1. There are only blue pens, green pens and red pens in a box.

The ratio of the number of blue pens to the number of green pens is 2 : 5
The ratio of the number of green pens to the number of red pens is 4 : 1

There are less than 100 pens in the box.

What is the greatest possible number of red pens in the box?

B : G
2 : 5
(×4)
8 : 20

G : R
4 : 1
(×5)
20 : 5 ✓

8 + 20 + 5 = 33
3 × 33 = 99

B : G : R
8 : 20 : 5 ✓
(×3)
24 : 60 : 15

15 ✓

(Total for Question is 3 marks)

Let x be the reciprocal of 1·6

$x \times 1{\cdot}6 = 1$
$(\div 1{\cdot}6) \quad (\div 1{\cdot}6)$
$x = 0{\cdot}625$

0·625 ✓

Range of numbers which will:
Round up to 9·8
$9{\cdot}75 \leq x$
Round down to 9·8
$x < 9{\cdot}85$

$9{\cdot}75 \leq x < 9{\cdot}85$ ✓

2. In a village

the number of houses and the number of flats are in the ratio 7 : 4
the number of flats and the number of bungalows are in the ratio 8 : 5

There are 50 bungalows in the village.

How many houses are there in the village?

houses : flats
7 : 4 This ratio can be scaled up by a factor of 2
x2
flats : bungalows
x2
8 : 5
14 : 8 : 5 (1)
houses : flats : bungalows

houses : bungalows
14 : 5

Scale the ratio up by a factor of 10 to calculate now many houses there are when there are 50 bungalows.

x10
14 : 5
x10
140 : 50 (1)

Number of houses when there are 50 bungalows

140 (1)

(Total for Question is 3 marks)

3. £360 is shared between Abby, Ben, Chloe and Denesh.

The ratio of the amount Abby gets to the amount Ben gets is 2 : 7

Chloe and Denesh each get 1.5 times the amount Abby gets.

Work out the amount of money that Ben gets.

A : B
= 2 : 7

1.5 × 2 = 3

so C : D
= 3 : 3

(1)

A : B : C : D (1)

= 2 : 7 : 3 : 3 = 15 parts.

15 parts = £360

÷15 ↓ 1 part = £24 (1)

÷15

money that Ben gets: (1)

£24 × 7 = £168.

£ 168

(Total for Question is 4 marks)

4. Tom and Adam have a total of 240 stamps.
The ratio of the number of Tom's stamps to the number of Adam's stamps is 3 : 7

Tom buys some stamps from Adam.
The ratio of the number of Tom's stamps to the number of Adam's stamps is now 3 : 5

How many stamps does Tom buy from Adam?
You must show all your working.

	Tom : Adam	
Original	3 : 7	Total 240 stamps
New	3 : 5	Total 240 stamps

Seeing how many stamps Tom had originally and after the sale

Original → 3+7=10 (1) $\frac{240}{10}=24$ $3\times24=72$ stamps

New → 3+5=8 (1) $\frac{240}{8}=30$ $3\times30=90$ stamps (1)

getting how many stamps '1' in the ratio is worth

90-72=18 (1)

