

## Q1

Multiply 420 by  $\frac{2}{7}$  to find the number of vanilla cakes..

$$420 \times \frac{2}{7} = 120 \text{ vanilla}$$

[1]

Multiply 420 by 0.35 to find the number of banana cakes.

$$420 \times 0.35 = 147 \text{ banana}$$

[1]

Subtract 120 and 147 from 420, to find the total number of lemon and chocolate cakes.

$$420 - (120 + 147) = 153 \text{ lemon and chocolate}$$

[1]

The sum of the ratio numbers in the lemon : chocolate ratio will be the number of 'parts' that the ratio divides the 153 cakes into.

Divide 153 by that sum to find the size of one part.

Then multiply that by 4 (the 'lemon' number in the ratio) to find the number of lemon cakes.

$$4 + 5 = 9$$

$$153 \div 9 = 17$$

$$17 \times 4 = 68$$

[1]

**68 lemon cakes** [1]

## Q2

If  $\frac{3}{4}$  of children were in the Stalls then  $\frac{1}{4}$  were in the Circle.

So multiply the number of children in the Circle (117) by 4 to find the total number of children.

$$117 \times 4 = 468$$

[1]

The 'children' number in the ratio is 2, so 468 children represents two of the 'parts' that the ratio divides all the people into.

Divide 468 by 2 to find the size on one part.

Then multiply that by 7 (the sum of the two ratio numbers,  $5 + 2$ ) to find the total number of people in the theatre.

(Note that you don't need to find the number of adults to answer the question!)

$$468 \div 2 = 234$$

$$234 \times 7 = 1638$$

[2]

*1 mark for dividing by 2 and multiplying by 7, then 1 mark for the correct answer 1638.*

*You can also get 2 marks here by dividing by 2 and multiplying by 5 to get the number of adults (1170).*

Now divide the total number of people by 2600 and convert to a percentage.

$$\frac{1638}{2600} = 0.63 = 63\%$$

[1]

Finally interpret your answer in the context of the question.

**63% of the seats were occupied, so yes there were people on more than 60% of the seats.** [1]

## Q3

Turn the ratios for all shapes and for white shapes into fractions.

Multiply the 'white shapes' fraction by the 'white shapes that are circles' fraction to find the fraction of all shapes that are white circles.

$$\frac{3}{3+7} = \frac{3}{10} \text{ of all shapes are white}$$

$$\frac{4}{4+5} = \frac{4}{9} \text{ of white shapes are circles}$$

$$\frac{3}{10} \times \frac{4}{9} = \frac{2}{15} \text{ of all shapes are white circles}$$

[1]

Turn the ratios for all shapes and for black shapes into fractions.

Multiply the 'black shapes' fraction by the 'black shapes that are circles' fraction to find the fraction of all shapes that are black circles.

$$\frac{7}{3+7} = \frac{7}{10} \text{ of all shapes are black}$$

$$\frac{2}{2+5} = \frac{2}{7} \text{ of black shapes are circles}$$

$$\frac{7}{10} \times \frac{2}{7} = \frac{1}{5} \text{ of all shapes are black circles}$$

[1]

Finally add those two fractions together to find the fraction of all shapes that are circles.

$$\frac{2}{15} + \frac{1}{5} = \frac{1}{3}$$

[1]

$\frac{1}{3}$  [1]

#### Q4

4

To compare the two ratios, we need them to divide  $AD$  into the same number of 'parts'.

The first ratio divides  $AD$  into  $1+5=6$  parts.

The second ratio divides  $AD$  into  $7+11=18$  parts.

So multiply the first ratio by 3, so it also divides  $AD$  into 18 parts.

$$AB : BD = 1 : 5 = (1 \times 3) : (5 \times 3) = 3 : 15$$

[1]

So now we know that  $AB$  is 3 of the 18 parts, and  $CD$  is 11 of the 18 parts.

We also know that  $AC$  is 7 of the 18 parts.

