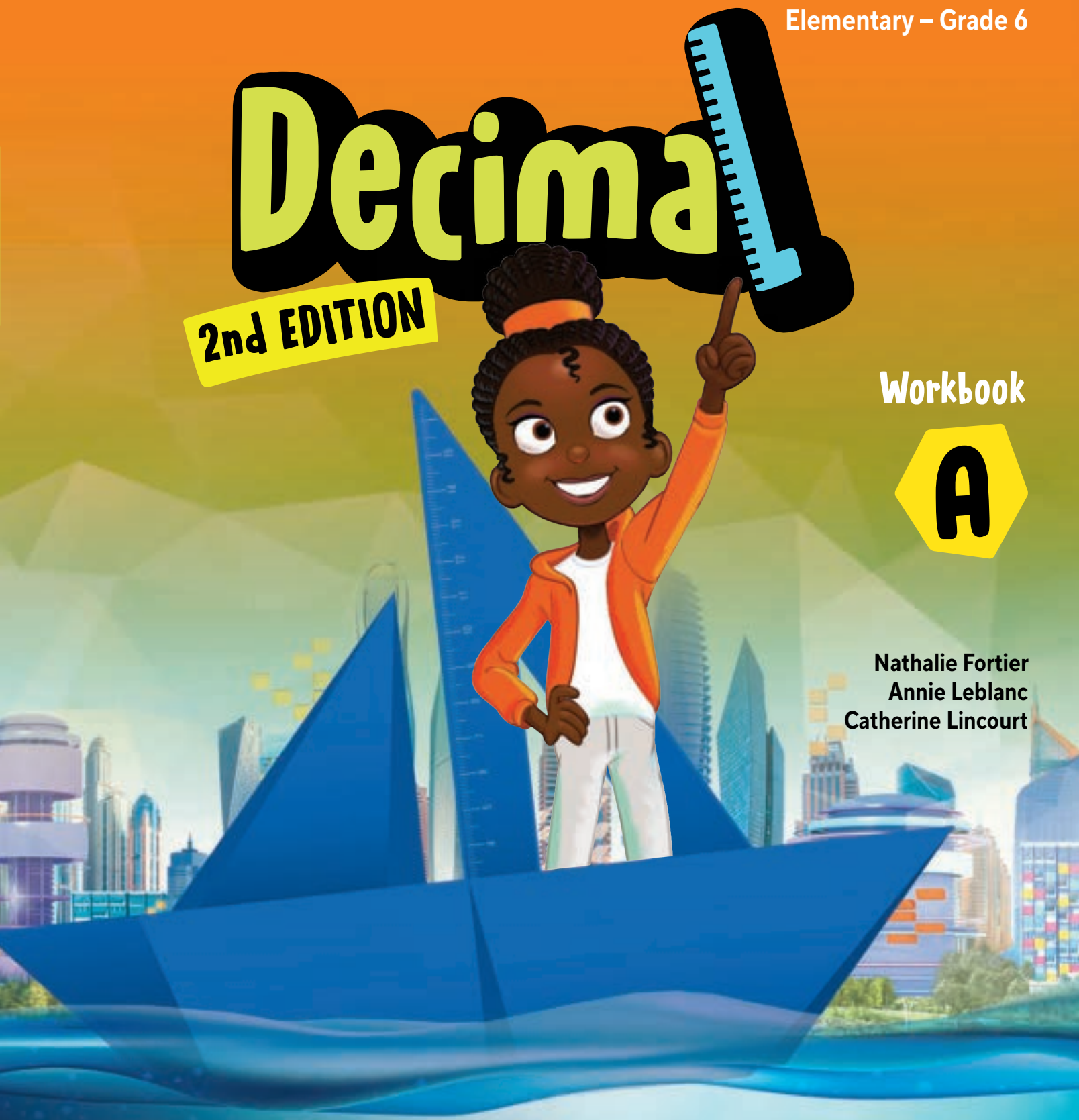
MATHEMATICS

Elementary – Grade 6

Decimal

2nd EDITION



Workbook A

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ERPI

i+

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THEME 1

Hitting the Numbers Road

1. Use all the digits on the licence plates to form the biggest and smallest numbers possible.

2. How many kilometres will the odometer show by the time the car reaches Québec?

3. If the car travels at a constant speed of 110 km/h, how many kilometres will it cover in 30 min?

In Olden Times

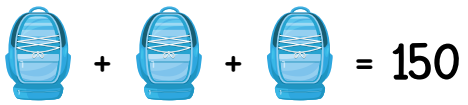
Over the millennia, human civilizations have had different number systems, some more efficient than others. People have used a variety of objects to help them count, for example, pebbles, drawings, symbols, bones and pieces of wood. However, it is difficult to calculate large quantities with systems like these. That is why the discovery of place value was so important in the history of mathematics.

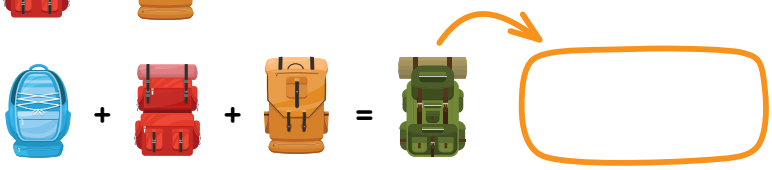
Who'd Have THOUGHT?

Are you familiar with the tradition of throwing a coin in a fountain for good luck or to make a wish come true? The Trevi Fountain, in Rome, Italy, fills up with coins so fast that it has to be vacuumed several times a week! Over a year, the cleaners collect an average of 1.5 million euros in coins. The money is handed over to a charitable organization that uses it to finance a variety of good works.

Puzzle

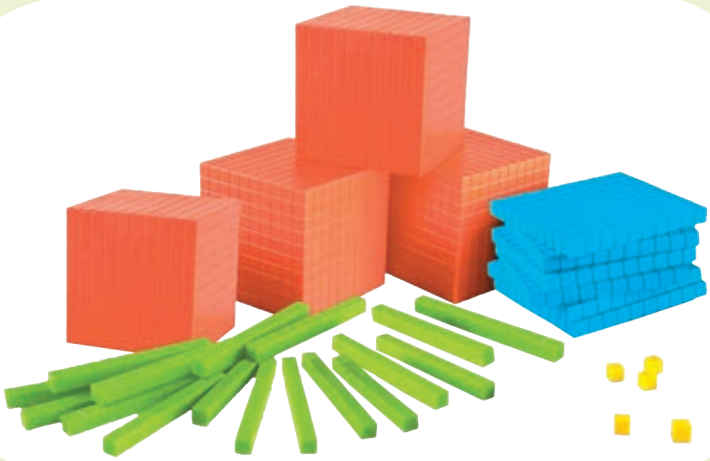
Find the value of the green backpack.





Math Chat

Alike, Yet Different



What is the same and what is different in the 3 pictures?

Arithmetic CHAMP

Cutting and pasting 0s

Flex your math muscles!

a

b

c

d

e

I Learn

Representing Numbers up to 1 000 000

You can represent numbers in different ways.

Here are 3 ways to represent the number 865 342.

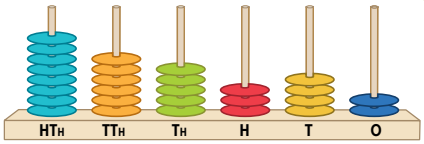
865 342

With digits in a place value chart

Millions	Thousands			Ones		
Millions (M)	Hundred Thousands (HTh)	Ten Thousands (TTh)	Thousands (Th)	Hundreds (H)	Tens (T)	Ones (O)
	8	6	5	3	4	2

You read the number 865 342 as "eight hundred sixty-five thousand three hundred forty-two."

With an abacus



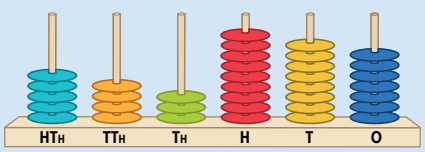
With objects such as money

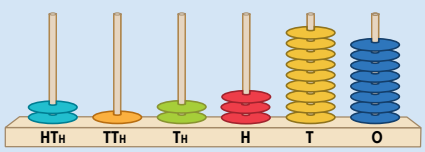
8650 ×  + 6 ×  + 4 ×  + 1 × 

I Practise

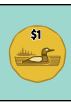
1 **Write** the numbers represented by the money and the abacuses.

a) 39 ×  + 5 ×  + 6 ×  + 13 ×  + 4 ×  + 8 × 

b) 

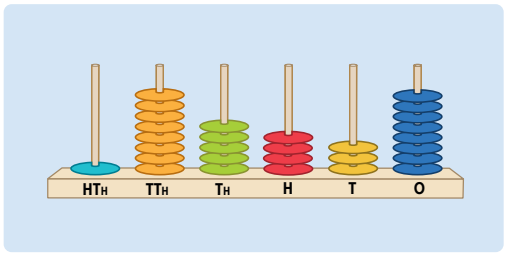
c) 

2 **Find** 2 possible representations of the following sums of money using paper money and coins. You cannot use a bill or a coin if there is an X in its column.

							
Example: $135 648	1356		2		X	3	2
	X	2500	32	1000	1		3
a) $167 704		X				X	
	X		X				
b) $220 267				X		X	
	X	X					X

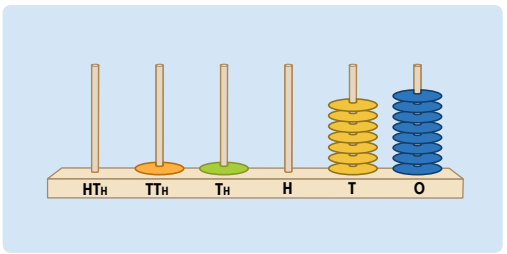
3 These are the populations of several imaginary towns. **Write** the population of each town, including the number of new births.

a) Squishton:



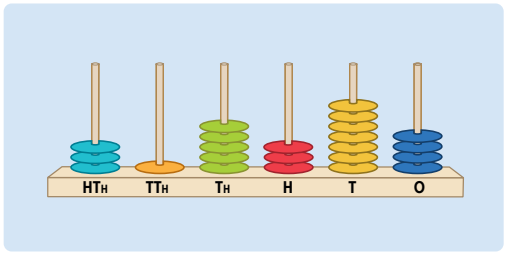
349 new births

b) Prettiville:



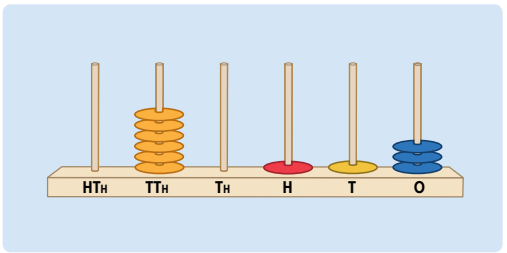
125 new births

c) Leverburg:



279 new births

d) Jonastown:



88 new births

I Learn

Place Value in a Number

The value of a digit in a number depends on the **position** of the digit.

In the number 865 342, each digit has a specific value according to its place.

Place	Millions (M)	Hundred Thousands (HTh)	Ten Thousands (TTh)	Thousands (Th)	Hundreds (H)	Tens (T)	Ones (O)
Digit		8	6	5	3	4	2
Value		800 000	60 000	5000	300	40	2

Reminder

You can see that this number contains

M	HTh	TTh	Th	H	T	O
	8	6	5	3	4	2

8 hundred thousands

86 ten thousands

865 thousands

8653 hundreds

86 534 tens

865 342 ones

I Practise

1 **Write** the place and value of the **5** in each number.

	Number	Place	Value
a)	257 190		
b)	384 652		
c)	820 571		
d)	475 193		
e)	599 021		

2 **Write** how many hundred thousands (HTh), ten thousands (TTh), hundreds (H) and tens (T) there are in each number.

	HTh	TTh	H	T
a) 532 906 →				
b) 628 765 →				
c) 927 086 →				

3 **Find** the matching number for each statement below.

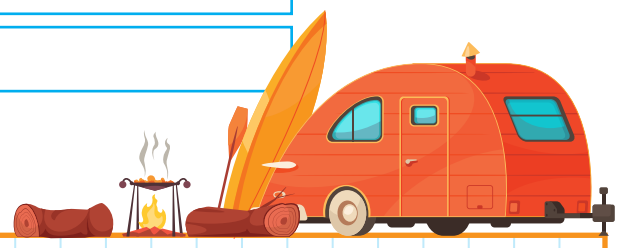
652 885 | 629 427 | 685 842 | 684 903 | 427 629 | 695 067 | 689 890

a) This number contains 69 ten thousands. ____

b) The 8 in this number has a value of 80. ____

c) This number contains 629 thousands. ____

d) The 9 in this number has a value of 900. ____



4 **Find** the result of each operation.

a) 87 thousands + 46 782 = ____

b) 920 000 − 19 hundreds = ____

5 A group of tourists gave their guide $1147 to pay for an activity they wanted to do. The money they gave the guide included only one coin and no $20 bills. How can you represent the money the guide received?

I Learn

Decomposing a Number

Decomposing a number means representing it in an **equivalent form**.

You can decompose a number in different ways, such as breaking it down by the place values of its digits (*expanded form*). A place value chart is useful for finding the expanded form of a number.

Place	M	HTh	TTh	Th	H	T	O
Digit		5	8	3	9	2	6
Value		500 000	80 000	3000	900	20	6

583 926

- 5 HTh + 8 TTh + 3 Th + 9 H + 2 T + 6 O
- (5 × 100 000) + (8 × 10 000) + (3 × 1000) + (9 × 100) + (2 × 10) + (6 × 1)
- 500 000 + 80 000 + 3000 + 900 + 20 + 6

There are other ways to decompose 583 926, for example:

583 926

- 500 000 + 83 000 + 926
- 583 000 + 900 + 26

Decomposing numbers makes it easier to multiply them.

837 × 7

= (800 × 7) + (30 × 7) + (7 × 7)
= 5600 + 210 + 49
= 5859

I Practise

1 **Find** each number that has been decomposed. Then **circle** the 2 equivalent decomposed forms.

a) 5 HTh + 1900 T + 24 Th

b) 4000 + 200 + 90 O + 52 TTh

c) 19 T + 51 TTh + 4000

d) 20 000 + 19 Th + 4 Th + 500 000

2 **Find** the matching number for each decomposed form below.

