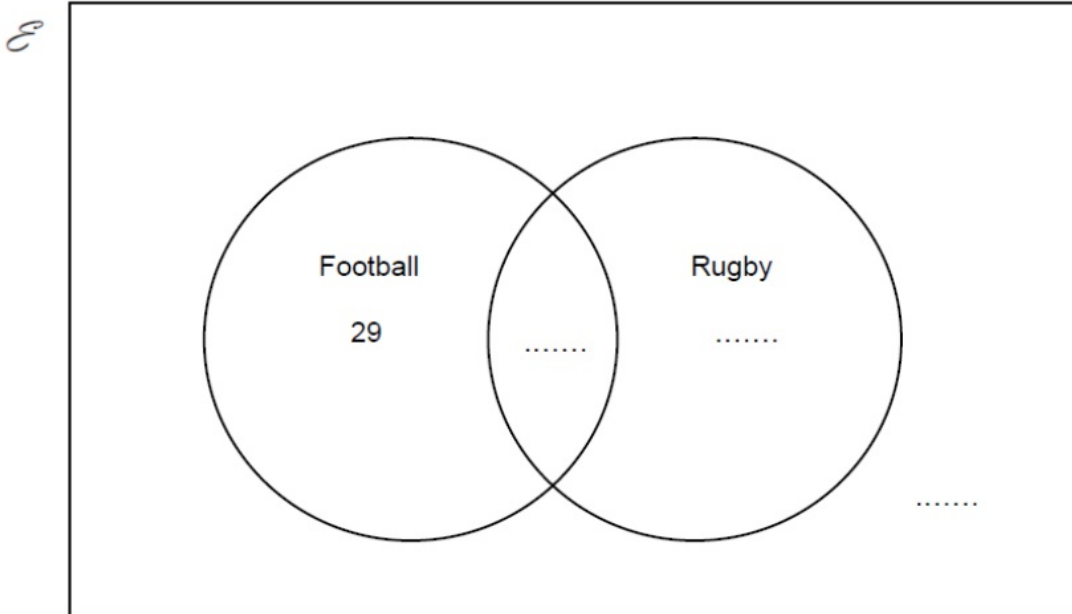


R5. Expressing one number
as a % of another

OCR

3 Here is a Venn diagram.



80 people were asked if they watch football or rugby.

[3]

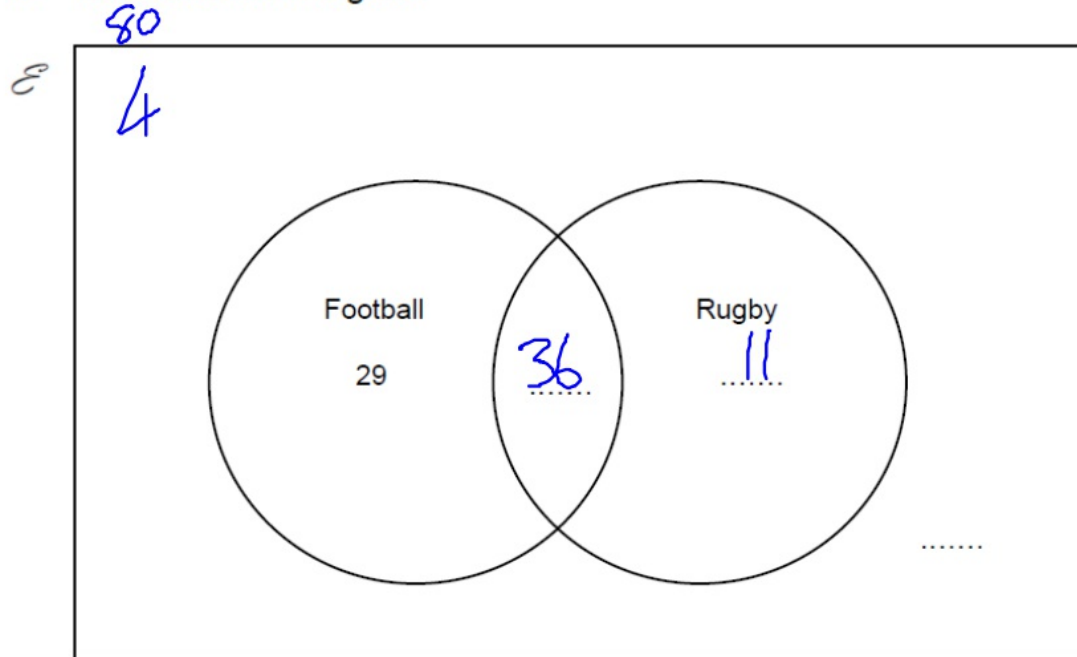
- 29 said they watch football, but not rugby.
- 65 said they watch football.
- 47 said they watch rugby.

(a) Complete the Venn diagram.

(b) What percentage of the people asked do **not** watch football or rugby?

(b).....% [2]

3 Here is a Venn diagram.



80 people were asked if they watch football or rugby.

- 29 said they watch football, but not rugby.
- 65 said they watch football. 76
- 47 said they watch rugby.

(a) Complete the Venn diagram.

(b) What percentage of the people asked do **not** watch football or rugby?

[3]

$$\frac{4}{80} = 0.05 \quad \downarrow \times 100$$

5%

(b).....5%.....% [2]

(b) Boris wins £5000.

He gives $\frac{1}{5}$ of the money to his wife.

He gives 30% of the remaining money to his children.

What percentage of the **original** amount does Boris have left?

(b)..... % **[5]**

(b) Boris wins £5000.

He gives $\frac{1}{5}$ of the money to his wife.

He gives 30% of the remaining money to his children.

What percentage of the **original** amount does Boris have left?

$$\frac{2800}{5000} = 0.56 = 56\%$$

Wife

$$\frac{1}{5} \text{ of } £5000 = £1000$$

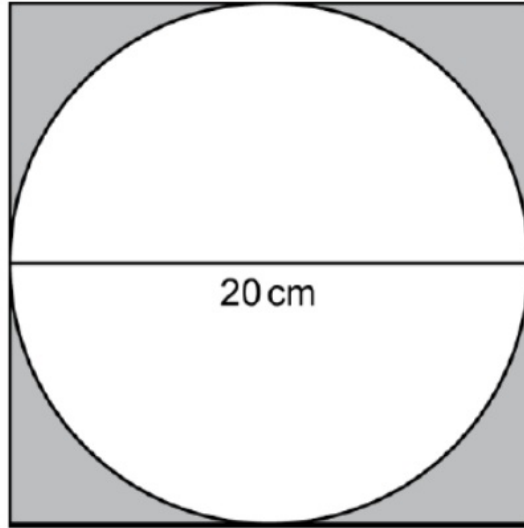
$$\text{Remaining} = £4000$$

$$\begin{aligned} \rightarrow 30\% \text{ of } £4000 &= \\ &= £1200 \end{aligned}$$

$$\begin{aligned} \underline{\underline{\text{left } £5000 - 1200 - 1000}} \\ &= £2800 \end{aligned}$$

(b) 56 % [5]

- 13** A circle, diameter 20 cm, is drawn inside a square. The four sides of the square touch the circle.

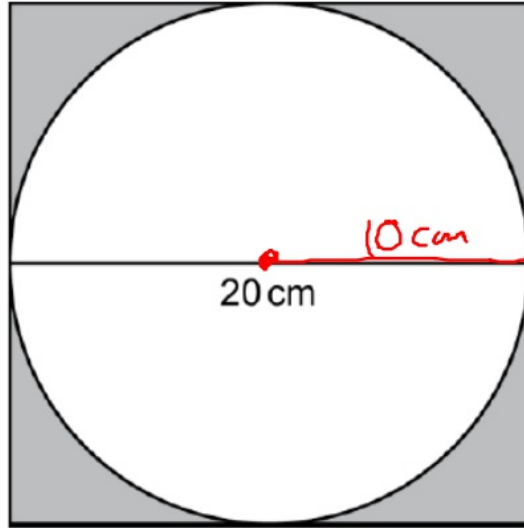


Not to scale

What percentage of the square is shaded?

.....% **[5]**

- 13 A circle, diameter 20 cm, is drawn inside a square. The four sides of the square touch the circle.



What percentage of the square is shaded?

$$\text{full square} \rightarrow 20 \times 20 = 400 \text{ cm}^2$$

$$\text{Circle } \pi r^2 \text{ or } r^2 \times \pi$$

$$\pi \times 10^2 = 314.159$$

$$\text{Shaded} = 400 - 314.159 = 85.84 \dots \text{ cm}^2$$

$$\frac{85.84 \dots}{400} = 0.2146 \times 100 \swarrow$$

$$\underline{\underline{21.46}} \dots \% \text{ [5]}$$

16 Here is some information from three packets of food.

Burgers
Total weight 440 g
of which
154 g is fat

Sausages
Total weight 350 g
of which
120 g is fat

Meatballs
Total weight 330 g
of which
116 g is fat

Which food has the highest proportion of fat?
Show how you decide.

..... [4]

16 Here is some information from three packets of food.

Burgers
Total weight 440 g
of which
154 g is fat

Sausages
Total weight 350 g
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Total weight 330 g
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116 g is fat

Which food has the highest proportion of fat?
Show how you decide.

