Write your name here

Surname	Other Names

Mathematics

2022 Paper 2 (Calculator)
Foundation Tier

Time: 1 hour 30 minutes

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – there may be more space than you need.
- **Calculators may be used**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working.**

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets – use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Foundation Tier Formulae Sheet

Perimeter, area and volume

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

Area of a trapezium = $\frac{1}{2}(a + b)\, h$

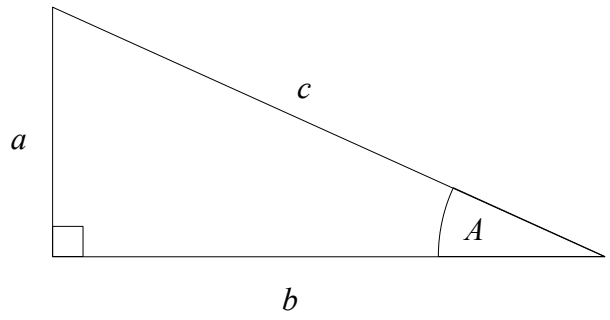
Volume of a prism = area of cross section × length

Where r is the radius and d is the diameter:

Circumference of a circle = $2\pi r = \pi d$

Area of a circle = πr^2

Pythagoras' Theorem and Trigonometry



In any right-angled triangle where a, b and c are the length of the sides and c is the hypotenuse:

$$a^2 + b^2 = c^2$$

In any right-angled triangle ABC where a, b and c are the length of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c} \qquad \cos A = \frac{b}{c} \qquad \tan A = \frac{a}{b}$$

Compound Interest

Where P is the principal amount, r is the interest rate over a given period and n is number of times that the interest is compounded:

Total accrued = $P\left(1 + \frac{r}{100}\right)^n$

Probability

Where P (A) is the probability of outcome A and P (B) is the probability of outcome B:

P (A or B) = P (A) + P (B) – P (A and B)

END OF EXAM AID

1 Write down a multiple of 7 that is between 20 and 30

21 [or 28]

(Total for Question 1 is 1 mark)

2 Write 3761 to the nearest hundred.

3800

(Total for Question 2 is 1 mark)

3 Write 0.9 as a percentage.

90 %

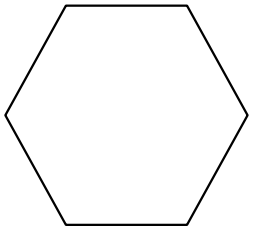
(Total for Question 3 is 1 mark)

4 Change 75 kilograms to grams.

75000 grams

(Total for Question 4 is 1 mark)

5 Here is a shape.

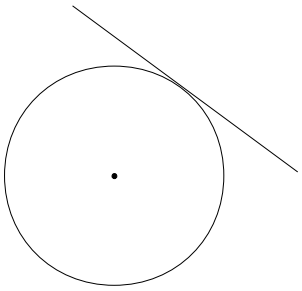


Write down the mathematical name for the shape.

Hexagon

(Total for Question 5 is 1 mark)

6 Write down the mathematical name for the straight line touching the circle.



Tangent

(Total for Question 6 is 1 mark)

7 Here are three symbols.

<	>	=

Write one of these symbols in each box to make four true statements

$\frac{3}{4}$ [>] $\frac{1}{2}$

25 [<] 30

$\frac{2}{5}$ [=] 0.4

-9 [<] -4

(Total for Question 7 is 2 marks)