469 967	470 690	469 070	470 760	471 960

a) 600 + 400 000 + 90 + 70 000 = ☐

b) 69 000 + 400 000 + 70 = ☐

c) 7 TTh + 9 H + 4 HTh + 6 T + 1 Th = ☐

d) 76 T + 47 TTh = ☐

e) (9 × 100) + (69 × 1000) + (6 × 10) + (4 × 100 000) + (7 × 1) = ☐

3 **Complete** the decomposed form of each number.

a) 385 900 = 59 H + 2 HTh + 16 TTh + ☐

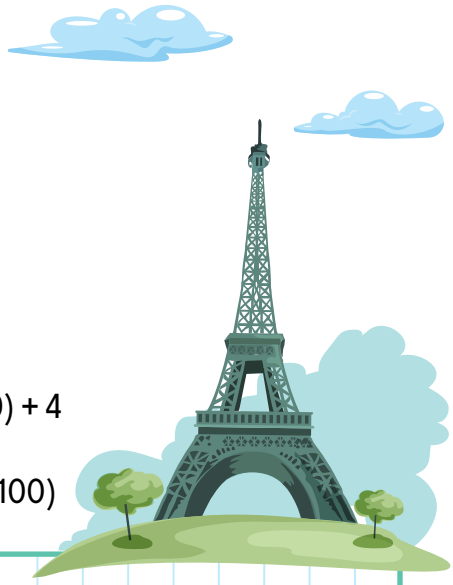
b) 837 195 = 7000 + 90 + 800 000 + 100 + ☐

c) 453 897 = 38 H + 97 O + 35 TTh + ☐

d) 69 425 = (☐ × 10) + (☐ × 1)

e) 846 214 = (84 × ☐) + (☐ × 10) + 4

f) 654 800 = (654 × ☐) + (☐ × 100)



I Learn

Comparing Numbers

You compare numbers to find out whether they are **equal** (=) or whether one is **greater** (>) or **less** (<) than the other.
A place value chart can help you quickly compare 2 numbers.

If the 2 numbers have the same number of digits, you start by comparing the digits with the greatest place value. If these digits are of equal value, then you compare the digits to the right.

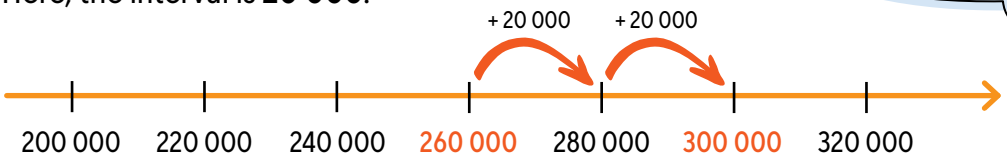
Place →	M	HTh	TTh	Th	H	T	O
1st number →		5	8	3	9	2	6
2nd number →		5	8	2	9	2	6

583 926 > 582 926

Reminder

You can also use a number line to compare numbers.

The distance between 2 markings is called the **interval**.
Here, the interval is **20 000**.



260 000 < 300 000 because 260 000 comes before 300 000.
300 000 > 260 000 because 300 000 comes after 260 000.

I Practise

1 **Write** the numbers in decreasing order.

a)

220 202	202 200	200 202	222 002	200 220	222 202

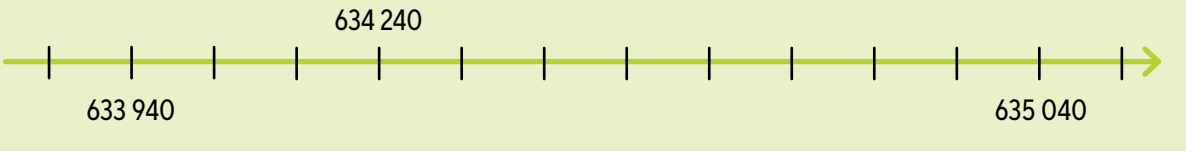
b)

655 565	695 566	659 966	659 956	695 956	695 596

2 **Find** the interval on the number line. Then **locate** the numbers on the line.

Interval

634 640 634 340 634 440 634 140 634 940



3 In each group, **circle** the 2 numbers that would be closest to each other on a number line.

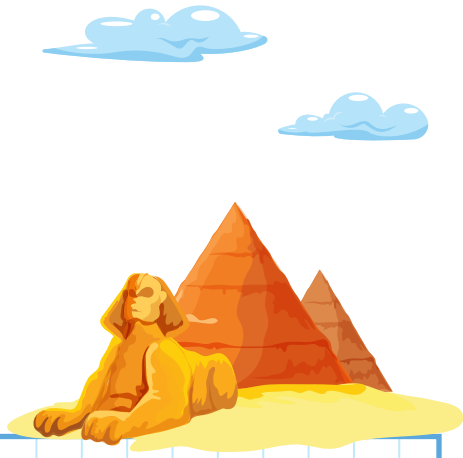
a)	652 890	655 990	675 890	656 200	650 890	659 200
b)	900 000	900 700	910 900	899 990	900 020	910 000
c)	438 002	488 002	655 990	500 000	675 002	408 990

4 **Do** the operations, **write** the results and **compare** them using the correct symbol: <, > or =.

a) 989 742 – 300 Th ☐ 425 Th + 25 TTh

b) 2329 H + 115 000 ☐ 127 900 + 220 Th

c) 876 923 – 54 TTh ☐ 739 Th – 401 077

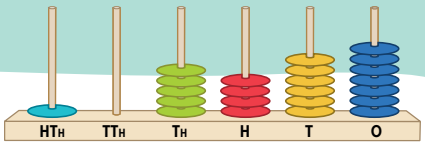


I Use Reasoning

Cedar Point, in the United States, is a huge amusement park that is home to 70 rides, including 17 roller coasters.

These are the numbers of visitors who rode the roller coasters during the past weekend:

Friday →



Saturday → 24 Th + 9 TTh + 8 H + 6 T + 4 O

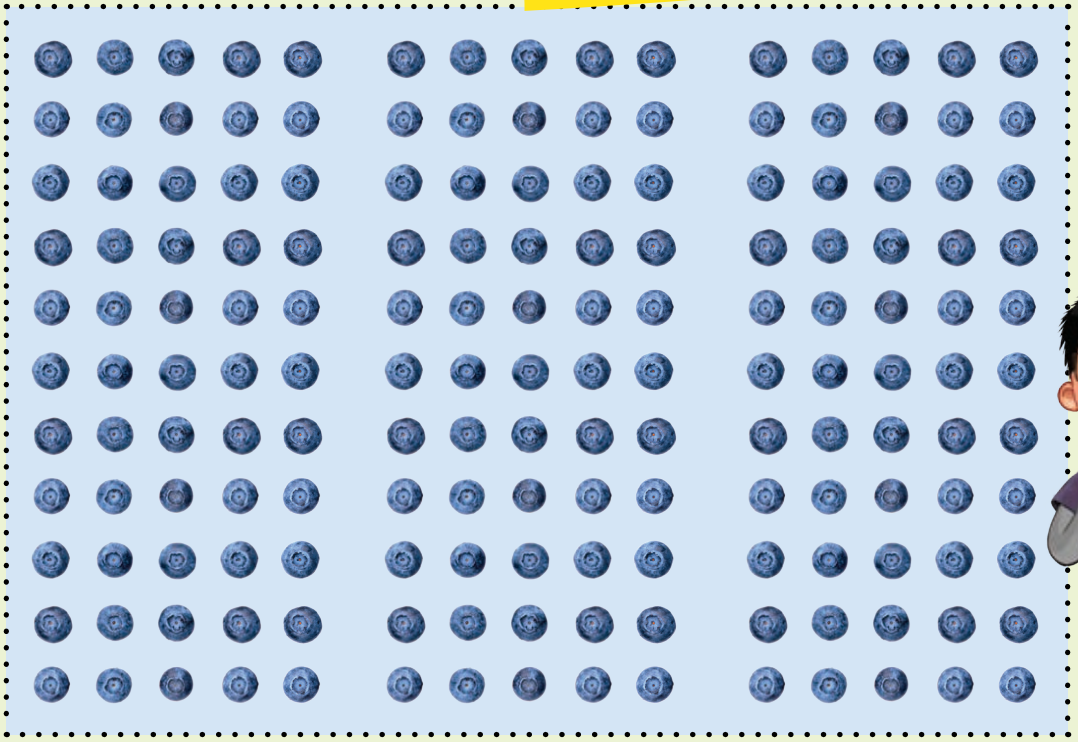
Sunday → (6 × 100) + (3 × 10 000) + (9 × 10) + (2 × 100 000) + 8

Next weekend, the park manager expects 500 000 visitors to ride the roller coasters. How many more visitors are expected to ride the roller coasters next weekend compared to last weekend's number?

Next weekend, _____ more visitors are expected to ride the roller coasters.

Math Chat

What Do You See?



Arithmetic CHAMP

Cutting and pasting 0s

Flex your math muscles!

a

b

c

d

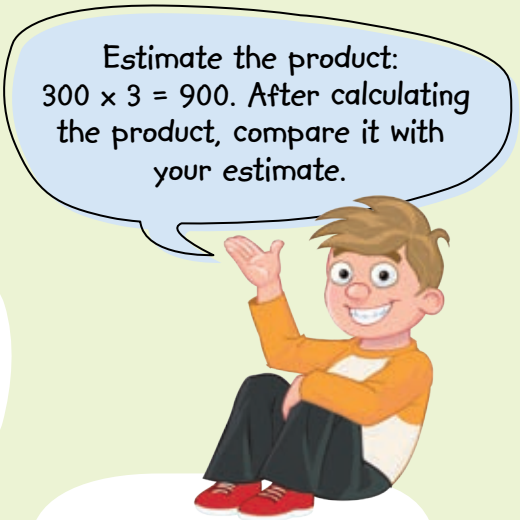
e

I Learn

Multiplying a 3-Digit Number by a 1-Digit Number

The conventional process for multiplying numbers is also called a *multiplication algorithm*.

346 × 3 = ?



Steps

1. Multiply the ones by the ones.

   3 × 6 ones = 18 ones

   Carry the resulting ten.

2. Multiply the ones by the tens

   3 × 4 tens = 12 tens

   and add the carried number, which makes 13 tens.

   Carry the resulting hundred.

3. Multiply the ones by the hundreds

   3 × 3 hundreds = 9 hundreds and add

   the carried number, which makes 10 hundreds.

346 × 3 = 1038

Th	H	T	O	
	1	1		← Carried numbers
	3	4	6	
×			3	
1	0	3	8	

The product (1038) is close to the estimate (900).

I Practise

1 **Do** the multiplications.

a)

		4	5	6
×				4

b)

		8	1	0
×				7

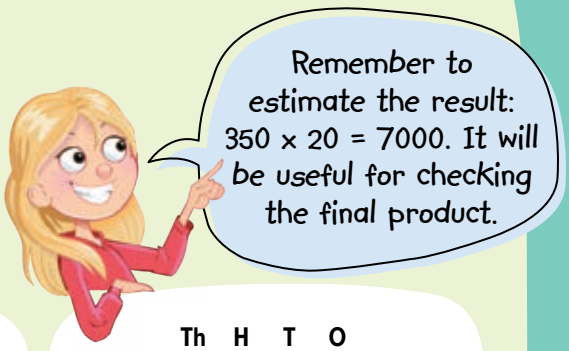
c)

		6	9	2
×				8

I Learn

Multiplying a 3-Digit Number by a 2-Digit Number

This is the conventional process for multiplying a 3-digit number by a 2-digit number.



346 × 23 = ?

Steps

1. Multiply each digit in the number 346 by 3 ones, following the same steps as when you multiply by a 1-digit number.

Th	H	T	O	
	1	1		
	3	4	6	
×		2	3	
1	0	3	8	(3 × 346)

2. Multiply each digit in the number 346 by the tens in the 2nd factor (2 tens).

   2 tens × 6 ones = 120 ones

   Align the 20 with the ones and remember to carry the 1 (which represents 10 tens).

   20 × 4 tens = 80 tens + 10 tens (carried)
   = 90 tens = 9 hundreds

   20 × 3 hundreds = 60 hundreds = 6 thousands

Th	H	T	O	
		1		
	3	4	6	
×		2	3	
1	0	3	8	
+ 6	9	2	0	(20 × 346)

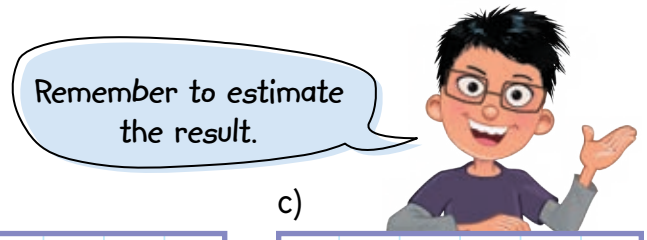
3. Add the 2 partial products.

Th	H	T	O
	3	4	6
×		2	3
1	0	3	8
+ 6	9	2	0
7	9	5	8

346 × 23 = 7958

The product (7958) is close to the estimate (7000).

I Practise



1 **Do** the multiplications.

a)

$$\begin{array}{r} 439 \\ \times\ 17 \\ \hline \end{array}$$

b)

$$\begin{array}{r} 842 \\ \times\ 25 \\ \hline \end{array}$$

c)

$$\begin{array}{r} 739 \\ \times\ 36 \\ \hline \end{array}$$

d)

$$\begin{array}{r} 525 \\ \times\ 24 \\ \hline \end{array}$$

e)

$$\begin{array}{r} 685 \\ \times\ 18 \\ \hline \end{array}$$

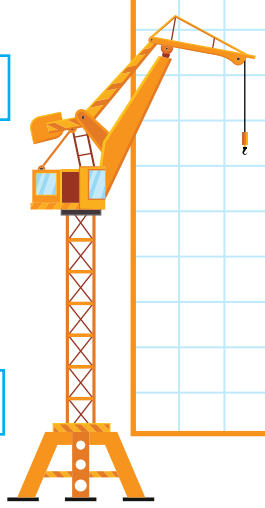
f)

$$\begin{array}{r} 941 \\ \times\ 39 \\ \hline \end{array}$$

2 **Solve** the problems.

a) The distance between Montréal and Québec is 233 km. The distance between Montréal and Mexico City is about 16 times as far. What is the distance between Montréal and Mexico City?

b) A 38-storey hotel is being built in Paris, France. There will be 112 rooms on each floor. How many rooms will there be in the hotel?