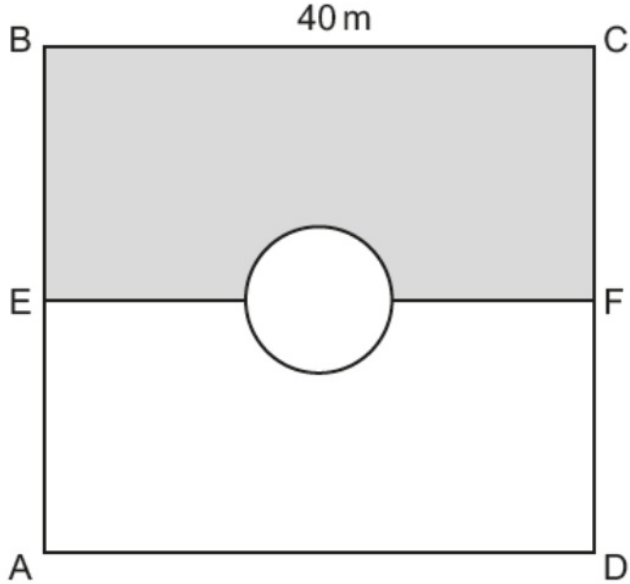
$$\frac{\text{Burgers}}{154}{440} = 0.35$$

$$\frac{\text{Sausages}}{120}{350} = 0.3428$$

$$\frac{\text{Meatballs}}{116}{330} = 0.351$$

Meatballs..... [4]

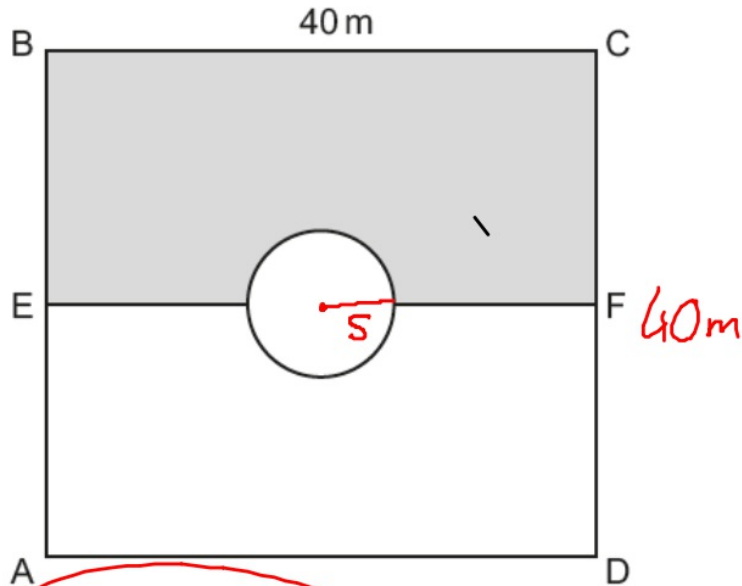
18 The diagram shows all the paths in a park.
ABCD is a square of side 40 metres.
E is the midpoint of AB. F is the midpoint of CD.
The circular path is in the centre of the square and has radius 5 metres.



(a) Work out the percentage of the square ABCD that is shaded.

(a) % [6]

- 18 The diagram shows all the paths in a park.
 ABCD is a square of side 40 metres.
 E is the midpoint of AB. F is the midpoint of CD.
 The circular path is in the centre of the square and has radius 5 metres.



full square = 40×40
 $= 1600 \text{ m}^2$

Circle $r^2 \times \pi$ or πr^2
 $5^2 \times \pi = 78.5398 \text{ m}^2$

$1600 - 78.5398 \text{ m}^2$
 $= 1521.46 \text{ m}^2$

$\div 2$
 $= 760.73 \text{ m}^2$

grey

- (a) Work out the percentage of the square ABCD that is shaded.

$\frac{760.73}{1600} \times 100 = 47.55\%$

(a) 47.55 % [6]

- 10** The pass mark for a test is 86%.
Steve scores 52 out of 61 marks.

Does he pass the test?
Explain your answer.

.....

..... [2]

- 10 The pass mark for a test is 86%.
Steve scores 52 out of 61 marks.

Does he pass the test?
Explain your answer.

$$\frac{52}{61} = 0.8524 = 85.24\%$$

No, he does not pass

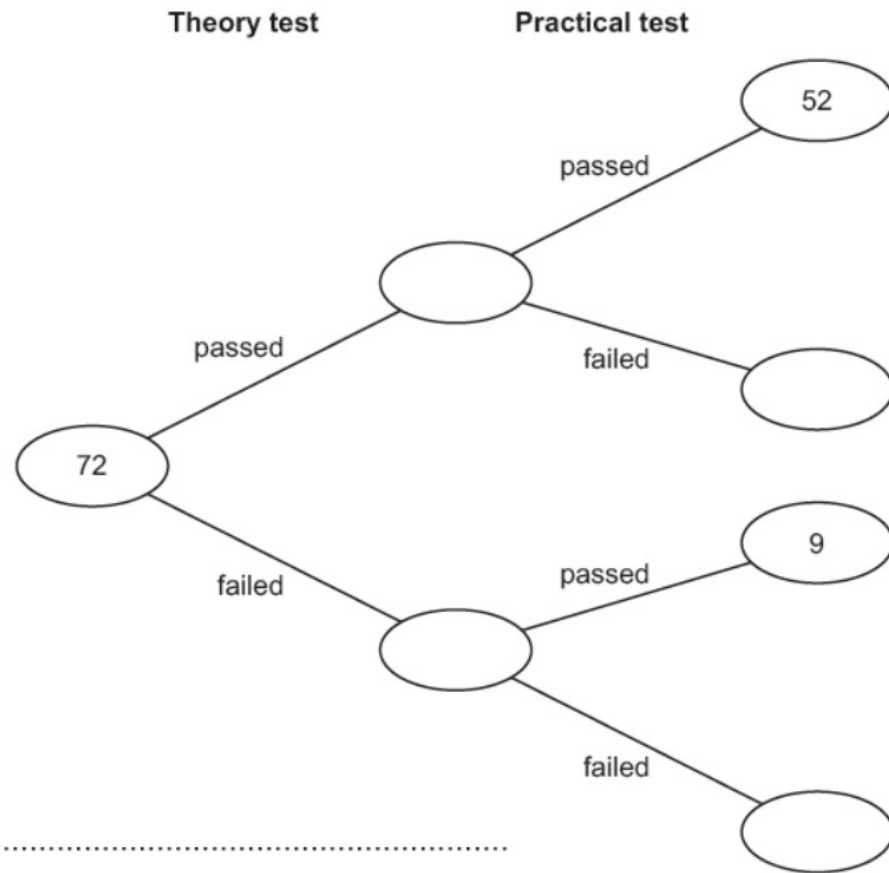
[2]

- 8 72 students each took a theory test followed by a practical test. They either passed or failed each test.

Created by W Neill

This frequency tree shows some of the results.

- (a) How many students passed both tests?
- (b) $\frac{5}{6}$ of the 72 students passed the theory test.
Complete the frequency tree.



- (c) Which test was passed by more students?
Explain your reasoning.

..... because

.....

..... [3]

- 8 72 students each took a theory test followed by a practical test. They either passed or failed each test.

Created by W Neill

This frequency tree shows some of the results.

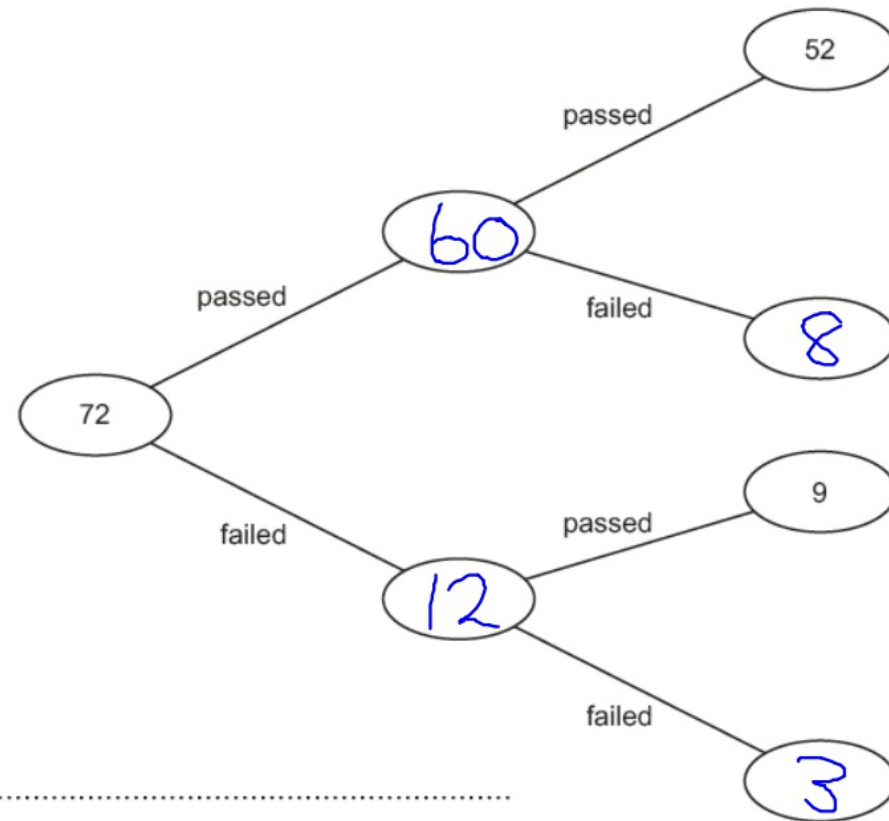
- (a) How many students passed both tests?

52 ✓

- (b) $\frac{5}{6}$ of the 72 students passed the theory test.

