Surname TP Solutions	Centre Number	Candidate Number
First name(s)		0

GCSE

C300U20-1

A22-C300U20-1

THURSDAY, 3 NOVEMBER 2022 – MORNING

MATHEMATICS – Component 2
Calculator-Allowed Mathematics
FOUNDATION TIER

2 hours 15 minutes

ADDITIONAL MATERIALS

An additional formulae sheet.

A calculator will be required for this examination.

A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·142 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	7	
2.	6	
3.	4	
4.	5	
5.	4	
6.	4	
7.	7	
8.	7	
9.	5	
10.	4	
11.	2	
12.	9	
13.	5	
14.	6	
15.	3	
16.	2	
17.	5	
18.	5	
19.	4	
20.	2	
21.	4	
22.	7	
23.	7	
24.	6	
Total	120	

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Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

Curved surface area of a cone = πrl

Surface area of a sphere = $4\pi r^2$

Volume of a sphere = $\frac{4}{3}\pi r^3$

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

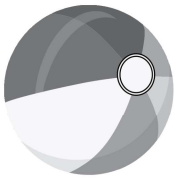
$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

Examiner only

1. Enzo and Jane are taking a group of children to the beach for a day trip.
They go to a shop to buy some items for the trip.



(a) Complete Enzo's bill below. [4]

12·3 ÷ 4·1

Enzo's Bill		
15	Buckets	£ 35·25
3	Sets of spades	£12.30
17	Toy ducks	£ 16·15
	Total	£ 63·70

15 x 2.35

17 x 0.95

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(b) Enzo is given a 10% discount.
How much discount will he get? [1]

0·1 x 63·7 = £ 6·37

(c) Jane has £15 to spend.
The shop has a special offer on beach balls:

'Buy two get one free'

What is the maximum number of beach balls Jane can buy? [2]

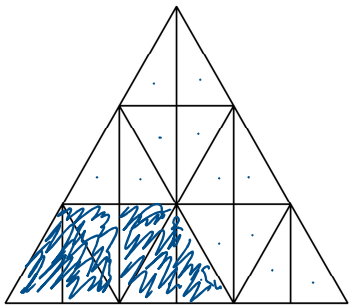
15 ÷ 3·2 = 4·6875 can buy 4, which means 2 more free, so 6 in total

Examiner only

2. (a) Write the number 340 205 in words. [1]

Three hundred and forty thousand, two hundred and five.

(b) Shade $\frac{1}{3}$ of the following shape. [1]



18 triangles
18 ÷ 3 = 6

(c) What is the value of the 2 in the number 5·2614? [1]
Circle your answer.

$\frac{2}{1}$ $\frac{2}{100}$ $\frac{2}{10}$ 2000 200

(d) Write these numbers in order of size.
Start with the smallest. [1]

6 –3 –5 3·6 3·45

Smallest				Largest
-5	-3	3.45	3.6	6

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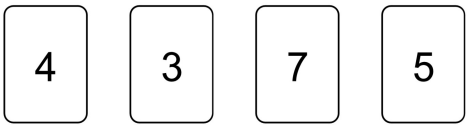
Examiner only

(e) Here are four cards with numbers on them.



(i) Write down the largest four-digit number that can be made by rearranging the cards. [1]

.....

.....

7 5 4 3

(ii) Write down the smallest **even** four-digit number that can be made by rearranging the cards. [1]

.....

.....