3 **Do** the multiplications. Then **colour** the results in the grid below.
The number left at the end is the secret number.

a)

$$\begin{array}{r} 329 \\ \times\ 14 \\ \hline \end{array}$$

b)

$$\begin{array}{r} 524 \\ \times\ 23 \\ \hline \end{array}$$

c)

$$\begin{array}{r} 658 \\ \times\ 16 \\ \hline \end{array}$$

d)

$$\begin{array}{r} 469 \\ \times\ 52 \\ \hline \end{array}$$

e)

$$\begin{array}{r} 1680 \\ \times\ 32 \\ \hline \end{array}$$

Grid

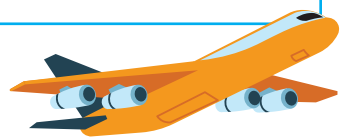
53 760	10 528
4606	40 283
12 052	24 388

4 **Solve** the problems.

a) This week, 28 groups of 54 people reserved tickets for a Broadway musical in New York City. The theatre contains 32 rows of 55 seats. How many seats are still available?

b) Each issue of the magazine *Distant Travels* contains 75 pages. How many pages are there in 255 issues of the magazine?

c) There are 8 flights a day between Toronto and New York. Each flight carries an average of 142 passengers. About how many passengers fly between Toronto and New York in a 2-week period?



5 Using digits 0 to 9, **complete** the operations so that they are correct.

a)

	□	6	3
×			5
	8	□	□

b)

	7	5	□
×			4
	□	□	0	8

c)

	□	6	□	
×		□	7	
	1	□	□	6
+	8	□	4	0
	□	9	□	6

d)

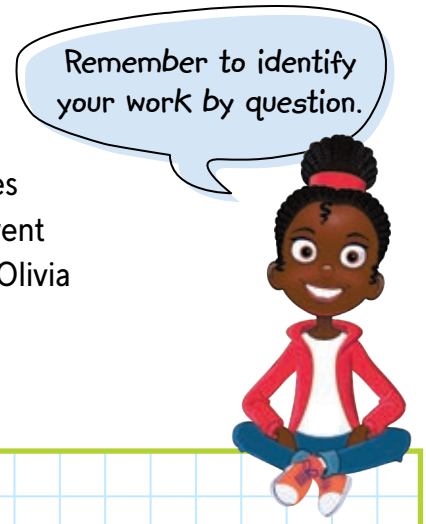
	□	□	6	
×			8	
	2	□	4	8

6 **Solve** the problems.

a) A train of 23 cars travels between Québec and Montréal 5 times a day. Each car contains 42 seats. If all the seats are taken on each trip, how many passengers does the train carry in a day?

b) It is harvest time at the Frutti family farm in Niagara Falls, Ontario. The farm has 25 rows of fruit trees. In each row, pickers filled 340 crates of fruit. The neighbouring farm harvested 5 times as much fruit. How many crates of fruit did the neighbouring farm harvest?

c) During a 6-month trip in Africa, Olivia observed 130 species of plants. This was 12 times fewer species than when she went to South America for 2 years. How many plant species did Olivia observe during her travels in South America?



I Use Reasoning

Mr. Papadopoulos has owned an olive grove for several years.

- His olive grove contains 152 rows of 12 olive trees.
- Of these olive trees, 11 hundreds are still too young to produce fruit.
- The other trees each produce 32 kg of olives.

Mr. Papadopoulos has developed different olive-based products over the years:

- He uses 15 000 kg of olives to make olive oil.
- 75 hundreds of kilograms of olives are packaged for direct consumption.
- The rest of the olives are used to make soap.

How many kilograms of olives does Mr. Papadopoulos use to make soap?

Mr. Papadopoulos uses _____ of olives to make soap.

Math Chat

Which One Doesn't Belong?

9×27

3^5

$3 \times 3 \times 3 \times 3 \times 3$

5^3

Arithmetic CHAMP

Cutting and pasting 0s

Flex your math muscles!

a

b

c

d

e

I Learn

Exponential Notation

Exponential notation is a way of expressing numbers by using **exponents**. It is a simpler way of writing the product of a factor multiplied any number of times by itself.

Reminder

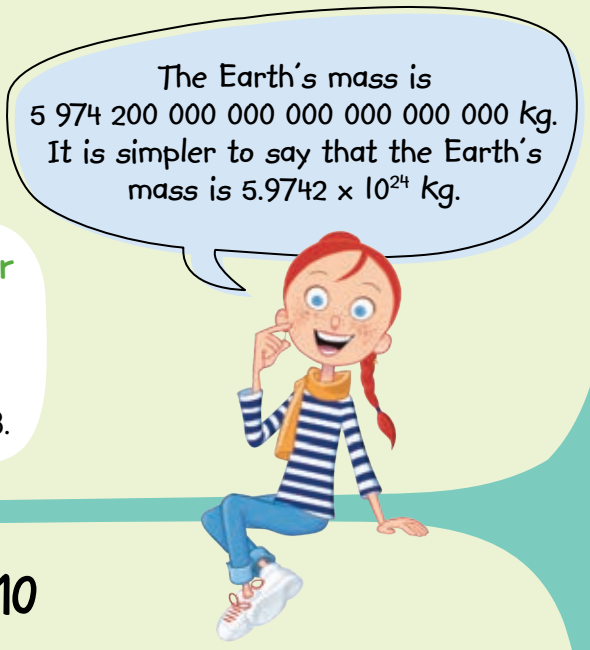
A number to the power of 2 is a square number.

A number to the power of 3 is a cube number.

Exponent → Power

Base → $2^3 = 2 \times 2 \times 2 = 8$

2 to the power of 3 is 8.



Powers of 10

Powers of 10 represent place values in our number system.

	M	HTh	TTh	Th	H	T	O
Power of 10	10^6	10^5	10^4	10^3	10^2	10^1	10^0
Value	1 000 000	100 000	10 000	1000	100	10	1

You can use the powers of 10 to decompose a number and write it in expanded form.

Example: $(3 \times 10^5) + (4 \times 10^4) + (5 \times 10^3) + (8 \times 10^2) + (4 \times 10^1) + (2 \times 10^0) = 345\,842$

It is important to remember that

- a number to the power of 1 is always equal to itself
- a number to the power of 0 is always equal to 1

Here is an example to show you why:

$5^3 = 125$

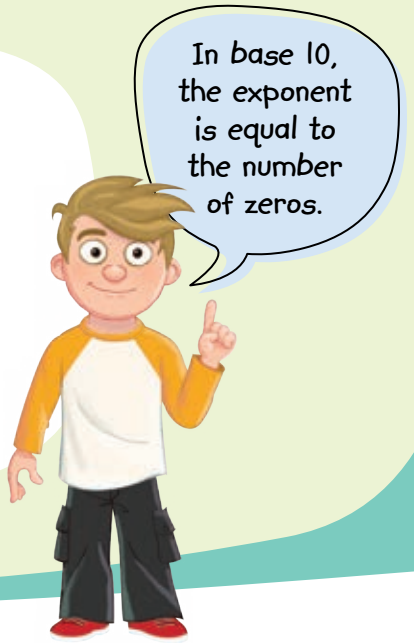
$5^2 = 25$, which is 125 divided by 5

$5^1 = 5$, which is 25 divided by 5

$5^0 = 5$ divided by 5, so 1.

$5^1 = 5$

$5^0 = 1$



I Practise

1 Mae says: "3^4 is the same as 3×4." Is she right?
Explain your answer.

2 **Write** the repeated multiplication that matches each expression.
Then **calculate** the power.

	Repeated Multiplication	Power
Example: 6^2	6×6	36
a) 2^4		
b) 10 squared		
c) 7 cubed		
d) 3 to the power of 5		
e) 9 to the power of 4		
f) 10 to the power of 6		

3 **Calculate** the powers and **compare** them using the correct symbol: <, > or =.

a) $9^2 \square 2^9$

b) $10^5 \square 1000$

c) $3^5 \square 342$

d) $125 \square 5^3$

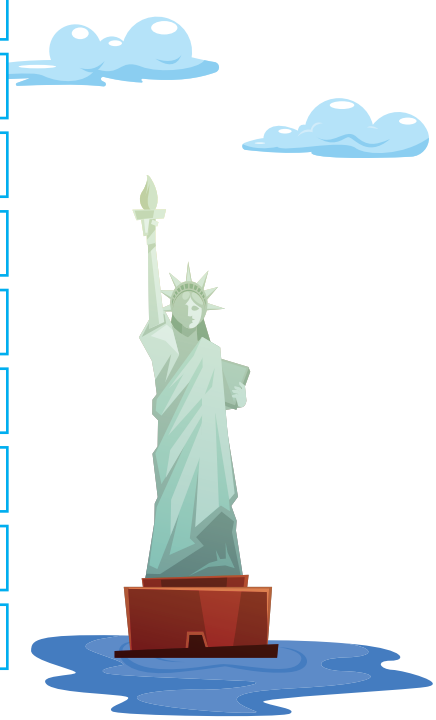
e) $7^3 \square 3^7$

4 **Calculate** the result of each operation.

		Calculation		Result
Example:	$5^2 + 2^3$	$(5 \times 5) + (2 \times 2 \times 2)$ $25 \quad + \quad 8$	=	33
a)	$3^3 + 3^2$		=	
b)	$6^2 + 7^3 + 8^2$		=	
c)	$5^3 - 4^2$		=	
d)	$2^5 - 5^2$		=	
e)	$7^1 + 2^4$		=	

5 **Calculate** the result of each multiplication.

Example:	7×10^2	=	$7 \times 100 = 700$
a)	4×10^4	=	
b)	2×10^5	=	
c)	12×10^3	=	
d)	5×10^1	=	
e)	60×10^2	=	
f)	49×10^4	=	
g)	684×10^0	=	
h)	741×10^2	=	



6 **Write** the number that matches each expanded form.

a) $(6 \times 10^5) + (8 \times 10^4) + (7 \times 10^3) + (5 \times 10^2) + (9 \times 10^1) + (4 \times 10^0) =$

b) $(2 \times 10^3) + (8 \times 10^2) + (2 \times 10^5) + (4 \times 10^4) + (5 \times 10^0) =$

c) $(7 \times 10^1) + (3 \times 10^2) + (2 \times 10^3) + (6 \times 10^4) + (1 \times 10^5) =$

7 **Match** each number to its expanded form.

a) 36 247	• $(8 \times 10^4) + (2 \times 10^3) + (5 \times 10^2) + (9 \times 10^1) + (7 \times 10^0)$
b) 790 263	• $(3 \times 10^4) + (6 \times 10^3) + (2 \times 10^2) + (4 \times 10^1) + (7 \times 10^0)$
c) 82 597	• $(7 \times 10^5) + (9 \times 10^4) + (2 \times 10^2) + (6 \times 10^1) + (3 \times 10^0)$
d) 200 200	• $(2 \times 10^5) + (2 \times 10^2)$

8 The Gulf of St. Lawrence has an area of 236×10^3 km^2.
It empties into the Atlantic Ocean, which has an area of 1064×10^5 km^2.
Write the areas of the 2 bodies of water in standard form.

Area of the Gulf of St. Lawrence:

Area of the Atlantic Ocean:

9 Russia, the largest country in the world, has an area of about 17 000 000 km^2.
Canada, the 2nd largest country, has an area of about 10 000 000 km^2.
Write the areas of the 2 countries in exponential notation.

Area of Russia:

Area of Canada:

I Learn

Divisibility Rules

Divisibility rules help you find out quickly whether a number can be divided **entirely** by another, which means there is no remainder.

A Number Is Divisible by	Divisibility Rules	Examples
2	if its last digit is even, which means it ends in 0, 2, 4, 6 or 8.	324
3	if the sum of its digits is divisible by 3.	4572 4 + 5 + 7 + 2 = 18 18 is divisible by 3.
4	• if its last 2 digits are 0s; **or** • if the number formed by its last 2 digits is divisible by 4; **or** • if the number formed by its last 2 digits is divisible by 2, twice in a row.	6400 624 788 88 ÷ 2 = 44 and 44 ÷ 2 = 22
5	if its last digit is 0 or 5.	345, 750
6	if it is divisible by 2 and 3; in other words, if it is an even number and the sum of its digits is divisible by 3.	348 3 + 4 + 8 = 15 15 is divisible by 3.
8	• if its last 3 digits are 0s; **or** • if the number formed by its last 3 digits is divisible by 8; **or** • if the number formed by its last 3 digits is divisible by 2, three times in a row.	7000 6824 824 ÷ 8 = 103 2432 432 ÷ 2 = 216 216 ÷ 2 = 108 108 ÷ 2 = 54
9	if the sum of its digits is divisible by 9.	4572 4 + 5 + 7 + 2 = 18 18 is divisible by 9.
10	if its last digit is 0.	3640

You can use divisibility rules to find all the divisors of a number. Then you can list the divisors in pairs of factors.

These are the divisors of 36:
(1, 36) (2, 18) (3, 12) (4, 9) (6, 6).

A tip for writing the divisors of a number in order is to imagine a rainbow that matches the pairs of factors, beginning with 1. Check whether the number is divisible by 2, then by 3 and so on.

I Practise

1 a) **Circle** the numbers that are divisible by 4.

53 848	65 788	78 564	752 974	467 325
211 011		32 000		941 212
44 838	23 604	196 348	85 432	38 429

b) **Draw an X** on the numbers that are divisible by both 4 and 8.

2 **Circle** the statement that is true.

a) A number that can be divided by 4 can also be divided by 8.

b) A number that can be divided by 8 can also be divided by 4.

3 **Fill in** the table.

	Number Divisible by		
	2	3	6
Example: 75 036	×	×	×
a) 685 737			
b) 900 328			
c) 754 932			
d) 345 954			
e) 137 139			

4 **Draw an X** on the numbers that are divisible by 3. **Circle** the numbers that are divisible by 9.

189 999	127 435	39 396	869 535	783 431
900 245	769 999	35 814	24 612	696 987

5 **Find** all the divisors of each number.

a) 42:

b) 72:

c) 54:

d) 63:

6 **Answer** the questions using the following numbers. You can use numbers more than once.

14 625	6372	134 328	6348	81 700	40 121	22 840

a) Which number is divisible by 2, 4, 5, 8 and 10?

b) Which number is divisible by 2, 3, 6 and 9?

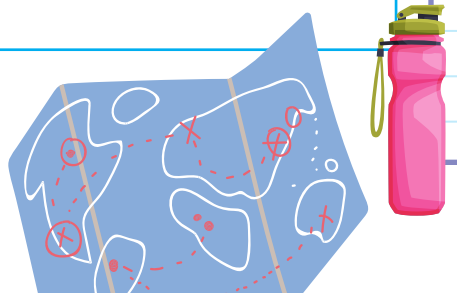
c) Which numbers are divisible by 2, 3 and 6, but not by 9?

d) Which number is divisible by 3 and 9, but not by 6?

e) Which numbers are divisible by 2 and 4, but not by 8?

f) Which number is not divisible by 2, 3, 4, 5, 6, 8, 9 and 10?

7 Between 1700 and 1800 cyclists have registered for the Charlevoix bike rally. Groups may be made up of 2, 4, 5 or 10 cyclists, but not 3 or 8. How many cyclists in all have registered for the rally?