Complete the frequency tree.

$\frac{5}{6}$ of 72 = 60 passed theory

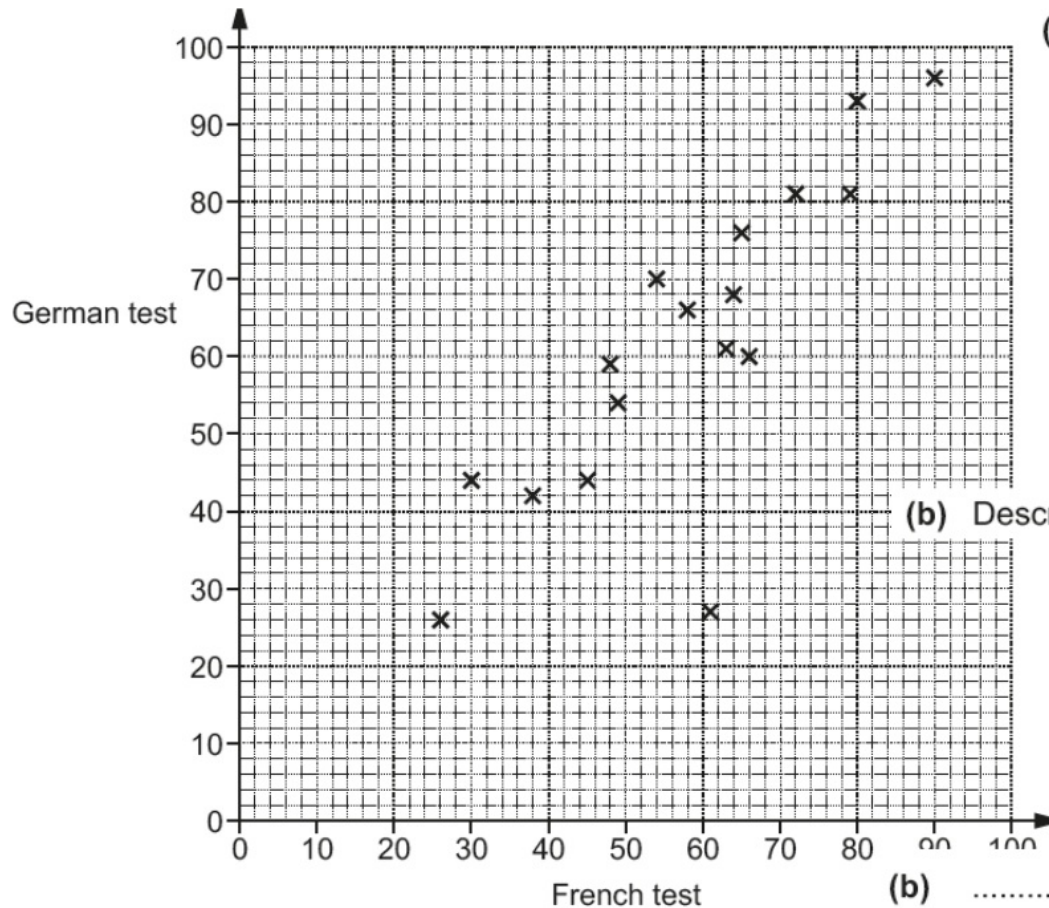


- (c) Which test was passed by more students? Explain your reasoning.

Theory = $\frac{60}{72}$ because

Practical = $\frac{61}{72}$ Practical was passed by more as $\frac{61}{72} > \frac{60}{72}$ [3]

- 17 The scatter diagram shows the results of 17 students in their French test and their German test. Created by W Neill
Both tests are out of 100.



(a) Here are the results of another 4 students.

French	21	75	48	53
German	30	78	46	61

Plot these results on the scatter diagram.

(b) Describe the type and strength of the correlation shown in this diagram.

(b) [2]

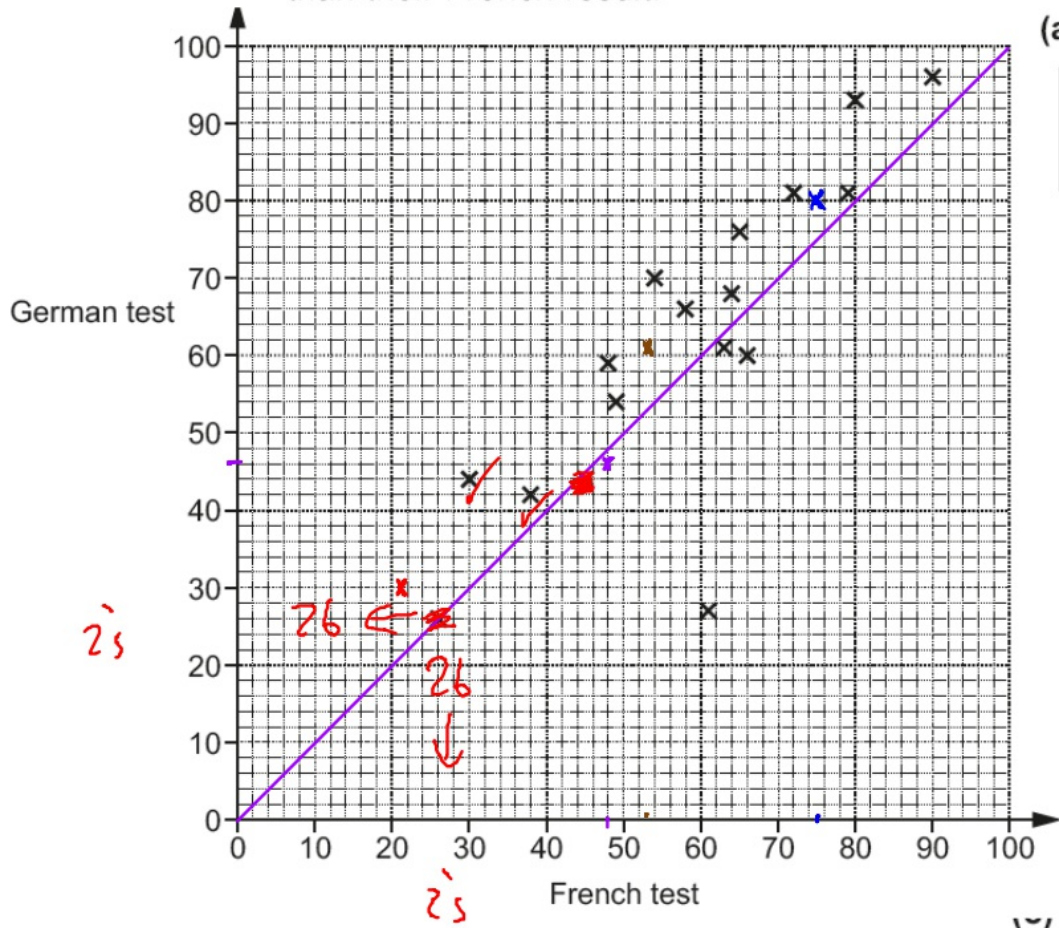
Created by W Neill

(c) Work out the percentage of the students whose German result was **higher** than their French result.

(c) % [4]

Created by W Neill

(c) Work out the percentage of the students whose German result was **higher** than their French result.



(a) Here are the results of another 4 students.

French	21	75	48	53
German	30 ✓	78 ✓	46	61 ✓

Plot these results on the scatter diagram.

$$\frac{15}{21} = 0.71428$$

$$= 71.428$$

$$71.4 \dots \dots \dots \% [4]$$

- 12 Jack carries out a survey in his school.
He selects 50 students, at random, and asks them

Created by W Neill

Do you think that it is a good idea to have women-only railway carriages?

These are his results.

	Number of students
Yes	32
No	13
Don't know	5

- (a) What percentage of the students in Jack's survey answered 'Yes'?

(a) % [3]

- (b) Jack says

My survey shows that people in England think that it is a good idea to have women-only railway carriages.

Explain why Jack may be wrong.

.....

- 12 Jack carries out a survey in his school.
He selects 50 students, at random, and asks them

Created by W Neill

Do you think that it is a good idea to have women-only railway carriages?

These are his results.

	Number of students
<u>Yes</u>	32
No	13
Don't know	5

- (a) What percentage of the students in Jack's survey answered 'Yes'?

$$\begin{array}{r} 32 \\ \hline 50 \end{array} \quad \begin{array}{r} 64 \\ \hline 100 \end{array}$$

x2 x2

(a) 64 % [3]

- (b) Jack says

My survey shows that people in England think that it is a good idea to have women-only railway carriages.

Explain why Jack may be wrong.

His sample is only from school. He needs other ages.

3 (a) Write 48 as a percentage of 200.

Created by W Neill

(a) % [1]

(b) Work out $\frac{1}{4}$ of 80.

(b) [1]

3 (a) Write 48 as a percentage of 200.