3 5 7 4

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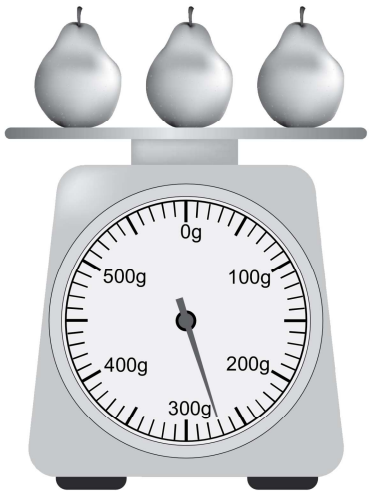
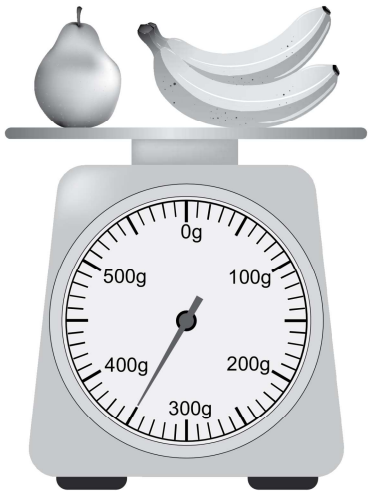
Examiner only

3. The scales below are used to measure the mass of some fruit in grams.

(a) What is the total mass of the fruit on each of the scales? [1]



270 grams



350 grams

(b) Calculate the mass of each pear and the mass of each banana.

Assume that:

- each pear has the same mass
- each banana has the same mass. [3]

270 ÷ 3 = 90g ← pears

350 - 90 = 260

260 ÷ 2 = 130

Pear 90 grams Banana 130 grams

Examiner only

4. (a) (i) One hundred tickets are sold in a raffle.
A ticket is to be selected at random and the person with that ticket wins the prize.
Sandra buys one of the tickets.

Circle the expression that describes the chance that Sandra wins the prize in the raffle. [1]

impossible **unlikely** **an even chance** **likely** **certain**

(ii) Henry has six pairs of shoes in his cupboard.
He picks one shoe out at random.

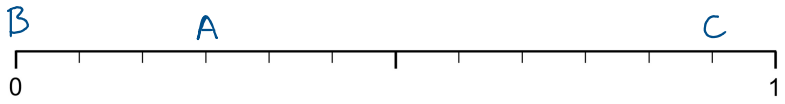
Circle the expression that describes the chance that Henry picks out a shoe for his left foot. [1]

impossible **unlikely** **an even chance** **likely** **certain**

(b) Zac has a bag containing 12 marbles.
1 marble is green, 3 are red and the rest are blue.
Zac chooses one marble at random from the bag.

On the probability scale shown below, label the points **A**, **B** and **C** where:

- **A** is the probability that Zac chooses a red marble → 3/12
- **B** is the probability that Zac chooses a yellow marble → 0
- **C** is the probability that Zac chooses a marble that is not green. 11/12 [3]



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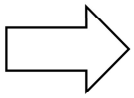
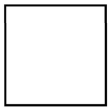
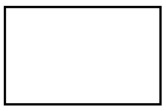
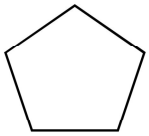
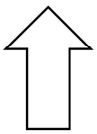
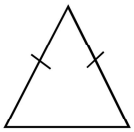
5. Nine shapes are shown below.

Shape A	Shape B	Shape C
		

Shape D	Shape E	Shape F
		

Shape G	Shape H	Shape I
		

Complete the following sentences. [4]

Shapes D and E have only two lines of symmetry.

Shape B has rotational symmetry of order 4.

Shapes A and H are congruent.

Shapes C and G are similar but not congruent.

Examiner only

6. The table below shows part of a train timetable between Portsmouth Harbour and London Waterloo.

Train Times: Portsmouth Harbour to London Waterloo

Portsmouth Harbour	06:15	07:14	07:45	08:15	08:45	09:15	09:45
Petersfield	06:48	07:45	08:17	08:47	09:17	09:47	10:17
Haslemere	07:02	07:59	08:31	09:01	09:31	10:00	10:31
Guildford	07:16	08:17	08:49	09:18	09:48	10:18	10:48
London Waterloo	07:53	08:56	09:30	09:55	10:29	10:52	11:24

(a) Elise catches the 08:45 train from Portsmouth Harbour to London Waterloo.