8 Find the number that is exactly half way between $\frac{1}{6}$ and $\frac{7}{12}$

Add up and divide by 2

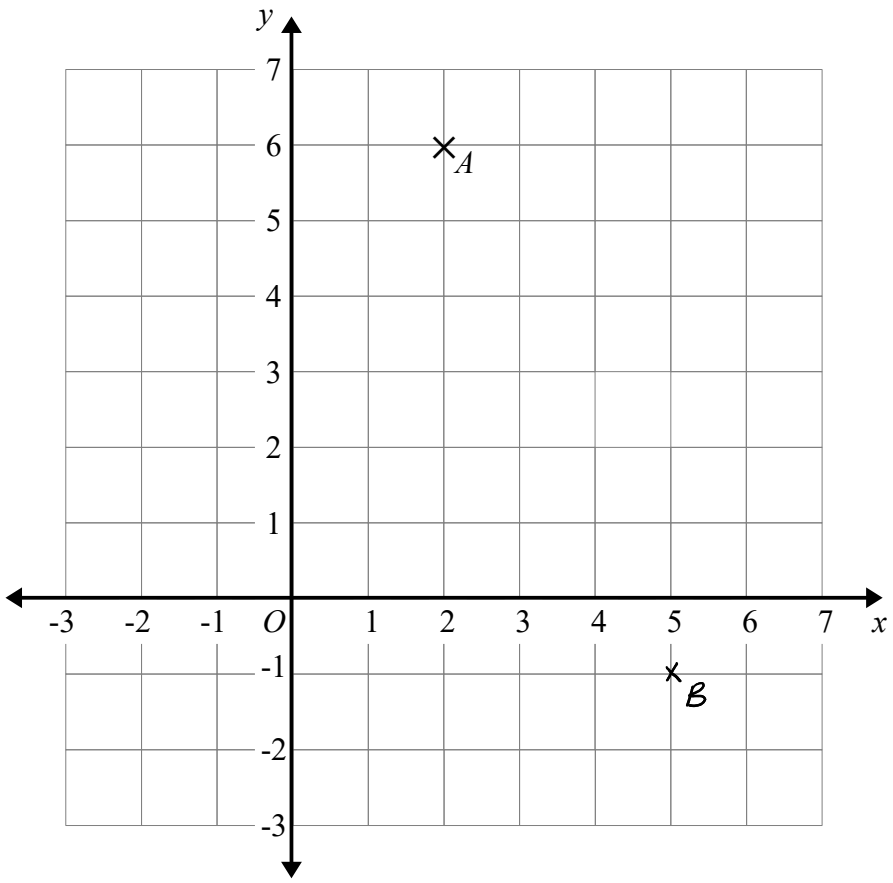
$\frac{1}{6} + \frac{7}{12} = \frac{3}{4}$

$\frac{3}{4} \div 2 = \frac{3}{8}$

$\frac{3}{8}$

(Total for Question 8 is 2 marks)

9



(a) Write down the coordinates of point *A*.

(2 , 6)

(1)

(b) On the grid mark with a cross (×) the point (5, –1).
Label this point *B*.

(1)

(Total for Question 9 is 2 marks)

10 A film starts at 7.45 pm.
The film lasts 98 minutes.

What time does the film finish?

7.45 → 15 mins → 8.00 → 60 mins → 9.00 → 23 mins → 9.23

98 − 75 = 23

9.23 pm

(Total for Question 10 is 2 marks)

11 Mr Blair buys 30 pens, 30 rulers, 30 pencils and 30 calculators.

Price List

Pens	5 for 85p
Rulers	10 for £2.64
Pencils	6 for 52p
Calculators	£6.25 each

What is the total amount of money Mr Blair spends?

Pens: $\frac{30}{5} = 6$ $\quad 6 \times 0.85 = 5.10$

Rulers: $\frac{30}{10} = 3$ $\quad 3 \times 2.64 = 7.92$

Pencils: $\frac{30}{6} = 5$ $\quad 5 \times 0.52 = 2.60$

Calculators: $\quad 30 \times 6.25 = 187.5$

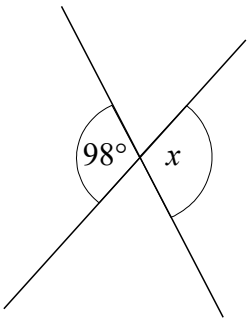
$5.10 + 7.92 + 2.60 + 187.50$

$= 203.12$

£203.12

(Total for Question 11 is 4 marks)

12



(a) Work out the size of the angle marked x.

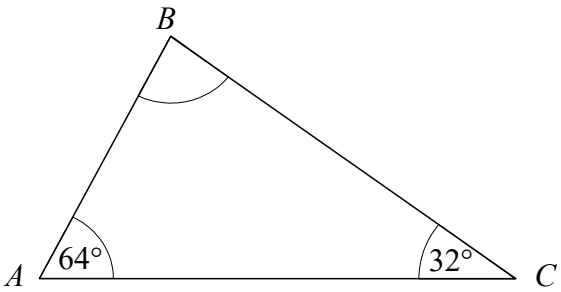
98 °

(b) Give a reason for your answer.

(vertically) opposite angles are equal

(Total for Question 12 is 2 marks)

13



180 − 64 − 32

(a) Work out the size of the angle ABC.