Created by W Neill

R5

$$\frac{48}{200} \xrightarrow{\div 2} \frac{24}{100} = 24\%$$

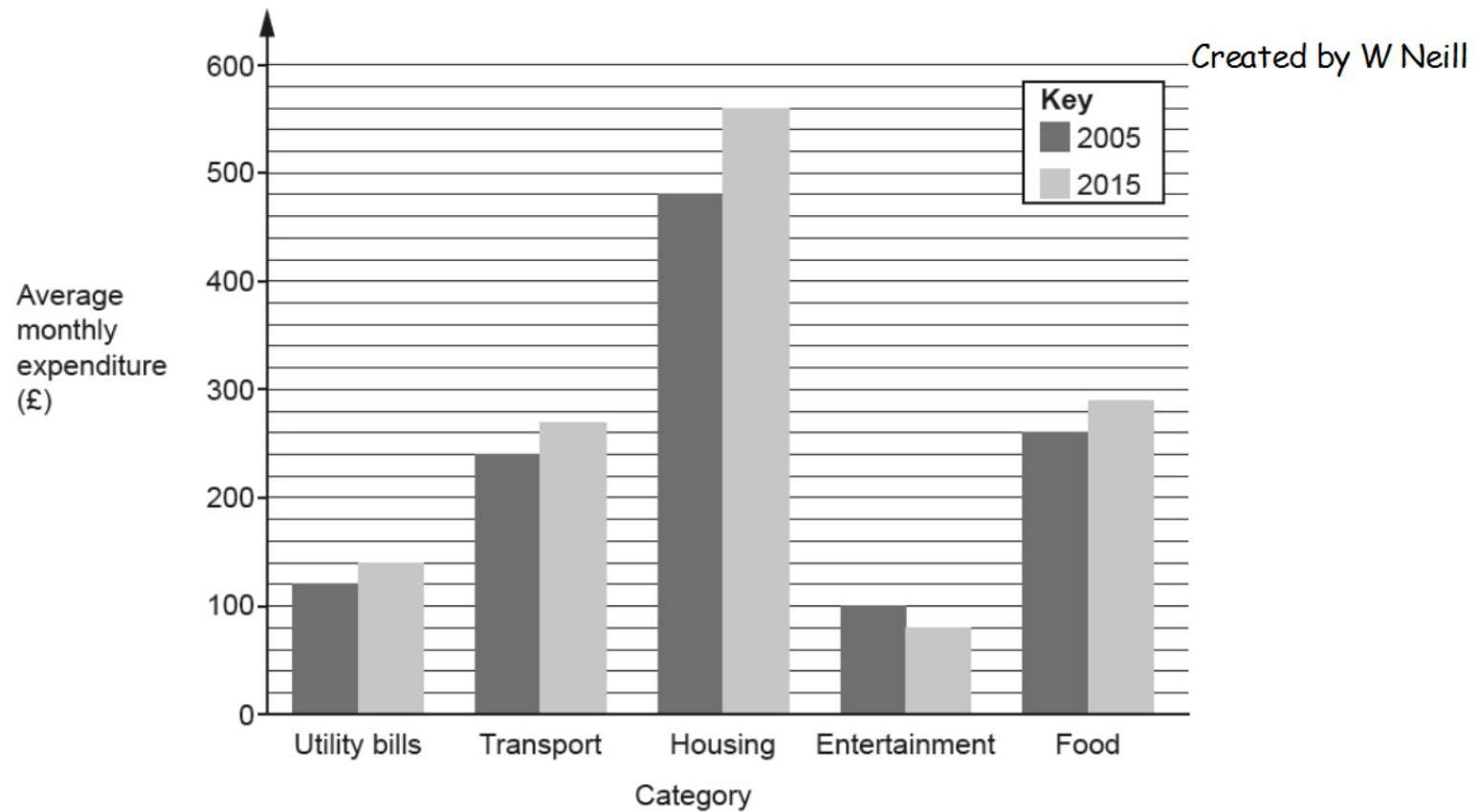
(b) Work out $\frac{1}{4}$ of 80.

R4a

$$\frac{1}{4} \text{ of } 80$$

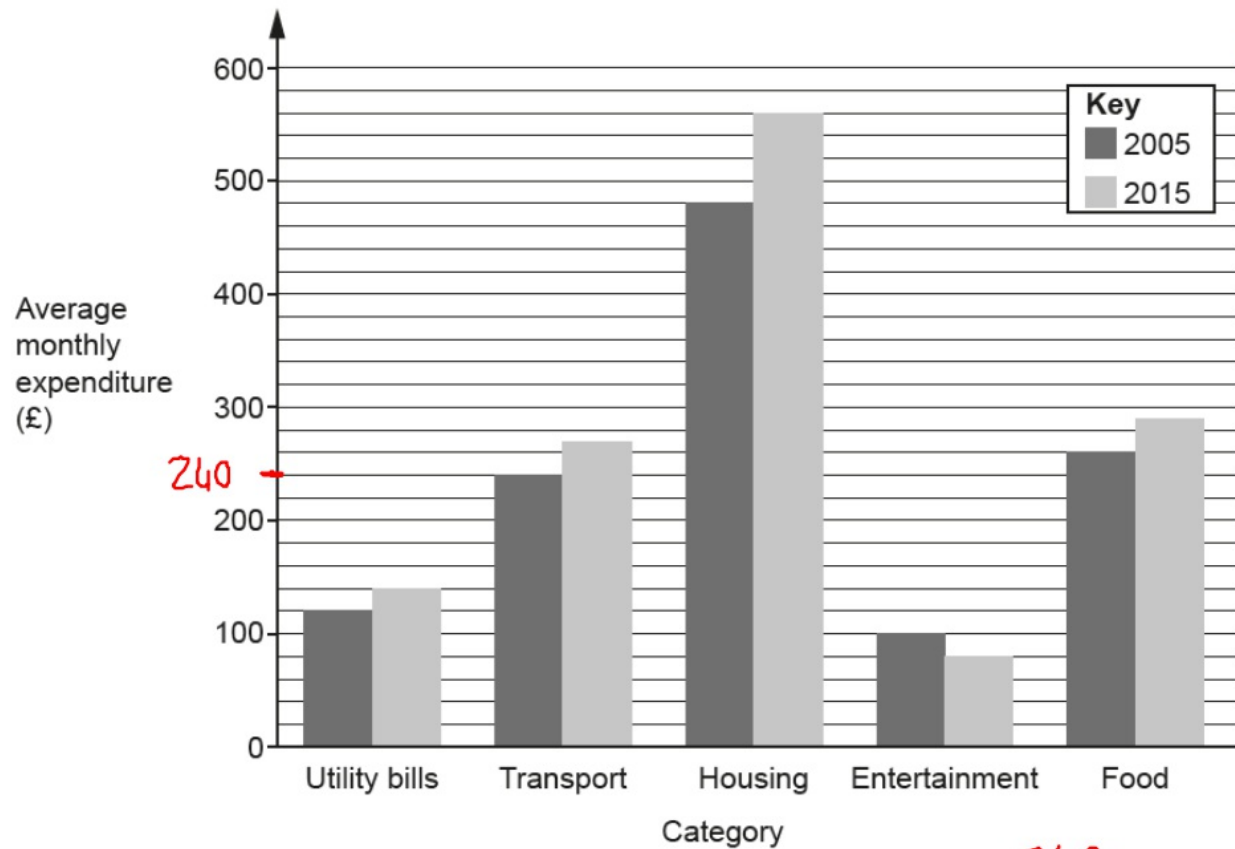
(a) 24 % [1]

(b) 20 ✓ [1]



(c) The total average monthly expenditure in 2005 was £1200.

RS What percentage of this was spent on transport?



$$\frac{24}{120} = \frac{12}{60}$$

$$\frac{6}{30} = \frac{1}{5}$$

$$\frac{1}{5} = 0.2$$

20% ✓

(c) The total average monthly expenditure in 2005 was £1200.

RS What percentage of this was spent on transport?

$$\frac{240}{1200}$$

$$\frac{24}{120}$$

$$\frac{\quad}{100}$$

14 Here is the nutritional information for a 110g serving of cereal.

Created by W Neill

RS

Carbohydrates	99.4 g
Proteins	9.5 g
Fats	1.1 g

Emily says that more than 90% of this serving is carbohydrates.

Is she correct?
Explain your reasoning.

.....
..... [3]

Here is the nutritional information for a 110g serving of cereal.

Carbohydrates	99.4g
Proteins	9.5g
Fats	1.1g

RS

Emily says that more than 90% of this serving is carbohydrates.

Is she correct?
Explain your reasoning.

$$C = \frac{99.4}{110}$$

90% of 110g

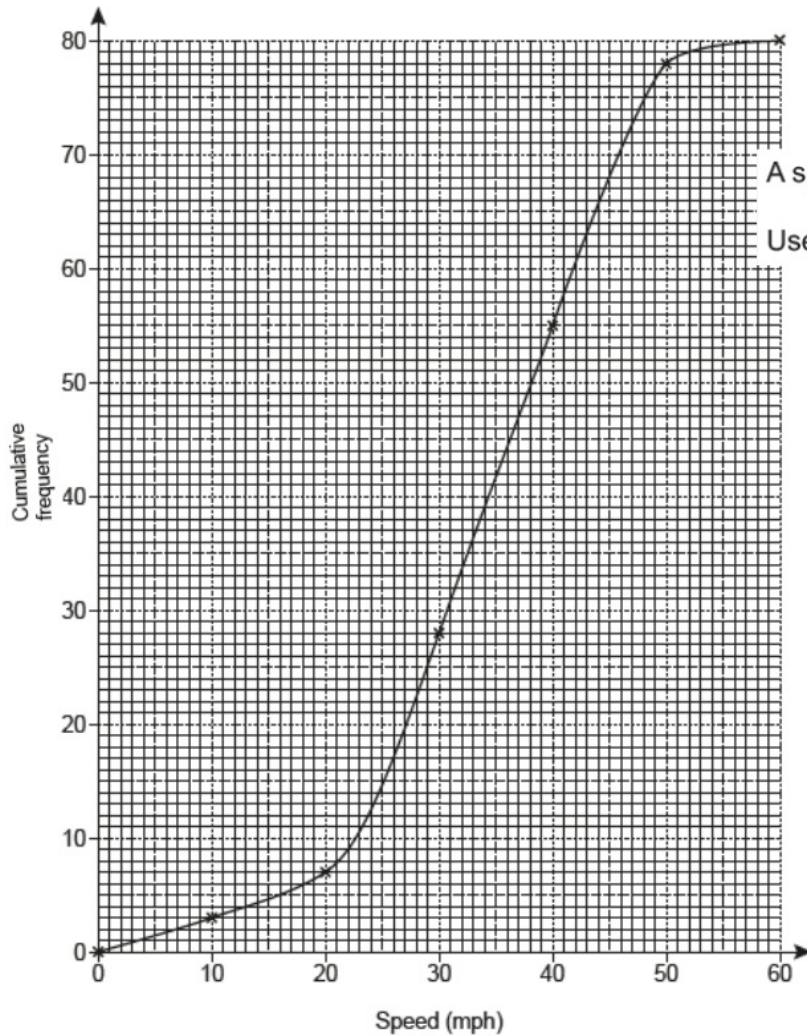
$$\begin{array}{l} \times 9 \left(\begin{array}{l} 10\% = 11g \\ 90\% = 99g \end{array} \right) \times 9 \end{array}$$

