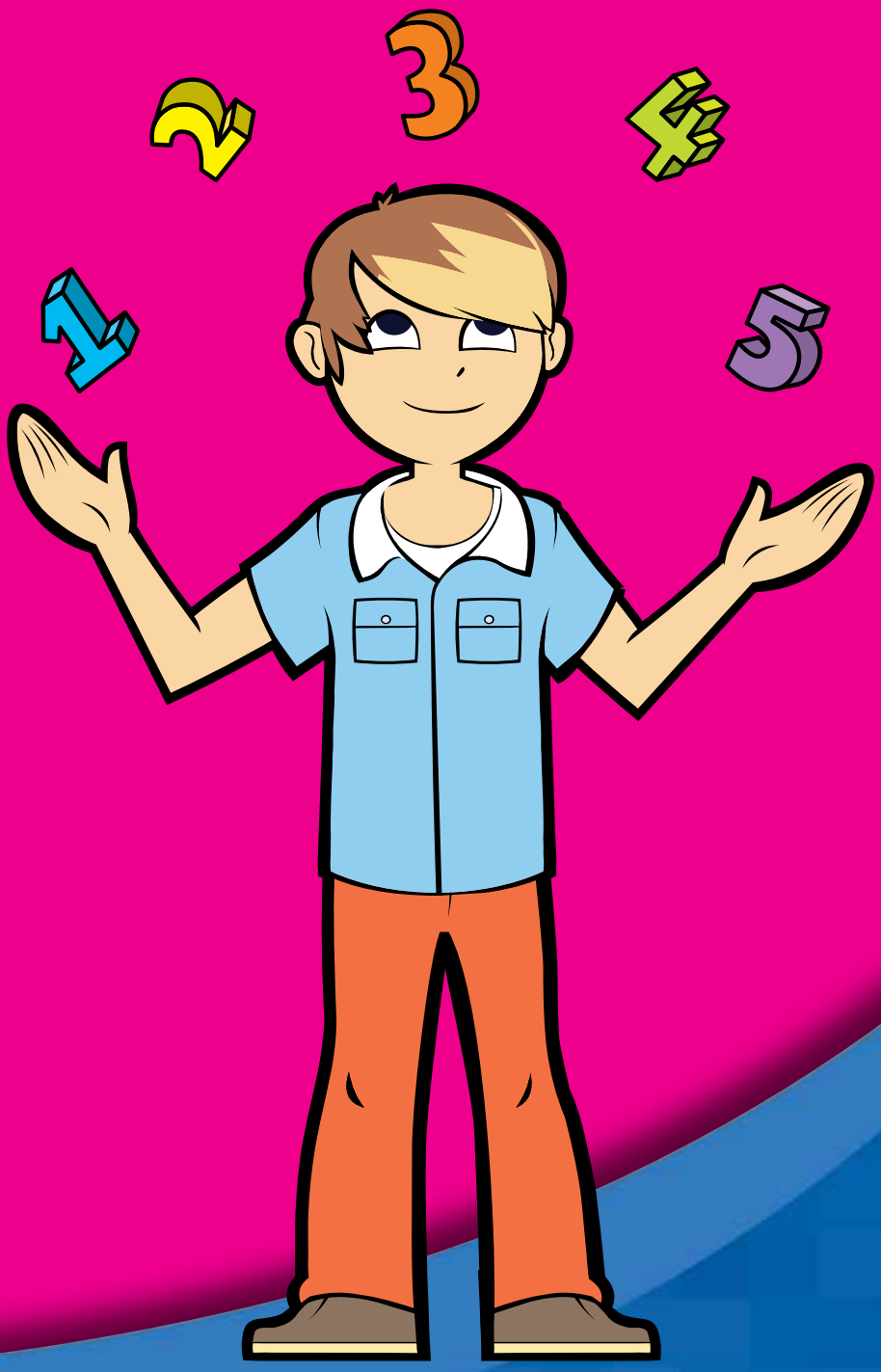
MATHLETICS

G SERIES Student Book

Reading and Understanding Whole Numbers



Name _____

Series G – Reading and Understanding Whole Numbers

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Read and understand numbers – place value

The place of a digit in a number tells us its value.

