

# RATIOS AS LINEAR FUNCTIONS

## Task 1

- 1) The ratio of blue to red counters is 2 : 3. What fraction of the counters are blue?

$$\text{Total parts} = 2 + 3 = 5$$

$$\frac{2}{5}$$

- 2) The ratio of red to orange sweets is 3 : 7. What fraction of the sweets are orange?

$$\text{Total parts} = 3 + 7 = 10$$

$$\frac{7}{10}$$

- 3) A paint mixes yellow and blue in the ratio 4 : 1. What fraction of the paint is yellow?

$$\text{Total parts} = 4 + 1 = 5$$

$$\frac{4}{5}$$

- 4) In a cinema the ratio of adults to children is 1 : 6. What fraction of the people are adults?

$$\text{Total parts} = 1 + 6 = 7$$

$$\frac{1}{7}$$

- 5) The ratio of right-handed to left-handed pupils in a class is 7 : 2. What percentage of the pupils are left-handed? Give your answer to the nearest percentage.

$$\text{Total parts} = 7 + 2 = 9$$

$$\frac{2}{9} = 22\%$$

- 6) A bag has red, green and yellow counters in the ratio 9 : 4 : 7. What percentage of the counters are green?

$$\text{Total parts} = 9 + 4 + 7 = 20$$

$$\frac{4}{20} = 20\%$$

- 7) At a school, pupils take Spanish, French and German in the ratio 5 : 9 : 4. What fraction of the pupils do not study Spanish?

$$\text{Total parts} = 5 + 9 + 4 = 18$$

$$\frac{13}{18}$$

- 8) A bag contains red and blue counters.  $\frac{3}{8}$  of the counters are red. Write the ratio of red to blue counters.

$$3 : 5$$

- 9) A drink is made with 30% syrup, and the rest is sparkling water. Write the ratio of syrup to sparkling water in the drink. Give your answer in simplest form.

$$30 : 70$$

$$3 : 7$$

- 10) The ratio A : B is 2 : 5. What fraction of the ratio represents A?

$$\text{Total parts} = 2 + 5 = 7$$

$$\frac{2}{7}$$

- 11) In a sale  $\frac{2}{3}$  of the items in a store are marked down. Write the ratio of the items marked down, to the items that are full priced.

$$2 : 1$$

- 12) In a jewellery store,  $\frac{4}{11}$  of the jewellery is silver and the rest of the jewellery is gold. Write the ratio of gold jewellery to silver jewellery.

$$7 : 4$$

- 13) At a concert the number of adults to children is in the ratio 5 : 2. The children are all either under 10 or over 10. The ratio of children under 10 to children over 10 is 3 : 4. What fraction of all the people at the concert are children under 10?

Fraction of children:

$$\frac{2}{7}$$

Fraction of children under 10:

$$\frac{2}{7} \times \frac{3}{4} = \frac{6}{28}$$

- 14) On a coach the ratio of teachers to students is 1 : 12. All the students study either science or history. The ratio of science students to history students is 5 : 7. What fraction of all the people on the coach are history students? Give your answer in simplest form.

**Fraction of students:**

$$\frac{12}{13}$$

**Fraction of history students:**

$$\frac{12}{13} \times \frac{7}{12} = \frac{84}{156} = \frac{7}{13}$$

- 15) In a park the ratio of adults to children is 4 : 1. The children are all either playing football or playing basketball. The ratio of football players to basketball players is 2 : 3. What percentage of all the people in the park are basketball players?

**Fraction of children:**

$$\frac{1}{5}$$

**Fraction of children that play basketball:**

$$\frac{1}{5} \times \frac{3}{5} = \frac{3}{25} = 12\%$$

- 16) In a university the ratio of national to international students is 7 : 3. 40% of the international students are studying engineering. What fraction of all the students in the university are international engineering students? Give your answer in simplest form.

**Fraction of international students:**

$$\frac{3}{10}$$

**Fraction of international engineering students:**

$$\frac{3}{10} \times \frac{4}{10} = \frac{12}{100} = \frac{3}{25}$$

## Task 2

- 17) Given that  $a : b = 2 : 3$  and  $b : c = 3 : 4$ , write the ratio  $a : b : c$ .

$$\begin{array}{l} a : b : c \\ 2 : 3 : 4 \end{array}$$

- 18) Given that  $p : q = 6 : 7$  and  $q : r = 5 : 9$ , write the ratio  $p : q : r$ .

