

Ratio Questions

Q1.

Anna and Bill share some money in the ratio 2 : 5

Anna gets £A

Bill gets £B

Carl and Donna share twice as much money as Anna and Bill share.

They share the money in the ratio 3 : 1

Carl gets £C

Donna gets £D

Find $A : B : C : D$

Give your answer in its simplest form.

$$A : B : C : D$$

$$2 : 5$$

$$3 : 1$$

$$2 + 5 = 7 \text{ parts} \quad \times 2 = 14$$

$$3 + 1 = 4 \text{ parts} \quad \times 7 = 28$$

$$4 : 10 : 21 : 7$$

$$\underline{4 : 10 : 21 : 7}$$

(Total for question = 3 marks)

Q2.

$$x^2 - 9y^2 = 0 \text{ where } x > 0 \text{ and } y > 0$$

Work out the ratio $x : y$

$$x^2 = 9y^2$$

$$x = 3y$$

$$\therefore x : y$$

$$= 3 : 1$$

$$\underline{3 : 1}$$

Q3.

On a farm

the number of cows and the number of sheep are in the ratio 6 : 5
the number of sheep and the number of pigs are in the ratio 2 : 1

The total number of cows, sheep and pigs on the farm is 189

How many sheep are there on the farm?

$$\begin{array}{l} C : S : P \\ 6 : 5 \\ 2 : 1 \\ 12 : 10 : 5 \\ 70 \end{array}$$

$$12 + 10 + 5 = 27$$

$$27 \text{ parts} = 189$$

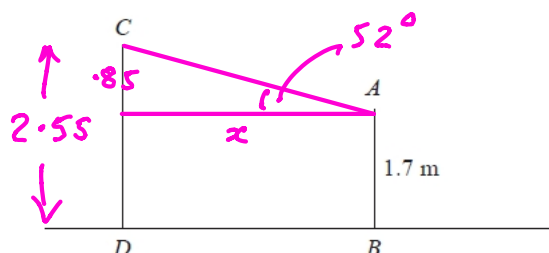
$$1 \text{ part} = \frac{189}{27} = 7$$

$$\text{Sheep} = 10 \text{ parts} = 10 \times 7 = 70$$

(Total for question = 3 marks)

Q4.

The diagram shows two vertical posts, AB and CD , on horizontal ground.



$$AB = 1.7 \text{ m}$$

$$CD : AB = 1.5 : 1$$

The angle of elevation of C from A is 52°

Calculate the length of BD .

Give your answer correct to 3 significant figures.

$$\tan 52^\circ = \frac{0.85}{x}$$

$$x \tan 52^\circ = 0.85$$

$$x = \frac{0.85}{\tan 52^\circ} = 0.664 \text{ m}$$

$$0.664 \text{ m}$$

(Total for question is 4 marks)

Q5.

Given that

$$2x - 1 : x - 4 = 16x + 1 : 2x - 1$$

find the possible values of x .

$$\frac{2x-1}{x-4} = \frac{16x+1}{2x-1}$$

$$(2x-1)(2x-1) = (16x+1)(x-4)$$

$$4x^2 - 4x + 1 = 16x^2 - 63x - 4$$

$$0 = 12x^2 - 59x - 5$$

$$0 = 12x^2 + x - 60x - 5$$

$$0 = x(12x+1) - 5(12x+1)$$

$$0 = (x-5)(12x+1)$$

(Total for question = 5 marks)

$$\Rightarrow x = 5 \quad \text{or} \quad x = -\frac{1}{12}$$

Q6.

P has coordinates $(-9, 7)$

Q has coordinates $(11, 12)$

M is the point on the line segment PQ such that $PM : MQ = 2 : 3$

Line L is perpendicular to the line segment PQ.

L passes through M.

Find an equation of L.

$$\text{Gradient PQ} = \frac{12-7}{11-(-9)} = \frac{5}{20} = \frac{1}{4}$$

$$\text{Gradient of L} = -4$$

Line is of the form

$$\text{Sub } (-1, 9)$$

$$y = -4x + c$$

$$9 = -4(-1) + c$$

$$9 = 4 + c$$

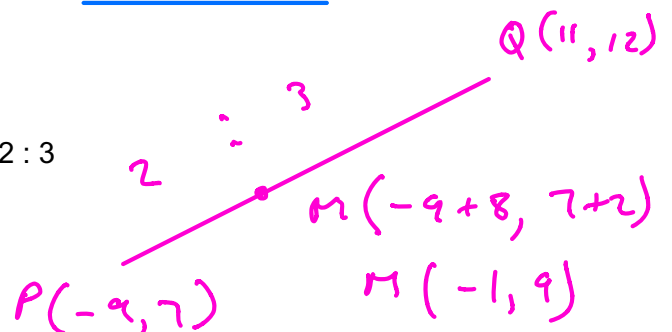
$$9 - 4 = c$$

$$5 = c$$

$$y = -4x + 5$$

(Total for question = 5 marks)

$$\begin{aligned} 12x-5 \\ = -60 \\ +1 = -60 \end{aligned}$$



Q7.