1 216 085

1 is worth	1 000 000 or 1 million
2 is worth	200 000 or 2 hundred thousands
1 is worth	10 000 or 1 ten thousand
6 is worth	6 000 or 6 thousands
0 is worth	0 or 0 hundreds
8 is worth	80 or 8 tens
5 is worth	5 or 5 ones

1 **Fill in the place value chart for each number. The first one has been done for you.**

	Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
816 958		*8*	*1*	*6*	*9*	*5*	*8*
1 254 958							
91 806							
1 048 787							
958 656							
1 362 055							

2 **Circle the larger number:**

a 240 547 / 241 253

b 519 476 / 591 476

c 353 537 / 335 647

d 525 461 / 525 614

e 512 444 / 512 333

f 432 498 / 433 498

3 **Write the next 3 numbers in each sequence:**

a + 10 000	33 591			
b + 100 000	459 012			
c – 1 000	708 518			
d – 100	1 000 000			

Read and understand numbers – expanded notation

When we write numbers using expanded notation, we identify and name the value of each digit.

154 231 = 100 000 + 50 000 + 4 000 + 200 + 30 + 1

1 **Convert the numbers into expanded notation:**

a 246 936 — *200 000 + 40 000 + 6 000 + 900 + 30 + 6*

b 88 421

c 856 913

d 714 533

e 240 547

f 215 632

g 770 421

h 467 809

2 **Write the number from the expanded notation. Remember to group the digits in 3s.**

a 500 000 + 20 000 + 3 000 + 700 + 40 + 1 _____

b 80 000 + 5 000 + 200 + 70 + 3 _____

c 400 000 + 5 000 + 200 + 50 + 2 _____

d 900 000 + 40 000 + 1 000 + 80 + 5 _____

e 20 000 + 7 000 + 300 + 8 _____

f 300 000 + 2 000 + 500 + 80 + 4 _____

g 800 000 + 50 000 + 6 000 + 200 + 30 + 8 _____

Read and understand numbers – ordering

When ordering numbers it is important to look closely at the place of the digits.

1 **Put the following numbers in order from smallest to largest:**

548 654 ☐

550 654 ☐

547 521 ☐

485 554 ☐

547 656 ☐

256 441 ☐

995 841 ☐

smallest ↓ largest

2 **Read the following instructions and complete the table:**

You are in charge of compiling the ratings for the top 10 television programs for the week. You have ordered them according to your personal preference but your editor is not amused.

She wants you to reorder them from most popular to least popular according to the number of viewers. This now seems like a good idea as you like your job and want to keep it.

Use the final column to record the correct order of popularity.

Your order	Program	Viewers	Revised order
1	Guess that Tune	840 000	
2	Romsey's Kitchen Nightmares	330 000	
3	Friends and Neighbours	432 000	
4	Big Sister	560 000	
5	Gladiator Fighters	290 000	
6	Sea Patrol 7	390 000	
7	Crime Scene Clues	388 000	
8	Crazy Housewives	300 000	
9	Tomorrow Tonight	740 000	
10	Better Homes and Backyards	360 000	

3 **Play this game with 3 friends. The aim is to make the biggest number you can. You'll each need to make a copy of this page and cut out your set of digit cards below. Put each player's cards together and shuffle. You only need one copy of the 5 points card for the whole group.**

0	1	2	3	4
5	6	7	8	9

5 points

Instructions

1. Make sure you have shuffled the cards well before you deal out 6 cards to each player.
2. Turn the remaining cards face down in 1 pile.
3. Play rock paper scissors to see who will go first. When it is their turn, players may swap one of their cards for the top card. It's a lucky dip though; the card may help or hinder!
4. Player 1 makes the biggest number they can using all their cards. They take the 5 point card as their number is the only one out there.
5. Player 2 then tries to make a larger number. If they can do so, then the 5 point card goes to them.
6. Player 3 and 4 follow the same steps.
7. The player with the largest number at the end of the game gets the 5 points. Keep score after each round.
8. Play again. Or try a different variation such as the smallest number, the largest even number or the smallest odd number.

Read and understand numbers – prime and composite numbers

A factor is a number that divides equally into another number.

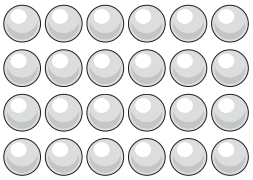
5 × 4 = 20

20 arranged in 5 rows means 4 in each row.

5 and 4 are factors of 20.