$$99g = 90\%$$

Yes she is correct as $99.4g > 99g$ ✓

- 12 The cumulative frequency graph shows the speeds, in miles per hour (mph), of vehicles passing a 40 mph speed limit sign on a road.

Video created by W Neill



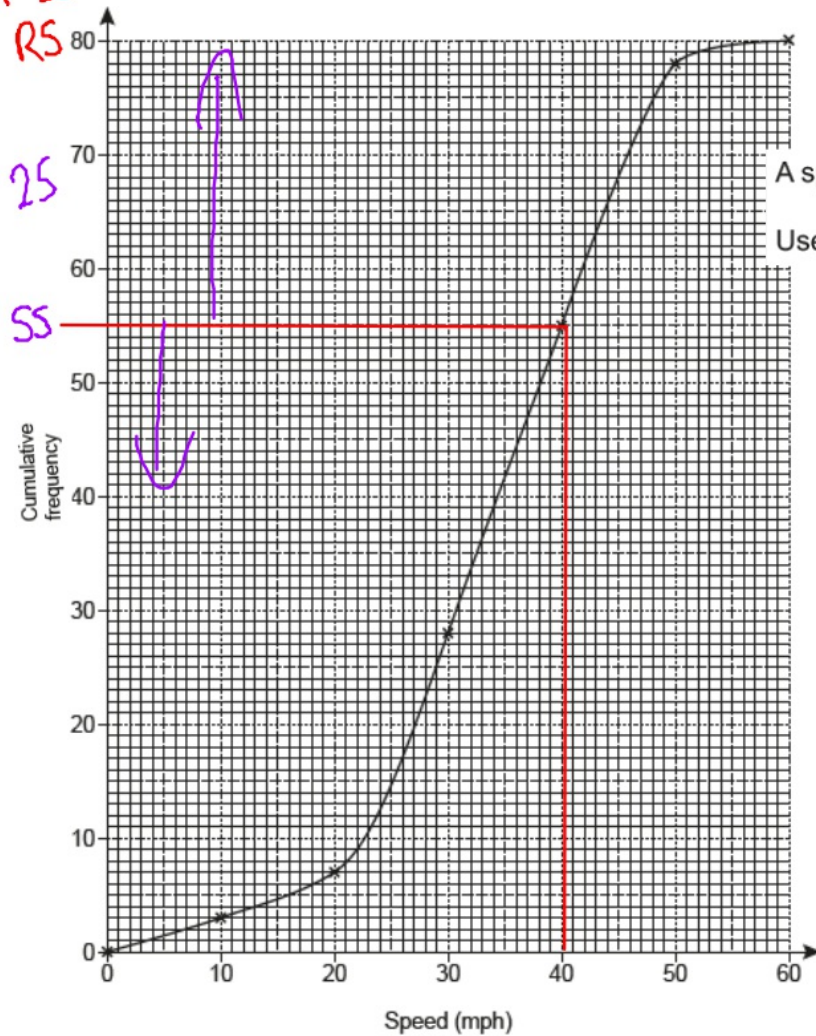
A speed camera will be installed if more than 30% of vehicles go over the speed limit of 40 mph.

Use information from the graph to decide if a speed camera should be installed.

[4]

12 The cumulative frequency graph shows the speeds, in miles per hour (mph), of vehicles passing a 40 mph speed limit sign on a road.

Video created by W Neill



A speed camera will be installed if more than 30% of vehicles go over the speed limit of 40 mph.

Use information from the graph to decide if a speed camera should be installed.

[4]

80 vehicles

25 vehicles went over 40mph

$$\frac{25}{80} = 31.25\%$$

Yes, install as $31.25\% > 30\%$.

9 Here are the results of a survey of 437 people in a town.

- R27
- 62 males speak Spanish.
- R5
- 153 females do not speak Spanish.
 - 280 people do not speak Spanish.

Jeff says

At least 2 out of every 5 females in the town can speak Spanish.

Is he correct?

Show clearly how you reached your decision.

..... [6]

9 Here are the results of a survey of 437 people in a town.

- R27
- 62 males speak Spanish.
- R5
- 153 females do not speak Spanish.
 - 280 people do not speak Spanish.

Jeff says $\frac{2}{5} = 40\%$
 $\frac{4}{10}$

Jeff says

At least 2 out of every 5 females in the town can speak Spanish.

Is he correct?

Show clearly how you reached your decision.

$$\frac{95}{248} = 38.3\%$$

	Speak Span	Don't Speak Sp	Total
male	62	127	189
female	95	153	248
Total	157	280	437

Jeff is incorrect
as $38.3\% < 40\%$

-
- 10** 60% of the people in a town are males.
20% of the males are left-handed.
21.6% of all the people are left-handed.

Created by W Neill

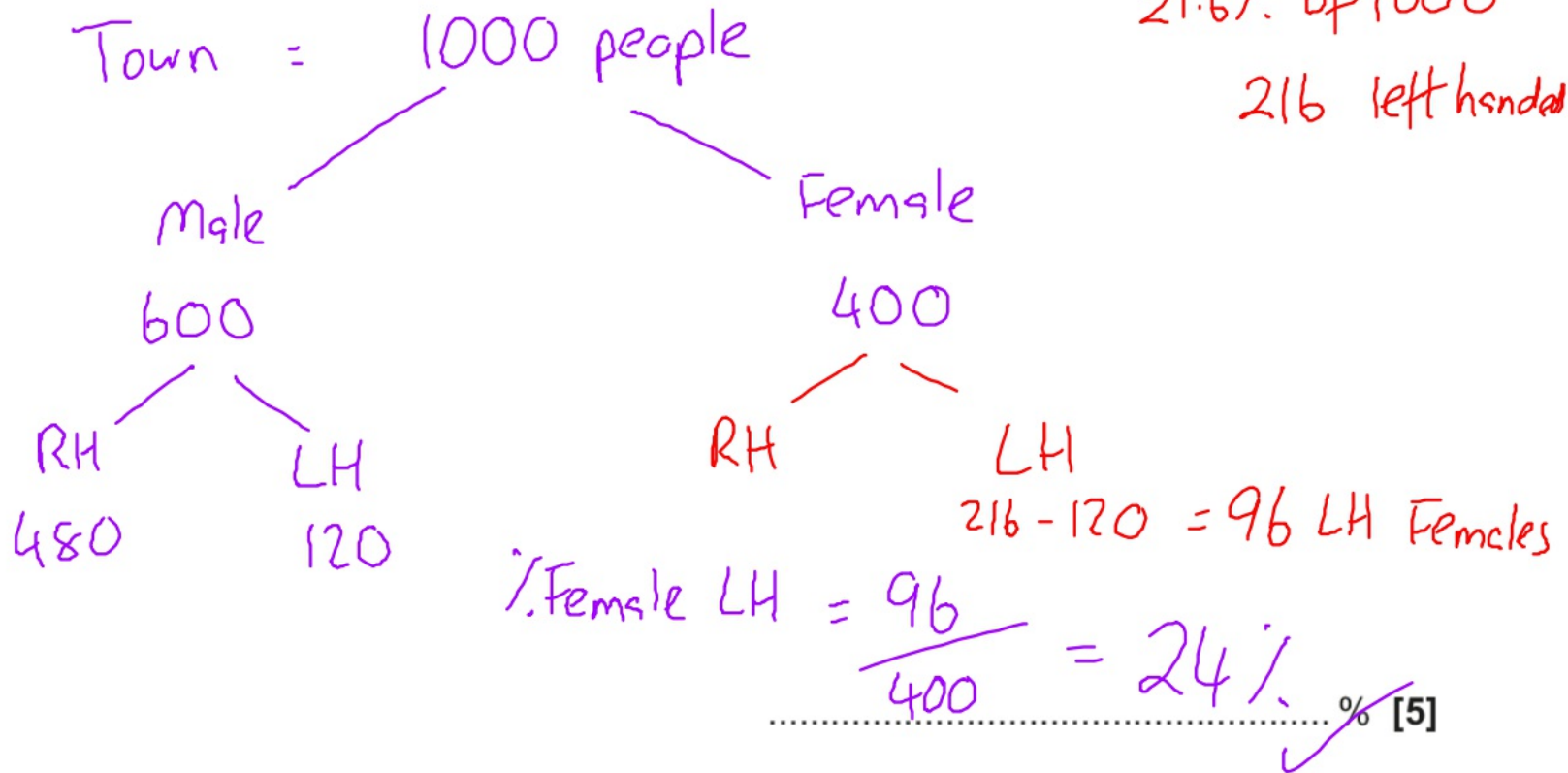
Work out the percentage of the people who are not male who are left-handed.