So you can subtract 3 (the  $AB$  number) from 7 (the  $AC$  number) to find how many of the 18 parts belong to  $BC$ .

$$AB : BC : BD = 3 : (7-3) : 11$$

[1]

$$AB : BC : BD = 3 : 4 : 11 \quad [1]$$

#### Q5

5a

There are some small cubes and some large cubes in a bag.  
The cubes are red or the cubes are yellow.

The ratio of the number of small cubes to the number of large cubes is 4:7

The ratio of the number of red cubes to the number of yellow cubes is 3:5

(a) Explain why the least possible number of cubes in the bag is 88

$$4+7=11, 3+5=8$$

LOWEST COMMON MULTIPLE  
OF 11 AND 8 IS 88

5b

All the small cubes are yellow.

(b) Work out the least possible number of large yellow cubes in the bag.

EQUATE RATIOS TO 88

$$\begin{array}{ccc} S:L & S:L & R:Y \\ 4:7 = \underline{32:56} & 3:5 = \underline{33:55} \end{array}$$

$\xrightarrow{\times 8}$                        $\xrightarrow{\times 11}$

IF ALL SMALL CUBES ( $\frac{32}{88}$ ) ARE YELLOW

REMAINING YELLOW CUBES MUST BE LARGE

$$55 - 32 = 23$$

23 LARGE YELLOW  
CUBES

Q6

Start by turning 'b is two thirds of c' into a ratio.

$$b = \frac{2}{3}c$$

$$\frac{b}{c} = \frac{2}{3}$$

$$b:c = 2:3$$

Now do the same for a and c.

$$5a = 4c$$

$$\frac{a}{c} = \frac{4}{5}$$

$$a:c = 4:5$$

[]

This mark is for either a correct b:c ratio OR a correct a:c ratio.

$c$  appears in both ratios, so we can use that to connect them into a single three-term ratio.  
To do that, the  $c$  numbers need to be the same in both ratios.  
So 'scale up' the  $b : c$  ratio by a factor of 5, and scale up the  $a : c$  ratio by a factor of 3.

$$b : c = (2 \times 5) : (3 \times 5) = 10 : 15$$

$$a : c = (4 \times 3) : (5 \times 3) = 12 : 15$$

□

Finally, connect those into a single three-term ratio.

$$a : b : c = 12 : 10 : 15 \quad \square$$

## Q7

7

Start by turning  $10b = 7c$  into a ratio.

$$10b = 7c$$

$$\frac{b}{c} = \frac{7}{10}$$

$$b : c = 7 : 10$$

□

$b$  appears in both ratios, so we can use that to connect them into a single three-term ratio.  
To do that, the  $b$  numbers need to be the same in both ratios.  
So 'scale up' the  $a : b$  ratio by a factor of 7, and scale up the  $b : c$  ratio by a factor of 4.  
Then connect the two ratios into a single ratio.

$$a : b = (9 \times 7) : (4 \times 7) = 63 : 28$$

$$b : c = (7 \times 4) : (10 \times 4) = 28 : 40$$

$$a : b : c = 63 : 28 : 40$$

□

Finally, remove the  $b$  part of that triple ratio to get the answer the question is looking for.

$$a : c = 63 : 40 \quad \square$$

## Q8

First convert the ratios for each year and person to fractions out of the total rent.

In 2018, Arjun pays  $\frac{5}{5+7} = \frac{5}{12}$  of the total rent. In 2019, Arjun pays  $\frac{9}{9+13} = \frac{9}{22}$  of the total rent.

In 2018, Greta pays  $\frac{7}{5+7} = \frac{7}{12}$  of the total rent. In 2019, Greta pays  $\frac{13}{9+13} = \frac{13}{22}$  of the total rent.

