1. Number properties: what do you know?



Name _____ Class _____ Date _____

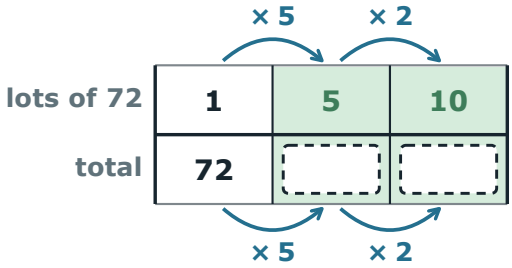
Max and Tim's stop · Picton · ferry arrives. The ferry from Wellington ties up at Picton, and Tim strides down the ramp while Max opens the journal on a wharf post.

Today: Describe a number by what you know: the **value** of its digits, what it **rounds** to, its **factors** and **multiples**, and whether it is **prime** or **square**.

Warm-up Strategies you know

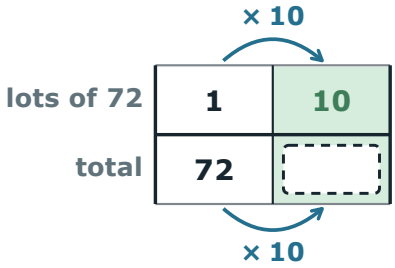
Each answer helps with the next one. Fill in the model, then write the equation.

1 **a)** 5 × 72 × 2



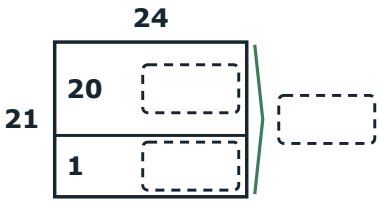
5 × 72 × 2 = _____ × 2 = _____

b) 10 × 72



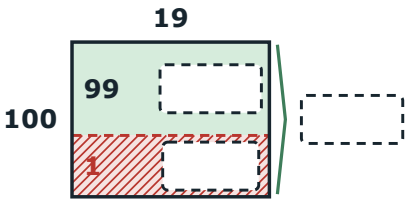
10 × 72 = _____

c) 24 × 21



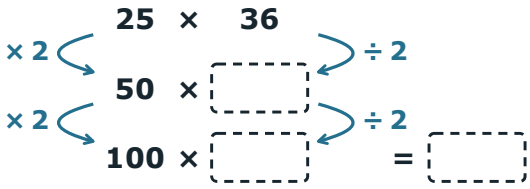
24 × 21 = _____

d) 19 × 99



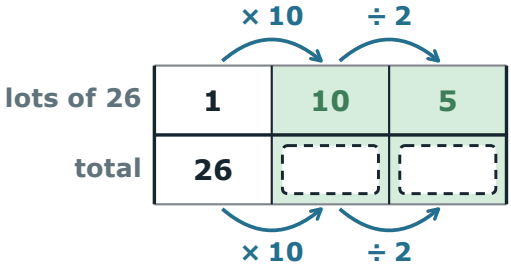
19 × 99 = _____

e) 25 × 36



25 × 36 = _____

f) 5 × 26



5 × 26 = _____ ÷ 2 = _____

Number properties: what do you know?

KNOWLEDGE **Digits, factors, multiples, primes and squares**

WORKED EXAMPLE **Arrange 20 counters in equal rows to find all the factors of 20.**

5

4 

1 × 20 = 20

2 × 10 = 20

4 × 5 = 20

number of factors: 6

1. 2 equal rows of **10**: 2 and 10 are factors of 20.
2. 3 rows leave 2 counters over. 4 rows of **5**: 4 and 5 are factors too. 5 rows of 4 is the same pair turned round: stop.
3. With 1 × 20: 1, 2, 4, 5, 10 and 20. That is **6** factors.

factors of 20: 1, 2, 4, 5, 10, 20: there are 6

2 ★ Fill in or finish the model, then write the equation.

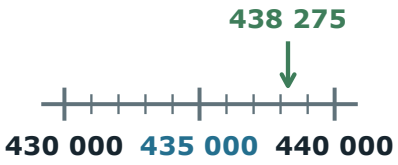
a) What is the value of the digit **4** in **2 431 506**?