Finding how many stamps were sold

18

5. A group of people went to a restaurant.
Each person chose one starter and one main course.

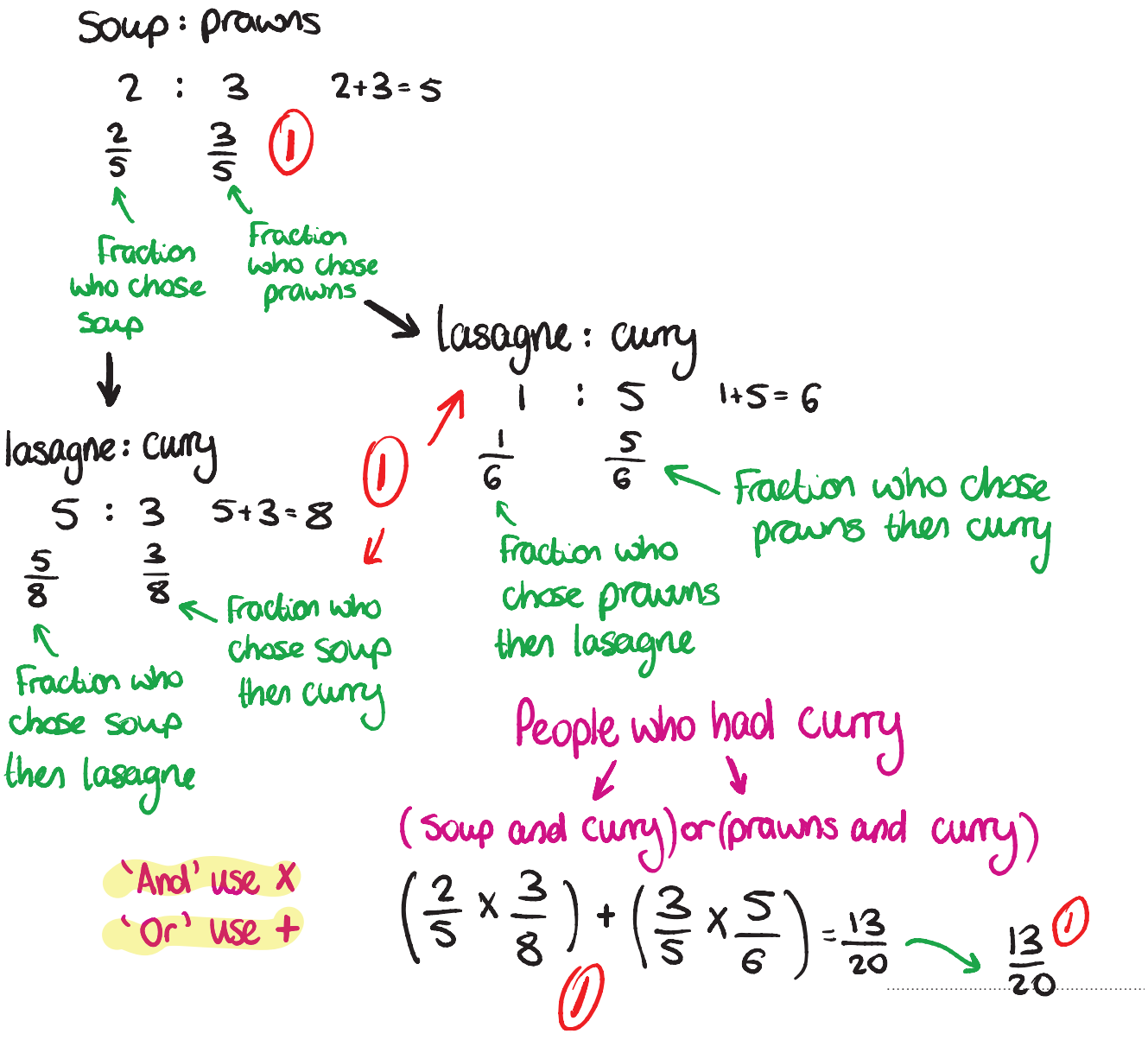
starter	main course
soup	lasagne
prawns	curry

the number of people who chose soup : the number of people who chose prawns = 2 : 3

Of those who chose soup,
the number of people who chose lasagne : the number of people who chose curry = 5 : 3

Of those who chose prawns,
the number of people who chose lasagne : the number of people who chose curry = 1 : 5

What fraction of the people chose curry?
You must show how you get your answer.



6. Given that $\frac{a}{b} = \frac{2}{5}$ and $\frac{b}{c} = \frac{3}{4}$

find $a : b : c$

$a : b = 2 : 5$ $\quad b : c = 3 : 4$ ✓

$a : b : c$

To find b, LCM(5, 3) = 15

$a : b$		$b : c$
2 : 5		3 : 4
×3 ↓ 6 : 15	↓×3	×5 ↓ 15 : 20 ↓×5

6 : 15 : 20 ✓

(Total for Question is 3 marks)

7. Rosie, Matilda and Ibrahim collect stickers.

$$\underset{\text{Rosie has}}{\text{number of stickers}} : \underset{\text{Matilda has}}{\text{number of stickers}} : \underset{\text{Ibrahim has}}{\text{number of stickers}} = 4:7:15$$

Ibrahim has 24 more stickers than Matilda.

Ibrahim has more stickers than Rosie.
How many more?

R : M : I
4 : 7 : 15
$4x : 7x : 15x = 26x$

26x stickers in total.

Ibrahim has $15x$ stickers
↳ Ibrahim also has 24 more stickers than Matilda.

Matilda has $7x$ stickers.

∴ Ibrahim has $(7x + 24)$ stickers.

