

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic

Ratio, Proportion and Rates of Change

Writing and simplifying ratios

v1.0

Name _____

Materials

For this paper you must have:

- Mathematical instruments

Information

- The marks for questions are shown in brackets

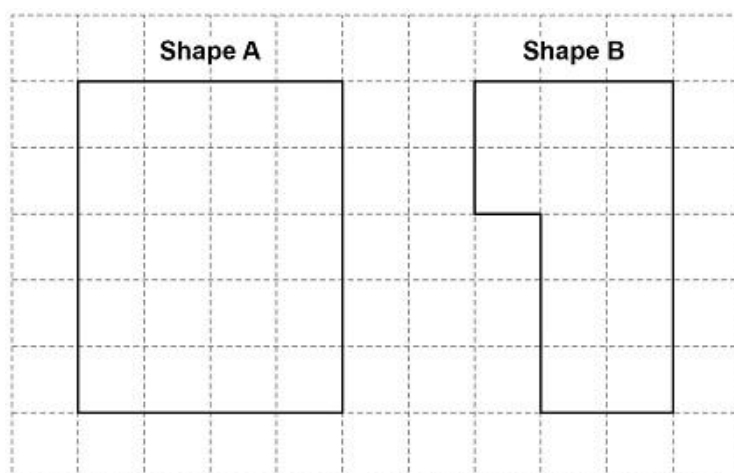
Advice

- In all calculations, show clearly how you work out your answer

For questions 1 to 5 you must **NOT** use a calculator.



Q1.



Work out area of Shape A : area of Shape B
Give your answer in its simplest form.

(Total 2 marks)

Q2.

A password has 30 characters.
It is made up of 5 numbers, 15 letters and some symbols.
Work out the ratio numbers : letters : symbols
Give your answer in its simplest form.

(Total 2 marks)

Q3.

Here is some information about a group of animals.

	Cats	Dogs
Dark fur	15	7
Light fur	5	14

(a) Write down the number of dark fur dogs to light fur dogs as a ratio.
Give your answer in its simplest form.

(1)

(b) What percentage of the cats have dark fur?

(2)

(Total 3 marks)

Q4.

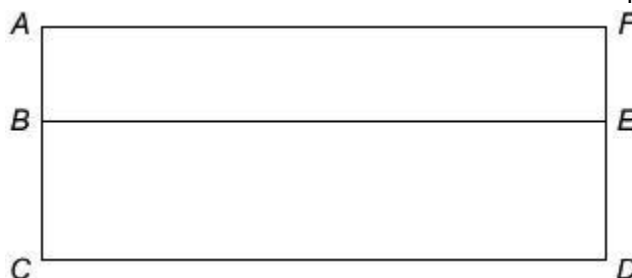
$ABEF$ and $ACDF$ are rectangles.