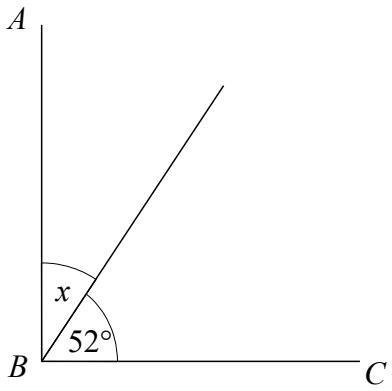
84 °

(b) Give a reason for your answer.

Angles in a triangle add to 180°

(Total for Question 13 is 2 marks)

14 *AB* and *BC* are perpendicular lines. Work out the size of the angle marked *x*.



90 − 52

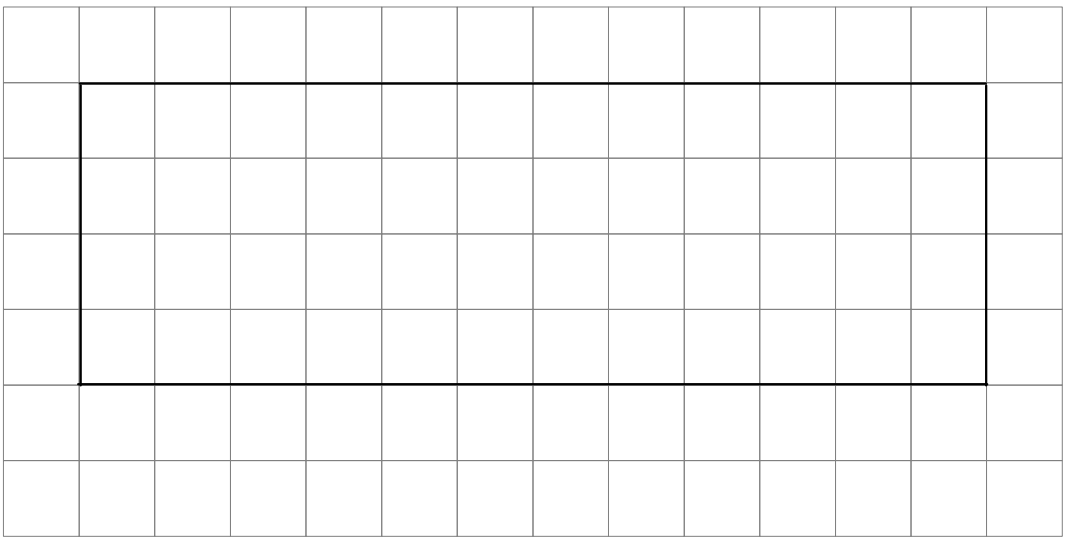
38 °

(Total for Question 14 is 1 marks)

15 The length of a rectangle is three times the width of the rectangle.
The area of the rectangle is 48 cm^2.

Draw the rectangle on the centimetre grid.

4 × 12



(Total for Question 15 is 2 marks)

16 The table shows information about the number of goals a team scored in 38 games.

Goals	Frequency
0	7
1	14
2	11
3	6
4 or more	0

0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1
1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3

(a) Find the median number of goals scored.

$\frac{38}{2} = 19$ Middle number

1

(1)

(b) Write down the mode

Most common

1

(1)

(c) Work out the mean number of goals the team scored in all 38 games.

$7 \times 0 = 0$
$14 \times 1 = 14$
$11 \times 2 = 22$
$6 \times 3 = 18$

$14 + 22 + 18 = 54$

$\frac{54}{38} = \frac{27}{19} = 1.42$

1.42

(2)

(Total for Question 16 is 4 marks)

17 (a) Factorise $18x + 24$

$6(3x+4)$

(1)

(b) Expand and Simplify $7(t-4) + 5(t-2)$

$7t - 28 + 5t - 10$

$12t - 38$

(2)

(Total for Question 17 is 3 marks)

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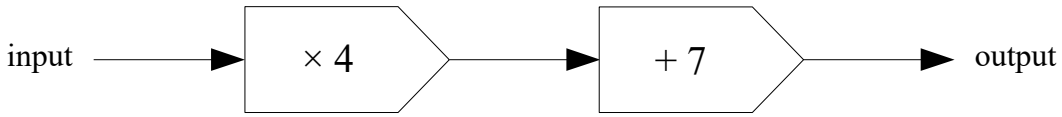
18 Here is a number machine.