.....% **[5]**

- 10 60% of the people in a town are males.
20% of the males are left-handed.
21.6% of all the people are left-handed.

Created by W Neill

Work out the percentage of the people who are not male who are left-handed.



Edexcel

The ratio of the number of boys to the number of girls in a class is 12 : 13

(c) What percentage of the class are boys?

R13

R5

.....%

(2)

B G

The ratio of the number of boys to the number of girls in a class is 12 : 13

(c) What percentage of the class are boys?

R13

R5

$$\text{fraction are boys} = \frac{12}{25} \quad \frac{48}{(2)}\%$$

$$\frac{12}{25} = 0.48 \times 100 = 48\%$$

- 15** There are only red buttons, yellow buttons and orange buttons in a jar.
The number of red buttons, the number of yellow buttons and the number of orange buttons are in the ratio 7:4:9

Work out what percentage of the buttons in the jar are orange.

..... %

(Total for Question 15 is 2 marks)

- 15 There are only red buttons, yellow buttons and orange buttons in a jar.
The number of red buttons, the number of yellow buttons and the number of orange buttons are in the ratio 7:4:9

Work out what percentage of the buttons in the jar are orange.

$$\begin{array}{r} R : Y : O \\ 7 : 4 : 9 \end{array}$$

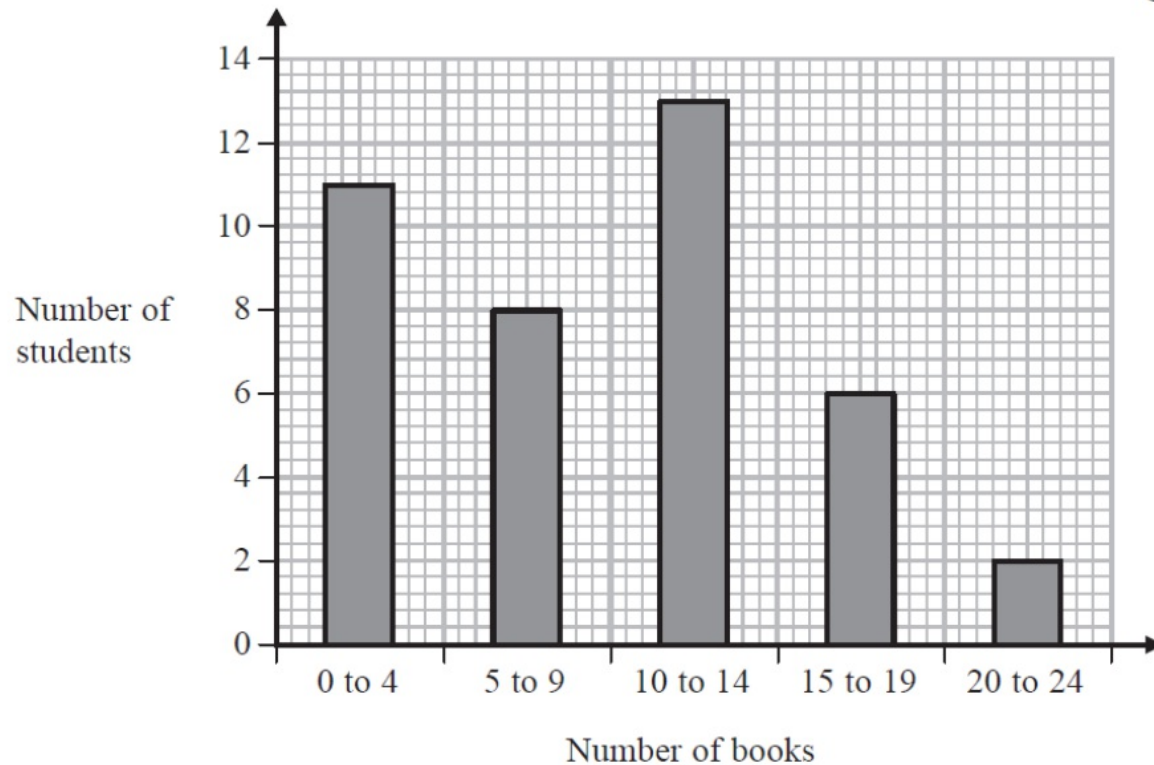
$$\begin{array}{r} \xrightarrow{\times 5} \\ \frac{9}{20} \qquad \frac{45}{100} \\ \xrightarrow{\times 5} \end{array}$$

.....45.....%

(Total for Question 15 is 2 marks)

23 Fran asks each of 40 students how many books they bought last year.

The chart below shows information about the number of books bought by each of the 40 students.



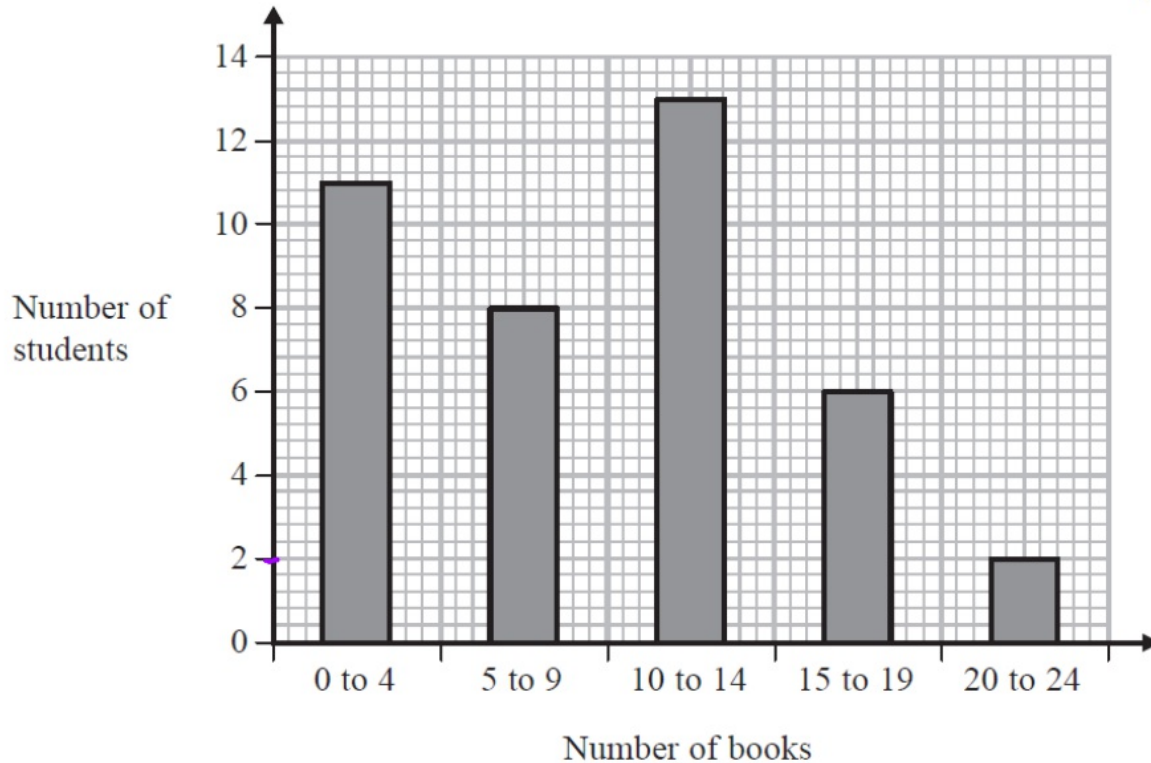
(a) Work out the percentage of these students who bought 20 or more books.

R5%

(2)

23 Fran asks each of 40 students how many books they bought last year.

The chart below shows information about the number of books bought by each of the 40 students.



$$\frac{2}{40} = 0.05$$

$$= 5\%$$

(a) Work out the percentage of these students who bought 20 or more books.

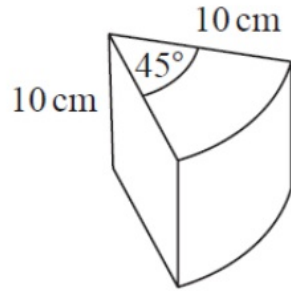
R5

$$\frac{5}{(2)} \%$$

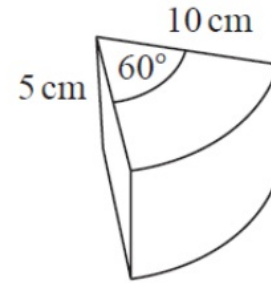
19 Here are two solid prisms, prism **A** and prism **B**.

Video created by W Neill

G32
R24
R5



prism **A**



prism **B**

The cross section of prism **A** is a sector, with angle 45° , of a circle of radius 10 cm.
The prism has a depth of 10 cm and a mass of 40π grams.

The cross section of prism **B** is a sector, with angle 60° , of a circle of radius 10 cm.
The prism has a depth of 5 cm and a mass of 50π grams.

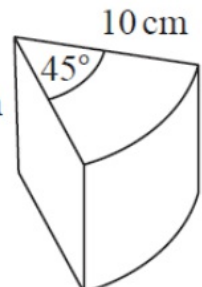
Express the difference in the densities of the two prisms as a percentage of the density of prism **A**.