M	HTh	TTh	Th	H	T	O
2	4	3	1	5	0	6

the 4 is worth ☐

the 4 in 2 431 506 is worth _____

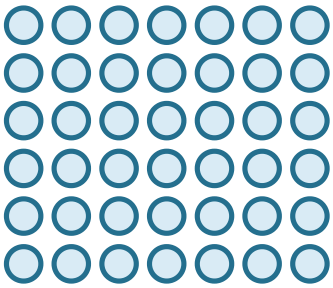
b) Round **438 275** to the nearest **10 000**.



nearest 10 000: 438 275 ≈ _____

c) Find all the factors of **42**. Complete each factor pair.

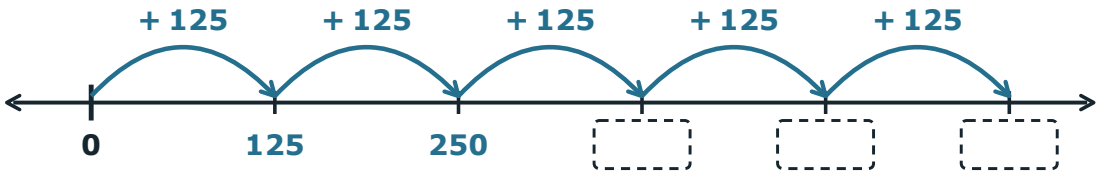
?

6 

1 × 42 = 42

42 = 1 × 42 = 2 × _____ = 3 × _____ = 6 × _____ : _____ factors

d) Complete the multiples of **125**: 125, 250, __, __, __

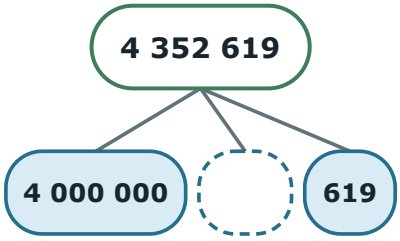


multiples of 125: 125, 250, _____, _____, _____

2 *Question 2 continued: fill in or finish the model, then write the equation.*

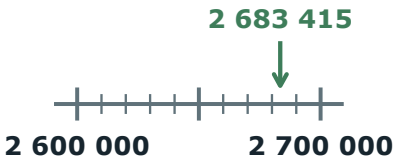
e) Complete the part-whole model:
4 352 619 = 4 000 000 + ? + 619

4 352 619 = 4 000 000 + _____ + 619



3 ★ Round **2 683 415** to the nearest **100 000**. Write the halfway number under the long mark first.

nearest 100 000: 2 683 415 ≈ _____



4 ★ The first pair is 1 × 32. **Find all the factors of 32**: choose the rows of each pair yourself.

32

1 ●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

1 × 32 = 32

32 = 1 × 32 = _____ × _____ = _____ × _____ : _____ factors

5 ★ Find the lowest common multiple of **4** and **10**: count up both rows until they meet.

LCM of 4 and 10 = _____

4s	4	8			
10s	10		30	40	50

6 ★ One row of **7** counters. Build the square, then find **7²**.

7

? ○○○○○○○

7^2 = _____

7 ★ **Is 57 a prime number?** 57 counters stand in one row. Find the fewest equal rows, more than 1.

57 = _____ × _____

Draw your model

8 ★ Which multiples of 100 000 does **374 826** lie between? Round it to the nearest 100 000.

nearest 100 000: 374 826 ≈ _____

Draw your model

Number properties: what do you know?

9 ★

Is 64 a square number? 64 counters stand in 4 rows of 16. Re-cut them into a square.

64 = _____

Draw your model

10 ★

The factors of 12 are 1, 2, 3, 4, 6 and 12. **Find all the factor pairs of 100**, then the highest common factor of 12 and 100.

Draw your model

100 = _____ × _____ = _____ × _____ = _____ × _____

= _____ × _____ = _____ × _____ and highest common factor of 12 and 100

= _____

APPLICATION **On the wharf at Picton** Draw your own model, then write your number sentence.

11 ★★

In the marina, Wiremu moors the **24 yachts** of the sailing school in equal rows. **Find every factor pair of 24**: each pair is a way he could moor them. Then count the factors.