How long should her train journey take? [2]

8:45 +15 = 9:00 ; 9:00 +60 = 10:00 ; 10:00 +29 = 10:29 ; 15+60+29 = 104 mins

(b) Paul lives in Petersfield and works in Guildford.
He starts work at 10 a.m.
It takes him 15 minutes to walk from the train station to work.
Paul needs to arrive at work on time.

What is the time of the latest train from Petersfield he can take? [2]

10:00 − 15mins = 9:45 am ← train must arrive in Guilford so need to be on 9:18 arrival

9:18 leaves Petersfield at 08:47

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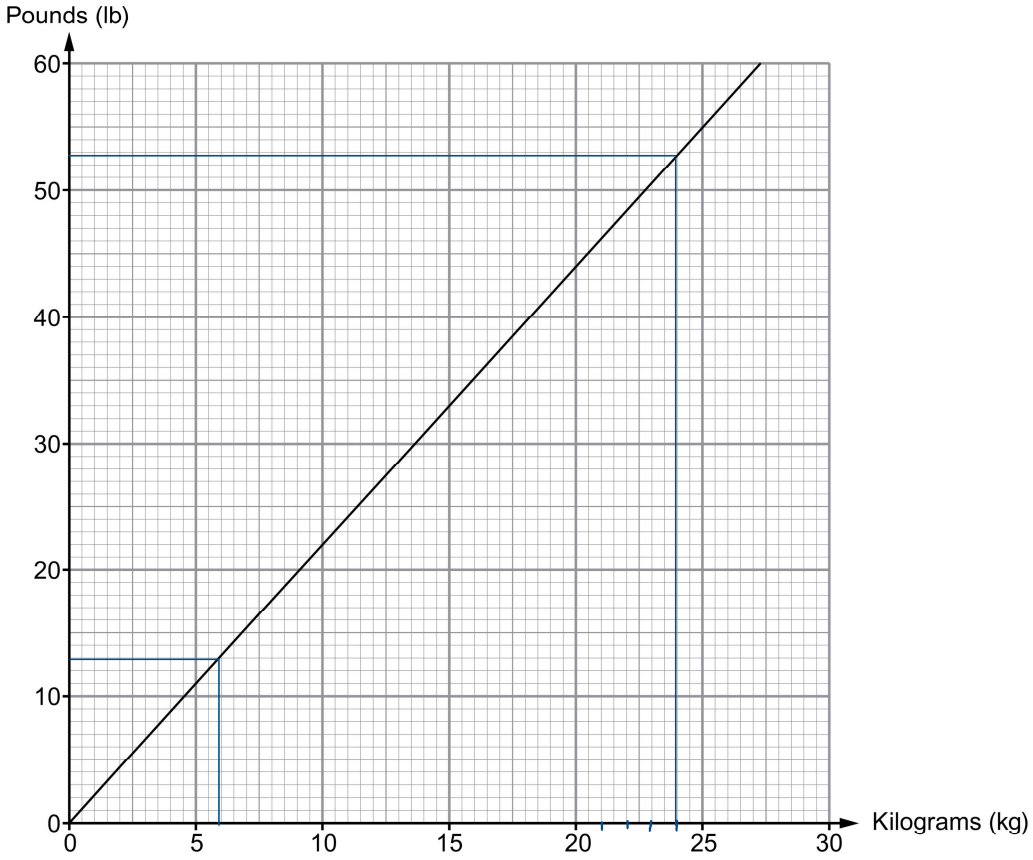
7. Georgia is going on holiday to France.
She takes one large suitcase and one piece of hand luggage.

The graph below can be used to convert between kilograms and pounds.



(a) (i) Georgia's suitcase has a mass of 24 kg.
What is the mass of the suitcase in pounds? [1]

52.8 lb

(ii) Her hand luggage has a mass of 13 pounds.
What is the mass of her hand luggage in kilograms? [1]

5.9 kg

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Examiner only

(b) A car hire company in France uses the following formula to calculate costs in euros (€).