$AF = 10$ cm

$AB = 2$ cm

$BC = 4$ cm

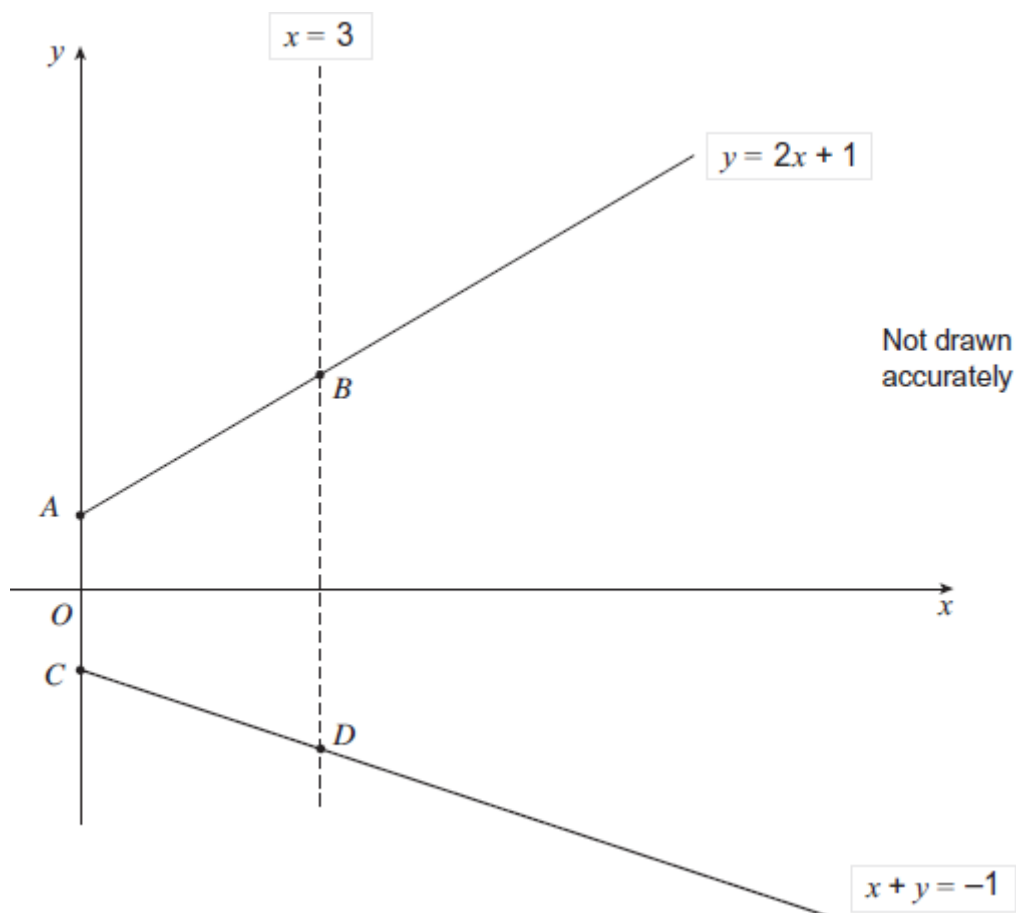
Not drawn accurately



Work out
perimeter $ABEF$: perimeter $ACDF$
Give your answer in its simplest form.

(Total 3 marks)

Q5.



Work out the ratio of lengths $AC : BD$

(Total 4 marks)

Q6.

$e : f = 2 : 3$ and $f : g = 5 : 4$

Work out $e : g$

Give your answer in its simplest form.

(Total 3 marks)

Q7.

A straight path between D and E passes through P .

$DE = 200$ metres

P is 60 metres **closer** to E than to D .



Not drawn accurately

Work out the ratio $DP : PE$

Give your answer in its simplest form.

(Total 3 marks)

Q8.