(a) Find the output when the input is 5

$5 \times 4 = 20$

$20 + 7 = 27$

27

(1)

(b) Find the output when the input is –3

$-3 \times 4 = -12$

$-12 + 7 = -5$

-5

(1)

(c) Find the input when the output is 71

input ← ÷ 4 ← − 7 ← output

$71 - 7 = 64$

$\frac{64}{4} = 16$

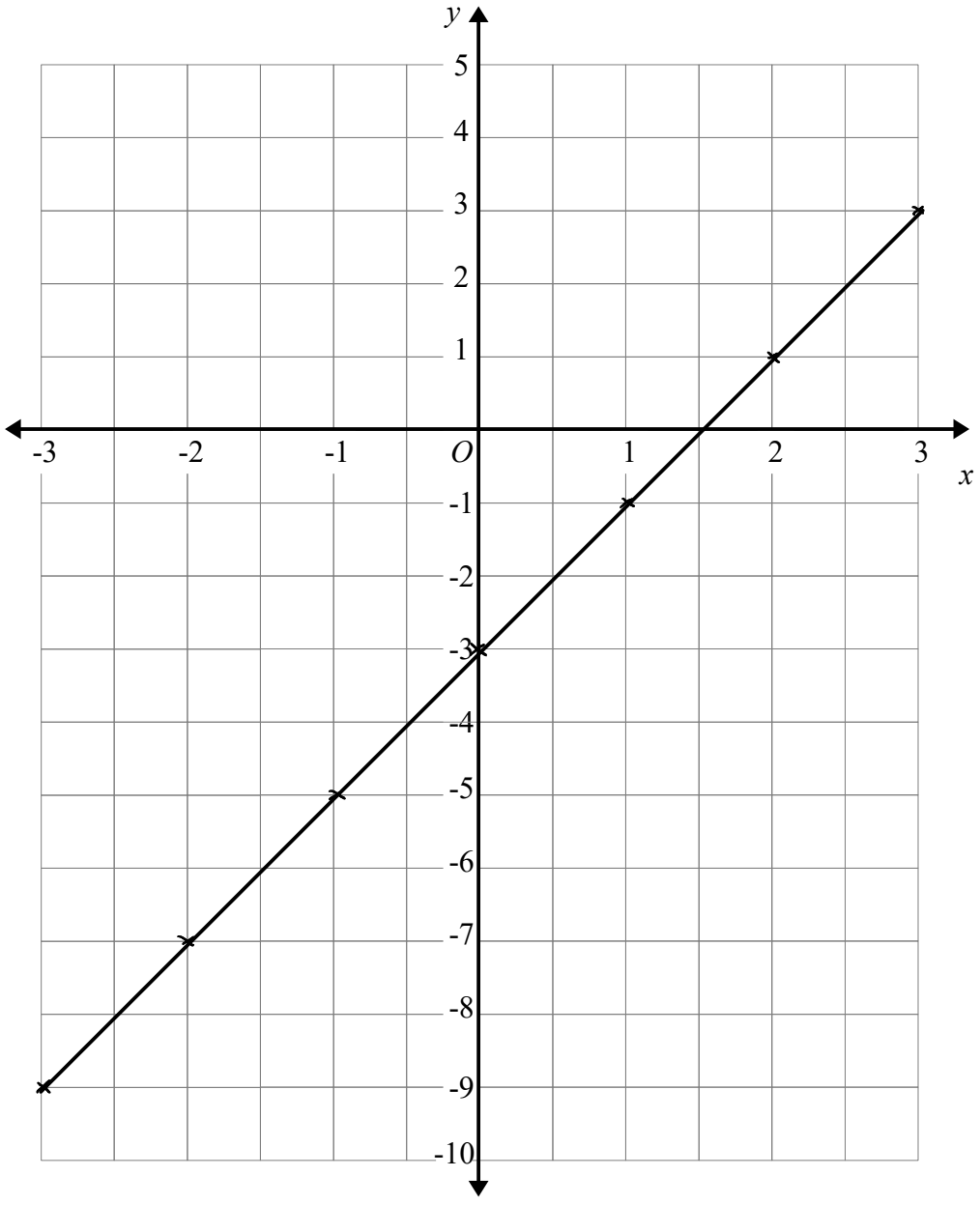
16

(2)

(Total for Question 18 is 4 marks)