Letting  $T_1$  be the total rent paid in 2018 and  $T_2$  the total rent paid in 2019, we can write two equations in  $T_1$  and  $T_2$  using the given information.  
Arjun pays the same in 2018 and 2019:

$$\frac{9}{22}T_2 = \frac{5}{12}T_1$$

Greta pays \$290 more in 2019 than 2018:

$$\frac{13}{22}T_2 = \frac{7}{12}T_1 + 290$$

□

The question asks for Arjun's rent in 2019 so we only need to find  $T_2$ .  
Solve the two equations simultaneously, eliminating  $T_1$ .  
Rearrange the first equation to find  $T_1$  in terms of  $T_2$ .

$$T_1 = \frac{9 \times 12}{22 \times 5}T_2 = \frac{108}{110}T_2 = \frac{54}{55}T_2$$

Now substitute  $T_1$  into the second equation.

$$\therefore \frac{13}{22}T_2 = \frac{7}{12} \left( \frac{54}{55}T_2 \right) + 290$$

□

Rearrange and solve for  $T_2$ .

$$\begin{aligned}\frac{13}{22}T_2 - \frac{63}{110}T_2 &= 290 \\ \frac{1}{55}T_2 &= 290 \\ T_2 &= 15\,950\end{aligned}$$

[1]

In 2019, Arjun pays  $\frac{9}{22}$  of the total rent, so find the amount he pays by multiply this fraction by the total rent for 2019 ( $T_2$ ).

$$\frac{9}{22} \times 15\,950 = 6525$$

**\$6525** [1]

Whole number of US Dollars so two decimal places are not required.

## Q9

- i) Both ratios contain women. Therefore you need to write each ratio as equivalent ratios where the number of parts for women is the same for both ratios.

Find a common multiple of the current number of parts for women (4 and 3).

The lowest common multiple of 4 and 3 is 12. Therefore multiply both parts in the men : women ratio by 3 and multiply both parts in the women : children ratio by 4.

$$\text{men : women} = 15 : 12 \text{ and women : children} = 12 : 28$$

[1]

Both ratios has the same number of parts for women so you can now write a ratio between men, women and children.

**15 : 12 : 28** [1]

- ii) Use the ratio men : women : children.

$$\text{men : women : children} = 12 : 15 : 28$$

Divide the actual number of children by the number of parts that represent children in the ratio, this will tell you how many people one part represents in the ratio.

$$224 \div 28 = 8$$

[1]

Find the actual number of men and women multiplying their number of parts by 8.

$$\begin{aligned}\text{Men} &= 12 \times 8 = 96 \\ \text{Women} &= 15 \times 8 = 120\end{aligned}$$

Add together the number of men and women to find the total.

$$96 + 120$$

[1]

**216 men and women in total** [1]

## Q10

10

As the ratio is 11:2 and 11 represents the number of adults, of which there are 220, we can find how many people 1 part of the ratio represents

$$220 \div 11 = 20$$

So the "2" part of the ratio represents

$$2 \times 20 = 40 \text{ children}$$

[1]

So we know there are 220 adults and 40 children in total

70% of the adults paid the standard fare

$$0.7 \times 220 = 154 \text{ adults paid standard fare}$$

[1]

$$\text{Therefore } 220 - 154 = 66 \text{ adults paid premier fare}$$

[1]

All of the children paid the standard fare

Finding the total paid:

$$(40 \times 60) + (154 \times 84) + (66 \times 140) = 24576$$

[1]

**\$ 24 576** [1]

## Q11

11

- i) It helps to write the ratio of  $A : B$  and  $B : C$  underneath each other with B in the same column.

$$A : B : C$$

$$7 : 10$$

$$4 : 3$$

The lowest common multiple of 10 and 4 is 40. Multiply the first line by 4 and the second line by 10 so that B is 40 in both lines.

$$A : B : C$$

$$28 : 40$$

$$40 : 30$$

[1]

We can see that

$$A : C = 28 : 30$$

[1]

But we need to write the answer in its simplest terms- the highest common factor of 28 and 30 is 2- so divide both by 2.

**Answer = 14 : 15** [1]

ii) Using our working from part (i), we can write the ratio of  $A : B : C$  as

$$A : B : C = 28 : 40 : 30$$

This can be simplified to

$$A : B : C = 14 : 20 : 15$$

Company C has 15 "parts", which represent 45 people. So divide 45 by 15

$$45 \div 15 = 3$$

[1]

So, one part in the ratio represents 3 people.

Add the parts in the ratio of  $A : B : C$  to find the total number of parts

$$14 + 20 + 15 = 49$$

Multiply these 49 parts by 3 to find the total number of people

$$49 \times 3$$

[1]

**Answer = 147** [1]