$d = 2f$

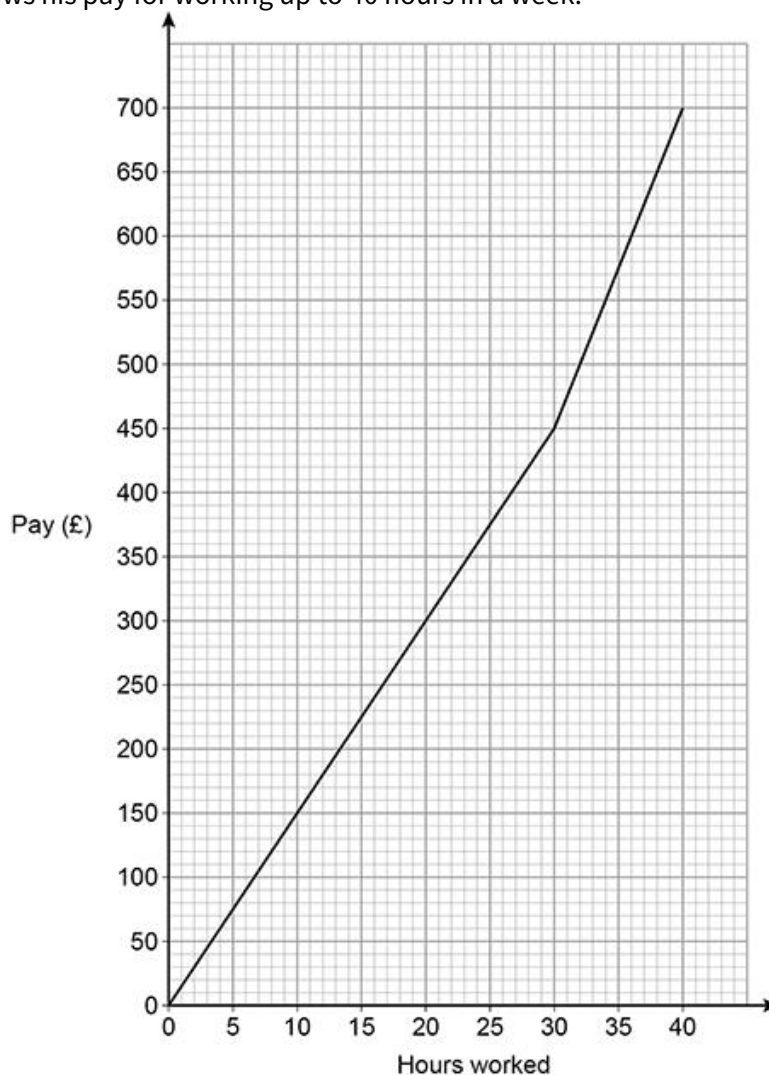
$$\frac{e-f}{d-e} = \frac{1}{4}$$

Work out the ratio $e : f$

(Total 3 marks)

Q9.

In a week, Samir is paid
 a basic hourly rate for the first 30 hours worked
 an overtime hourly rate for any extra hours worked.
 The graph shows his pay for working up to 40 hours in a week.

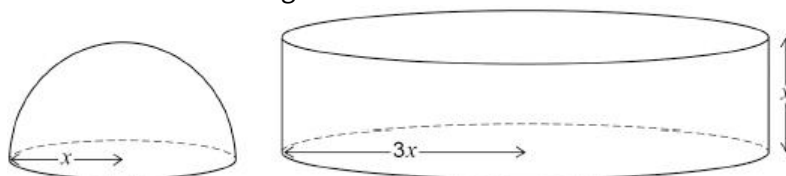


Work out the ratio basic hourly rate : overtime hourly rate
 Give your answer in its simplest form.

(Total 3 marks)

Q10.

A solid hemisphere has radius x .
 A solid cylinder has radius $3x$ and height x .



Surface area of a sphere = $4\pi r^2$
 where r is the radius

Work out the ratio

total surface area of the hemisphere : total surface area of the cylinder

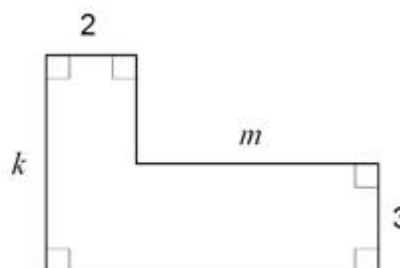
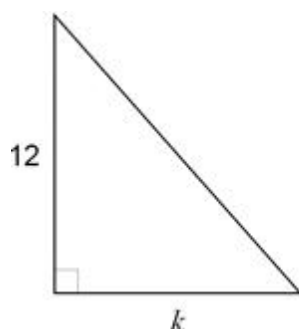
Give your answer in its simplest form.

You **must** show your working.

(Total 3 marks)

Q11.

In the diagrams, all lengths are in centimetres.



Not drawn accurately

The two shapes have equal areas.

Work out $k : m$

(Total 3 marks)

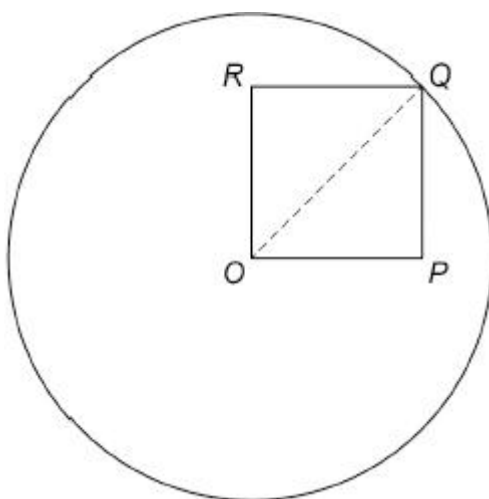
Questions 12 to 13 are **higher** tier only.

Q12.

A circle, centre O , has circumference 20π cm

Q is a point on the circle.

$OPQR$ is a **square**.



Not drawn accurately

perimeter of the square : circumference of the circle = $\sqrt{a} : \pi$ where a is an integer.