$p : q$	$q : r$
6 : 7	5 : 9
$\times 5$ $\times 5$	$\times 7$ $\times 7$
30 : 35	35 : 63

$$\begin{array}{l} p : q : r \\ 30 : 35 : 63 \end{array}$$

- 19) Given that  $a : b = 3 : 5$  and  $b : c = 2 : 7$ , write the ratio  $a : b : c$ .

$a : b$	$b : c$
3 : 5	2 : 7
$\times 2$ $\times 2$	$\times 5$ $\times 5$
6 : 10	10 : 35
$a : b : c$	
6 : 10 : 35	

- 20) Given that  $x : y = 4 : 7$  and  $y : z = 3 : 8$ , write the ratio  $x : y : z$ .

$x : y$	$y : z$
4 : 7	3 : 8
$\times 3$ $\times 3$	$\times 7$ $\times 7$
12 : 21	21 : 56
$x : y : z$	
12 : 21 : 56	

- 21) Given that  $m : n = 1 : 6$  and  $m : p = 3 : 10$ , write the ratio  $n : p$ . Give your answer in simplest form.

$m : n$	$m : p$
1 : 6	3 : 10
$\times 3$ $\times 3$	
3 : 18	
$n : p$	
18 : 10	
9 : 5	

- 22) The ratio of lions to tigers is 7 : 4. The ratio of bears to lions is 5 : 2. Find the ratio of tigers to bears.

$L : T$	$B : L$
7 : 4	5 : 2
$\times 2$ $\times 2$	$\times 7$ $\times 7$
14 : 8	35 : 14
$T : B$	
8 : 35	

- 23) Amir, Ben and Corey share £212. The ratio of Amir's share to Ben's share is 5 : 3. The ratio of Ben's share to Corey's share is 4 : 7. How much does Corey receive?

$A : B$	$B : C$
5 : 3	4 : 7
$\times 4$ $\times 4$	$\times 3$ $\times 3$
20 : 12	12 : 21

$$\begin{aligned}
 A : B : C \\
 20 : 12 : 21 \\
 20 + 12 + 21 = 53 \\
 £212 \div 53 = £4
 \end{aligned}$$

**Corey receives:**  
 $£4 \times 21 = £84$

- 24) Given that  $m : p = 2 : 9$  and  $n : p = 5 : 6$ , write the ratio  $m : n : p$ .

$m : p$	$n : p$
2 : 9	5 : 6
$\times 2$ $\times 2$	$\times 3$ $\times 3$
4 : 18	15 : 18

$$\begin{aligned}
 m : n : p \\
 4 : 15 : 18
 \end{aligned}$$

- 25) A survey is taken about vehicles in a car park. The results are expressed in the following ratios, as the numbers of:

$$\begin{aligned}
 \text{Cars : Motorbikes} &= 5 : 3 \\
 \text{Cars : Vans} &= 10 : 1
 \end{aligned}$$

If there were 187 vehicles recorded, how many vans were recorded?

$C : M$	$C : V$
5 : 3	10 : 1
$\times 2$ $\times 2$	
10 : 6	

$$\begin{aligned}
 C : M : V \\
 10 : 6 : 1 \\
 10 + 6 + 1 = 17 \\
 187 \div 17 = 11
 \end{aligned}$$

$$\begin{aligned}
 10 : 6 : 1 \\
 \times 11 \quad \times 11
 \end{aligned}$$

$$110 : 66 : 11$$

**11 vans were recorded.**

### Task 3

- 26) In a fruit basket, there are apples, bananas and oranges. The ratio of apples to fruit that are not apples is 3 : 7. The ratio of bananas to fruit that are not bananas is 2 : 5. Work out the ratio of apples : bananas : oranges.

