

## Q1

Let  $x$  be the recurring decimal

$$x = 0.281818181\dots$$

Multiply both sides by 10

$$10x = 2.81818181\dots$$

Multiply both sides by 10 again

$$100x = 28.1818181\dots$$

There is still no pair of equations with a matching decimal part, so multiply by 10 again

$$1000x = 281.81818181\dots$$

[]

The two equations for  $1000x$  and  $10x$  both contain the trail of .818181... , so we can find  $1000x - 10x$  to eliminate the recurring part

$$1000x - 10x = 281.81818181\dots - 2.81818181\dots$$

[]

Simplifying

$$990x = 279$$

Divide both sides by 990

$$x = \frac{279}{990}$$

Simplify the fraction by dividing the top and bottom by 9

$$x = \frac{31}{110} \quad []$$

## Q2

Let  $x$  be the recurring decimal

$$x = 0.045454545\dots$$

Multiply both sides by 10

$$10x = 0.45454545\dots$$

Multiply both sides by 10 again

$$100x = 4.54545454\dots$$

There is still no pair of equations with a matching decimal part, so multiply by 10 again

$$1000x = 45.45454545\dots$$

[]

The two equations for  $1000x$  and  $10x$  both contain the trail of .454545... , so we can find  $1000x - 10x$  to eliminate the recurring part

$$1000x - 10x = 45.45454545\dots - 0.45454545\dots$$

[]

Simplifying

$$990x = 45$$

Divide both sides by 990

$$x = \frac{45}{990}$$

Simplify the fraction by dividing the top and bottom by 45

$$x = \frac{1}{22} \quad []$$

## Q3

We can rewrite both numbers as fractions, and then multiply them, to find the desired result

First we can rewrite  $0.1\dot{3}\dot{6}$  as a fraction

Let  $x$  be  $0.1\dot{3}\dot{6}$

$$x = 0.136363636\dots$$

Multiply both sides by 10

$$10x = 1.36363636\dots$$

Multiply both sides by 10 again

$$100x = 13.6363636\dots$$

There is still no pair of equations with a matching decimal part, so multiply by 10 again

$$1000x = 136.363636\dots$$

The two equations for  $1000x$  and  $10x$  both contain the trail of  $.36363636\dots$ , so we can find  $1000x - 10x$  to eliminate the recurring part

$$1000x - 10x = 136.36363636\dots - 1.36363636\dots$$

*Method for finding recurring decimal as fraction [1]*

Simplifying

$$990x = 135$$

Divide both sides by 990

$$x = \frac{135}{990}$$

Simplifying

$$990x = 135$$

Divide both sides by 990

$$x = \frac{135}{990}$$

Simplify the fraction by dividing the top and bottom by 45

$$x = \frac{3}{22}$$

The other number,  $0.\dot{2}$ , can be rewritten

$$0.\dot{2} = \frac{2}{9}$$

[1]

Multiply the two fractions together

$$\frac{3}{22} \times \frac{2}{9} = \frac{3 \times 2}{22 \times 9} = \frac{6}{198}$$

Simplify, by dividing the top and bottom by 6

$\frac{1}{33}$  [1]

Must include full working as it is a "prove" question

Q4

4

Let  $x$  be the recurring decimal

$$x = 0.436363636\dots$$

Multiply both sides by 10

$$10x = 4.36363636\dots$$

Multiply both sides by 10 again

$$100x = 43.6363636\dots$$

There is still no pair of equations with a matching decimal part, so multiply by 10 again

$$1000x = 436.363636\dots$$

[1]

The two equations for  $1000x$  and  $10x$  both contain the trail of  $.363636\dots$ , so we can find  $1000x - 10x$  to eliminate the recurring part

$$1000x - 10x = 436.363636\dots - 4.363636\dots$$

[1]

Simplifying

$$990x = 432$$

Divide both sides by 990

$$x = \frac{432}{990}$$

Simplify the fraction by dividing the top and bottom by 18

$$x = \frac{24}{55} \quad [1]$$

## Q5

5

Let  $x$  be the recurring decimal

$$x = 0.318181818\dots$$

Multiply both sides by 10

$$10x = 3.18181818\dots$$

Multiply both sides by 10 again

$$100x = 31.8181818\dots$$

There is still no pair of equations with a matching decimal part, so multiply by 10 again

$$1000x = 318.181818\dots$$

[1]

The two equations for  $1000x$  and  $10x$  both contain the trail of  $.181818\dots$ , so we can find  $1000x - 10x$  to eliminate the recurring part

$$1000x - 10x = 318.181818\dots - 3.181818\dots$$

[1]

Simplifying

$$990x = 315$$

Divide both sides by 990

$$x = \frac{315}{990}$$

Simplify the fraction by dividing the top and bottom by 45

$$x = \frac{7}{22} \quad [1]$$

## Q6

6

Let  $x$  be the recurring decimal

$$x = 0.0151515\dots$$

Multiply both sides by 10

$$10x = 0.151515\dots$$

Multiply both sides by 10 again

$$100x = 1.515151\dots$$

There is still no pair of equations with a matching decimal part, so multiply by 10 again

$$1000x = 15.151515\dots$$

The two equations for  $1000x$  and  $10x$  both contain the trail of  $.151515\dots$ , so we can find  $1000x - 10x$  to eliminate the recurring part

$$1000x - 10x = 15.151515\dots - 0.151515\dots$$

[1]