..... %

(Total for Question 19 is 5 marks)

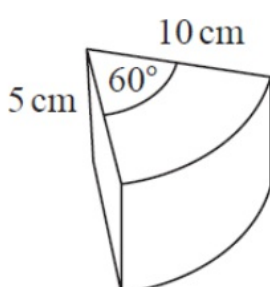
19 Here are two solid prisms, prism A and prism B.

G32 $R^2 \times \pi \div 8 \times 10$
 R24
 R5 $\frac{100\pi}{8} \times 10$
 $= \frac{1000\pi}{8} = 125\pi$



prism A

$R^2 \times \pi \div 6 \times 5$
 $100\pi \div 6 \times 5$
 $\frac{500\pi}{6}$




prism B

The cross section of prism A is a sector, with angle 45° , of a circle of radius 10 cm. The prism has a depth of 10 cm and a mass of 40π grams.

The cross section of prism B is a sector, with angle 60° , of a circle of radius 10 cm. The prism has a depth of 5 cm and a mass of 50π grams.

Express the difference in the densities of the two prisms as a percentage of the density of prism A.

$$\begin{aligned} \text{diff} &= 0.6 - 0.32 \\ &= 0.28 \\ \frac{0.28}{0.32} &= \frac{28}{32} = \frac{7}{8} \\ &= \frac{7}{8} \\ &= 87.5\% \end{aligned}$$



A

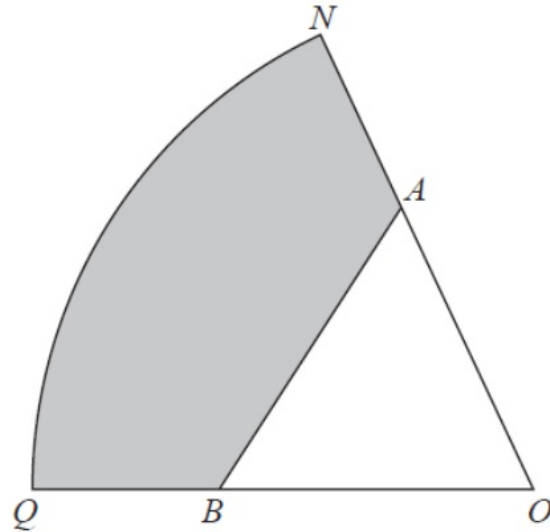
$$D = \frac{40\pi}{125\pi} = \frac{40}{125} = \frac{8}{25} = 0.32 \text{ g/cm}^3$$

B

$$D = \frac{50}{\pi} = \frac{500\pi}{6} \quad 0.6 \text{ g/cm}^3$$

$$= 50 \times \frac{6}{500} = \frac{300}{500}$$

87.5 %



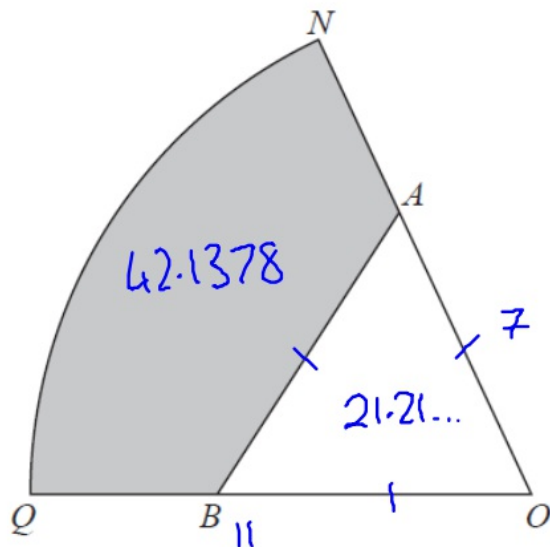
ONQ is a sector of a circle with centre O and radius 11 cm.

A is the point on ON and B is the point on OQ such that AOB is an equilateral triangle of side 7 cm.

Calculate the area of the shaded region as a percentage of the area of the sector ONQ .
Give your answer correct to 1 decimal place.

.....%

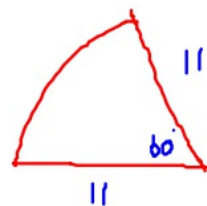
(Total for Question 17 is 5 marks)



ONQ is a sector of a circle with centre O and radius 11 cm.

A is the point on ON and B is the point on OQ such that AOB is an equilateral triangle of side 7 cm.

Calculate the area of the shaded region as a percentage of the area of the sector ONQ .
Give your answer correct to 1 decimal place.



$$\begin{aligned} \text{Area} & \dots R^2 \times \pi \\ & 11^2 \times \pi \div 6 \\ & = 63.35545185 \text{ cm}^2 \end{aligned}$$

$$\text{Area of } \Delta = \frac{1}{2} ab \sin C$$

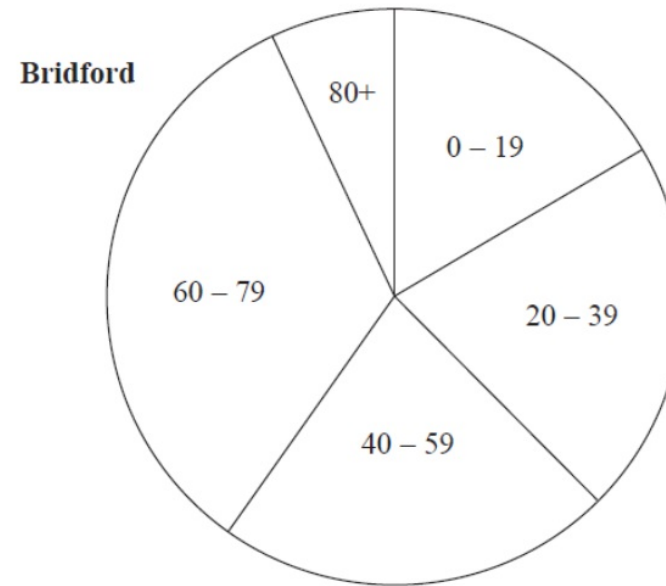
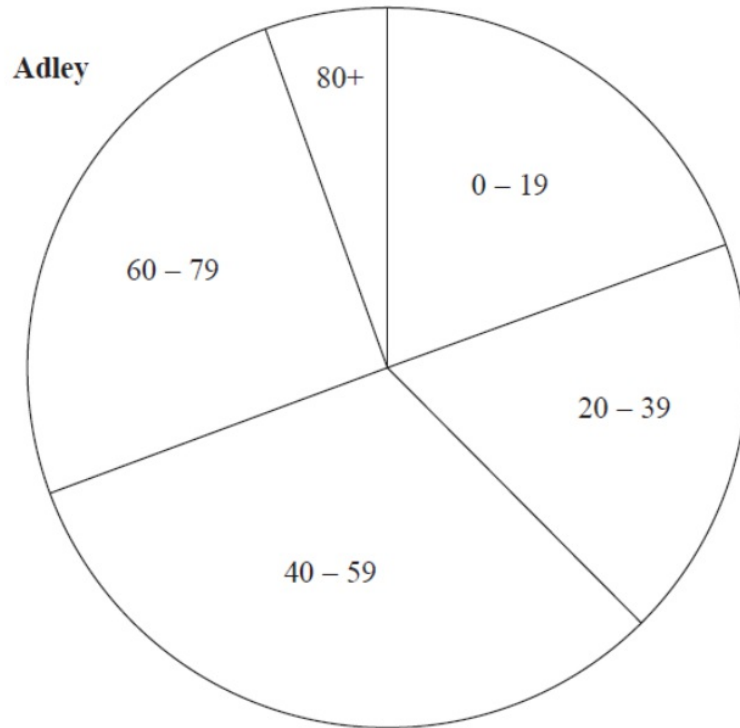
$$\begin{aligned} & \begin{array}{c} 7 \\ \triangle \\ 7 \end{array} \quad 60^\circ \\ & = \frac{1}{2} (7)(7) \sin 60 \\ & = 21.21762239 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \frac{42.1378}{63.35545} & = 0.6651 \\ & = 66.51\% \end{aligned}$$

.....%

(Total for Question 17 is 5 marks)

11 The pie charts give information about the ages, in years, of people living in two towns, Adley and Bridford.



Diagrams accurately drawn

The ratio of the number of people living in Adley to the number of people living in Bridford is given by the ratio of the areas of the pie charts.