$15x = 7x + 24$

$8x = 24$ (÷8)

$x = 3$ (÷8) (1)

(1) 33

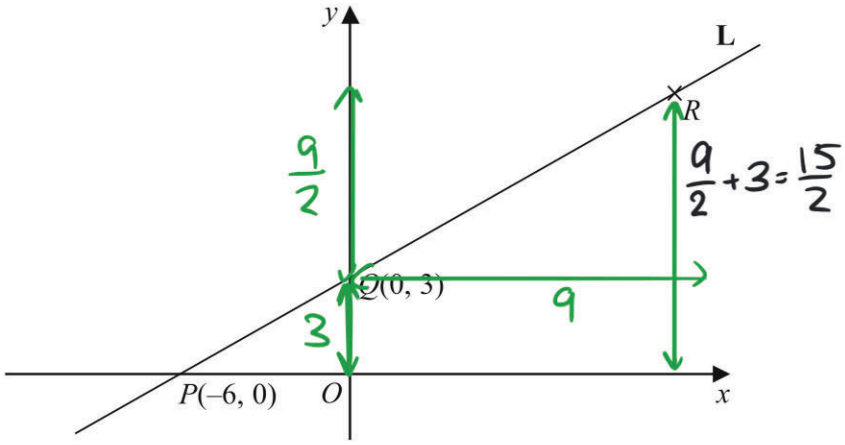
(Total for Question is 3 marks)

R : M : I
$4x : 7x : 15x$
$4(3) : 7(3) : 15(3)$
$12 : 21 : 45$ (1)

Ibrahim has 45 stickers, while Rosie has 12 stickers.

∴ Ibrahim has 33 more stickers than Rosie.

8. Here is a sketch of the line **L**.



The points $P(-6, 0)$ and $Q(0, 3)$ are points on the line **L**.

The point R is such that PQR is a straight line and $PQ : QR = 2 : 3$

(a) Find the coordinates of R.

x coordinates 0 -- 6 = 6 ×3 → 2 : 3 → 6 : 9 ×3 ← distance Q to R in x direction is 9

y coordinates 3 − 0 = 3 ×3/2 → 2 : 3 → 3 : 9/2 ×3/2

distance Q to R in y direction is 9/2

(1) (1)

(9 , 15/2)

(2)

(b) Find an equation of the line that is perpendicular to **L** and passes through Q.

Q(0,3), P(−6,0) → $m = \frac{\text{change in } y}{\text{change in } x} = \frac{3-0}{0--6} = \frac{3}{6}$ ← gradient L (1)

gradient

To get gradient of perpendicular line take the negative reciprocal of m

(1) $m = -\frac{6}{3}$ ← gradient line perpendicular to L

Equation of line is $y - y_1 = m(x - x_1)$ using Q(0,3)

$y - 3 = \frac{-6}{3}(x - 0) \Rightarrow y - 3 = -2x$

$\Rightarrow y = -2x + 3$

$y = -2x + 3$ (1)

(3)

9. Natalie makes potato cakes in a restaurant.

She mixes potato, cheese and onion so that

weight of potato : weight of cheese : weight of onion = 9 : 2 : 1

Natalie needs to make 6000 g of potato cakes.

Cheese costs £2.25 for 175 g.

Work out the cost of the cheese needed to make 6000 g of potato cakes.

Amount of cheese needed for 6000 g of potato cakes:

P : C : O

= 9 : 2 : 1 → total 12 parts. (1)

÷12 (12 parts = 6000 g ; 1 part = 500 g.) ÷12

Cheese has 2 parts ∴ amount of cheese needed

= 2 × 500 g = 1000 g. (1)

Cost of 1000 g of cheese:

175 g = £2.25 (1)

× 1000/175 (1000 g = £12.86) × 1000/175

(1)

£ 12.86

(Total for Question is 4 marks)

10. Olivia and Jessica have in total half as many sweets as Fran and Gary have in total.

Fran and Gary share their sweets in the ratio 2 : 3
Olivia and Jessica share their sweets in the ratio 9 : 1

Fran got w sweets.
Gary got x sweets.
Olivia got y sweets.
Jessica got z sweets.

Find, in its simplest form, $w : x : y : z$

Let's say Olivia and Jessica have 50 sweets.
Then Fran and Gary have 100 sweets. (1)

F : G = 2 : 3 → 5 parts for 100 sweets.

∴ 1 part = 20 sweets.

F : G = 2 : 3 = 40 : 60.

O : J = 9 : 1 → 10 parts for 50 sweets. (1)

∴ 1 part = 5 sweets.

O : J = 9 : 1 = 45 : 5.

w : x : y : z
= F : G : O : J (1)
= 40 : 60 : 45 : 5
= 8 : 12 : 9 : 1 (1)

8 : 12 : 9 : 1

(Total for Question is 4 marks)