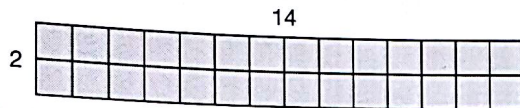


LESSON

4

Prime and Composite Numbers

Numbers multiplied to form a product are factors of the product.



$$\begin{array}{ccccc} & 2 & \times & 14 & = & 28 \\ & \uparrow & & \uparrow & & \uparrow \\ & \text{factor} & & \text{factor} & & \text{product} \end{array}$$

2 and 14 are factors of 28.

What are other factors of 28? How do you know?

Explore

You will need Colour Tiles or congruent squares and grid paper.

- Find all the different rectangles you can make using each number of tiles from 2 to 20.
Draw each rectangle on grid paper.
Write a multiplication sentence that describes the number of tiles in each rectangle.
- For which numbers of tiles could you make only 1 rectangle?
For which numbers of tiles could you make 2 rectangles?
3 rectangles?



A 2 by 1 rectangle
is the same as
a 1 by 2 rectangle.

Show and Share

Share your work with another group of students.

What are the factors of 2? Of 3?

What are the factors of 16? Of 20?

How could you find the factors of a number without making rectangles?



Connect

- Suppose you have 23 Colour Tiles.
You can make only 1 rectangle with all 23 tiles.



23 has 2 factors: 1 and 23
A number with exactly 2 factors,
1 and itself, is a **prime number**.
23 is a prime number.

A prime number is a number
greater than 1 that is divisible
only by 1 and itself.

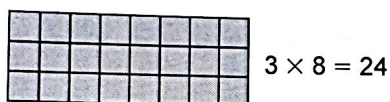
- Suppose you have 24 Colour Tiles.
You can make 4 different rectangles with 24 tiles.



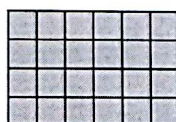
$$1 \times 24 = 24$$



$$2 \times 12 = 24$$



$$3 \times 8 = 24$$



$$4 \times 6 = 24$$

24 has 8 factors: 1, 2, 3, 4, 6, 8, 12, and 24
The factors that are prime numbers are 2 and 3.

Here are 2 different strategies students used to find factors.

- Yao used multiplication facts to find all the factors of 40.
She looked for whole numbers whose product is 40.

$1 \times 40 = 40$	1 and 40 are factors of 40.
$2 \times 20 = 40$	2 and 20 are factors of 40.
$4 \times 10 = 40$	4 and 10 are factors of 40.
$5 \times 8 = 40$	5 and 8 are factors of 40.

40 has 8 factors: 1, 2, 4, 5, 8, 10, 20, and 40
The factors that are prime numbers are 2 and 5.

- Maddie used arrays to find all the factors of 18.



$$1 \times 18 = 18$$



$$2 \times 9 = 18$$



$$3 \times 6 = 18$$

The factors of 18 are: 1, 2, 3, 6, 9, and 18

The factors that are prime numbers are 2 and 3.

Every number has at least 2 factors: 1 and the number itself

A number with more than 2 factors is a **composite number**.

Practice

You may use Colour Tiles or counters to model your solutions.

1. List all the factors of each number.

a) 6 b) 9 c) 25 d) 30 e) 12
f) 50 g) 28 h) 98 i) 20 j) 63

2. a) Name a prime number.

Explain how you know it is a prime number.

- b) Name a composite number.

Explain how you know it is a composite number.

3. Which numbers below are factors of 80?

How do you know?

a) 2 b) 3 c) 4 d) 5
e) 6 f) 8 g) 9 h) 10

4. Which of the numbers 2, 3, 4, 5, 6, 8, 9, 12, 15, 17, and 19 are factors of:

a) 24? b) 38? c) 45? d) 51?

What strategy did you use to find out?

5. Eggs are packaged in cartons of 12.

Which of these numbers of eggs can be packaged in full cartons? How do you know?

a) 96 b) 56 c) 60 d) 74

6. Write 3 numbers between 30 and 50 that have:

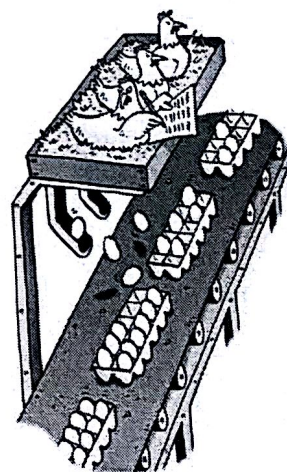
a) exactly 2 factors each b) more than 2 factors each

7. Write 3 numbers less than 100 that have exactly 4 factors each.

8. Sort these numbers as prime or composite.

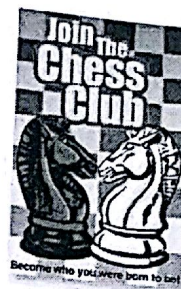
How did you decide where to place each number?