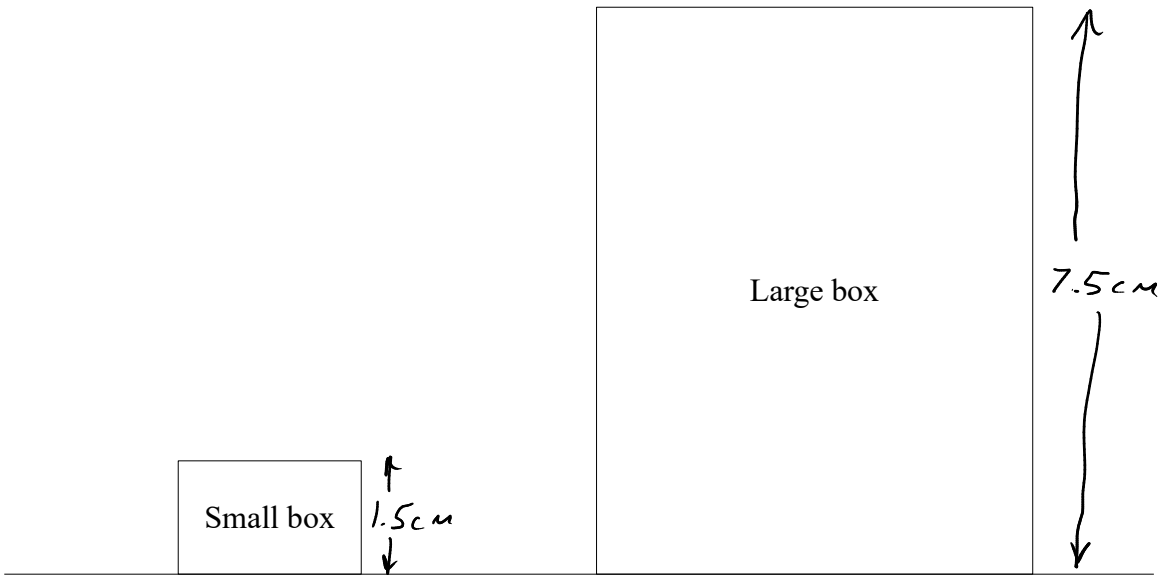
19 On the grid, draw the graph of $y = 2x - 3$ for values of x from -3 to 3

x	-3	-2	-1	0	1	2	3
y	-9	-7	-5	-3	-1	1	3



(Total for Question 19 is 3 marks)

20 The accurate scale drawing shows a small box and a large box



The small box has a real height of 20 centimetres.

Find an estimate for the real height of the large box.

1.5cm = 20 cm (×5)

7.5cm = 100 cm (×5)

100cm

(Total for Question 20 is 2 marks)

21 Karen buys a pack of 8 bottles of water.
The pack costs £1.25

Karen sells all 8 bottles of water for 50p each.

Work out Karen's percentage profit.

$8 \times 0.5 = 4$

$\%\ \text{Profit} = \frac{\text{change}}{\text{original}} \times 100$

$= \frac{4 - 1.25}{1.25} \times 100$

$= 220$

220 %

(Total for Question 21 is 3 marks)

22 (a) Write the ratio 32 : 112 in its simplest form.

2 : 7

(1)

(b) It rained on $\frac{3}{7}$ of the days in February.

Write the ratio of the number of days it rained to the number of days it did not rain.