I Learn

Decomposing a Number into Prime Factors

Factors are numbers you multiply to get a product.

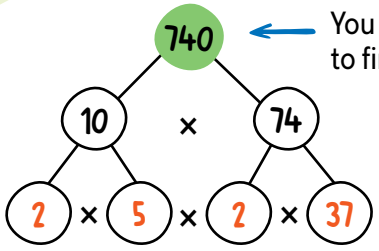
$2 \times 35 = 70$

Factors — Product

The factors of a number form pairs. Each number in a pair is a divisor of the product. The divisors of 70 are {1, 2, 5, 7, 10, 14, 35, 70}.
Its prime factors are 2, 5 and 7.

You can decompose a number into prime factors by drawing a **factor tree**. To do this, keep decomposing factors until they are all prime numbers. This is called *prime factorization*.

For example, to decompose 740 into prime factors:

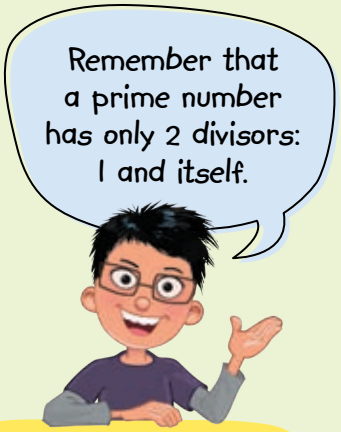


You can divide 740 by 2, 4, 5 or 10 to find the factors.

When all the factors are prime numbers, you have finished the prime factorization.

$740 = 2^2 \times 5 \times 37$

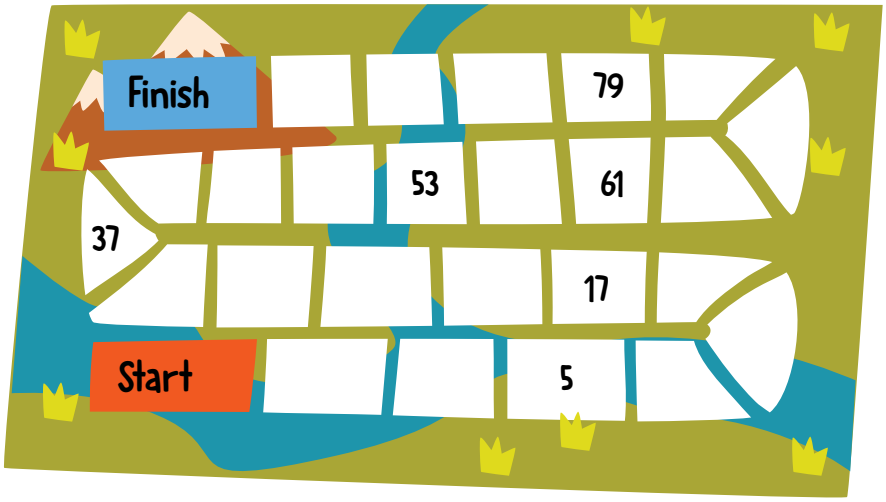
If prime factors appear more than once in a factorization, write them in exponential notation.
Always write the factors in increasing order.



You can use divisibility rules to help you find the factors of a number to decompose.

I Practise

1 **Complete** Mara's game board. It must contain all the prime numbers between 0 and 100.



2 **Decompose** each number into prime factors. In the last box, **cross out** the exponential expression that doesn't match one of the factorizations.

a)

120

b)

369

c)

162

Exponential Expressions

$3^2 \times 41$ $2^4 \times 3$

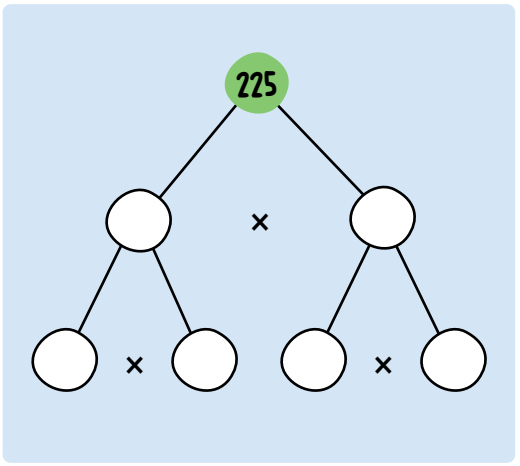
$2^3 \times 3 \times 5$ 2×3^4

3 **Indicate** whether the statements are true or false.

	True	False
a) All prime numbers are odd.	☐	☐
b) There are 25 prime numbers between 0 and 100.	☐	☐
c) 1 is a prime number.	☐	☐
d) 47 and 49 are prime numbers.	☐	☐
e) If a number greater than 2 is not a prime number, then it is a composite number.	☐	☐
f) All prime numbers have only 2 divisors.	☐	☐
g) 2^5 represents the prime factorization of 32.	☐	☐

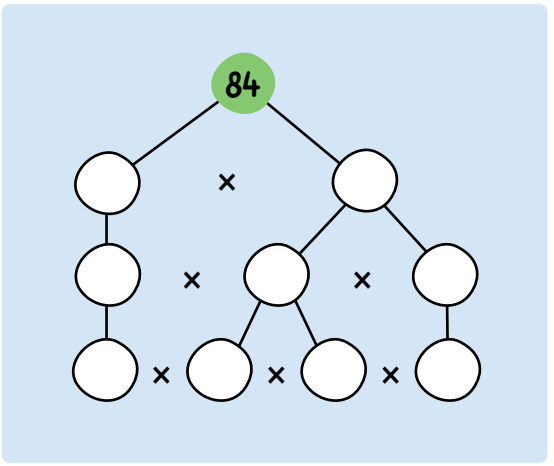
4 **Decompose** the numbers into prime factors using the factor trees provided.
Write the results in exponential notation.

a)



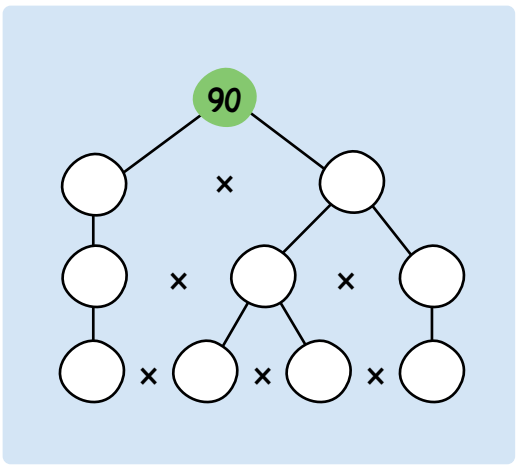
225 = ____

b)



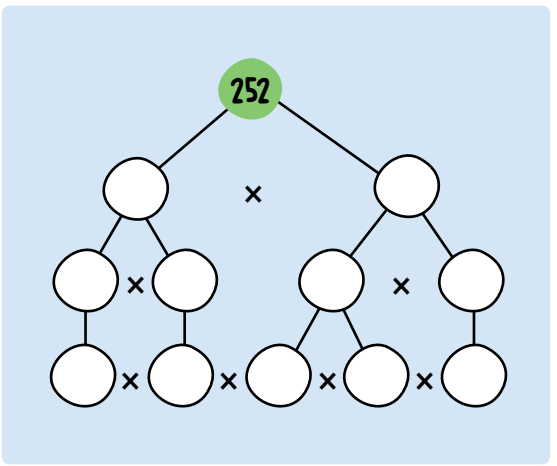
84 = ____

c)



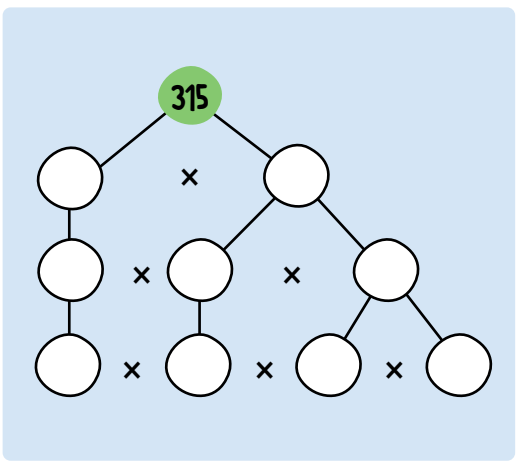
90 = ____

d)



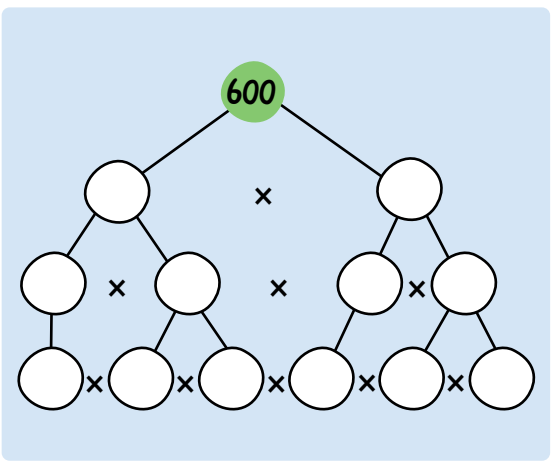
252 = ____

e)



315 = ____

f)



600 = ____

I Use Reasoning

Luke is organizing a field trip to Birdland Park.

- The number of participants will be between 450 and 480.
- For certain activities, the group must be divided into 6 or 9 equal teams.
- The field trip will cost 5^2 per participant.
- Luke must use $8165 of the fees collected to pay for the participants' transportation and lunch.
- The rest of the money will be donated to a foundation that pays for the park maintenance.

Luke thinks he will be able to donate $4000 to the foundation.
Is he right? Explain your answer.

Luke is right ☐ Yes ☐ No

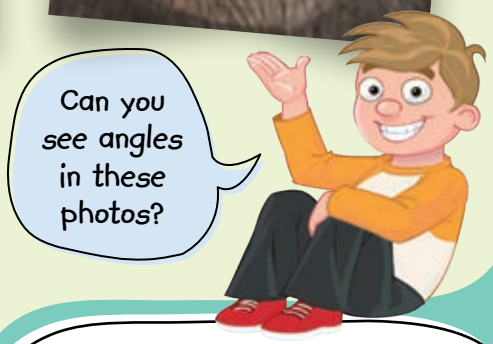
because _____

Math Chat

SECTION 4

Alike, Yet Different

What is the same and what is different in the 3 photos?



Arithmetic CHAMP

Training for math champions

Flex your math muscles!

a

b

c

d

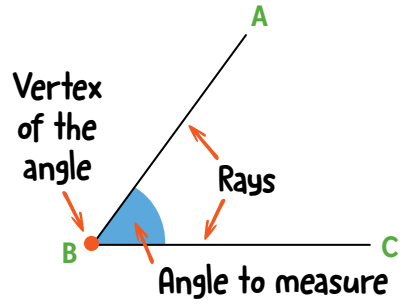
e

I Learn

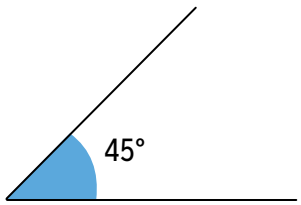
Estimating and Measuring Angles in Degrees

An angle is a **geometric figure** formed by 2 rays that start at the same point. The point is called the **vertex of the angle**.

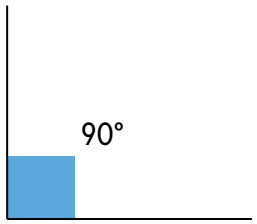
An angle is identified by the symbol ∠ and the letters labelling the rays. In the example to the right, the angle is identified as ∠ ABC or ∠ CBA. The letter in the middle matches the vertex of the angle.



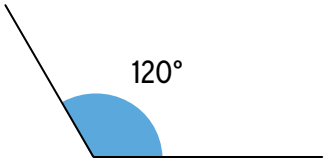
Different **types of angles** are defined by their measure in degrees (°).



Acute angle
(between 0° and 90°)



Right angle
90°



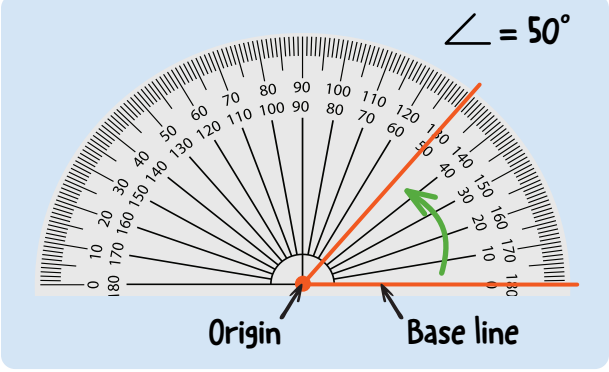
Obtuse angle
(between 90° and 180°)

A **protractor** is a tool for drawing and measuring angles in degrees. You will find 2 scales of 0° to 180° on this measuring instrument.

Follow these steps to measure an angle in degrees:

Observe the angle. Since it measures less than 90°, it is an acute angle.

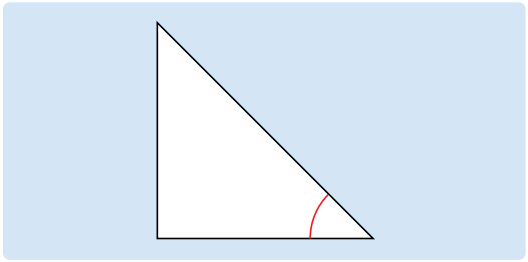
1. Place the **origin** of the protractor on the vertex of the angle.
2. Place the **base line** of the protractor on one of the rays of the angle, aligning the ray with 0°.
3. Starting from 0°, follow the **degree markings** up to the 2nd ray of the angle. The marking at the 2nd ray equals the measure of the angle: here, it is 50°.



I Practise

1 **Identify** the type of angle (acute, obtuse or right) indicated in each polygon. Then **measure** the angle with your protractor.