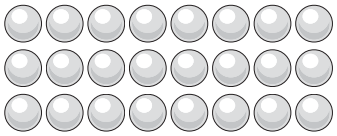
1 **How many ways can 24 objects be arranged? Use the arrays below to complete the facts:**

a



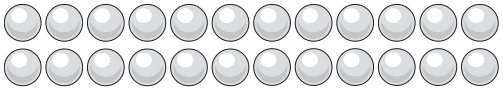
□ × □ = 24

b



□ × □ = 24

c



□ × □ = 24

d

□ × □ = 24

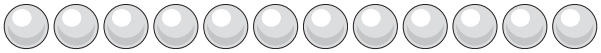
24 can be arranged in many different ways. The factors of 24 are 1, 2, 3, 4, 6, 8, 12 and 24.

Composite numbers are numbers with more than two factors.

24 is a composite number.

A prime number is only divisible by 1 so has only two factors: 1 and itself. 7 is a prime number.

2 **How many ways can 12 objects be arranged?**



Draw all the combinations you can think of:

Read and understand numbers – prime and composite numbers

Eratosthenes (276 BC – 194 BC) was a Greek mathematician who developed a clever way to find prime numbers.

3 **Find all the prime numbers in the hundred grid below. (Do not shade the number itself as it is not a multiple.)**

a Cross out 1 since it is not prime.

b Shade all the multiples of 2.

c Shade all the multiples of 3.

d Shade all the multiples of 5.

e Shade all the multiples of 7.

f The remaining numbers are prime numbers, apart from 1 which is a special case. List them:

_____

_____

The Sieve of Eratosthenes

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

4 **Circle the prime numbers. Use the Sieve of Eratosthenes to help you.**

65	89	47	94	25	43
11	27	32	19	21	65
7	53	99	87	26	13

Read and understand numbers – mixed practice

1 **Work out what the secret numbers are. Assume all numbers are positive, unless stated otherwise.**

a I am the only even prime number. I am _____.

b I am one of the two numbers that are neither prime nor composite. I am not zero.

I am _____.

c I am a 2 digit number. I am less than 40. I am a prime number and my second digit is smaller than my first number. I am _____.

d I am the largest 5 digit number where no number is repeated. I am _____.

e I am the largest 4 digit number that uses the 4 smallest prime numbers. I am _____.

f I am a prime number. My digits add to total the smallest prime number. I am _____.

2 **In these next questions, there is more than 1 possible answer.**

a Look at the number 598 652.

Write 5 numbers that are larger than this with the same number of digits.

_____

Write 5 numbers that are smaller.

_____

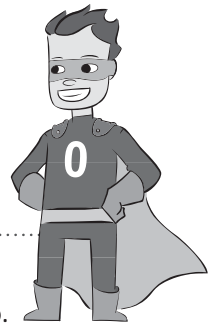
b Rounded to the nearest 100 km, my train trip was 3 000 km long. How long could it have been? How many answers to this question can you find?

Zero the Hero

apply

Getting ready

In this activity, you are going to make different numbers by performing operations (not the medical kind) to remove zeros from a number. You will work with a partner. You'll need a calculator to share.



What to do

1. Enter a 6 digit number into a calculator. Make sure it contains 1 zero.
2. Pass the calculator to your partner. Their job is to remove the zero from the calculator using one addition or subtraction problem.
3. If they can read the number correctly and explain how they did it in 1 step they score 10 points.
4. Swap roles. The first person to score 50 points wins the game.

What to do next

Can you invent a similar game using a calculator? Does it need to be harder or easier for you to enjoy playing it? How could you change it? What will you ask your partner do with the numbers? Try it out and refine it until it works well.

Write down your instructions so that another team can play your game. Swap your instructions with another team and play each other's game.

Enter the number 46 783 into your calculator. I want to see a zero in the hundreds place. Can't do it? Drop down and give me 20 push-ups.

DISCOVER

Having problems reading the numbers? You could put the numbers under headings to help you identify the value of the zero.

HT	TT	Th	H	T	U

CHECK

Goldbach's conjecture — investigate

Getting ready

In the year 1742, a Prussian mathematician called Christian Goldbach looked at many sums and made a conjecture. He said that every even number over 4 is the sum of 2 prime numbers. (Actually he said over 2 but that was when 1 was considered a prime number. That is now so 1742.)

