



Challenging Problem Solving: Ratio

1. The ratio of highlighters to felt tips in Abi's pencil case is 1:6. The ratio of felt tips to pencils is 3:2. Given that she has ten more felt tips than pencils, how many highlighters does she have?
2. In a drama club, 75% of the members are 18 and under. Out of the people over 18, the ratio of dancers to singers is 3:2. What percentage of the drama club are singers over 18?
3. In a zoo, the ratio of elephants to penguins is 1:8. The ratio of penguins to tigers is 6:1. What is the ratio of elephants to tigers? Give your answer in its simplest form.
4. Callie has three types of biscuits for a coffee morning. She has digestives, custard creams and shortbreads in the ratio 2:5:3. The digestives are either chocolate or plain. The ratio of chocolate digestives to plain digestives is 3:2. Callie has 18 chocolate digestives. Calculate the total number of biscuits.
5. The ages of Amit, Brenda and Carleigh are in the ratio 11:7:10. In six years' time, their ages will be in the ratio 14:10:13. Calculate their ages in five years' time.



6. The ratio of members of Team A to members of Team B in a room is 2:3. After 12 more members of Team A enter the room, the ratio is 10:9. How many members of each team are there in the room now?

7. The ratio of red marbles to blue marbles in a bag is 4:7. After five more red marbles are added to the bag, the ratio is 3:4. How many red marbles are in the bag now?

8. A coach has American and German tourists on it in the ratio 6:7. At the first stop, eight of the American tourists get off the coach, making the ratio 4:7. How many tourists are now on the coach?



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9. A school holds a fair in its main hall. The ratio of children to adults in the hall is 4:1. Eight adults leave the hall and go into an adjoining room to purchase a hot drink and snacks. The ratio in the hall is now 8:1. How many children are at the fair?

10. The ratio of boys to girls in a classroom is 2:3. After 3 more boys enter the classroom, the ratio is 3:4. How many pupils were there in the room at the start?



Challenging Problem Solving: Ratio **Answers**

1. The ratio of highlighters to felt tips in Abi's pencil case is 1:6. The ratio of felt tips to pencils is 3:2. Given that she has ten more felt tips than pencils, how many highlighters does she have?

$$3 - 2 = 1$$

$$10 \div 1 = 10$$

$$\begin{aligned}\text{Felt tips} &= 10 \times 3 \\ &= 30\end{aligned}$$

$$\begin{aligned}\text{Highlighters} &= 30 \div 6 \\ &= 5\end{aligned}$$

2. In a drama club, 75% of the members are 18 and under. Out of the people over 18, the ratio of dancers to singers is 3:2. What percentage of the drama club are singers over 18?

$$100 - 75 = 25$$

$$25 \div 5 = 5$$

$$5 \times 2 = 10\%$$

3. In a zoo, the ratio of elephants to penguins is 1:8. The ratio of penguins to tigers is 6:1. What is the ratio of elephants to tigers? Give your answer in its simplest form.

$$8 \times 6 = 48$$

The ratio of elephants to penguins to tigers is 6:48:8.

$$\begin{aligned}\text{Ratio of elephants to tigers} &= 6:8 \\ &= 3:4\end{aligned}$$

4. Callie has three types of biscuits for a coffee morning. She has digestives, custard creams and shortbreads in the ratio 2:5:3. The digestives are either chocolate or plain. The ratio of chocolate digestives to plain digestives is 3:2. Callie has 18 chocolate digestives. Calculate the total number of biscuits.

$$18 \div 3 = 6$$

$$\begin{aligned}\text{Digestives} &= 6 \times 5 \\ &= 30\end{aligned}$$

$$30 \div 2 = 15$$

$$2 + 5 + 3 = 10$$

$$\begin{aligned}\text{Total number of biscuits} &= 15 \times 10 \\ &= 150\end{aligned}$$

5. The ages of Amit, Brenda and Carleigh are in the ratio 11:7:10. In six years' time, their ages will be in the ratio 14:10:13. Calculate their ages in five years' time.

Common difference = 3

$$6 \div 3 = 2$$

$$\begin{aligned} \text{Amit} &= (2 \times 14) - 1 \\ &= 27 \text{ years old} \end{aligned}$$

$$\begin{aligned} \text{Brenda} &= (2 \times 10) - 1 \\ &= 19 \text{ years old} \end{aligned}$$

$$\begin{aligned} \text{Carleigh} &= (2 \times 13) - 1 \\ &= 25 \text{ years old} \end{aligned}$$

6. The ratio of members of Team A to members of Team B in a room is 2:3. After 12 more members of Team A enter the room, the ratio is 10:9. How many members of each team are there in the room now?