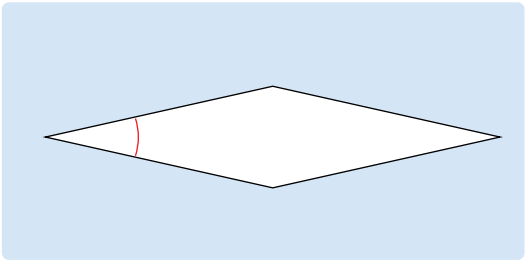
a)



Type: ☐

Measure: ☐

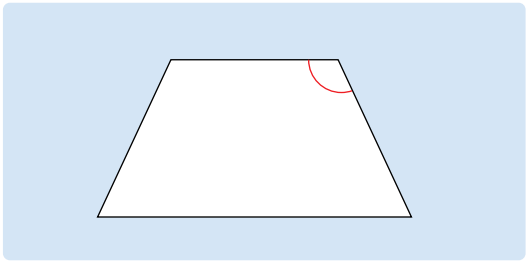
b)



Type: ☐

Measure: ☐

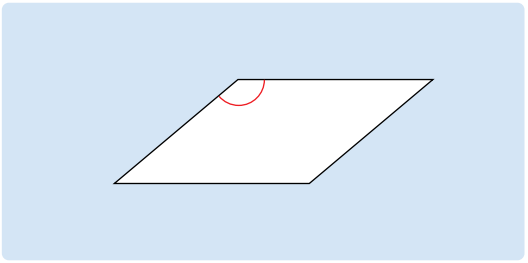
c)



Type: ☐

Measure: ☐

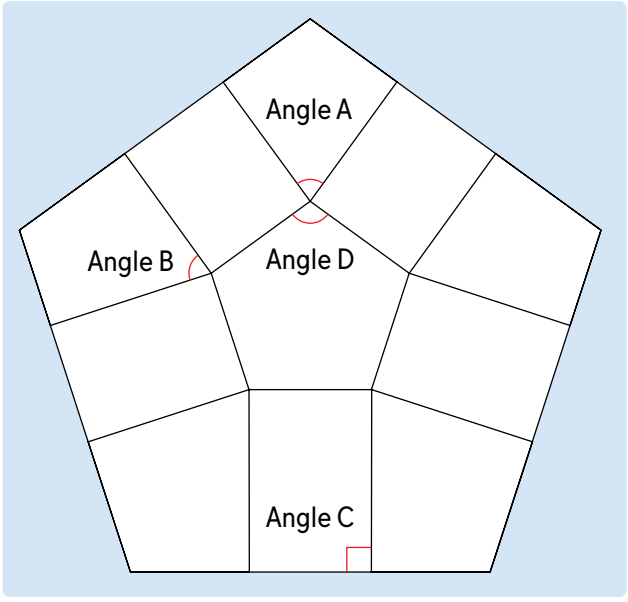
d)



Type: ☐

Measure: ☐

2 **Observe** the simplified plan of the Pentagon, an important building near Washington, in the United States. **Identify** the type of each angle and **write** its measure.



	Type	Measure
Angle A:		
Angle B:		
Angle C:		
Angle D:		

I Learn

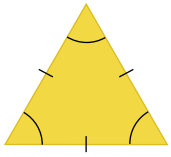
Triangles

Triangles are 3-sided polygons. The sum of the 3 interior angles of a triangle is always 180°. Triangles are classified by the characteristics of their sides and their angles.

These are different types of triangles:

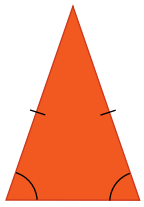
Triangle

Equilateral



- 3 congruent sides
- 3 congruent angles (60° each)

Isosceles



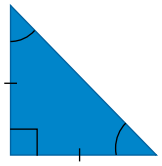
- 2 congruent sides
- 2 congruent angles

Scalene

- 3 non-congruent sides
- 3 non-congruent angles

Right

Isosceles



- 2 congruent sides
- 2 congruent angles
- 1 right angle (90°)

Scalene

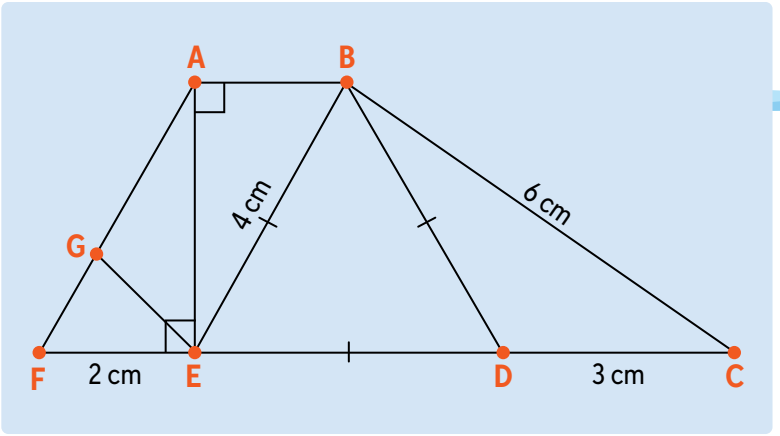
- 3 non-congruent sides
- 1 right angle (90°)

I Practise

1 **Indicate** whether the statements are true or false.

	True	False
a) An equilateral triangle has 3 acute angles.	☐	☐
b) The 3 sides and 3 angles of a scalene triangle are congruent.	☐	☐
c) A right triangle can contain an obtuse angle.	☐	☐
d) A right angle measures 45°.	☐	☐
e) A triangle cannot have more than one obtuse angle.	☐	☐

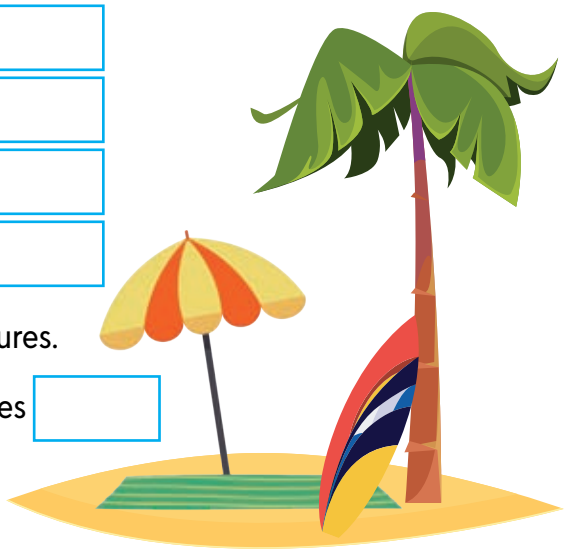
2 a) **Observe** the figure and **identify** the type of each triangle below.



- △ BCD: _____
- △ BDE: _____
- △ AEF: _____
- △ BCE: _____

b) **Complete** the sentence without measuring the figures.

Angle BAE measures _____, angle FEG measures _____ and segment FC measures _____.



3 **Observe** the figure and **answer** the questions. **Use** your ruler and protractor.

a) What do triangles ABC and DEF have in common?

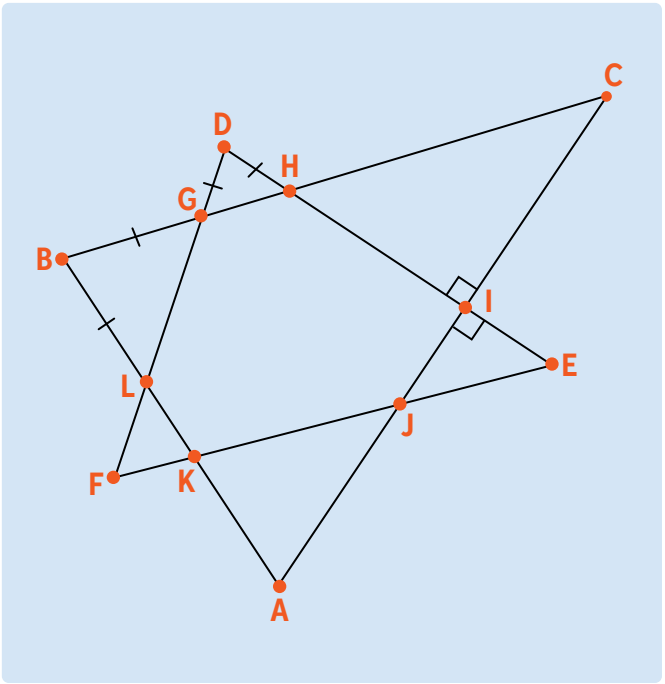
_____

b) What do triangles CIH and EIJ have in common?

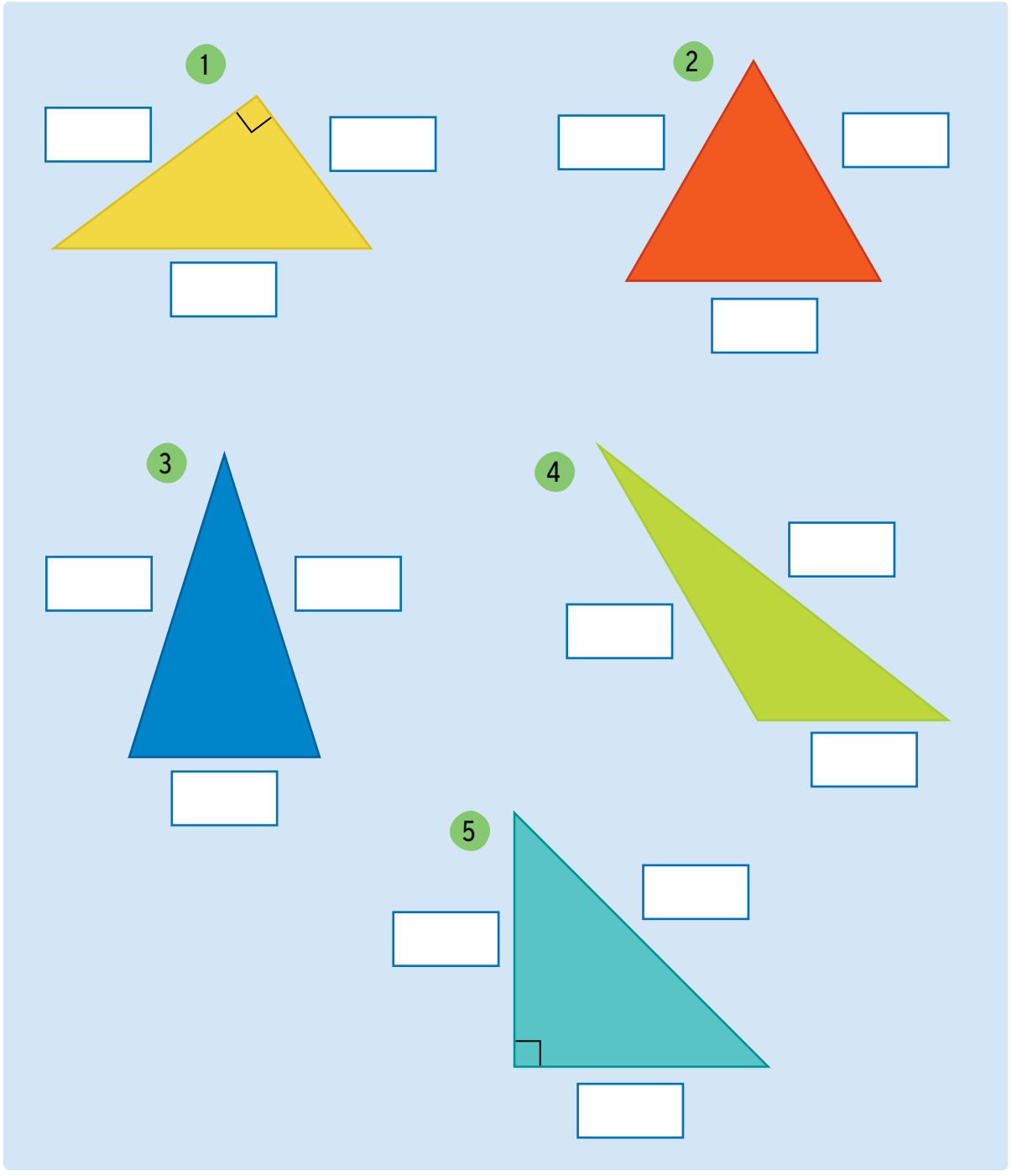
_____

c) What do triangles GDH and GBL have in common?

_____

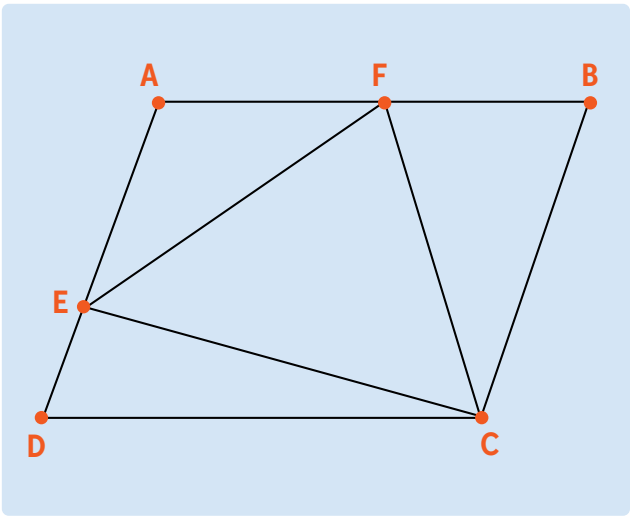


4 **Measure** the sides of each triangle. Then **fill in** the table below.



Type of Triangle	Triangle Number	Number of Acute Angles	Number of Obtuse Angles	Number of Right Angles
Equilateral				
Isosceles				
Scalene right				
Isosceles right				
Scalene				

5 a) **Measure** the following angles in the figure using your protractor.



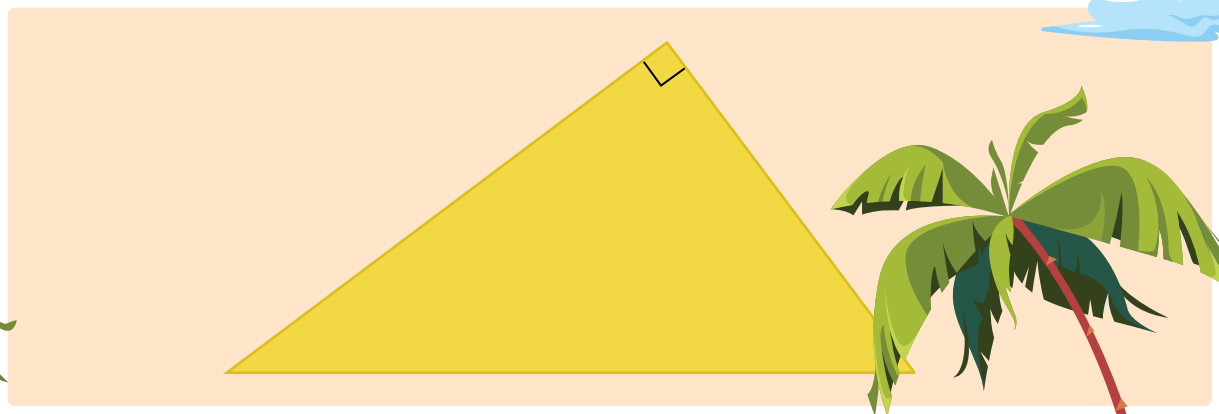
- ∠ DCE
- ∠ ECF
- ∠ DCF
- ∠ FCB
- ∠ DCB

b) How can you relate the measure of angle DCB to the measures of angles DCE, ECF and FCB?