What to do

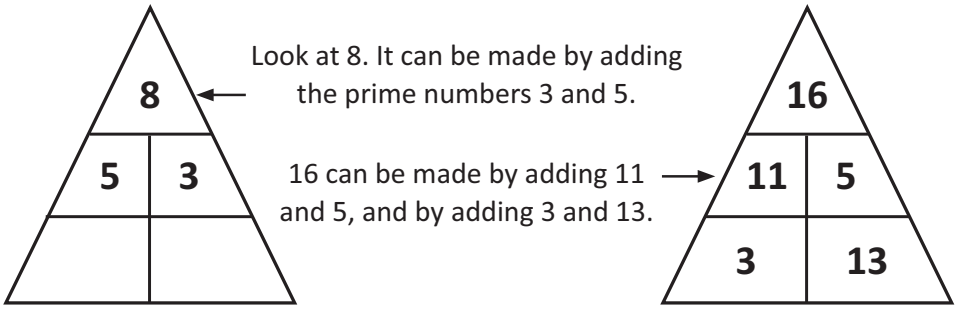
You have been asked by the Mathematics Institute to test this out.

How high can you go?

What will you need to help you solve this problem? You may want to use the table of prime numbers on page 18.

You can work by yourself or as part of a small group.

Here are a few to start you off.



Use the triangles on page 18 to record your thinking. Or create your own. You may need more!

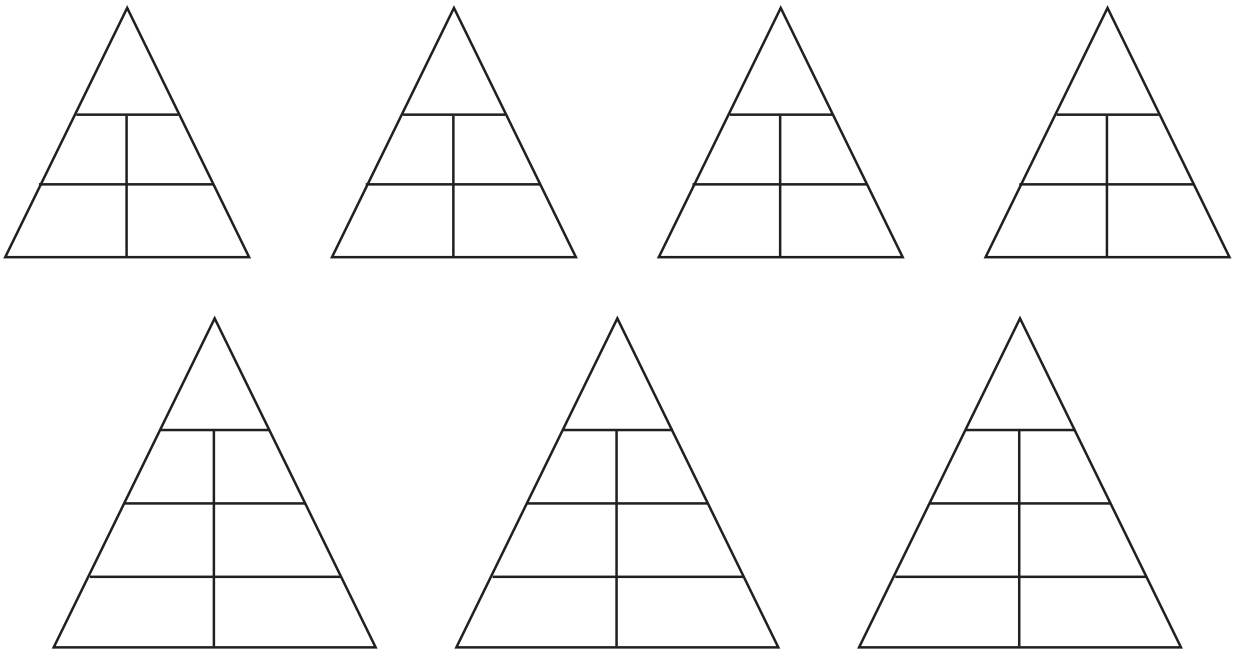
What to do next

Which even number can be made the most ways? Discuss your answer with 2 friends. Do they agree?

Goldbach's theory has never been absolutely proven or disproven. The publishing group Faber and Faber offered a $1 000 000 prize to any one who could do so. No one was able to claim the prize at the end of the competition time. Who knows, you could be the one to claim the glory (if not the prize). You could rename the conjecture. What would you call it?