Work out the value of a .

You **must** show your working.

(Total 4 marks)

Q13.

Write this ratio in its simplest form

$$\sqrt{12} : \sqrt{48} : \sqrt{300}$$

(Total 3 marks)

For the rest of the questions, you may use a calculator.



Q14.

Circle the ratio that is the same as $3 : 4$

$6 : 7$

$6 : 8$

$6 : 9$

$6 : 16$

(Total 1 mark)

Q15.

Jill puts 440 sweets into small bags, medium bags and large bags.



She uses

30 small bags

twice as many medium bags as large bags.

There are no sweets left over.

For the number of bags, work out the ratio small : medium : large

(Total 4 marks)

Q16.

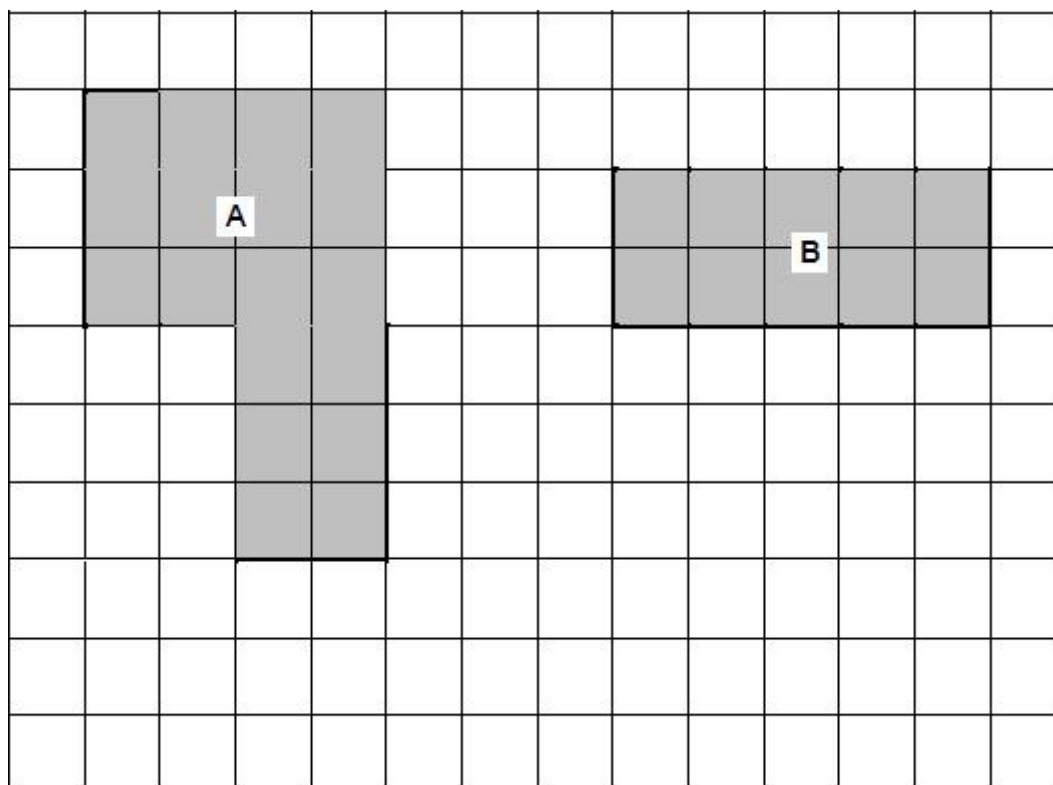
There are between 20 and 30 students in a class.

The ratio of left-handed students to right-handed students is 3 : 8

How many students are in the class?

(Total 2 marks)

Q17.



Work out perimeter of shape A : perimeter of shape B

Give your answer in its simplest form.

(Total 3 marks)

Q18.

Here are the results after 250 spins of a coin.

Heads	128
Tails	122

The coin is spun an extra 50 times.

After all 300 spins, the relative frequency of Heads is 0.49

For the **extra 50 spins**, work out number of Heads : number of Tails

(Total 3 marks)

Q19.

Jess saves 2p, 5p and 10p coins.

She has

- 45 10p coins
- 8 times as many 2p coins as **10p coins**
- £17.70 in total.