Car hire cost = €11.25 x number of days car hire + insurance

(i) Georgia decides to hire a car for 8 days.
Insurance will cost her €95.

Calculate the cost of Georgia's car hire. [2]

$(11.25 \times 8) + 95 = €185$

(ii) Meena is also hiring a car from the same company.
She has €270 to spend on car hire.
Insurance will cost her €126.
She wants to hire the car for as many days as possible.

For how many whole days can Meena afford to hire the car? [3]

$270 = 11.25 \times d + 126$
$-126 \quad\quad\quad\quad\quad\quad -126$

$144 = 11.25d$
$\div 11.25 \quad\quad \div 11.25$

$12.8 = d$ 12 whole days

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Examiner only

8. Malik is planning a birthday party for 25 children.
He can choose either a swimming party or an adventure centre party.

Swimming Party

£320 for 20 children.
£7.25 for each additional child.

Special Offer:
$\frac{1}{3}$ off the total cost of the party.

Adventure Centre Party

£13.60 per child.
15% off the total cost for groups of more than 20 children.

Malik works out the total cost for each party.
He chooses the cheaper of the parties.

Which party does Malik choose?

Swimming Party ☑ Adventure Centre Party ☐

You must show all your working. [7]

Swimming Party 320 + (5 x 7.25) = 356.25

1/3 x 356.25 = 118.75

356.25 - 118.75 = £237.50

Adventure Centre Party 25 x 13.60 = 340

0.15 x 340 = 51

340 - 51 = £289

Examiner only

9. Rochelle is training for a marathon.
For each of the last five weeks she has recorded how many miles she has run.

- Rochelle runs a whole number of miles each week.
- Her median is 23 miles.
- Her mode is 29 miles.
- Her range is 8 miles.

How many miles in total has Rochelle run in the last five weeks?
You may use the boxes below to help you. [5]

21	22	23	29	29

Sum = 124 miles

Total number of miles Rochelle has run 124

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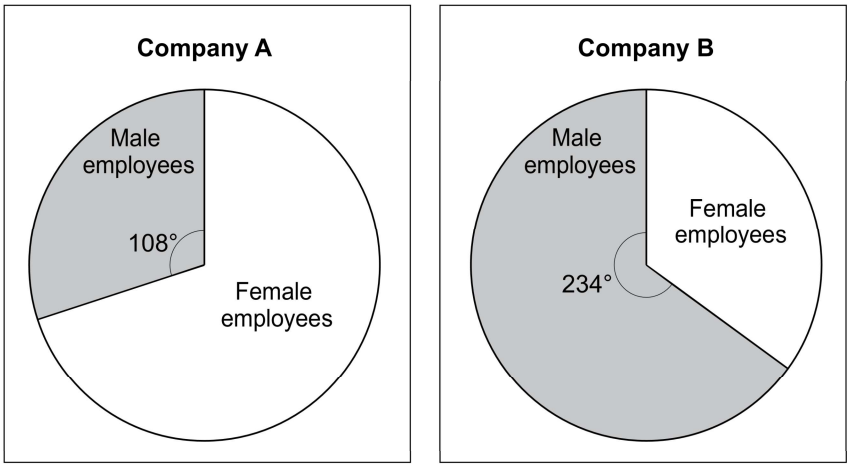
Examiner only

10. Two different companies use pie charts to show the proportion of male and female employees.



(a) Jamie says,

"Company A has more female employees than Company B."

Give a reason why he may be incorrect. [1]

Company B may have a lot more employees than A.