White shapes and black shapes are used in a game.
Some of the shapes are circles.
All the other shapes are squares.

The ratio of the number of white shapes to the number of black shapes is 3:7

The ratio of the number of white circles to the number of white squares is 4:5

The ratio of the number of black circles to the number of black squares is 2:5

Work out what fraction of all the shapes are circles.

$$W : B \\ 3 : 7$$

$$WC : WS \\ 4 : 5$$

$$BC : BS \\ 2 : 5$$

$$\frac{3}{10} W \quad \text{and} \quad \frac{7}{10} B$$

$$WC = \frac{3}{10} \times \frac{4}{5} = \frac{2}{15}$$

$$BC = \frac{7}{10} \times \frac{2}{5} = \frac{1}{5}$$

$$\text{Circles} = \frac{2}{15} + \frac{1}{5}$$

$$\frac{1}{3}$$

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

(Total for question = 4 marks)

Q8.

In a company, the ratio of the number of men to the number of women is 3 : 2

40% of the men are under the age of 25

10% of the women are under the age of 25

What percentage of all the people in the company are under the age of 25?

$$\frac{3}{5} \times 0.4 + \frac{2}{5} \times 0.1 = \frac{2}{5} = 0.28 = 28\%$$

$$28$$

%

(Total for question = 4 marks)

Q9.

On a school trip the ratio of the number of teachers to the number of students is 1 : 15

The ratio of the number of male students to the number of female students is 7 : 5

Work out what percentage of all the people on the trip are female students.
Give your answer correct to the nearest whole number.

$$\frac{15}{16} \times \frac{5}{12} = \frac{25}{64} = 0.390625$$

39

..... %

(Total for question = 3 marks)

Q10.

The surface gravity of a planet can be worked out using the formula

$$g = \frac{6.67 \times 10^{-11} m}{r^2}$$

where

m kilograms is the mass of the planet
 r metres is the radius of the planet

For the Earth and Jupiter here are the values of m and r .

Earth
$m = 5.98 \times 10^{24}$
$r = 6.378 \times 10^6$

Jupiter
$m = 1.90 \times 10^{27}$
$r = 7.149 \times 10^7$

$$\begin{array}{c} E \quad : \quad J \\ \frac{6.67 \times 10^{-11} \times 5.98 \times 10^{24}}{(6.378 \times 10^6)^2} : \frac{6.67 \times 10^{-11} \times 1.90 \times 10^{27}}{(7.149 \times 10^7)^2} \\ \frac{5.98 \times 10^{24}}{(6.378 \times 10^6)^2} : \frac{1.90 \times 10^{27}}{(7.149 \times 10^7)^2} \end{array}$$

Work out the ratio of the surface gravity of Earth to the surface gravity of Jupiter.
Write your answer in the form 1 : n

$$1 : \frac{1.90 \times 10^{27}}{(7.149 \times 10^7)^2} \times \frac{(6.378 \times 10^6)^2}{5.98 \times 10^{24}}$$

1 : 2.53

1 : 2.53

(Total for question = 3 marks)

Q11.

$a = \sqrt{7} + \sqrt{c}$ and $b = \sqrt{63} + \sqrt{d}$ where c and d are positive integers.

Given that $c : d = 1 : 9$

find, in its simplest form, the ratio $a : b$

$$a = \sqrt{7} + \sqrt{c}$$

$$b = \sqrt{63} + \sqrt{d} = \sqrt{9 \times 7} + \sqrt{9c} \\ = 3\sqrt{7} + 3\sqrt{c}$$

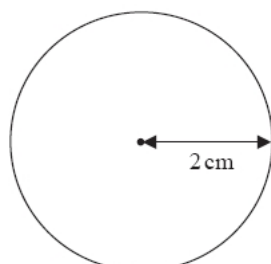
$$a : b \\ = 1 : 3$$

$$1 : 3$$

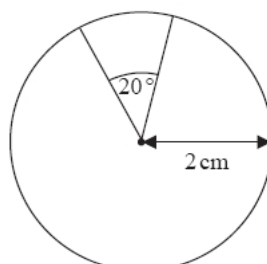
(Total for question = 3 marks)

Q12.

Here are two watch faces, **A** and **B**.



face A



face B

Diagram NOT
accurately drawn

Both watch faces are circular with radius 2cm.

The materials used to make both watch faces have the same thickness.

A is made entirely of plastic.