Goldbach's conjecture

investigate

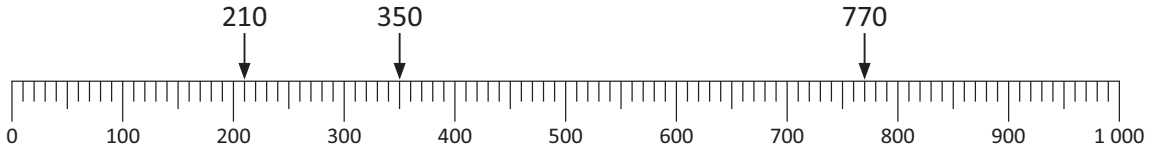


2	3	5	7	11	13
17	19	23	29	31	37
41	43	47	53	59	61
67	71	73	79	83	89
97	101	103	107	109	113
127	131	137	139	149	151
157	163	167	173	179	181
191	193	197	199	211	223
227	229	233	239	241	251
257	263	269	271	277	281
283	293	307	311	313	317
331	337	347	349	353	359
367	373	379	383	389	397
401	409	419	421	431	433
439	443	449	459	461	463
467	479	487	491	499	

Round and estimate – round to the nearest power of ten

Rounding makes big numbers easier to work with. We round to numbers that we can deal with easily in our heads.

We most commonly round to the nearest 10 or power of 10.



770 rounds to 800

210 rounds to 200

350 rounds to 400

Round *up* when it is halfway between the 10s or more.

Round *down* when the number is less than halfway.

REMEMBER

1 **Round to the nearest thousand:**

a 12 388 _____ **b** 9 525 _____

c 39 610 _____ **d** 55 239 _____

e 8 392 _____ **f** 89 743 _____

2 **Round to the nearest ten thousand:**

a 14 987 _____ **b** 24 033 _____

c 36 095 _____ **d** 77 330 _____

e 245 302 _____ **f** 695 474 _____

3 **Round to the nearest hundred thousand:**

a 828 549 _____ **b** 653 200 _____

c 105 525 _____ **d** 223 669 _____

e 856 914 _____ **f** 449 987 _____

Round and estimate – round to the nearest power of ten

4 **To find a secret fact about the gorilla, round the numbers in the clues below and insert the matching letters above the answers.**

2 000	50 000		400	8 000	20 000		400	8 000	50 000	400	200			
8 000		200	70 000	500	8 000	20 000		400	7 000	900	10 000			

H	249	rounded to the nearest hundred	**U**	69 623	rounded to the nearest thousand
N	19 432	rounded to the nearest ten thousand	**M**	462	rounded to the nearest hundred
T	49 832	rounded to the nearest thousand	**I**	2 490	rounded to the nearest thousand
L	850	rounded to the nearest hundred	**C**	361	rounded to the nearest hundred
D	10 320	rounded to the nearest thousand	**A**	7 711	rounded to the nearest thousand
O	6 625	rounded to the nearest thousand			

5 **Answer true or false:**

a When rounding to the nearest hundred, 18 762 rounds to 19 000.	True / False
b When rounding to the nearest thousand, 17 468 rounds to 17 000.	True / False
c When rounding to the nearest ten, 5 rounds up.	True / False
d We use rounding when we need to be absolutely precise.	True / False
e When rounding to the nearest hundred, 78 050 rounds to 78 100.	True / False
f When rounding to the nearest hundred, numbers round down from 50.	True / False
g You would be happy for your parents to use rounding for your weekly pocket money. You receive $14 pocket money.	True / False

6 **A number rounded to the nearest thousand is 4 000. List at least 10 numbers it could be.**

Round and estimate – round and estimate

We often round numbers when we are estimating, when being close enough provides us with the information we need to make a decision or calculation.

1 **Work out estimates for the following problems. The first one has been done for you.**

a 29 × 11

30 × 10 = *300*

b 19 × 22

□ × □ = □

c 12 × 41

□ × □ = □

d 32 × 51

□ × □ = □

e 62 × 29

□ × □ = □

f 21 × 39

□ × □ = □

g 11 × 59

□ × □ = □

h 41 × 39

□ × □ = □

i 19 × 69

□ × □ = □

2 **Circle the best estimate:**

a	52 + 39 =	20	90	200
b	70 × 29 =	2 100	210	40
c	299 + 415 =	70	500	700
d	812 – 325 =	50	500	600
e	39 × 80 =	50	320	3 200
f	310 + 99 =	4	40	400
g	395 – 198 =	2	20	200

A handy way to quickly multiply large numbers with zeros is to:

1 Cross off the zeros **40 × 20 =**

2 Perform the operation **4 × 2 = 8**

3 Add EXACTLY the number of zeros you crossed off **8 + 00**

40 × 20 = 800

Round and estimate – round and estimate

Sometimes it is best to round to a known fact rather than follow the normal rounding rules.

For example: 637 ÷ 9 = ?