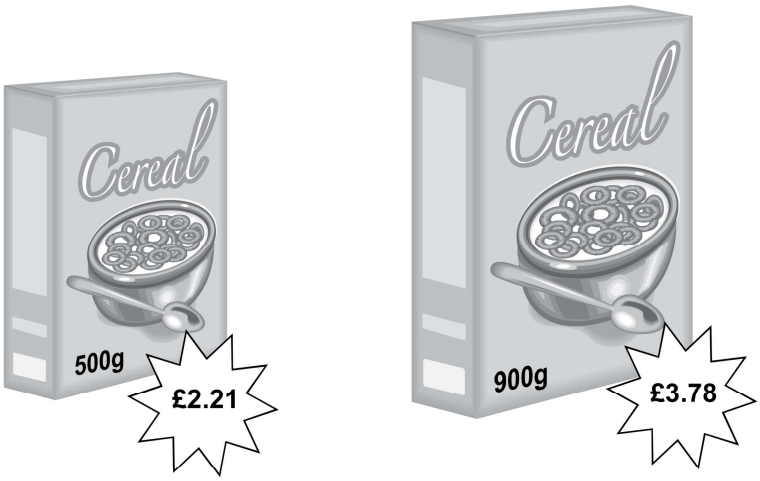
(b) Calculate the difference between the **percentage** of male employees in Company A and the **percentage** of male employees in Company B. [3]

$\frac{234}{360} - \frac{108}{360} = \frac{126}{360} = 0.35$

$= 35\%$

Examiner only

11. A shop sells the same breakfast cereal in two different-sized boxes.



Which box is the better value for money?

500 g ☐ 900 g ☑

You must show all your working. [2]

cost ÷ amount

2·21 ÷ 500 = 0·00442

3·78 ÷ 900 = 0·0042 ← less so cheaper

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Examiner only

12. (a) Simplify $10a \div 2$. [1]

$5a$

(b) Solve $4x - 5 = 2$. [2]

$+5 \quad +5$

$4x = 7$

$\div 4 \quad \div 4$

$x = 1.75$

(c) Expand $7(g - 6)$. [1]

$7g - 42$

(d) Factorise $6x + 4$. [1]

$2(3x + 2)$

(e) The shape below is a square.

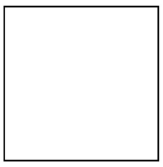


Diagram not drawn to scale

(i) Find an expression for the perimeter of the square.
Simplify your answer. [2]

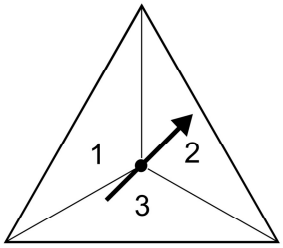
$8x \times 4 = 32x$

(ii) Find an expression for the area of the square.
Simplify your answer. [2]

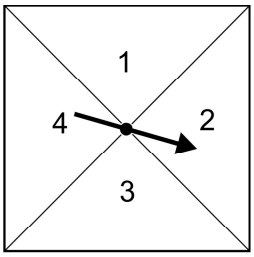
$8x \times 8x = 64x^2$

Examiner only

13. Hubert plays a game.
He spins these two fair spinners.



Spinner 1



Spinner 2

Hubert calculates a score. He **squares** the number on spinner 1 and **multiplies** it by the number on spinner 2.

(a) Complete the table below to show all the possible scores. [2]

Spinner 1 \ Spinner 2	1	2	3	4
3 (9)	9	18	27	36
2 (4)	4	8	12	16
1 (1)	1	2	3	4

Spinner 2

(b) To win the game Hubert must score **more than** 9.
He plays the game 108 times.

How many times would you expect him to win? [3]

$P(>9) = 5/12$

$5/12 \times 108 = 45$ times

Examiner only

14. Lynda cycles 31·5 km from home to work each day.

(a) One day, her journey to work takes her 1 hour and 45 minutes.

Calculate her average speed in km/h. [2]

$S = \frac{d}{t} = \frac{31.5}{1.75}$

$= 18$ km/h

(b) Lynda cycles home following the same route.
She leaves work at 4 p.m.
Her average speed on this journey is 15 km/h.