B has a 20° sector of metal and a 340° sector of plastic.

The ratio of the cost per cm^2 of the metal to the cost per cm^2 of the plastic is 3:2

Work out the ratio of the cost of the materials for **A** to the cost of the materials for **B**.

Give your answer in its simplest form.

You must show all your working.

$$\pi r^2$$

$$4\pi : 4\pi \left(\frac{17}{18} + \frac{3}{36} \right)$$

$$1 : \frac{37}{36}$$

$$A = 4\pi \text{ plastic}$$

$$= 36 : 37$$

$$B = \frac{17}{18} \times 4\pi \text{ plastic} + \frac{1}{18} \times 4\pi \text{ metal}$$

(Total for question = 4 marks)

$$A \text{ cost } 4\pi \text{ units} \quad B \text{ cost } \frac{17}{18} \times 4\pi + \frac{1}{18} \times 4\pi \times 1.5$$

Q13.

In a box of pens, there are

three times as many red pens as green pens
and two times as many green pens as blue pens.

For the pens in the box, write down
the ratio of the number of red pens to the number of green pens to the number of blue pens.

R : G : B
 3 : 1
 2 : 1
 6 : 2 : 1

6 : 2 : 1

(Total for question = 2 marks)

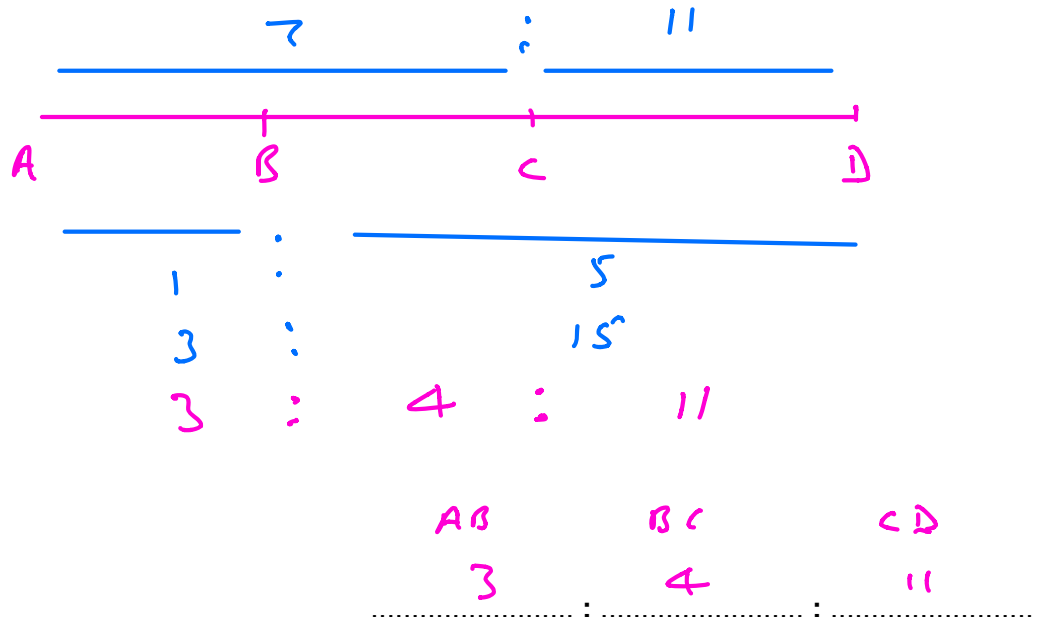
Q14.

The points A, B, C and D lie in order on a straight line.

$$AB : BD = 1 : 5$$

$$AC : CD = 7 : 11$$

Work out $AB : BC : CD$



(Total for question = 3 marks)

Q15.

Given that

$$a : b = 8 : 5 \quad \text{and} \quad b : c = 3 : 4$$

find the ratio

$$a : b : c$$

Give your answer in its simplest form.

$$\begin{array}{rcl} a & : & b & : & c \\ 8 & : & 5 & & \\ & & 3 & : & 4 \\ 24 & : & 15 & & \\ & & 15 & : & 20 \end{array}$$

$$\underline{24 : 15 : 20}$$

(Total for question = 3 marks)

Q16.

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?

$$B : G : R$$

$$\begin{array}{rcl} 2 & : & 5 \\ & & 4 & : & 1 \end{array}$$

$$\begin{array}{rcl} 8 & : & 20 \\ & & 20 & : & 5 \end{array}$$

$$\underline{8 : 20 : 5}$$

$$8 + 20 + 5 = 33 \text{ parts}$$

$$1 \text{ part} \leq 3 \quad 33 \times 3 = 99$$

$$5 \times 3 = 15$$

$$\underline{15 \text{ red}}$$

(Total for question = 3 marks)