

The Wheel Shop 1

You are helping out at a local bike shop, and the owner asks for help with some math problems. She needs to order the right parts for her vehicles, so she needs to make sure the numbers are correct.

1. If there are 12 bicycles in the shop, how many wheels are there? How many seats? How many brakes?

$$\begin{aligned} \text{Wheels} &= 12 \cdot 2 = 24 \\ \text{Seats} &= 12 \\ \text{Brakes} &= 12 \cdot 2 = 24 \end{aligned}$$

2. If there are 12 tricycles in the shop, how many wheels are there? How many seats? How many brakes?

$$\begin{aligned} \text{Wheels} &= 12 \cdot 3 = 36 \\ \text{Seats} &= 12 \\ \text{Brakes} &= 12 \cdot 2 = 24 \end{aligned}$$

3. Now imagine there are 15 seats and 30 wheels in the shop. How many bicycles and tricycles are there?

$$15 \text{ bikes} \cdot \underset{\substack{\text{per} \\ \text{bike}}}{2} \text{ wheels} = 30 \text{ total wheels}$$

4. What if there are 15 seats and 45 wheels?

$$15 \text{ tricycles} \cdot \underset{\substack{\text{per} \\ \text{trike}}}{3} \text{ wheels} = 45 \text{ total wheels}$$

5. Is it possible to have 15 seats and 50 wheels?

No. $50 \div 15 = 3.33$ ~~at~~ You would need more than 3 wheels per vehicle.

6. Is it possible to have 15 seats and 20 wheels?

No. Bikes have 2 wheels & $15 \cdot 2 = 30$.

7. Is it possible to have 15 seats and 36 wheels?

You can't have that few.

Yes! Make a table.

$x = \text{bikes}$, $y = \text{trikes}$, $w = \text{wheels}$

| | | | | | | | |
|-----|----|----|----|----|----|----|----|
| x | 15 | 14 | 13 | 12 | 11 | 10 | 9 |
| y | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| w | 30 | 31 | 32 | 33 | 34 | 35 | 36 |

8. Find all possible numbers of wheels, if you know there are 15 seats in the shop.

| | | | | |
|--------|--------------------|----|---------------------|--------|
| | $x = \text{bikes}$ | | $y = \text{trikes}$ | |
| wheels | 45 | 44 | 43 | 42 ... |
| x | 0 | 1 | 2 | 3 ... |
| y | 15 | 14 | 13 | 12 ... |

Any number of wheels between 30 & 45 is possible.

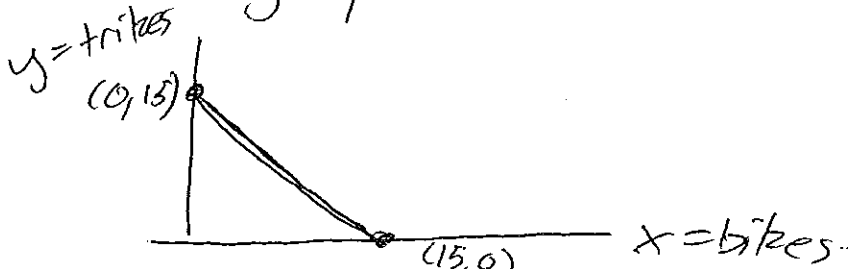
9. Is there an equation you can write that will help you solve this problem?

$$x + y = 15$$

$$2x + 3y = ?$$

10. Is there a way you can visually show all the combinations?

yes! A graph.



11. Now suppose you only know there are 30 wheels, but you don't know the number of seats.

Find all combinations of bicycles and tricycles that make 30 wheels.

| | | | | | | |
|---|----|----|----|----|----|----|
| x | 0 | 3 | 6 | 9 | 12 | 15 |
| y | 10 | 8 | 6 | 4 | 2 | 0 |
| w | 30 | 30 | 30 | 30 | 30 | 30 |

(Trading 3 bikes for 2 trikes, because both have 6 wheels)

12. Write an equation to model the problem.

$$2x + 3y = 30, \quad x + y = ?$$

13. Draw a picture to show all the combinations.