At what time does Lynda arrive home?
You must show all your working. [4]

$t = \frac{d}{S} = \frac{31.5}{15} = 2.1$ hrs

$0.1 \times 60 = 6$ $= 2$ hrs 6 mins

$\therefore$ 6:06 pm

Examiner only

15.

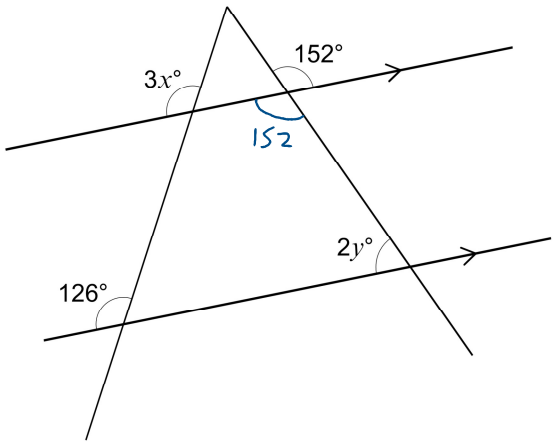


Diagram not drawn to scale

Find the value of x and the value of y. [3]

$126 = 3x$ (÷3 ÷3)

$42 = x$

$152 + 2y = 180$ (−152 −152)

$2y = 28$ (÷2 ÷2)

$y = 14$

$x =$ 42 $\quad y =$ 14

16. Calculate the value of $\dfrac{\sqrt{1456}}{1{\cdot}3^3 - 0{\cdot}7}$.

Give your answer correct to 1 decimal place. [2]

$25.489357342 \approx 25.5$ (1dp)

Examiner only

17. Tobias has a tank in the shape of a cuboid.
It has length 40 cm, width 25 cm and depth 32 cm.
He uses a jug with a capacity of 2 litres to fill the tank.
The tank and jug are shown below.

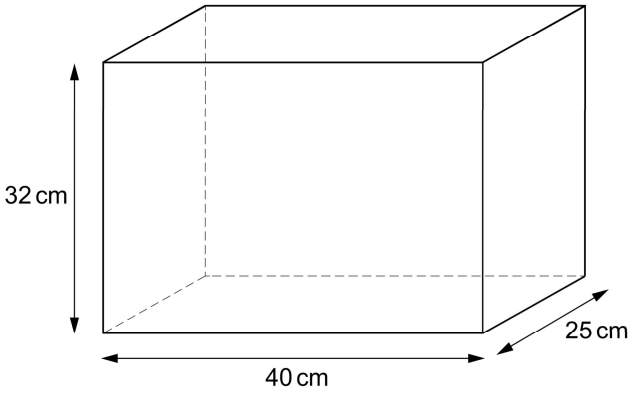


Diagram not drawn to scale

Jug capacity
2 litres

Tobias fills the jug to the top with water and pours it into the tank.
He repeats the process until the tank is full.

How many times does Tobias fill the jug? [5]

$V_{tank} = 32 \times 40 \times 25$

$= 32000\ cm^3$

$1L = 1000cm^3$

$2L = 2000$

$32000 \div 2000 = 16$ times

Tobias fills the jug ..... 16 ..... times.

Examiner only

18. Nathan and Lucy make and sell wooden items for gardens.

(a) Nathan makes and sells benches, tables and tool sheds.
Last year, the profit he made from selling these items was in the following ratio.

benches	:	tables	:	tool sheds
2	:	3	:	7

(i) What fraction of his profit did Nathan make from selling benches and tables? [1]

$\frac{2+3}{2+3+7} = \frac{5}{12}$

(ii) His total profit was £18 072.

How much profit did Nathan make from the sale of tool sheds? [2]

$2+3+7 = 12$

$18072 \div 12 = 1506$

b t ts

2 : 3 : 7) x1506

£10 542

(b) Lucy makes and sells planters.
Each planter costs Lucy £32 to make.
Each one that she sells makes a **profit** of £80.