_____ = _____ : _____ factors

Draw your model

12 ★★

Along the wharf Tim spots a bollard every **6 m** and a wooden post every **9 m**. At the ferry ramp a bollard and a post stand side by side. **After how many metres do a bollard and a post next stand side by side?**

_____ = _____ m

Draw your model

Number properties: what do you know?

13 ★★

On the ferry, Tim counted the seats of the lounge: **81 seats** in 3 long rows of 27. **Is 81 a square number? How many seats would stand in each row of a square?**

81 = _____

Draw your model

REASONING **Do you agree with Max and Tim** Decide, then explain how you know.

14 ★★★

a) Max says: "All prime numbers must be odd, because all even numbers have a factor of 2." **Do you agree with Max?**

- ◯ Yes: every even number has 2 as a factor
- ◯ No: 9 is odd, and it is not prime
- ◯ No: 2 is even, and its only factors are 1 and itself

Explain: _____

b) So find every factor pair of the even number **2** on counters, then count its factors.



2 = _____ × _____ : _____ factors

15 ★★★

a) Max writes in the journal: "Adding 0, multiplying by 1 and dividing a number by itself never change it: 8 + 0 = 8, 8 × 1 = 8 and 8 ÷ 8 = 8." **Do you agree with Max?**

- ◯ Yes: none of the three changes the number
- ◯ No: 8 + 0 is more than 8
- ◯ No: 8 ÷ 8 is not 8

Explain: _____

b) So check on counters: **8 counters** are shared into **8 equal rows**. Find 8 ÷ 8, then count all the rows.

Draw your model

8 ÷ 8 = _____ and 8 × _____ = _____

16 ★★★

a) Max says: "When you round to the nearest 1 000, you look at the thousands column." So he rounds **46 829** to 46 000. **Is Max correct?**

- ◯ Yes: the thousands digit is 6, so it stays 46 000
- ◯ No: the hundreds digit says on which side of halfway the number lies

Explain: _____

b) So round **46 829** to the nearest **1 000**.

Draw your model

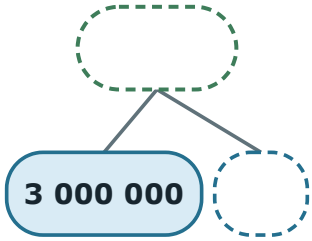
nearest 1 000: 46 829 ≈ _____

17 ★★★

a) Tim writes **three and a half million** in numerals as **3 000 500**. **What mistake has Tim made?**

- ◯ There is no mistake
- ◯ He wrote half a million as five hundred
- ◯ He should have written 3 500

b) So complete the part-whole model for **three and a half million**.



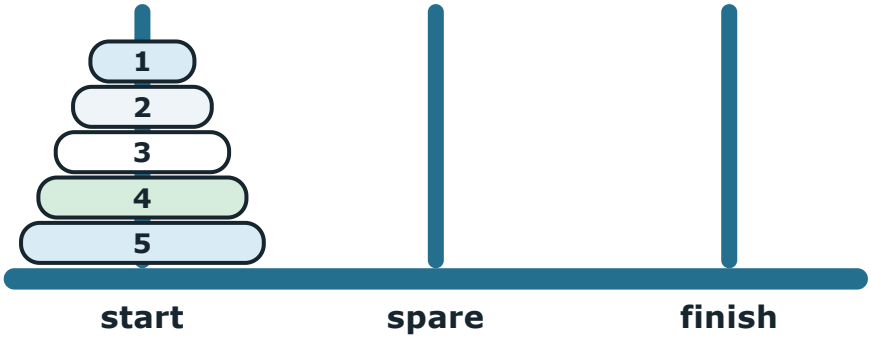
three and a half million = _____

Explain: _____

18 PROBLEM OF THE DAY **The tower of discs**

On the wharf at Picton, while the ferry unloads, Tim finds a wooden toy in his backpack and hands it to Max: five discs stacked on a pole, the biggest at the bottom. The whole tower must move to the pole marked finish. Only one disc moves at a time, and a bigger disc may never sit on a smaller one.

Move the tower in at most 40 moves. It can be done in 31: can you find that way? Write down every move.



Think further: What is the fewest number of moves for 6 discs? For 10?

Explain one thing you learned.

I can do this: ◯ independently ◯ with help ◯ I need more practice