6 **Draw** 3 lines in the triangle below to form other triangles.
Follow these rules:

- The new triangles must not contain any obtuse angles.
- There must be at least one right triangle.

How many triangles did you form?



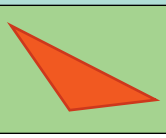
I Use Reasoning

Aunt Nadia has just come home from a trip to Barcelona. She was highly impressed by the Park Güell and the works by Catalan architect Antoni Gaudí .

Now Aunt Nadia wants to make a mosaic out of ceramic triangles on her coffee table. According to her sketch, she needs

- at least 450 equilateral triangles
- at least 135 scalene right triangles
- at least 240 isosceles non-right triangles

These are the types of ceramic triangles available at the ceramics store, the quantities of triangles per bag and the prices per bag:

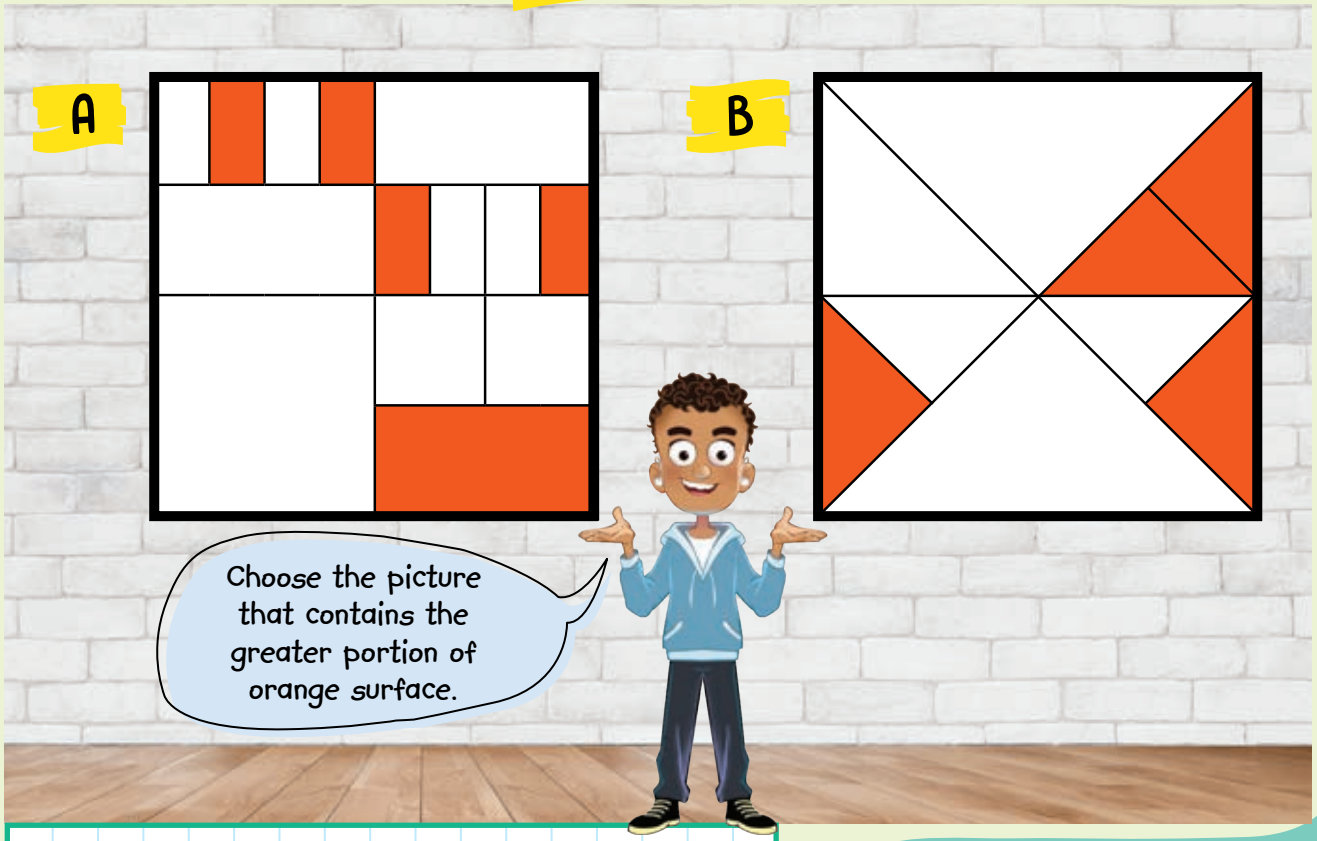
Type of ceramic triangle					
Quantity per bag	50	125	35	80	75
Price per bag	$89	$174	$56	$138	$132

How much will the ceramic triangles for Aunt Nadia's mosaic cost?

The ceramic triangles for Aunt Nadia's mosaic will cost _____.

Math Chat

It's Up to You



Arithmetic CHAMP

Training for math champions

Flex your math muscles!

a

b

c

d

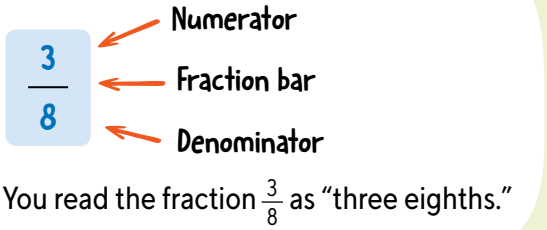
e

I Learn

The Different Meanings of Fractions

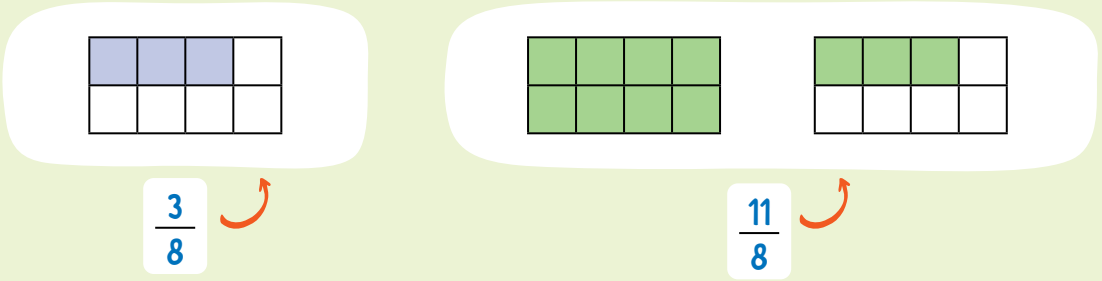
A fraction usually represents the relationship between a part of a whole (the **numerator**) and the whole (the **denominator**), which has been divided into equivalent parts.

The whole can be a **single whole** (only one object) or a **collection** (a group of objects).

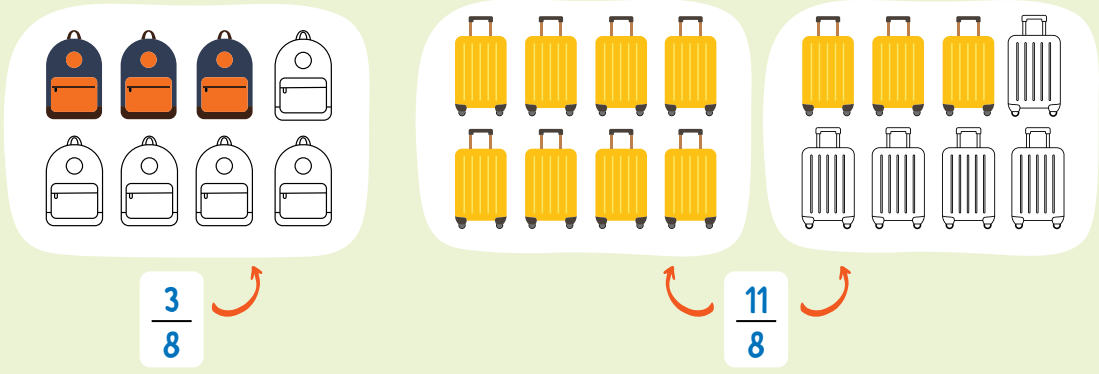


You read the fraction $\frac{3}{8}$ as "three eighths."

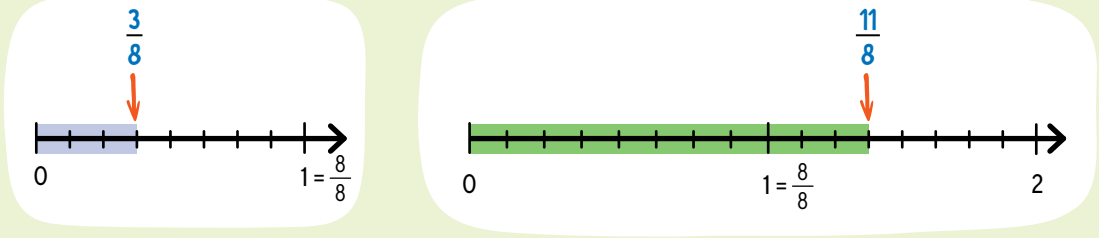
Single whole



Collection



Representation on a number line



Numerator < Denominator
Fraction < 1

Numerator > Denominator
Fraction > 1

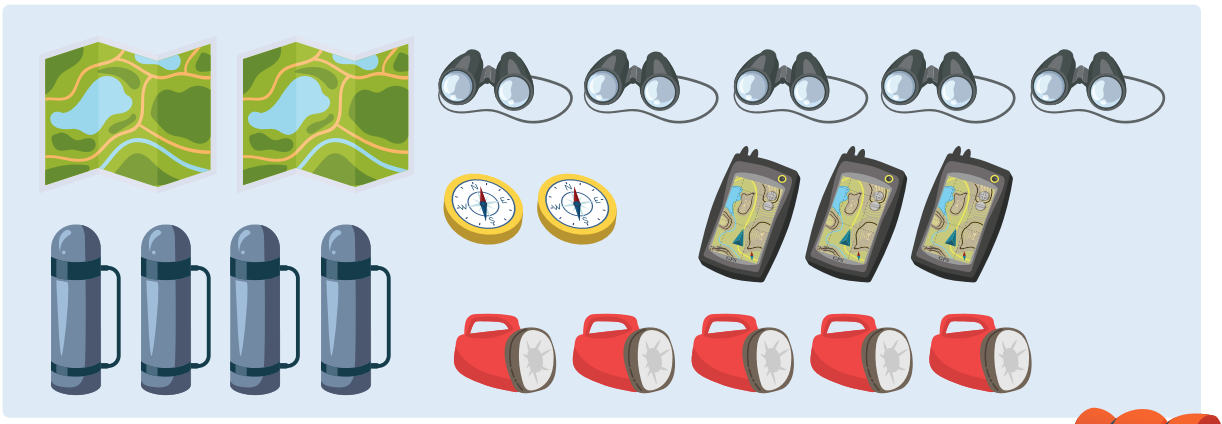
A fraction can also express a **ratio**. It then represents the comparison of 2 quantities in the same collection.

In this collection, there are 3 backpacks for 4 suitcases.

The ratio is written as **3** : **4**.

I Practise

1 **Observe** the objects. Then **circle** the correct fraction to complete each statement below.



a) $\frac{5}{20}$ $\frac{5}{21}$ $\frac{6}{21}$ of the objects are binoculars.

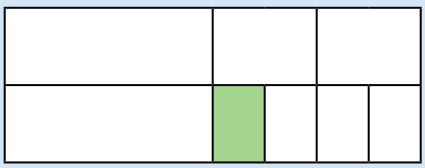
b) $\frac{2}{21}$ $\frac{4}{21}$ $\frac{1}{10}$ of the objects are compasses.

c) $\frac{1}{7}$ $\frac{3}{20}$ $\frac{3}{7}$ of the objects are GPS trackers.

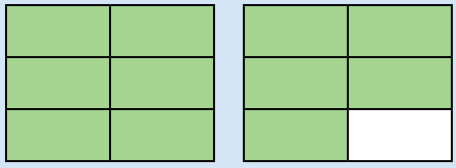
d) $\frac{1}{7}$ $\frac{4}{21}$ $\frac{1}{3}$ of the objects are for finding the right direction.

2 **Write** the fraction represented by the coloured part of each figure.

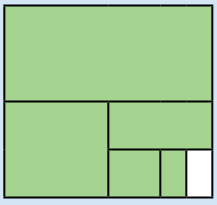
a)



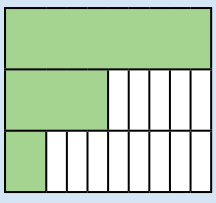
b)



c)

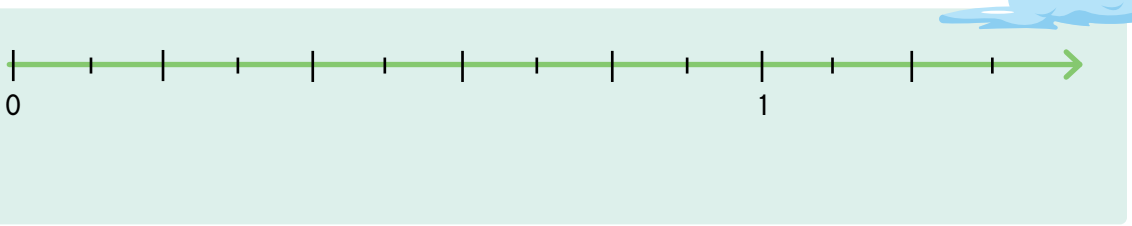


d)

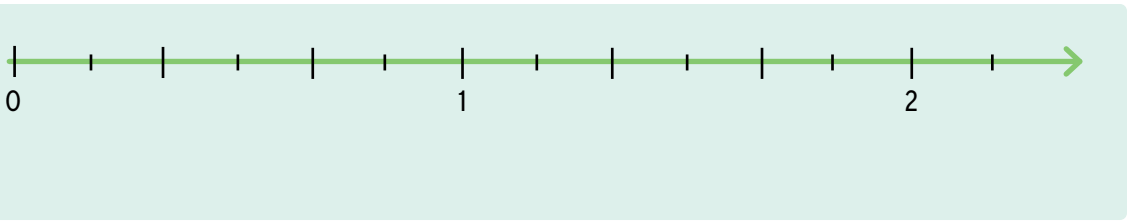


3 **Locate** the fractions on the number lines.

a) $\frac{2}{5}$ $\frac{6}{5}$ $\frac{1}{5}$ $\frac{3}{5}$

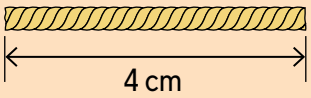


b) $\frac{2}{3}$ $\frac{4}{3}$ $\frac{1}{3}$ $\frac{5}{3}$



4 The average crew on a commercial flight consists of 2 pilots and 6 flight attendants.
Write the ratio of pilots to flight attendants.