Work out total **value** of 2p coins : total **value** of 5p coins

Give your answer in its simplest form.

(Total 4 marks)

Q20.

Kai says that 3 : 2 is an equivalent ratio to 9 : 6

Jo says that 1.5 : 1 is an equivalent ratio to 9 : 6

Who is correct?

Tick **one** box.

☐
☐
☐
☐

Both of them

Kai only

Jo only

Neither of them

Give reasons for your answer.

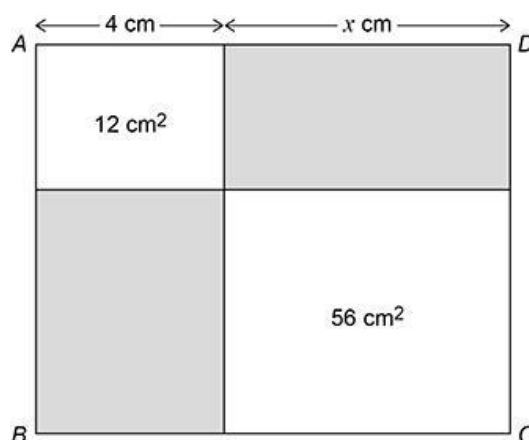
(Total 2 marks)

Q21.

Rectangle $ABCD$ is split into four smaller rectangles.

Two of the smaller rectangles are shaded.

Not drawn accurately



$$4 : x = 1 : 2$$

For rectangle $ABCD$, work out the ratio shaded area : unshaded area

Give your answer in its simplest form.

(Total 4 marks)

Q22.

$$r : w = 1 : 4$$

Write down the ratio $r^2 : w^2$

(Total 1 mark)

Q23.

Which ratio is **not** equivalent to the ratio 3 : 4

Circle your answer.

$$\frac{3}{4} : 1$$

$$1 : \frac{4}{3}$$

$$1 : 1.3$$

$$6 : 8$$

(Total 1 mark)

Q24.

$$a : b = 9 : 4 \quad \text{and} \quad 10b = 7c$$

Work out $a : c$ in its simplest form.

(Total 3 marks)

Q25.

a, b and c are positive integers.

$$a : b = 7 : 9 \quad \text{and} \quad b : c = 12 : 5$$

Work out the **smallest** possible value of $a + b + c$

(Total 2 marks)

Q26.

There are 30 students in a class.

12 of the students have school lunch.

Work out the ratio

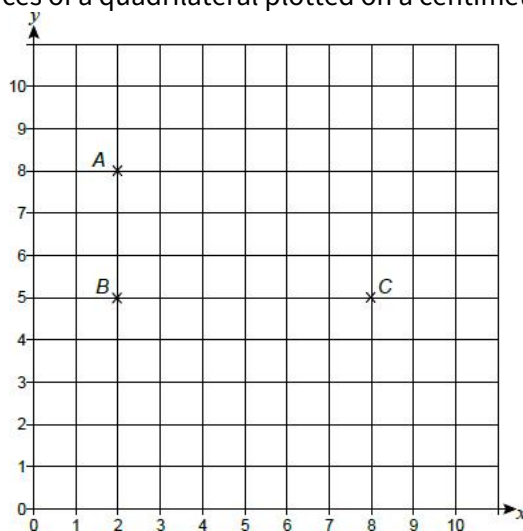
students having school lunch : students not having school lunch

Give your answer in its simplest form.

(Total 2 marks)

Q27.

A, B and C are three vertices of a quadrilateral plotted on a centimetre grid.



(a) Plot D on the grid so that $ABCD$ is a rectangle.

(1)

(b) E is the midpoint of BC .

Circle the **two** answers that describe triangle ABE .

scalene

isosceles

equilateral

right-angled

(2)

(c) Write down the ratio length of AB : length of BC

Give your answer in simplest form.

(2)

(Total 5 marks)

Q28.

120 adults complete a survey.