At the start, A:B = 2x:3x

At the end, A:B = (2x + 12):3x

$\frac{10}{19}$ of the final total are in Team A,

$$\text{so } \frac{2x + 12}{2x + 12 + 3x} = \frac{10}{19}$$

$$\frac{2x + 12}{5x + 12} = \frac{10}{19}$$

$$19(2x + 12) = 10(5x + 12)$$

$$38x + 228 = 50x + 120$$

$$12x = 108$$

$$x = 9$$

$$2x + 12 = 30$$

$$3x = 27$$

Alternatively, list multiples of the ratio 2:3 until you find a ratio that simplifies to 10:9 after 12 is added to the first number.

30:27 simplifies to 10:9.

There are now 30 members of Team A and 27 members of Team B.

7. The ratio of red marbles to blue marbles in a bag is 4:7. After five more red marbles are added to the bag, the ratio is 3:4. How many red marbles are in the bag now?

At the start, red:blue = $4x:7x$

At the end, red:blue = $(4x + 5):7x$

$\frac{3}{7}$ of the final total are red,

$$\text{so } \frac{4x + 5}{4x + 5 + 7x} = \frac{3}{7}$$

$$7(4x + 5) = 3(11x + 5)$$

$$28x + 35 = 33x + 15$$

$$5x = 20$$

$$x = 4$$

$$4x + 5 = 21$$

Alternatively, list multiples of the ratio 4:7 until you find a ratio that simplifies to 3:4 after 5 is added to the first number.

21:28 simplifies to 3:4.

There are now 21 red marbles in the bag.

8. A coach has American and German tourists on it in the ratio 6:7. At the first stop, eight of the American tourists get off the coach, making the ratio 4:7. How many tourists are now on the coach?

At the start, American:German = $6x:7x$

At the end, American:German = $(6x - 8):7x$

$\frac{4}{11}$ of the final total are American,

$$\text{so } \frac{6x - 8}{6x - 8 + 7x} = \frac{4}{11}$$

$$11(6x - 8) = 4(13x - 8)$$

$$66x - 88 = 52x - 32$$

$$14x = 56$$

$$x = 4$$

$$6x - 8 + 7x = 44$$

Alternatively, list multiples of the ratio 6:7 until you find a ratio that simplifies to 4:7 after 8 is subtracted from the first number.

16:28 simplifies to 4:7.

$$16 + 28 = 44$$

There are now 44 tourists on the coach.

9. A school holds a fair in its main hall. The ratio of children to adults in the hall is 4:1. Eight adults leave the hall and go into an adjoining room to purchase a hot drink and snacks. The ratio in the hall is now 8:1. How many children are at the fair?

At the start, children:adults = $4x:x$

At the end, children:adults = $4x:(x - 8)$

$\frac{8}{9}$ of the final total are children,

$$\text{so } \frac{4x}{4x + x - 8} = \frac{8}{9}$$

$$9 \times 4x = 8(5x - 8)$$

$$36x = 40x - 64$$

$$4x = 64$$

Alternatively, list multiples of the ratio 4:1 until you find a ratio that simplifies to 8:1 after 8 is subtracted from the second number.

64:8 simplifies to 8:1.

There are 64 children at the fair.

10. The ratio of boys to girls in a classroom is 2:3. After 3 more boys enter the classroom, the ratio is 3:4. How many pupils were there in the room at the start?

At the start, boys:girls = $2x:3x$

At the end, boys:girls = $(2x + 3):3x$

$\frac{3}{7}$ of the final total are boys,

$$\text{so } \frac{2x + 3}{2x + 3 + 3x} = \frac{3}{7}$$

$$7(2x + 3) = 3(5x + 3)$$

$$14x + 21 = 15x + 9$$

$$x = 12$$

$$2x + 3x = 60$$

Alternatively, list multiples of the ratio 2:3 until you find a ratio that simplifies to 3:4 after 3 is added to the first number.

27:36 simplifies to 3:4.

$$27 + 36 = 63$$

$$63 - 3 = 60$$

There were 60 pupils in the room at the start.