5 While wrapping a parcel, Maggie cuts a piece of string that represents $\frac{2}{7}$ of the entire string.
Draw the entire string and **write** its length.



6 **Answer** the questions.

a) If a whole equals 12 tokens, how many tokens represent $\frac{1}{3}$?

b) If 6 tokens represent $\frac{1}{3}$ of the whole, what is the whole?

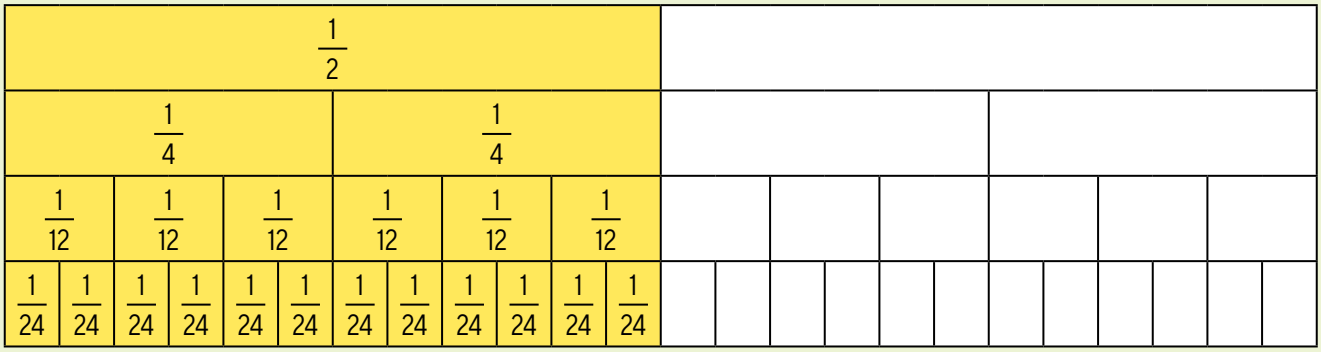
c) If a whole equals 8 tokens, what fraction do 6 tokens represent?

d) If a whole equals 9 tokens, how many tokens represent $\frac{5}{3}$?

I Learn

Equivalent Fractions

Equivalent fractions are fractions that represent the **same value** in relation to a whole.



$\frac{1}{2} = \frac{2}{4} = \frac{6}{12} = \frac{12}{24}$

These fractions are **equivalent** because they all represent half of the surface.

To find a fraction that is equivalent to a given fraction, you can

- **multiply** the numerator and denominator of the given fraction by the same number

$\frac{5}{6} \overset{\times 2}{=} \frac{10}{12}$ $\qquad$ $\frac{5}{6} \overset{\times 3}{=} \frac{15}{18}$

- **divide** the numerator and denominator of the given fraction by the same number

$\frac{10}{30} \overset{\div 5}{=} \frac{2}{6}$ $\qquad$ $\frac{10}{30} \overset{\div 2}{=} \frac{5}{15}$

There are an infinite number of equivalent fractions for any given fraction.

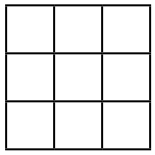
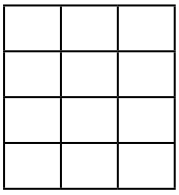
I Practise

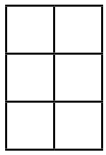
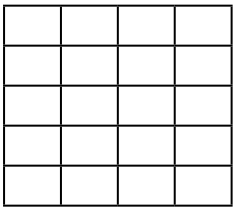
1 **Write** 2 equivalent fractions to represent the red airplane tickets on the left and the blue suitcases on the right.

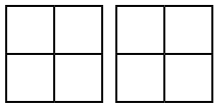
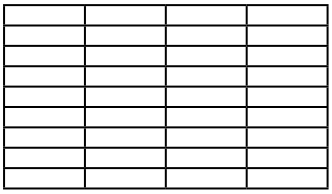
a)

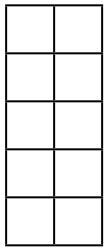
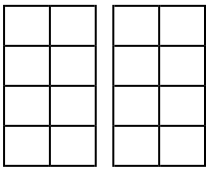
b)

2 **Colour** the correct number of squares to represent each fraction.
Match each fraction on the left to the equivalent fraction on the right.

a) $\frac{3}{9}$  $\frac{8}{12}$ 

b) $\frac{4}{6}$  $\frac{12}{20}$ 

c) $\frac{7}{4}$  $\frac{12}{36}$ 

d) $\frac{6}{10}$  $\frac{14}{8}$ 

3 **Write** each of the following fractions in the correct line below to form groups of equivalent fractions.

$\frac{3}{5}$ $\frac{40}{60}$ $\frac{1}{5}$ $\frac{9}{15}$ $\frac{15}{75}$ $\frac{2}{3}$ $\frac{36}{60}$ $\frac{30}{45}$ $\frac{10}{50}$

a) $\frac{18}{30}$ ☐ ☐ ☐

b) $\frac{10}{15}$ ☐ ☐ ☐

c) $\frac{5}{25}$ ☐ ☐ ☐

I Learn

Reducing Fractions

A fraction that is reduced to its **simplest form**, or *lowest terms*, is called an **irreducible fraction**. In an irreducible fraction, the only common divisor of the numerator and denominator is 1.

$\frac{24}{36} \overset{\div 2}{=} \frac{12}{18} \overset{\div 3}{=} \frac{4}{6} \overset{\div 2}{=} \frac{2}{3}$ ← Irreducible fraction

Or $\frac{24}{36} \overset{\div 12}{=} \frac{2}{3}$ ← Irreducible fraction

Remember to use the divisibility rules to find a common divisor of the numerator and denominator.

I Practise

1 **Find** the divisor used to reduce each starting fraction.

Example: $\frac{15}{36} \overset{\div 3}{=} \frac{5}{12}$

a) $\frac{24}{10} \overset{\div}{=} \frac{12}{5}$

b) $\frac{44}{32} \overset{\div}{=} \frac{22}{16}$

c) $\frac{49}{35} \overset{\div}{=} \frac{7}{5}$

d) $\frac{84}{108} \overset{\div}{=} \frac{7}{9}$

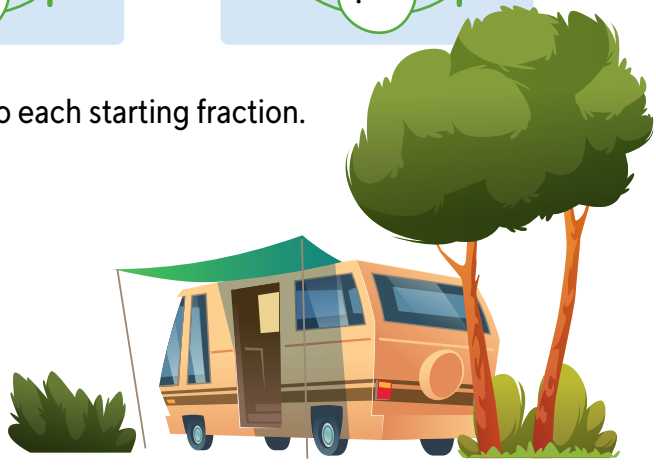
e) $\frac{110}{70} \overset{\div}{=} \frac{11}{7}$

2 **Circle** the irreducible fraction that is equivalent to each starting fraction.

a) $\frac{12}{18}$ = $\frac{6}{9}$ $\frac{4}{6}$ $\frac{2}{3}$ $\frac{3}{4}$

b) $\frac{39}{54}$ = $\frac{12}{18}$ $\frac{13}{18}$ $\frac{19}{27}$ $\frac{39}{54}$

c) $\frac{44}{16}$ = $\frac{24}{8}$ $\frac{22}{8}$ $\frac{11}{4}$ $\frac{6}{2}$



3 **Solve** the problems.

a) Yuri is preparing for his trip to Japan. He has rented an apartment in a building with 48 units. $\frac{1}{3}$ of the apartments in the building are rented by tourists. $\frac{3}{4}$ of the remaining apartments are rented by students. What fraction of the apartments are still free? **Write** your answer in the form of an irreducible fraction.

b) During a long trip around the world, Marta took photos of 30 different schools: 12 in Asia, 10 in Europe, 5 in Oceania and 3 in South America. What fraction of the total number of school photos do the photos from each continent represent? **Write** your answers in the form of irreducible fractions.

c) Marion has many beautiful travel books in her bookshelf. She has 9 books on Asia, 10 on Europe, 8 on Oceania and 15 on South America. What irreducible fraction of Marion's travel books do the books from each continent represent?

Continent	Irreducible Fraction
Asia	
Europe	
Oceania	
South America	

d) In the school multi-purpose room, the students in Mr. Maurice's class are presenting their projects on the regions of Québec. Six teams did their projects on the Côte-Nord region. The teams with projects on the Outaouais region take up $\frac{2}{12}$ of the room, and the Laurentides teams take up $\frac{1}{3}$. The remaining teams, whose region was Montérégie, take up the rest of the room.

What fraction of the room do the teams who did projects on the Montérégie and Côte-Nord regions take up together? **Write** your answer in the form of an irreducible fraction.

e) Alex sets out to discover the regions of Québec, taking 2 different tourist routes. He drives 225 km on the 1st route and then takes a break. Then, he drives 315 km on the 2nd route before stopping for the night. Each distance he covered equals $\frac{3}{4}$ of the total route length. What is the total length, in kilometres, of each tourist route?

1st route: 2nd route:

I Use Reasoning

The Prospects Foundation and the principal of Crickets School are organizing a science field trip for the 90 Grade 6 students. The students can choose among 4 places to visit:

- $\frac{1}{3}$ of the students choose to visit the natural science museum.
- $\frac{2}{5}$ of the students choose to visit the planetarium.
- $\frac{1}{6}$ of the students choose to visit the insectarium.
- The other students choose to visit the botanical garden.

These are the ticket prices for each of the visits:

Natural Science Museum	Planetarium	Insectarium	Botanical Garden
$12 per student	$11 per student	$8 per student	$9 per student

The Prospects Foundation will donate $575 to finance the field trip. The school will pay the rest of the costs. How much money will the school have to spend on the Grade 6 students' field trip?

The school will have to spend _____ on the Grade 6 students' field trip.

I Make Choices

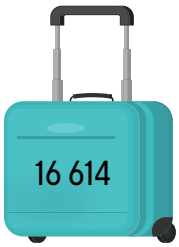
Circle the correct answer to each question. **Show** your work in the calculation spaces.

1 How many hundreds are there in 673 829?

a) 738 b) 6738

c) 673 d) 82

2 What is the product of 426 and 39?

a) 

b) 

c) 

d) 

3 What is the sum of $8^0 + 2^2 + 3^3$?

a) 

b) 

c) 

d) 

4 Which statement is true?

a) 4872 is divisible by 2, 3 and 5.

b) 4872 is divisible by 3, 4 and 9.

c) 4872 is divisible by 2, 8 and 9.

d) 4872 is divisible by 3, 4 and 8.

e) 4872 is divisible by 1, 4 and 5.

5 Which expression is the prime factorization of 900?

a) $2 \times 3^2 \times 5^3$

b) $2^3 \times 3^2 \times 5$

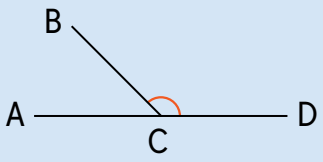
c) $3^2 \times 10^2$

d) $2^2 \times 3^2 \times 5^2$

e) $2^2 \times 5^2 \times 9$

f) $2^2 \times 3 \times 5^2$

6 What is the measure of angle BCD?



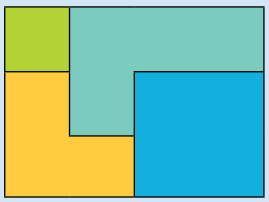
a) 45°

b) 130°

c) 145°

d) 135°

7 Which fraction of the figure does the yellow part represent?



a) $\frac{1}{6}$

b) $\frac{1}{3}$

c) $\frac{1}{4}$

d) $\frac{1}{12}$

8 Which fraction is equal to $\frac{48}{72}$ reduced to its simplest form?

a) $\frac{8}{12}$

b) $\frac{4}{6}$

c) $\frac{24}{36}$

d) $\frac{2}{6}$

e) $\frac{2}{3}$

f) $\frac{16}{24}$

Review

Arithmetic

1 Matthew sold $264 worth of fair-trade products for a local charity. **Represent** the sum he collected as 8 bills and 3 coins.

2 **Decompose** the number 827 916 in 3 different ways.

3 **Compare** the numbers using the correct symbol: **<**, **>** or **=**.

a) 773 377 ☐ 73 377

b) 827 277 ☐ 872 272

c) 960 065 ☐ 960 056

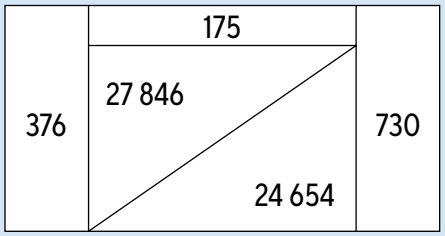
d) 110 010 ☐ 101 010

4 **Fill in** the rows of the table, starting each time from the given number.

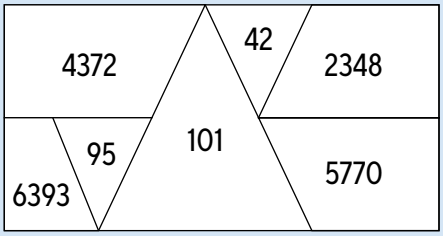
	Add 2 hundreds.	Subtract 15 tens.	Add 22 thousands.	Subtract 5 hundreds.
a) 145 789 →				
b) 325 189 →				
c) 900 000 →				

5 In each flag, **colour** the numbers divisible by 3 blue, the numbers divisible by 4 green and the numbers divisible by 5 yellow.

a)



b)



6 **Circle** the numbers that are divisible by 6.

43 560	39 552	66 262	430 002	561 712	43 824

7 **Do** the multiplications.