What is Lucy's profit from the sale of one planter as a percentage of the cost to make the planter? [2]

$\frac{80}{32} = 2.5$

$= 250\ \%$

Examiner only

19. The table gives a summary of the masses, m grams, of 30 buzzards.

650 750 850 950

Mass, m (grams)	$600 \leqslant m < 700$	$700 \leqslant m < 800$	$800 \leqslant m < 900$	$900 \leqslant m < 1000$
Frequency	8	7	4	11

(a) Moeen uses the midpoint of each group to calculate an estimate of the mean mass of these buzzards.
He does this correctly.

Calculate Moeen's answer. [3]

650 × 8 = 5200

750 × 7 = 5250

850 × 4 = 3400

950 × 11 = 10450 +

24300

mean = 24300 ÷ 30

= 810 g

(b) Deeta decides to estimate the mean mass of these buzzards.
She uses the values 600, 700, 800 and 900 rather than the midpoints.

Explain why her method is unlikely to give a good estimate of the mean mass. [1]

she is using the smallest possible values so the mean will very likely be too small.

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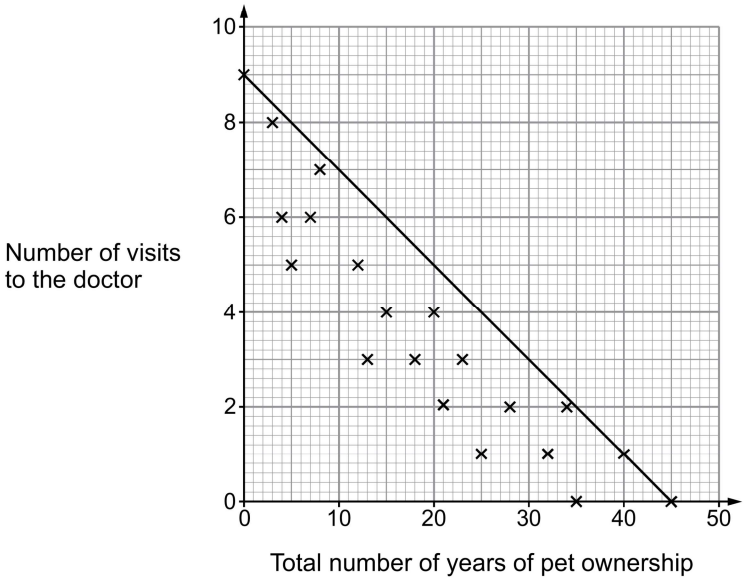
20. Debbie collects data about a group of 20 people.

Her data is:

- the total number of years for which they have owned a pet
- the number of visits they have each made to their doctor in the last year.

The scatter graph shows her results and her attempt to draw a line of best fit for the data.



(a) Make a criticism of Debbie's line of best fit. [1]

It does not follow the trend of the data

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(b) Debbie says,

Because there is a negative correlation, owning a pet for longer **causes** people to need to visit the doctor less often.

Is Debbie correct?

Yes ☐ No ☑

Explain how you decide. [1]

correlation does not necessarily mean causation

Examiner only

21. Janet invests £5000 in a savings account for 9 years.
She makes no further payments into or out of her account in this time.

For the first 5 years, her investment earns 2% compound interest per year.
After this, the interest rate decreases to 1·3% compound interest per year.

How much is Janet's investment worth at the end of the 9 years? [4]

$5000 \times (1 + 0.02)^5 = 5520.404016$

$5520.404016 \times (1 + 0.013)^4 = 5813.111385$

$= £5813.11$

22. (a) Circle the correct conversion of $7\,m^3$ to cm^3. [1]

0·00007 0·07 700 70000 **7000000**

$7 \times 100 \times 100 \times 100 = 7\,000\,000$

$m \rightarrow cm$ (×100)

$m^2 \rightarrow cm^2$ (×100 ×100)

$m^3 \rightarrow cm^3$ (×100 ×100 ×100)

Examiner only

(b) The diagram shows a shape made from a trapezium and a circle.