$\frac{3}{7} : \frac{4}{7}$

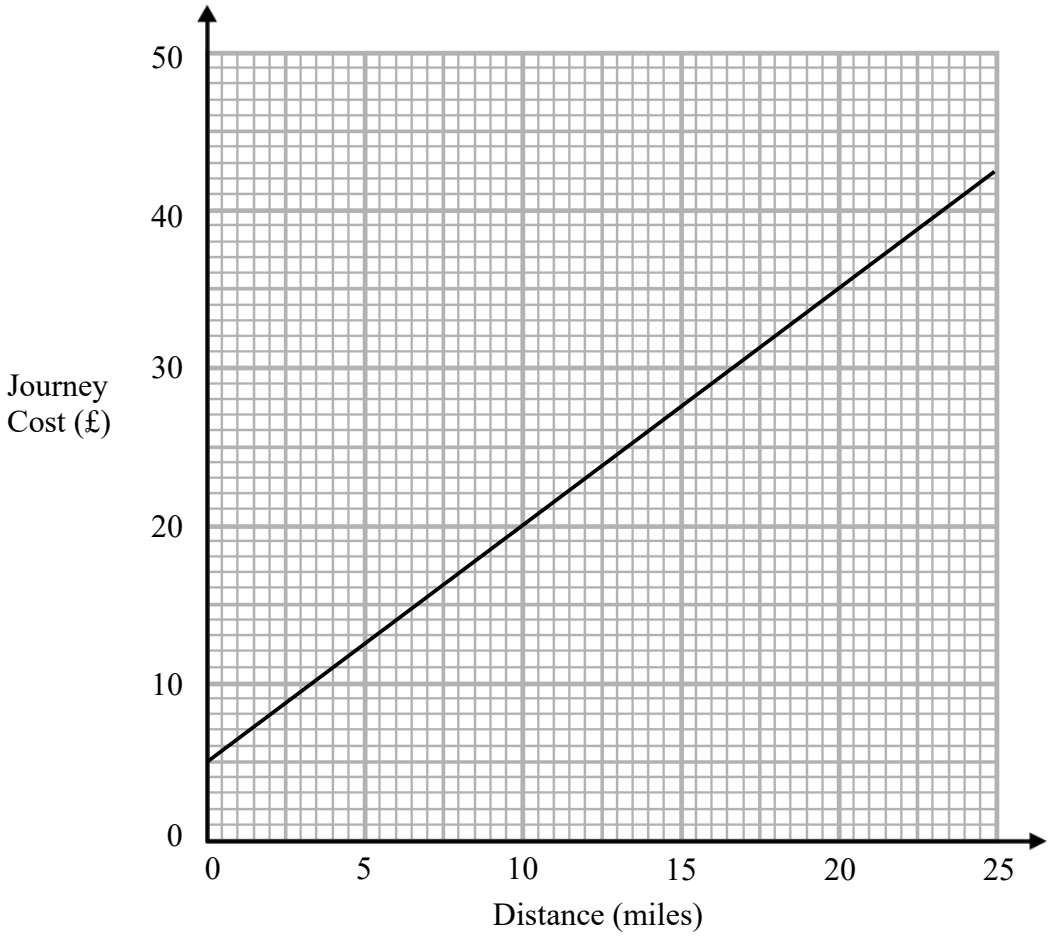
3 : 4

(1)

(Total for Question 22 is 2 marks)

23 Bill is a taxi driver.

You can use this graph to find the cost of a taxi for different distances.



For each journey there is a fixed charge plus a charge for the distance.

(a) How much is the fixed charge?

£ 5

(1)

Bill makes two journeys.
The distance of one journey is 10 miles further than the other journey.

(b) Work out the difference between the two journey costs.

10 mile journey = £20
20 mile journey = £35

35 − 20

£ 15

(2)

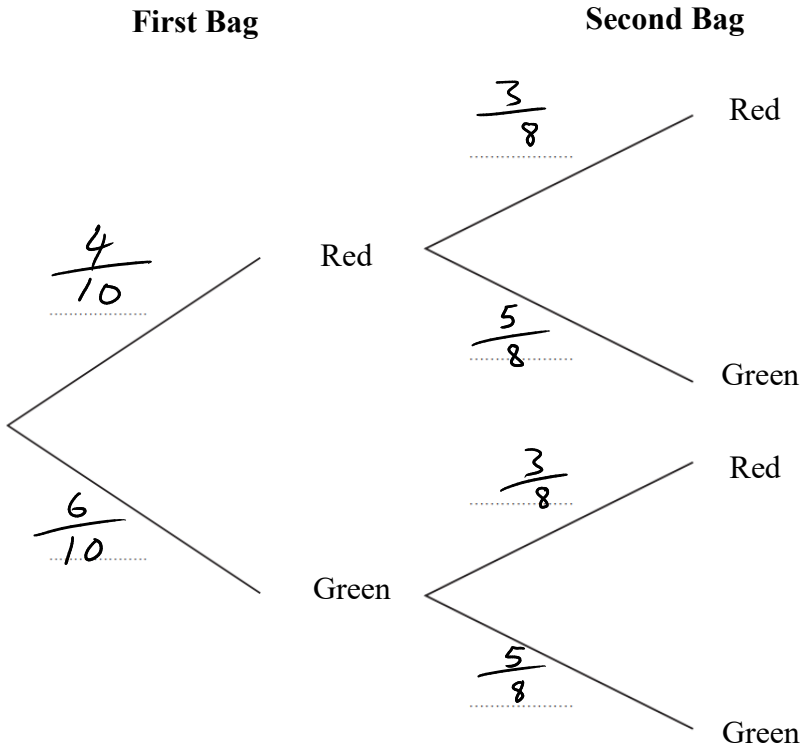
(Total for Question 23 is 3 marks)

24 Rachel has two bags.

In the first bag there are 4 red balls and 6 green balls.
In the second bag there are 3 red balls and 5 green balls.

Rachel takes at random a ball from the first bag.
She then takes at random a ball from the second bag.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Rachel takes two green balls.