4 8 6 × 9	8 2 7 × 3 4	7 0 5 × 2 3

8 **Decompose** each number by drawing a factor tree. **Write** the result in exponential notation.

a)

420

420 = ____

b)

231

231 = ____

9 **Circle** the fractions in each group that are equivalent to the 1st fraction.

a) $\frac{2}{3}$ — $\frac{5}{9}$ $\frac{6}{9}$ $\frac{2}{9}$ $\frac{40}{60}$

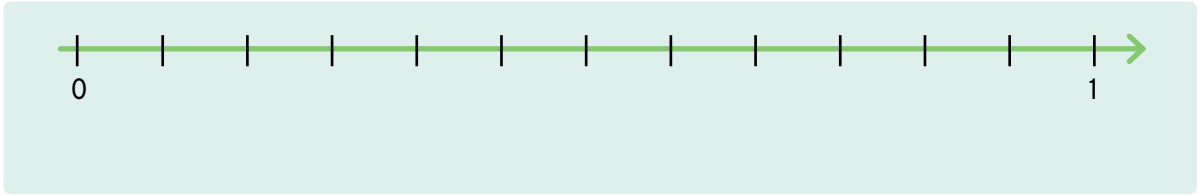
b) $\frac{3}{4}$ — $\frac{9}{12}$ $\frac{24}{32}$ $\frac{24}{36}$ $\frac{36}{48}$

c) $\frac{15}{25}$ — $\frac{2}{3}$ $\frac{3}{5}$ $\frac{5}{10}$ $\frac{30}{50}$

d) $\frac{4}{9}$ — $\frac{12}{18}$ $\frac{20}{45}$ $\frac{44}{99}$ $\frac{70}{80}$

10 **Locate** the fractions on the number line.

$\frac{2}{3}$ $\frac{1}{2}$ $\frac{5}{6}$ $\frac{1}{3}$ $\frac{1}{12}$



11 **Reduce** the fractions to their simplest forms.

a) $\frac{24}{36}$ = ☐

b) $\frac{36}{48}$ = ☐

c) $\frac{9}{63}$ = ☐

d) $\frac{14}{35}$ = ☐

e) $\frac{40}{60}$ = ☐

f) $\frac{6}{27}$ = ☐

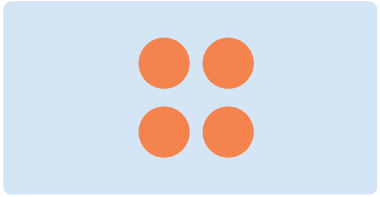
g) $\frac{45}{54}$ = ☐

h) $\frac{48}{78}$ = ☐

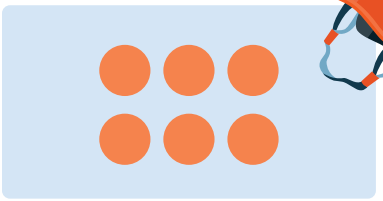
i) $\frac{63}{99}$ = ☐

12 If these tokens  represent $\frac{1}{3}$ of a collection of tokens, **circle** the picture that represents $\frac{4}{3}$ of the tokens.

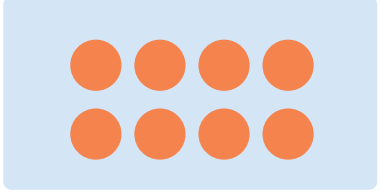
a)



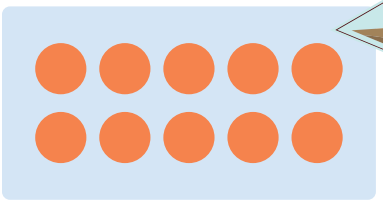
b)

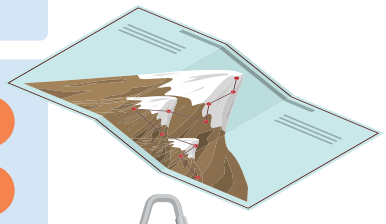


c)



d)





13 **Solve** the problems.

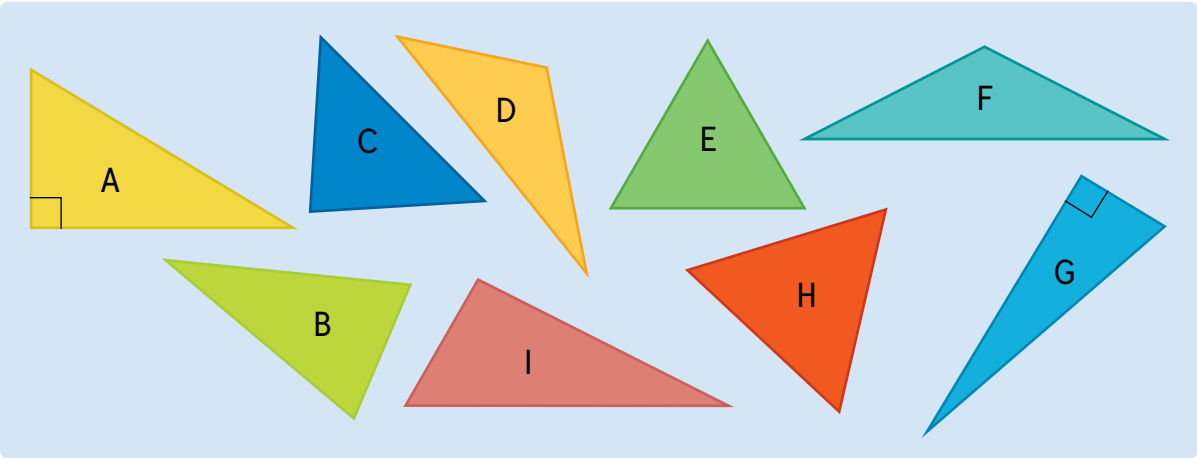
a) During his trip to China, Frank got stuck in a huge traffic jam on a 4-lane highway.
If there were 1783 cars in each lane, how many cars were involved in the traffic jam?

b) Angie visited a rice packaging factory while she was in China. She noticed that each packing crate contained 24 boxes of 12 bags of rice.
How many bags of rice were there in 87 packing crates?

c) Austin walked 1 km along the Great Wall of China. He counted 1250 bricks just in the bottom row of the wall on one side. The 2 walls on either side of the path each consist of 9 rows of bricks.
How many bricks are there along a 5 km stretch of the path?

Geometry and Measurement

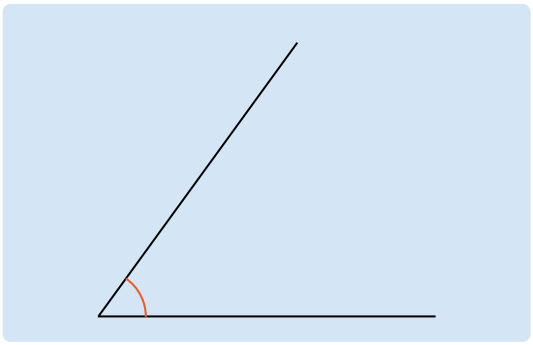
14 **Classify** the triangles by writing their letters in the correct columns of the table.



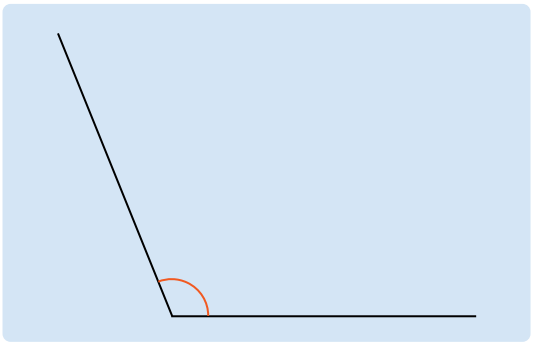
Isosceles Triangle	Equilateral Triangle	Scalene Triangle	Scalene Right Triangle

15 **Measure** the angles with a protractor and **write** the results.

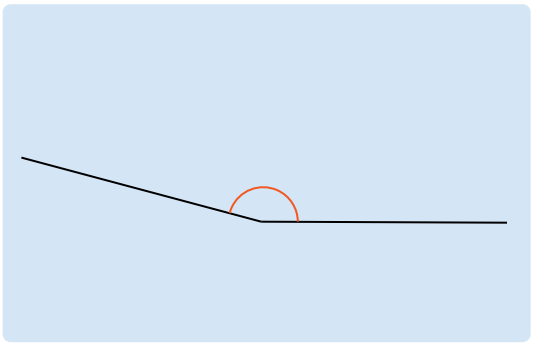
a)



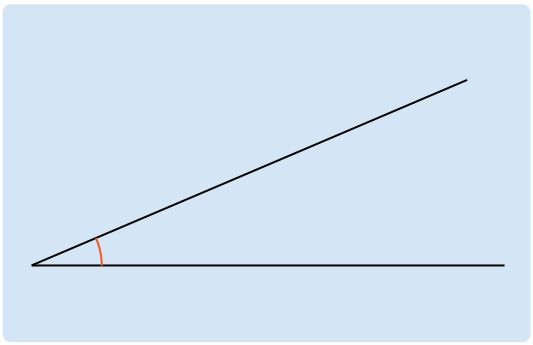
b)



c)



d)

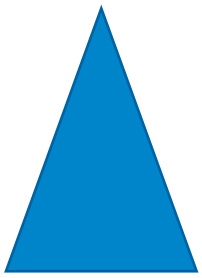


I Use Reasoning

Qian's family goes camping for their summer holiday. Every year, they go back to the same provincial park.

- There are 4 sectors with campsites in the park.
- Each sector is identified by a triangle.
- Qian and her family always choose a site in the "scalene" sector.

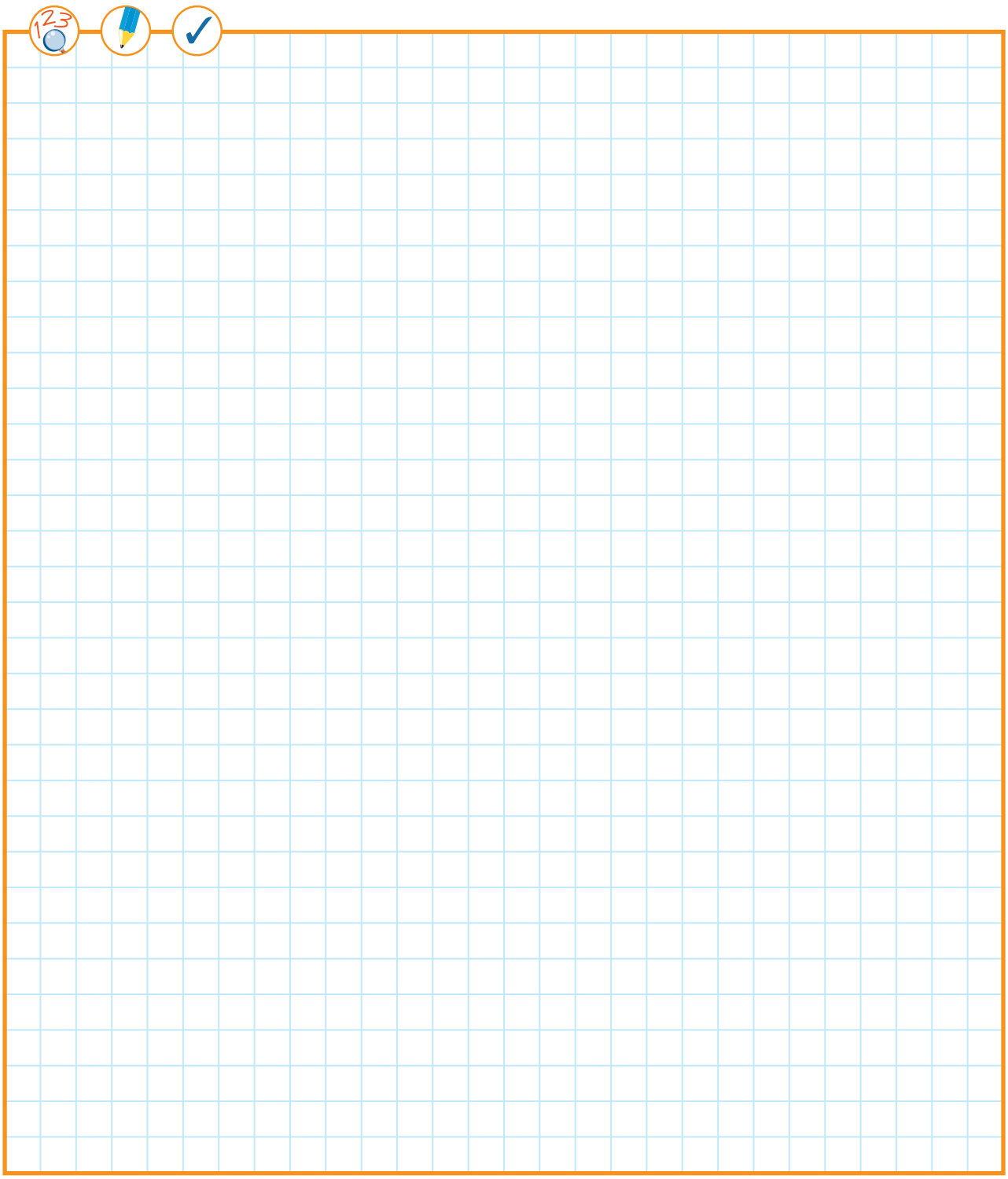
Near each camping sector, there is a hiking trail that forms a loop. The length of each trail is described in a list of clues on the sign:

Sector	Length of Trail (km)
	• Number between 13 and 20 • Divisible by 2 • Divisible by 3
	• Number between 10 and 20 • Divisible by 3 • Divisible by 5
	• Number between 7 and 14 • Divisible by 4 • Divisible by 6
	• Number between 0 and 15 • Divisible by 3 • Divisible by 9

If the hiking trail is a loop, do you have to calculate the distance and back, or does the trail take you back to the starting point?

Qian and her family will spend 21 days at the campsite. They will go hiking on $\frac{2}{3}$ of those days. On each of their hiking days, they plan to walk the entire length of the trail in their sector.

How many kilometres will Qian have walked by the end of her holiday?



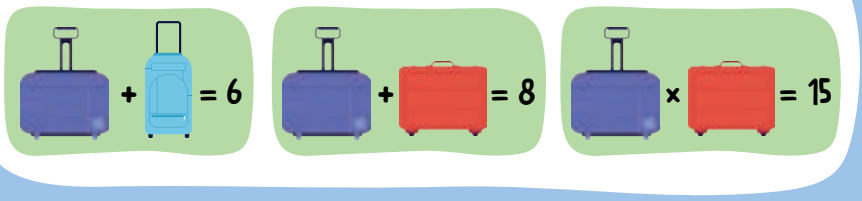
Qian will have walked _____ km by the end of her holiday.

GAME TIME

Secret Suitcase Code

Read the clues, do the addition and then write the digit represented by each suitcase.

Clues



Thousands	Hundreds	Tens	Ones
+			

Suitcase Code