	\$26	
May	\$85	\$34	
June	\$60	\$44	

Copy this table and complete the last column.

6. 2341 out of a workforce of 11345 were unemployed.
What percentage of this workforce was unemployed?
7. Out of a dance class of 28, 2 were absent.
What percentage of the class was present?
8. Of 1450 videos at the Video Village, 84 were new releases.
What percentage were not new releases?
9. In June, 8 days out of 30 had rain.
What percentage did not have rain?
10. 187 out of 203 trees planted along a boundary survived.
What percentage survived?
11. There were 65 families at Yaldhurst School. A questionnaire was sent to each family and 53 were returned.
What percentage of families did not return the questionnaire?

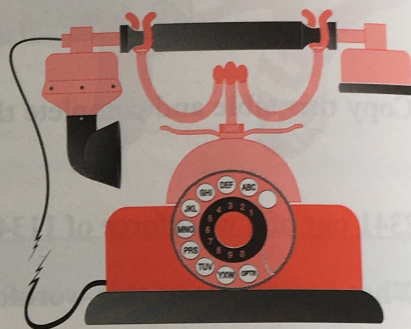


12. In Tony's class there are 14 girls and 18 boys.
What percentage are boys?

13. In one litre of air there is about
210ml oxygen
780ml nitrogen
10ml argon.

About what percentage of the air is oxygen?

14. Alexander Bell, who invented the telephone, lived from 1847 to 1922. He emigrated to Canada when he was 23.
What percentage of his life did he spend in Canada?



15. Judy and Wayne drove to Nelson from Christchurch. Judy drove 265km and Wayne drove 156km.

What percentage of the journey did Judy drive?

16.

Couple with no children	Couple with one or more children	One parent with children	One person household	Other
271,800	360,500	101,500	231,100	115,700

This table gives, to the nearest 100, the number of each type of household in New Zealand in 1991.

- (a) What percentage of households were couples with one or more children?
- (b) What percentage were one person households?
- (c) What percentage were couples with no children?

17. A flock of 800 ewes had 1000 lambs.
What is the lambing percentage for this flock?

Review 1 Pure gold is 24 carat gold.

What percentage of pure gold is 18 carat gold?

Review 2 A tutor, at a Polytechnic, chose 5 classes to survey. This tutor was comparing the number of females with the number of males. Copy and complete the following table.

Class	Total Present	Females Present	% Females
Word Processing	140	112	
Computing	130	26	
Mathematics III	100	14	
Biology I	75	15	
Interior Design	15	10	

Review 3 At a meeting, 116 out of 170 parents voted to change the school uniform.

What percentage did not want the uniform changed?

Review 4 New Zealand has 6.2 million hectares of native forest and 1.2 million hectares of introduced species.

What percentage of New Zealand forest is native?

Review 5


Butterscotch

6 tablespoons sugar
2 tablespoons vinegar
2 tablespoons butter

1. Put all ingredients in a bowl. Microwave on high 5 mins. Stir.
2. Microwave on high 2 more mins. Stir twice during cooking.
3. Allow to cool and set.

What percentage of this recipe is sugar?

EXERCISE 5:17

1. In a "Swimathon" a team of 6 swimmers swam a total of 2050.5m. If all except one swam 350m, how far did the sixth swim? 
2. Beth bought 10 plants at a nursery. 4 of the plants cost \$3.95 each, 3 cost \$2.75 each and 2 cost \$8.50 each. If the total came to \$49 how much did the other plant cost?
3. Jan worked out that there were 10 weeks till Christmas and she wanted to save some money each week to buy Christmas presents. She needed \$25 for each of her parents and \$15 for each of her 4 sisters and \$5 for each of her 7 nephews. How much did she have to save each week?
4. Georgina and Maria each took 4 books out of the library. They returned them 4 weeks overdue. The charges for overdue books are 5c per week per book for the first 2 weeks and 10c per week per book for each week after that.
 - (a) What was the total fine for each book?
 - (b) What was the total fine altogether?
5. Jack bought a cassette player on lay-by. It cost \$129.95 and he paid a deposit of \$35.95. He paid the cassette player off in four equal weekly payments.
 - (a) How much did he pay off each week?
 - (b) What percentage of the cost was the deposit?
6. Five friends went to see "Once Were Warriors". The tickets were \$8 each and they each spent \$4.80 on food and drink.
 - (a) How much did the students spend altogether?
 - (b) What fraction of the total cost was spent on food and drink?
7. Abbie earned \$368.50 each week. She spent \$80 per week on rent, \$75 on food, \$25 on petrol and \$30 on entertainment.
 - (a) How much did she have left each week?
 - (b) What percentage of her income did Abbie spend on rent?
 - (c) What percentage of her total expenses were spent on food and petrol?