$\frac{6}{10} \times \frac{5}{8} = \frac{3}{8}$

$\frac{3}{8}$

(2)

(Total for Question 24 is 4 marks)

25 100 students in year 7 either study French or German or Spanish.

45 of the students are boys and the rest are girls.

12 boys study German.
15 boys and 17 girls study French.
A total of 30 students study Spanish.

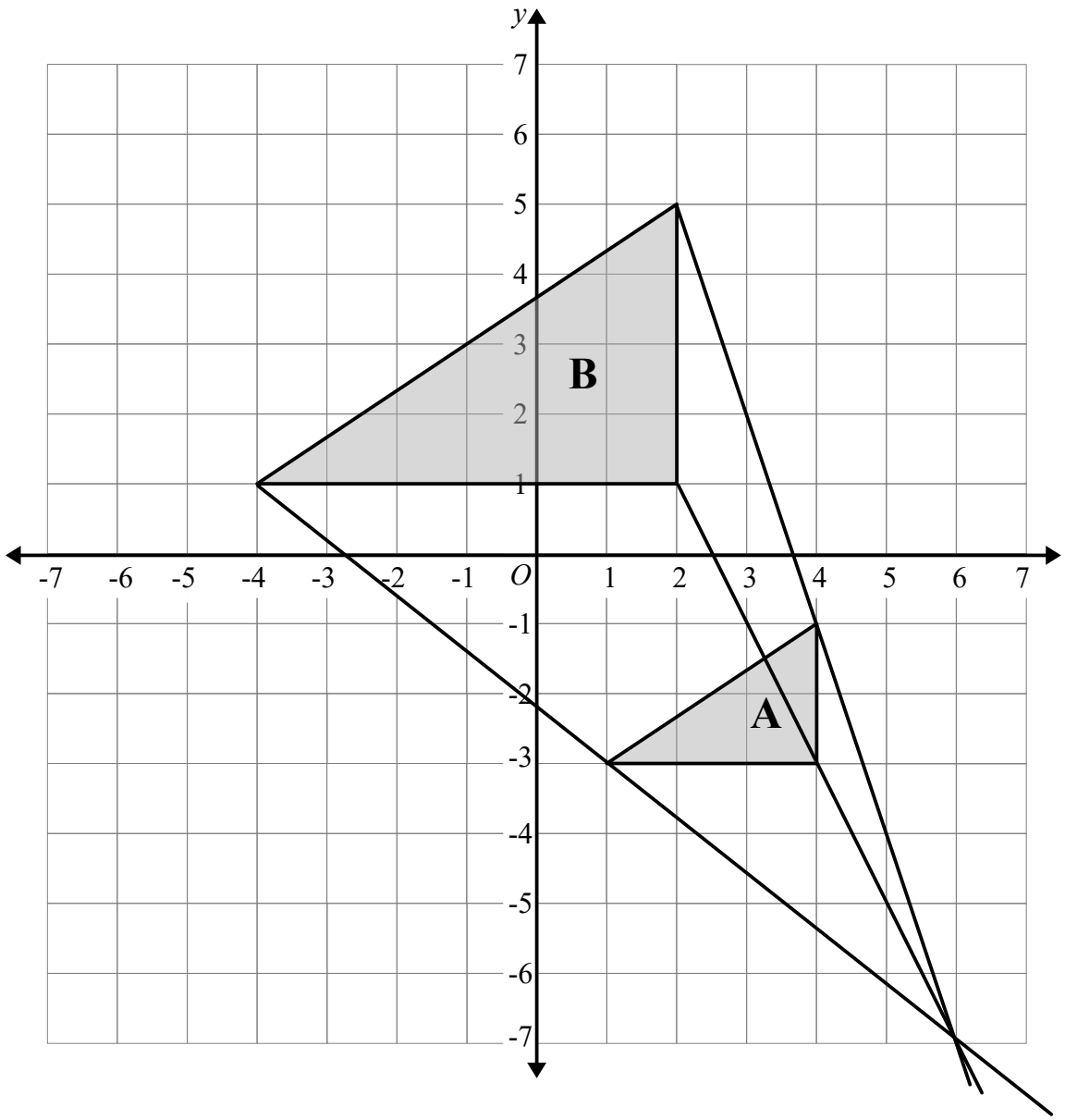
Work out how many girls study Spanish.

	Boys	Girls	Total
French	15	17	32
German	12	26	38
Spanish	18	12	30
Total	45	55	100

12

(Total for Question 25 is 4 marks)

26



Describe fully the single transformation that maps triangle **A** on triangle **B**.