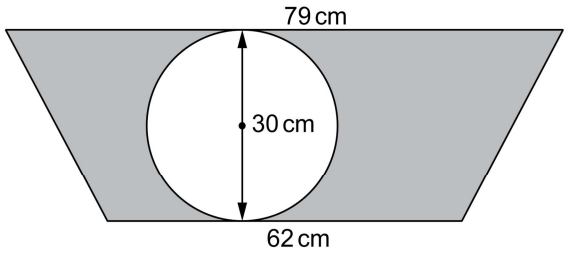

Diagram not drawn to scale

The parallel sides of the trapezium are tangents to the circle.
The diameter of the circle is 30 cm.

The ratio of the white area to the **shaded** area is as follows.

white area	:	shaded area
1	:	k

Find the value of k.
Show all your working and give your answer correct to 1 significant figure. [6]

white area = $\pi \times 15^2 = 225\pi$

trapezium = $\frac{a+b}{2} \times h = \frac{62+79}{2} \times 30 = 2115$

shaded = $2115 - 225\pi$

$= 1408.141653$

k = shaded ÷ white

$= 1408.141653 \div 225\pi$

$= 1.99\ldots$

$= 2$ (1sf)

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23. (a) Solve $5x+4=2x+6$. [2]

$5x+4=2x+6$

$-2x \quad -2x$

$3x+4=6$

$-4 \quad -4$

$3x=2$

$\div 3 \quad \div 3$

$x=2/3$

(b) Solve $4x-3>17$. [2]

$+3 \quad +3$

$4x>20$

$\div 4 \quad \div 4$

$x>5$

(c) Solve the following simultaneous equations. Use an algebraic (not graphical) method.

$5x-2y=16$ (1)

$x-y=5$ (2)

You must show all your working. [3]

$5x-2y=16$

(2) x 2 $\quad 2x-2y=10$ −

$3x=6$

$\div 3 \quad \div 3$

$x=2$

$x-y=5$

$2-y=5$

$+y \quad +y$

$2=y+5$

$-5 \quad -5$

$y=-3$

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24.

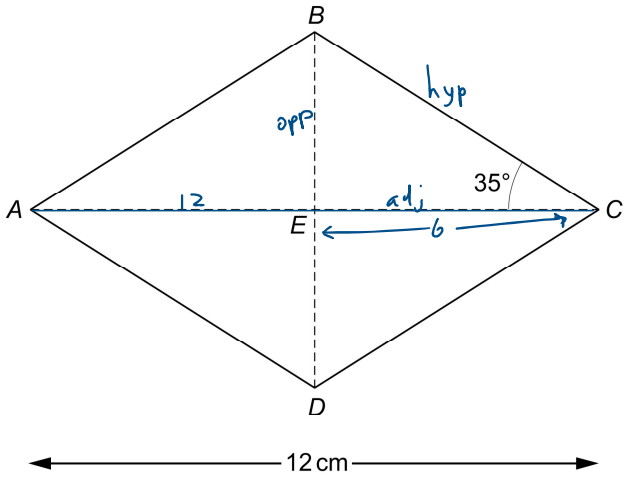

Diagram not drawn to scale

The diagram shows a rhombus, *ABCD*.
AC and *BD* intersect at *E*.
The length of *AC* is 12 cm.
$B\hat{C}E$ is 35°.

Find the perimeter of *ABCD*. [6]

$\cos\theta = \frac{A}{H} \rightarrow \cos 35 = \frac{6}{H}$

$H = \frac{6}{\cos 35} = 7.32$

Perimeter $= 4 \times 7.32$

$= 29.3$ cm (1 dp)

Perimeter of *ABCD* = 29.3 cm

END OF PAPER

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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