If we round 637 to 630 instead of 640 we get 630 ÷ 9 = 70

This is easier to work out in our heads because we know the division fact: 63 ÷ 9 = 7

3 **Estimate the answer to the following division questions. The first one has been done for you.**

a 329 ÷ 8 = 320 ÷ 8 = 40

b 487 ÷ 6 = ____ ÷ ____ = ____

c 427 ÷ 7 = ____ ÷ ____ = ____

d 367 ÷ 6 = ____ ÷ ____ = ____

e 568 ÷ 8 = ____ ÷ ____ = ____

f 729 ÷ 9 = ____ ÷ ____ = ____

4 **Hayley and Jack estimated answers to some calculations. Circle the most useful estimate:**

Calculation	Hayley	Jack
a 12 of you go to a restaurant. The set price is $18 a head. What will the bill roughly be?	$200	$300
b You want to buy a new MP3 player that costs $157 and 5 songs from iTunes at $1.69 each. You have $250. Can you do it?	Yes – $250	Yes – $170
c You travel 365 km on one day, 478 km the next, and 541 the next. Roughly how far have you travelled altogether?	1 400 km	1 000 km
d 94 divided by 9 equals	3	10
e 47 + 32 + 67 =	150	800
f You have $32. A packet of lollies costs $2.95. Roughly how many packets can you buy with your money?	10	7
g 1 020 × 58 =	50 000	60 000

Butler, fill my bath! solve

Getting ready

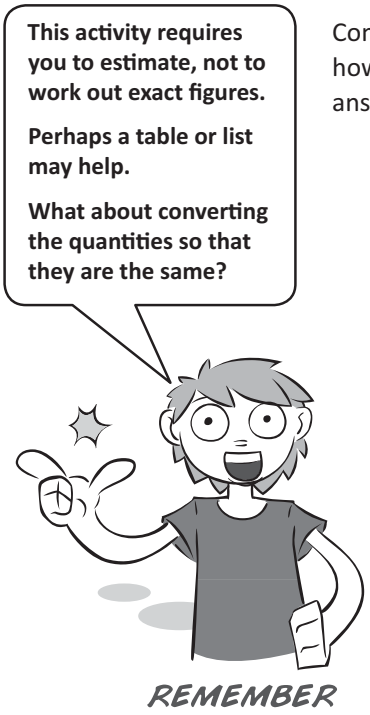
Your very demanding employer has decided he wants to bathe in lemonade as he believes the bubbles and sugar will make him young and attractive again. You think it will take more than lemonade, but you do his bidding anyway.

What to do

Using only a pencil and paper, work out the approximate number of 375 mL cans you will need to fill the 265 litre bathtub. His Lordship hates wastage, so you need to be as close as you can with your estimate.

Think of a strategy. Try it out. Are you on the right track?

Compare your answer with that of a friend. Are your answers similar? If not, discuss how each of you solved it, and work together to see if you can come up with an answer you both agree on.



What to do next

Can you get closer with your estimate? The more accurate you are, the fewer cans are used.

Round and estimate word problems — solve

What to do

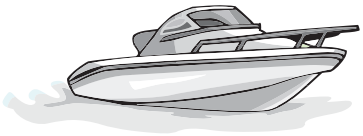
Solve these problems

a Dixie earned $10 433 in her first year as a singer. The next year her career took off and she earned $107 420. In the following year she raked in a cool $822 000. What were her earnings over the 3 years to the nearest ten thousand dollars?

_____

b Sadly for Dixie, success is fickle, and her career took a nosedive. In the fourth year, she made only $10 000 and had spent all but $100 000 of her previous earnings. The tax office then decided she owed $150 000 in back taxes. Will she have to go into debt to pay them back? If so, by how much?

_____



c Angus and his brothers are saving for a speed boat. Angus has $2 878, Richard has $1 790, and Jack has $4 213. The boat costs $15 000. Approximately how much more money do they need?

_____

d Jack has changed his mind about buying the speed boat. Instead he decides to join a get rich quick scheme that requires just $4 000 from him as a joining fee. Angus and Richard ask their cousin Fred to take Jack's place. Fred puts in $2 000 to the boat fund.

How much more money do they now need to buy the speed boat?

_____

Which information provided in the story is irrelevant to solving the problem?

_____

_____

How long before Jack regrets his decision?

_____

e Belle wants to buy 11 mini-chocolate bars. They each cost 80 cents. She estimates this will cost her $10. Is this a reasonable estimate?

_____

f Dion goes for a run 5 days a week. Each run is 5 km long. He tells his mates he runs about 50 km a week. Is this a reasonable estimation or is he just bragging? Explain your thinking:

_____