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 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?

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 ÷ 1 = 10

   Felt tips = 10 × 3 = 30

   Highlighters = 30 ÷ 6 = 5

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 ÷ 5 = 5

   5 × 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 × 6 = 48

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

   Ratio of elephants to tigers = 6:8 = 3:4

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 ÷ 3 = 6

   Digestives = 6 × 5 = 30

   30 ÷ 2 = 15

   2 + 5 + 3 = 10

   Total number of biscuits = 15 × 10 = 150

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 ÷ 3 = 2

   Amit = (2 × 14) – 1 = 27 years old

   Brenda = (2 × 10) – 1 = 19 years old

   Carleigh = (2 × 13) – 1 = 25 years old

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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 start, A:B = $2x$:$3x$

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

$\frac{10}{19}$ of the final total are in Team A, 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 red marbles are in the bag now?

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

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

$\frac{3}{7}$ of the final total are red, 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 start, American:German = $6x$:$7x$

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

$\frac{4}{11}$ of the final total are American, 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 start, children:adults = $4x$:x

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

$\frac{8}{9}$ of the final total are children, 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 start, boys:girls = $2x$:$3x$

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

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

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