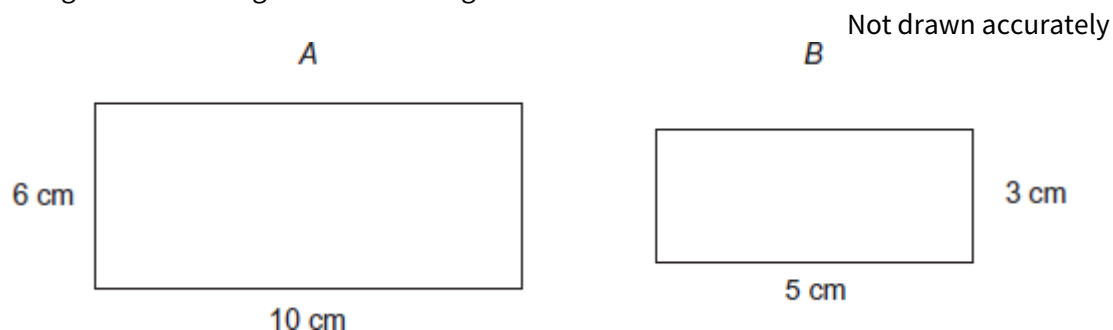
45 are men.

Write the ratio men : women in its simplest form.

(Total 2 marks)

Q29.

Rectangle B is an enlargement of rectangle A .



(a) Write down the scale factor of the enlargement from rectangle A to rectangle B .

(1)

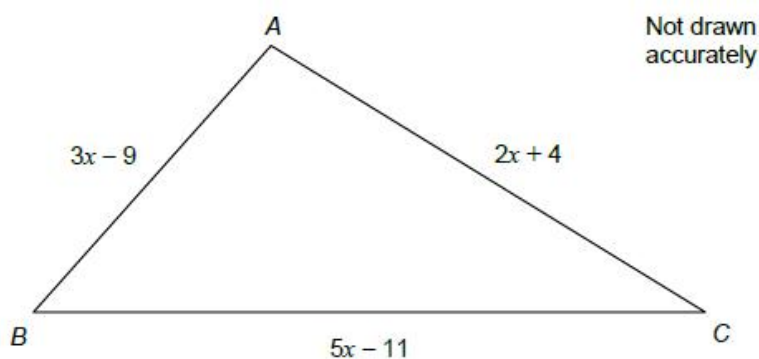
(b) Work out the ratio area of rectangle A : area of rectangle B
Give your answer in its simplest form.

(3)

(Total 4 marks)

Q30.

In this question all lengths are in centimetres.



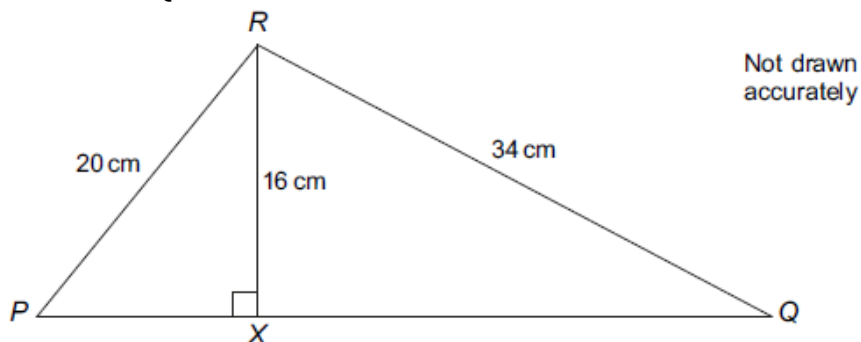
Given $AB : BC = 1 : 2$
show that $AC : BC = 3 : 4$

(Total 5 marks)

Q31.

In triangle PQR , X is a point on PQ .

RX is perpendicular to PQ .

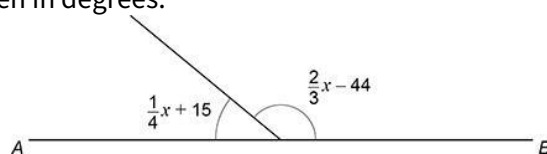


Work out the ratio $PX : XQ$
Give your answer in its simplest form.

(Total 4 marks)

Q32.

AB is a straight line.
Both angles are given in degrees.



Not drawn accurately

By working out the value of x ,
work out the ratio smaller angle : larger angle

(Total 4 marks)

Q33.

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3 \quad \text{where } r \text{ is the radius}$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h \quad \text{where } r \text{ is the radius and } h \text{ is the perpendicular height}$$

A sphere has radius $2x$ cm

A cone has

radius $3x$ cm

perpendicular height h cm

The sphere and the cone have the same volume.