**Make the total parts of the ratio the same**  
 (LCM is 70)

$a : n$	$b : n$
3 : 7	2 : 5
$\times 7$ $\times 7$	$\times 10$ $\times 10$
21 : 49	20 : 50

**Number of oranges:**  
 $70 - 21 - 20 = 29$

$$\begin{aligned}
 a : b : o \\
 21 : 20 : 29
 \end{aligned}$$

- 27) A customer feedback survey was given. Each review was positive, neutral or negative. The ratio of positive reviews to not positive reviews was 3 : 2. The ratio of negative reviews to not negative reviews was 2 : 7. Given there were fewer than 100 surveys given, work out the highest number of respondents that gave a negative review.

**Make the total parts of the ratio the same**  
 (LCM is 45)

$P : O$	$N : O$
3 : 2	2 : 7
$\times 9$ $\times 9$	$\times 5$ $\times 5$
27 : 18	10 : 35

**Number of neutral reviews:**  
 $45 - 27 - 10 = 8$

$$\begin{aligned}
 P : NU : N \\
 27 : 8 : 10 \\
 54 : 16 : 20 \quad (90 \text{ parts}) \\
 \mathbf{20 \text{ respondents}}
 \end{aligned}$$

28) The points A, B, C and D lie in order on a straight line, where

$$AB : BD = 4 : 7 \text{ and } AC : CD = 5 : 3.$$

Work out the ratio  $AB : BC : CD$ .

**Make the total parts of the ratio the same**  
(LCM is 88)

$AB : BD$		$AC : CD$	
$4 : 7$		$5 : 3$	
$\times 8$	$\times 8$	$\times 11$	$\times 11$
$32 : 56$		$55 : 33$	

**Length of BC:**  
 $88 - AB - CD$   
 $88 - 32 - 33 = 23$

**$AB : BC : CD$**   
 **$32 : 23 : 33$**

29) The points A, B, C and D lie in order on a straight line, where

$$AB : BD = 2 : 9 \text{ and } AC : CD = 7 : 8.$$

Work out the ratio  $AB : BC : CD$ .

**Make the total parts of the ratio the same**  
(LCM is 165)

$AB : BD$		$AC : CD$	
$2 : 9$		$7 : 8$	
$\times 15$	$\times 15$	$\times 11$	$\times 11$
$30 : 135$		$77 : 88$	

**Length of BC:**  
 $165 - AB - CD$   
 $165 - 30 - 88 = 47$

**$AB : BC : CD$**   
 **$30 : 47 : 88$**

31) A charity collects a bag of coins.

The ratio of the number of 50p coins to the number of 20p coins is  $3 : 2$ . The ratio of the number of 20p coins to the number of 10p coins is  $5 : 4$ . If the total value of all the coins is £103.00, work out how many 50p coins there are.

**Make the parts of the 20p coins the same:**

$50p : 20p$		$20p : 10p$	
$3 : 2$		$5 : 4$	
$\times 5$	$\times 5$	$\times 2$	$\times 2$
$15 : 10$		$10 : 8$	

$50p : 20p : 10p$   
 $15 : 10 : 8$

**Work out the values of the ratio:**

$50p \text{ coins} \rightarrow 15 \text{ parts} \rightarrow 15 \times 50p = 750p$

$20p \text{ coins} \rightarrow 10 \text{ parts} \rightarrow 10 \times 20p = 200p$

$10p \text{ coins} \rightarrow 8 \text{ parts} \rightarrow 8 \times 10p = 80p$

$7.50 : 2 : 0.8$

**Share £103 in the ratio:**

$7.5 + 2 + 0.8 = 10.3$

$103 \div 10.3 = 10$

**Number of 50p coins:**

$15 \times 10 = 150$

**There are 150, 50p coins.**

#### Task 4

30) Given that,

$A : B = 7 : 2$  and  $C : D = 3 : 8$ ,

$A + B = C + D$ ,

Work out the ratio  $A : B : C : D$ .

**Make total parts of the ratio the same**  
(LCM is 99)

$A : B$		$C : D$	
$7 : 2$		$3 : 8$	
$\times 11$	$\times 11$	$\times 9$	$\times 9$
$77 : 22$		$27 : 72$	

**$A : B : C : D$**   
 **$77 : 22 : 27 : 72$**