8. **AVERAGE HOUSEHOLD SPENDING**

Group	Per week
Housing	\$118
Food	\$102
Health, education, insurance and other services	\$95
Transportation	\$92
Running and equipping the home	\$81
Books, newspapers, tobacco alcohol and other goods	\$69
Clothing and footwear	\$27

Source: NZ Official 1995 Year Book

- What percentage of household spending went on food?
- What percentage went on clothing and footwear?
- What group is the greatest percentage spent on?
- Make some statements about this information.

9. On a farm of 1200 ewes, 850 had twins, 130 had triplets and the rest had single lambs.

- What fraction had triplets?
- What fraction had twins?
- What is the lambing percentage?



10.

VEHICLE CATEGORY	DAILY RATE	KILOMETRE RATE	4 DAYS & OVER UNLIMITED KILOMETRES	20 DAYS & OVER UNLIMITED KILOMETRES
NON DISCOUNTABLE RATES				
SUPER THRIFTY 3 Door Manual Hatchback	\$21	20c	\$34	\$23.50
TOURIST CLASS 4 Door	\$27	22c	\$39 / \$45	\$29 / \$35
EXECUTIVE CLASS 4 Door Large Car Some Auto and Air Conditioning	\$30	25c	\$45 / \$50	\$39 / \$45
MINIBUS Airconditioning, Auto, Power Steer.	\$50	45c	\$75	\$60
FORD FAIRLANE V8 Ghia 1992	\$95	50c	\$145	\$135

OUR RATES ARE NEGOTIABLE FOR LONGER TERM HIRES
BIG\$AVE CAR RENTALS

Jane wanted to hire a car for 5 days. She estimated she would travel about 500km in that time.

- What is the cheapest option for Jane?
- What percentage saving does she make over the next cheapest option?

DAY PASSES			
	ADULT	STUDENT	YOUTH
All Lifts	\$48	\$44	\$24
All Day	\$50 (\$12 refund)		
Half Day - Morning			
Half Day - Afternoon	\$38		
5 Day Anytime	\$217	\$198	\$109
Lower Mountain Lifts	\$36	\$36	\$18
First Timer's Pack	\$47	\$47	\$26
Chairlift Ride	\$13	\$13	\$7

SEASON PASSES			
	ADULT	STUDENT	YOUTH
Standard	\$720	\$660	\$360
Family	\$535	\$485	\$265
Super	\$150		
Super Super & Infant	Free		

SKI RUAPEHU PASSES		
	ADULT	YOUTH
6 DAY ANYTIME PASS	\$265	\$135

SKI RENTAL			
Rates: (GST incl)			
		Adult	Youth
Full Day	Skis/boots/poles	\$25	\$15
	Skis/poles	\$21	\$11
	Boots	\$14	\$8
	Poles	\$5	\$5
Half Day	Skis/boots/poles	\$18	\$11
5 Day	Skis/boots/poles	\$85	\$53
	Executive		
Snowboards	Skis	\$35	
	Boots	\$20	
	Skis/boots/poles	\$45	
X Country	Skis	\$30	
	Skis/boots/poles	\$37	
Clothing	Jackets	\$10	
	Pants	\$10	
	Tramping Boots	\$12	
Snowboards	Board only	\$40	
	Snowboard and boots	\$45	
	Half day	\$30	