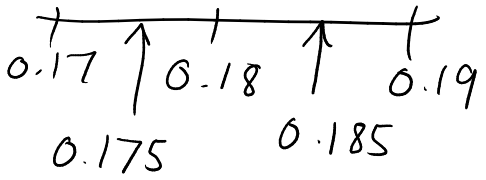
Enlargement, Scale Factor 2, Centre (6, -7)

(Total for Question 26 is 2 marks)

27 A number x is rounded to 2 decimal places.

The result is 0.18

Write down the error interval for x.



0.175 ≤ x < 0.185

(Total for Question 27 is 2 marks)

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28 (a) Simplify $a^9 \times a^4$

a^{13}

(1)

(b) Simplify $(4b^2c)^3$

$4b^2c \times 4b^2c \times 4b^2c$

$64b^6c^3$

(2)

(c) Simplify $d^9 \div d^4$

d^5

(1)

(Total for Question 28 is 4 marks)

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29 Given that $a:c = 1:6$ and $b:c = 2:5$

Find the ratio $a:b:c$
Give your answer in its simplest form.

×5 ×6

make the cs the same

$a:c$	$b:c$
5 : 30	12 : 30

$a:b:c$

5 : 12 : 30

5 : 12 : 30

(Total for Question 29 is 2 marks)

30 Nick bought a new car.
Each year the car depreciates in value by 12%.

original value = 100%
half value = 50%

Work out the number of years it takes for the car to half in value.

$100 \times 0.88 = 88$ 1 year

$88 \times 0.88 = 77.44$ 2 years

$77.44 \times 0.88 = 68.1472$ 3

$Ans \times 0.88 = 59.969\ldots$ 4

$Ans \times 0.88 = 52.77$ 5

$Ans \times 0.88 = 46.44$ 6

…….6…….years

(Total for Question 30 is 3 marks)

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31 In London potatoes cost £0.45 per lb.
In Dublin potatoes cost €1.48 per kilogram.

1 kg = 2.2 lbs
£1 = €1.15

In which city are potatoes better value for money, London or Dublin?
You must show your working.

Dublin €1.48 per 2.2 lbs

÷2.2 ÷2.2

€0.67̇2 per 1lb

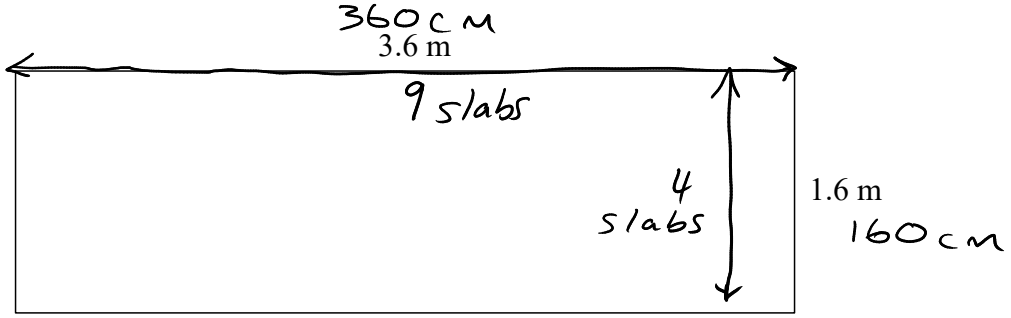
÷1.15

£0.58 per 1lb

London £0.45 < £0.58

(Total for Question 31 is 3 marks)

32 The diagram shows a patio in the shape of a rectangle.



Jack wants to cover the patio with paving slabs.
Each paving slab is a square of side 40 cm.

$\frac{360}{40} = 9$ $\frac{160}{40} = 4$

The paving slabs cost £7.59 each.
Jack has £300 to spend on paving slabs.

Does Jack have enough money to cover the patio with paving slabs.

$4 \times 9 = 36$ paving slabs

$36 \times 7.59 = £273.24$

Yes $£273.24 < £300$

(Total for Question 32 is 4 marks)

33 Solve the simultaneous equations

$$3x - y = -4 \quad \times 2$$
$$2x - 3y = 9 \quad \times 3$$

$$6x - 2y = -8$$
$$6x - 9y = 27$$

$$7y = -35$$
$$y = -5$$

$$2x - 3(-5) = 9$$
$$2x + 15 = 9$$
$$2x = -6$$
$$x = -3$$

$x =$ -3

$y =$ -5

(Total for Question 33 is 3 marks)