Simplifying

$$990x = 15$$

Divide both sides by 990

$$x = \frac{15}{990}$$

Simplify the fraction by dividing the top and bottom by 15

$$x = \frac{1}{66} \quad [1]$$

## Q7

Let  $x$  be the recurring decimal

$$x = 0.2813131313\dots$$

Multiply both sides by 10

$$10x = 2.81313131\dots$$

Multiply both sides by 10 again

$$100x = 28.131313\dots$$

There is still no pair of equations with a matching decimal part, so multiply by 10 again

$$1000x = 281.313131\dots$$

There is still no pair of equations with a matching decimal part, so multiply by 10 again

$$10000x = 2813.131313\dots$$

The two equations for  $10000x$  and  $100x$  both contain the trail of  $.131313\dots$ , so we can find  $10000x - 100x$  to eliminate the recurring part

$$10000x - 100x = 2813.131313\dots - 28.131313\dots$$

[1]

Simplifying

$$9900x = 2785$$

Divide both sides by 9900

$$x = \frac{2785}{9900}$$

Simplify the fraction by dividing the top and bottom by 5

$$x = \frac{557}{1980} \quad [1]$$

## Q8

8

Note that in this question  $0.4\dot{x}$  means that  $x$  is a recurring digit; it is not  $0.4$  multiplied by  $x$  or  $\dot{x}$  e.g. It could be  $0.411111\dots$  or  $0.488888\dots$  etc

Let  $y$  be the recurring decimal

$$y = 0.4\dot{x}xxxxx\dots$$

Multiply both sides by 10

$$10y = 4.\dot{x}xxxx\dots$$

Multiply both sides by 10 again

$$100y = 4x.\dot{x}xxxx\dots$$

The two equations for  $100y$  and  $10y$  both contain the trail of  $.\dot{x}xxxx\dots$ , so we can find  $100y - 10y$  to eliminate the recurring part

$$100y - 10y = 4x.\dot{x}xxxx\dots - 4.\dot{x}xxxx\dots$$

[1]

We can simplify the  $y$  terms, and the recurring decimal parts will be eliminated, leaving

$$90y = 4x - 4$$

It is important to understand that  $4x$  does not mean 4 multiplied by  $x$  in this context, it means 4 tens and  $x$  units (ones)

$$90y = 40 + x - 4$$

$$90y = 36 + x$$

[1]

Divide both sides by 90 to find an expression for  $y$

$$y = \frac{36 + x}{90} \quad [1]$$

## Q9

9

Let  $x$  be the recurring decimal

$$x = 0.324242424\dots$$

Multiply both sides by 10

$$10x = 3.24242424\dots$$

Multiply both sides by 10 again

$$100x = 32.424242\dots$$

There is still no pair of equations with a matching decimal part, so multiply by 10 again

$$1000x = 324.242424\dots$$

The two equations for  $1000x$  and  $10x$  both contain the trail of  $.242424\dots$ , so we can find  $1000x - 10x$  to eliminate the recurring part

$$1000x - 10x = 324.242424\dots - 3.242424\dots$$

[1]

Simplifying

$$990x = 321$$

Divide both sides by 990

$$x = \frac{321}{990}$$

Simplify the fraction by dividing the top and bottom by 3

$$x = \frac{107}{330} \quad [1]$$

## Q10

10

Complete the Venn diagram. The 67 who visit the garden only are already in the diagram.

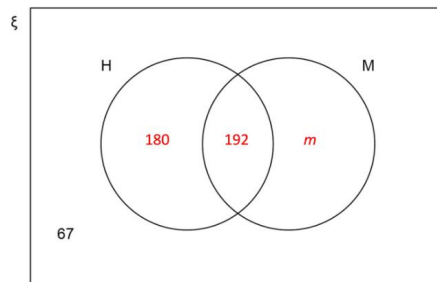
40% of 480 visit the house **and** museum.

$$0.4 \times 480 = 192$$

$\frac{3}{8}$  visit the house only.

$$\frac{3}{8} \times 480 = 180$$

We can put these numbers into the Venn diagram.



The number of people who visit the museum only is labelled  $m$  in the Venn diagram above.

$$m = 480 - (180 + 192 + 67) = 41$$

[1]

Now work out the total paid by multiplying the 180 people who visited the house only by £8, the 192 people who visited the house and museum by £12.50 and the 41 people who visited the museum only by £7.

$$\text{Total paid} = [180 \times 8] + [192 \times 12.5] + [41 \times 7]$$

(the square brackets above aren't necessary, they are just to make the method here a little clearer)

[1]

**Answer = £4127** [1]

## Q11

11

Let  $x$  be the recurring decimal

$$x = 2.75555\dots$$

Multiply both sides by 10

$$10x = 27.5555\dots$$

Multiply both sides by 10 again

$$100x = 275.5555\dots$$

[1]

The two equations for  $100x$  and  $10x$  both contain the trail of .5555... , so we can find  $100x - 10x$  to eliminate the recurring part

$$100x - 10x = 275.5555\dots - 27.5555\dots$$

[1]

Simplifying

$$90x = 248$$

Divide both sides by 90 and then simplify by dividing numerator and denominator by 2

$$x = \frac{248}{90} = \frac{124}{45} \quad [1]$$

## Q12

Let  $x$  be the recurring decimal.

$$x = 0.416161616\dots$$

Multiply both sides by 10.

$$10x = 4.16161616\dots$$

Multiply both sides by 10 again.

$$100x = 42.61616161\dots$$

There is still no pair of equations with a matching decimal part, so multiply by 10 again.

$$1000x = 416.161616\dots$$

□

The two equations for  $1000x$  and  $10x$  both contain the trail of  $.1616\dots$ , so we can find  $1000x - 10x$  to eliminate the recurring part.

$$1000x - 10x = 416.161616\dots - 4.161616\dots$$

□

Simplifying.

$$990x = 412$$

Divide both sides by 990.

$$x = \frac{412}{990}$$

Simplify the fraction by dividing the top and bottom by 2.

$$x = \frac{206}{495} \quad \square$$