- How much does it cost for two adults and a youth to ski All Lifts and hire skis/boots/poles for one day?
- What percentage saving is made if an adult uses the Lower Mountain Lifts rather than All Lifts?
- What percentage saving does a youth make by buying a 5 Day Anytime pass rather than buying 5 All Day passes?
- What percentage saving is made by an adult who buys a 6 Day Anytime Pass rather than 6 All Day passes?
- What percentage saving is made by an adult hiring skis/boots/poles on a 5 Day rental rather than five Full Day hires?
- How many days would an adult need to ski in a season for it to be cheaper to buy a season pass than to buy All Day passes? (Assume no gear needs to be hired.)
- If a family of 2 adults and 2 children, who had their own gear, skied for 20 days in a season, what percentage saving would they make by buying 2 family adult and 2 family youth season passes rather than four 5 Day Anytime passes?

12. \$1 N.Z. will buy the following

U.K. (pound)	0.4198	Germany (mark)	0.9616
U.S.A. (dollar)	0.6508	Australia (dollar)	0.8645
France (franc)	3.3061		

- Millie was going on a trip to England, France and Germany. She converted \$2500 N.Z. to pounds, \$1500 N.Z. to francs and \$2300 N.Z. to marks. How many pounds, francs and marks did Millie get?

- (b) Hannah's mother who lives in Australia sent Hannah \$300 Australian. How many N.Z. dollars would Hannah get for this?
- (c) Joel wanted to buy a book from the United States which cost \$59.95 U.S. How many N.Z. dollars would this book cost?
- (d) Asher got a tax refund from Britain of £598.52. How many N.Z. dollars is this?

Review 1 Lucinda put a leather jacket on lay-by. The price of the jacket was \$534.95. She paid a deposit of \$42.50 and paid the remainder off in three equal monthly payments. How much did she pay off each month?

Review 2 A truck loaded with 48 cartons weighs in on a weigh bridge at 21,568kg. The unladen weight of the truck is 15,400kg. Assume each carton is the same weight.

(a) Find the weight of 1 carton.

(b) What percentage of the loaded truck's weight is the cartons?

Review 3 Forrest earns \$52,000 each year. Last year he gave \$125 per week to charity.

(a) How much did he have left each week for himself?

(b) What fraction of his income does he give to charity?

Review 4 These tables give the charges per minute for telephone calls to some countries.

Country	Standard hours behind New Zealand	STANDARD Mon-Fri 8am-10pm	ECONOMY Mon-Fri 10pm-8am all weekend & stat hol.
American Samoa	23	\$1.80	\$1.42
Canada	15-21	\$1.99	\$1.69
Cook Islands	22	\$1.80	\$1.42
Fiji	0	\$1.80	\$1.42
Hong Kong	4	\$2.15	\$1.69
Indonesia	3-5	\$2.87	\$2.40

Country	Standard hours behind New Zealand	STANDARD Mon-Fri 8am-10pm	ECONOMY Mon-Fri 10pm-8am all weekend & stat hol.
Malaysia	4	\$2.73	\$1.89
Philippines	4	\$2.87	\$1.89
Solomon Islands	1	\$1.80	\$1.42
Thailand	5	\$2.87	\$2.40
Tonga	+1	\$1.80	\$1.42
Western Samoa	23	\$1.80	\$1.42

Friends and Family International Plan

Calls lasting up to 10 minutes	10%
Calls lasting from 10 up to 20 minutes	20%
Calls lasting from 20 up to 30 minutes	30%
Calls lasting 30 minutes and over	45%

- (a) How much does it cost to make a 6 minute call to Hong Kong on Saturday night?
- (b) What percentage saving is made on a 15 minute call to American Samoa if it is made after 10p.m. on a Wednesday night rather than at 9p.m.?
- (c) Misa rang her family in Tonga at 7a.m. on Thursday. She spoke for 35 minutes. How much will this call cost if she belongs to the Friends and Family International Plan?
- (d) Work out the percentage saving, if you belonged to the Friends and Family International Plan, on three calls you would like to make.