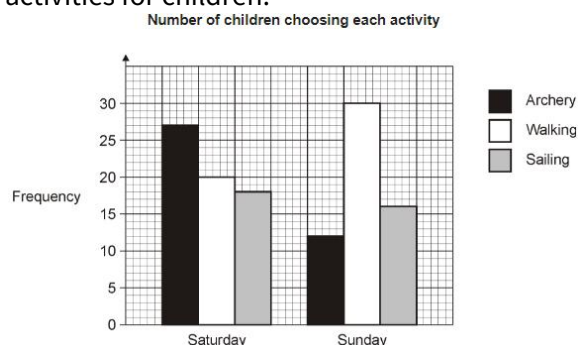
Work out radius of cone : perpendicular height of cone

Give your answer in the form $a : b$ where a and b are integers.

(Total 4 marks)

Q34.

An outdoor centre has activities for children.



- (a) Adults help with **walking** in the ratio
number of adults : number of children = 1 : 5

3 adults can help with walking on **Saturday**.

Is this enough?

You **must** show your working.

(2)

- (b) A group of people go **sailing** in the ratio
number of adults : number of children = 1 : 2
What fraction of the group are adults?

(1)

- (c) On **Sunday** all the children do the activity they choose.
The ratios for each activity are shown in the table.

Activity	Number of adults : number of children
Archery	1 : 3
Walking	1 : 5
Sailing	1 : 2

Work out the total number of adults needed for Sunday.

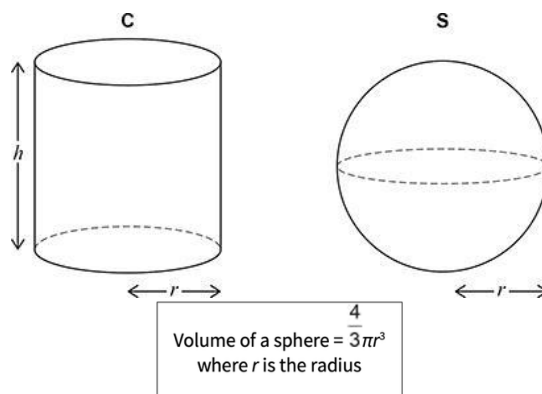
(3)

(Total 6 marks)

Questions 35 to 37 are **higher** tier only.

Q35.

A cylinder, C, and a sphere, S, each have radius r
C has height h



- (a) volume of C = volume of S
Work out the ratio $r : h$
You **must** show your working.

(3)

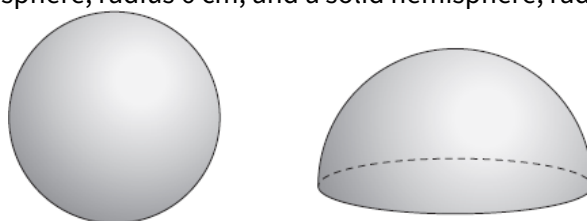
- (b) A **different cylinder** has radius $3r$ and height $2h$.
How many times bigger is the volume of this cylinder than the volume of C?

(2)

(Total 5 marks)

Q36.

The diagram shows a sphere, radius 6 cm, and a solid hemisphere, radius 9 cm

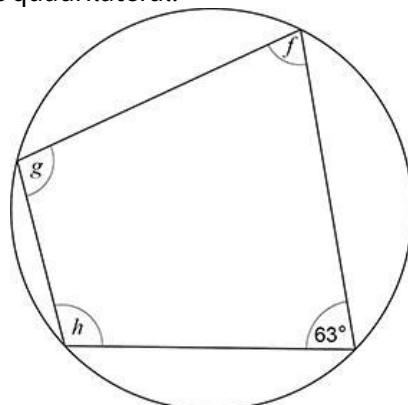


Work out the ratio
surface area of the sphere : **total** surface area of the hemisphere
Give your answer in its simplest form.

(Total 5 marks)

Q37.

Here is a cyclic quadrilateral.



Not drawn
accurately

$$f : g = 2 : 3$$

Work out $f : h$

Give your answer in its simplest form.

(Total 4 marks)