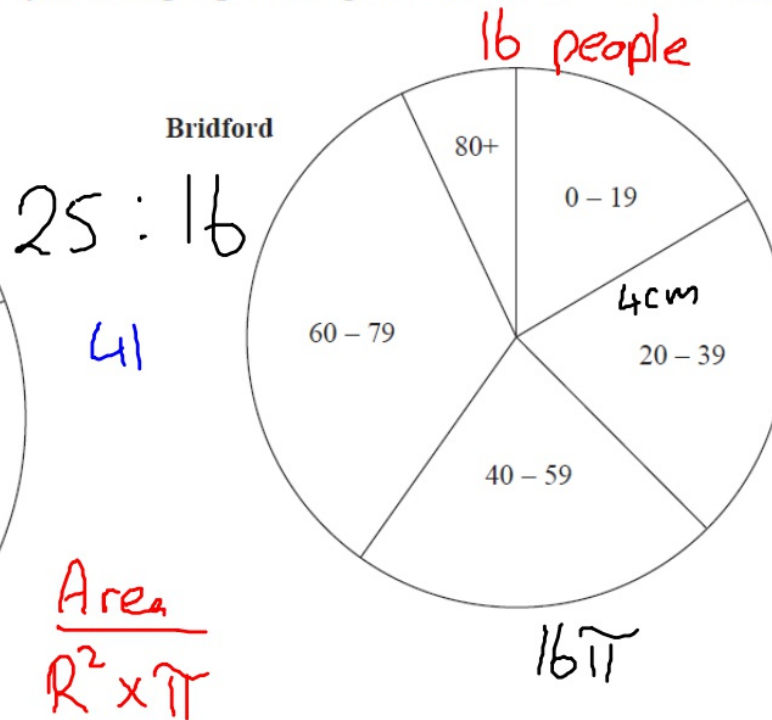
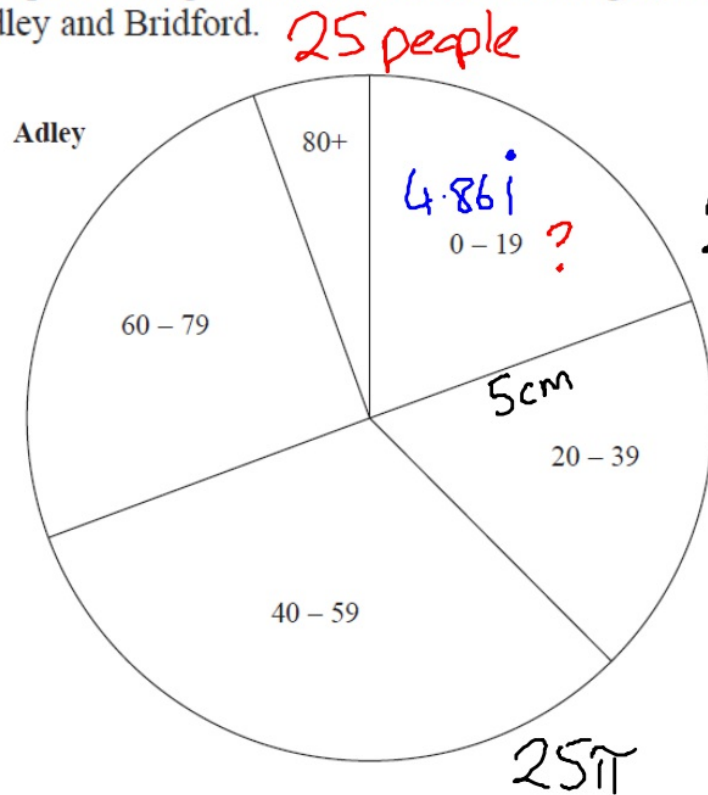
What proportion of the total number of people living in these two towns live in Adley **and** are aged 0 – 19?

Give your answer correct to 3 significant figures.

.....

(Total for Question 11 is 3 marks)

11 The pie charts give information about the ages, in years, of people living in two towns, Adley and Bridford. Created by W Neill



Diagrams accurately drawn

The ratio of the number of people living in Adley to the number of people living in Bridford is given by the ratio of the areas of the pie charts.

What proportion of the total number of people living in these two towns live in Adley and are aged 0 – 19?

Give your answer correct to 3 significant figures.

Adley $\frac{70^\circ}{360}$ of 25 people

Ans $\frac{4.861}{41} = 11.85636\%$

(Total for Question 11 is 3 marks)

AQA

20

An exam has two papers.

RS

Anil scores

33 out of 60 on paper 1

and

75 out of 100 on paper 2

Work out his percentage score for the exam.

[3 marks]

Answer _____ %

20 An exam has two papers.

RS

Anil scores

33 out of 60 on paper 1

and

75 out of 100 on paper 2

Work out his percentage score for the exam.

[3 marks]

$$\frac{33}{60}$$

$$\frac{75}{100}$$

$$\text{overs } 11 = \frac{108}{160}$$

$$= 0.675 \times 100$$

Answer 67.5% ✓ %

5 Work out 20% of 14 000

[2 marks]

R7

Answer _____

5

Work out 20% of 14 000

[2 marks]

R7

$$10\% = 1400$$

$$20\% = 2800$$

Answer 2800 ✓

2 What is 50 as a percentage of 20?
Circle your answer.

R5

[1 mark]

10%

40%

150%

250%

- 2 What is 50 as a percentage of 20?
Circle your answer.

R5

[1 mark]

10%

40%

150%

250%

$$\begin{array}{l} 1 = 100\% \\ 2\frac{1}{2} = 250\% \end{array} \quad \frac{50}{20} = 2\frac{1}{2}$$

22

The cross section of an earring is a semicircle, centre C , radius 25 mm

Video created by W Neill

The earring is black and white.

G25

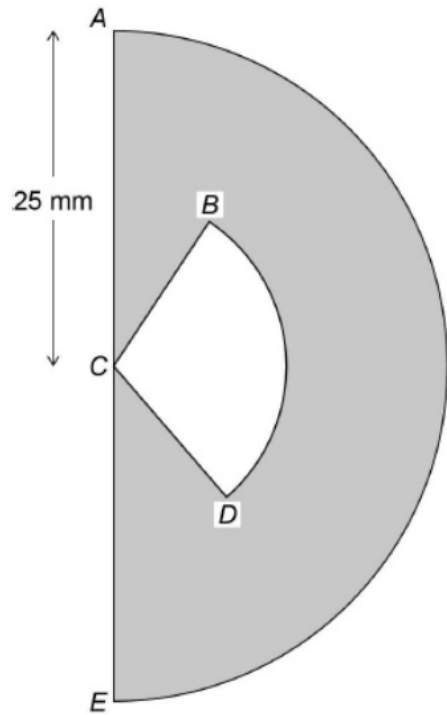
R5

The shaded area is black.

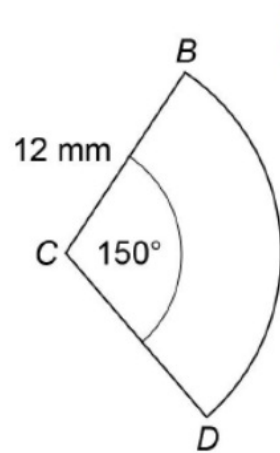
Is more than 20% of the semicircle white?

You **must** show your working.

[5 marks]



Not drawn accurately



Not drawn accurately

Sector BCD is white and has radius 12 mm

22

The cross section of an earring is a semicircle, centre C, radius 25 mm

Video created by W Neill

The earring is black and white.

G25

R5

The shaded area is black.

Is more than 20% of the semicircle white?

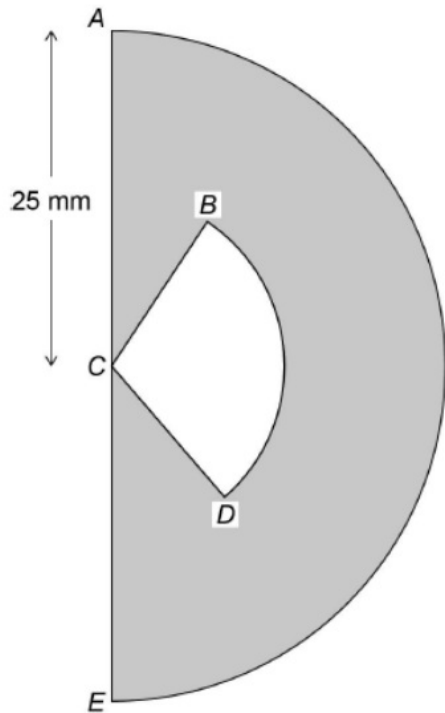
You must show your working.

[5 marks]

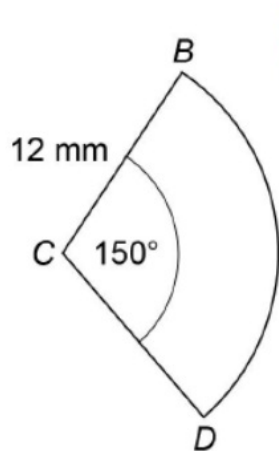
full earring ... $R^2 \times \pi \div 2$
 $25^2 \times \pi \div 2 = 981.74777$
 cm^2

white ... $R^2 \times \pi \div 360 \times 150$
 $12^2 \times \pi \div 360 \times 150 = 188.49...$
 cm^2

$\therefore \frac{188.49...}{981.74...} = 0.1919$
 $= 19.19\%$
 No, $19.19 < 20\%$.



Not drawn accurately



Not drawn accurately

Sector BCD is white and has radius 12 mm

4 Work out 40 as a percentage of 10

Circle your answer.

R5

[1 mark]

4%

25%

300%

400%

4 Work out 40 as a percentage of 10

Circle your answer.

R5

[1 mark]

4%

25%

300%

400%

$$\frac{40}{10} = 4 = 400\%$$

$$1 = 100\%$$

19

N49

R5

Lunch

Choose one starter and one main course

There are four starters and ten main courses to choose from.

Two of the starters and three of the main courses are suitable for vegans.

What percentage of the possible lunches have **both** courses suitable for vegans?

[3 marks]

Answer _____ %

19

N49

R5

Lunch

Choose one starter and one main course

There are four starters and ten main courses to choose from.

Two of the starters and three of the main courses are suitable for vegans.

What percentage of the possible lunches have **both** courses suitable for vegans?

[3 marks]

S	and	Main			
4	X	10	=	40	$\frac{6}{40}$ vegans
2	X	3	=	6	

Answer _____ 15% ✓ %