59 93 97 87 73 45



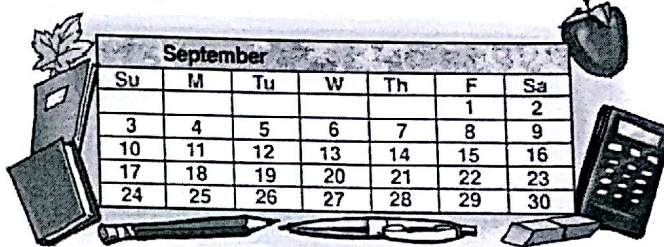


9. Between 20 and 28 students signed up for the chess club. The students could not be divided exactly into groups of 2, 3, 4, or 5. How many students signed up for the chess club? Show your work.



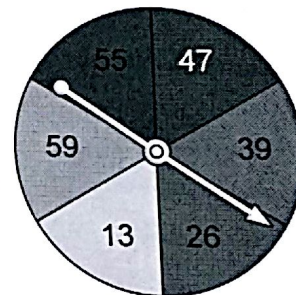
10. How many numbers between 70 and 80 are prime numbers? What numbers are they? Explain how you know they are prime numbers.

11. How many days in September have a prime number date? How many have a composite number date? Show how you know.



12. How can you tell that 32 and 95 are not prime numbers without finding their factors?

13. Brigitte and Stéphane play a game with this spinner. Brigitte gets a point if the pointer lands on a prime number. Stéphane gets a point if the pointer lands on a composite number. The first person to get 20 points wins. Who is more likely to win? How do you know?



14. A student said, "All prime numbers except for the number 2 are odd. So, all odd numbers must be prime numbers." Do you agree with the student? Explain.

15. Copy this Carroll diagram.

	Prime	Composite
Even		
Odd		

Sort the numbers from 2 to 30.

Reflect

Both 0 and 1 are neither prime nor composite. Explain why.

Prime and Composite Numbers

① Factors of #'s

a) $\underline{6}$ 2×3 1×6	b) $\underline{9}$ 1×9 3×3	c) $\underline{25}$ 1×25 5×5	d) $\underline{30}$ 1×30 2×15 3×10	e) $\underline{12}$ 1×12 2×6 3×4	f) $\underline{50}$ 1×50 2×25 5×10	g) $\underline{28}$ 1×28 2×14 4×7
h) $\underline{98}$ 1×98 2×49	i) $\underline{20}$ 1×20 2×10 4×5	j) $\underline{63}$ 1×63 3×21 7×9				

② a) 23 I know it is a prime number because its only factors are 1 and itself (1×23)

③ Factors of 80 = 1×80 , 2×40 , 4×20 , 5×16 , 8×10

a) Yes b) No c) Yes d) Yes e) no f) Yes
g) no h) Yes

④ a) 24 - 2, 3, 4, 6, 8, 12

b) 38 - 2,

c) 45 - 3, 5, 9, 15

d) 51 - 1, 3, 17

⑤ Multiples of 12 are 24, 36, 48, 60, 72, 84, 96

a) Yes b) No c) Yes d) no

⑥ a) 31, 37, 41, 43, 47

b) 32, 33, 34, 35, 36, 38
39, 40, 42, 44, 45, 48
48, 49.

⑦ 8, 9, 14 (and there are many more)

⑧ Prime numbers

- are almost always odd
- never end in 5 or 0
- have only 2 factors

* 59, 97, 87, 73 all follow these rules.

⑨ #'s between 20-28 that don't have 2, 3, 4, or 5 as factors

- 23 is the only # between 20-28 that does not have 2, 3, 4, or 5 as a factor.

⑩ 71, 73, and 79 are prime #'s. They follow the rules written in #8.

⑪ Follow the rules from #8

- Prime #'s between 1-30 are

1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

- Composite #'s between 1-30 are

4, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21, 22, 24, 25, 26, 27, 28, 30

⑫ Follow the rules in answer #8

⑬ We did this one in class.