

Stinky Farm

Moderate difficulty maths paper

Optional time limit: 30 minutes

This paper is based on the 11 Plus Lifeline maths paper 'Stinky Farm', with some question changes to accommodate the multiple-choice format.

Select the correct answer(s) by drawing a line through the relevant box (or boxes, if appropriate), as in this example:

A	5	<input checked="" type="checkbox"/>
B	9	<input type="checkbox"/>
C	13	<input type="checkbox"/>
D	22	<input type="checkbox"/>

Each question is worth 1 mark. Any exceptions to this rule will be indicated in the solutions that follow the question paper.

You may wish to use a separate sheet of paper for your working-out.

1. (a) Subtract 35 from 128.

A	94	<input type="checkbox"/>
B	93	<input type="checkbox"/>
C	163	<input type="checkbox"/>
D	83	<input type="checkbox"/>

(b) What is the remainder when 544 is divided by 3?

A	0	<input type="checkbox"/>
B	1	<input type="checkbox"/>
C	2	<input type="checkbox"/>
D	181	<input type="checkbox"/>

(c) What is the product of 6 and -5 ?

- | | | |
|----------|-------|--------------------------|
| A | -30 | <input type="checkbox"/> |
| B | -1 | <input type="checkbox"/> |
| C | 1 | <input type="checkbox"/> |
| D | 30 | <input type="checkbox"/> |

(d) Choose a positive factor of 40.

- | | | |
|----------|------|--------------------------|
| A | 0 | <input type="checkbox"/> |
| B | 80 | <input type="checkbox"/> |
| C | 15 | <input type="checkbox"/> |
| D | 8 | <input type="checkbox"/> |

2. Heidi has 322 chickens. 177 of them are male and the rest are female.

(a) (i) How many female chickens does Heidi have, correct to the nearest 10?

- | | | |
|----------|-------|--------------------------|
| A | 140 | <input type="checkbox"/> |
| B | 150 | <input type="checkbox"/> |
| C | 170 | <input type="checkbox"/> |
| D | 180 | <input type="checkbox"/> |

(ii) What is the value of the 3 in 322?

- | | | |
|----------|-------|--------------------------|
| A | 3 | <input type="checkbox"/> |
| B | 30 | <input type="checkbox"/> |
| C | 300 | <input type="checkbox"/> |
| D | 10 | <input type="checkbox"/> |

(b) How many male chickens would Heidi need to sell in order for exactly half of her chickens to be female?

- | | | |
|----------|------|--------------------------|
| A | 16 | <input type="checkbox"/> |
| B | 32 | <input type="checkbox"/> |
| C | 35 | <input type="checkbox"/> |
| D | 64 | <input type="checkbox"/> |

3. Here is a number pattern, with a number missing:

25 18 12 7 3 —

- (a) From the five numbers given above, select:

- (i) a factor of 100

- | | | |
|---|----|--------------------------|
| A | 25 | <input type="checkbox"/> |
| B | 18 | <input type="checkbox"/> |
| C | 12 | <input type="checkbox"/> |
| D | 7 | <input type="checkbox"/> |
| E | 3 | <input type="checkbox"/> |

- (ii) a multiple of 6

- | | | |
|---|----|--------------------------|
| A | 25 | <input type="checkbox"/> |
| B | 18 | <input type="checkbox"/> |
| C | 12 | <input type="checkbox"/> |
| D | 7 | <input type="checkbox"/> |
| E | 3 | <input type="checkbox"/> |

- (iii) two prime numbers

- | | | |
|---|----|--------------------------|
| A | 25 | <input type="checkbox"/> |
| B | 18 | <input type="checkbox"/> |
| C | 12 | <input type="checkbox"/> |
| D | 7 | <input type="checkbox"/> |
| E | 3 | <input type="checkbox"/> |

- (b) What is the median of the five numbers given above?

- | | | |
|---|----|--------------------------|
| A | 7 | <input type="checkbox"/> |
| B | 12 | <input type="checkbox"/> |
| C | 13 | <input type="checkbox"/> |
| D | 18 | <input type="checkbox"/> |


(c) What is the missing number?

- A -2 ☐
- B -1 ☐
- C 0 ☐
- D 1 ☐

(d) Find the median of all six numbers in the pattern.

- A 7 ☐
- B 9 ☐
- C 9.5 ☐
- D 12 ☐


4.



Stinky Farm

Buy 3 eggs, get 1 free!

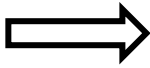

Eggs 20p each



Beauvoir Dairy

Buy 6 eggs, get 2 free!

Eggs 15p each

(a) Marco sees these signs and decides to buy some eggs.

(i) If he collects five eggs from Stinky Farm, how much money will he spend?

- A 60p ☐
- B 80p ☐
- C £1 ☐
- D £1.20 ☐

(ii) If he collects five eggs from Beauvoir Dairy and pays with a £2 coin, how much change will he get back?

- A £1 ☐
- B £1.20 ☐
- C £1.25 ☐
- D £1.55 ☐

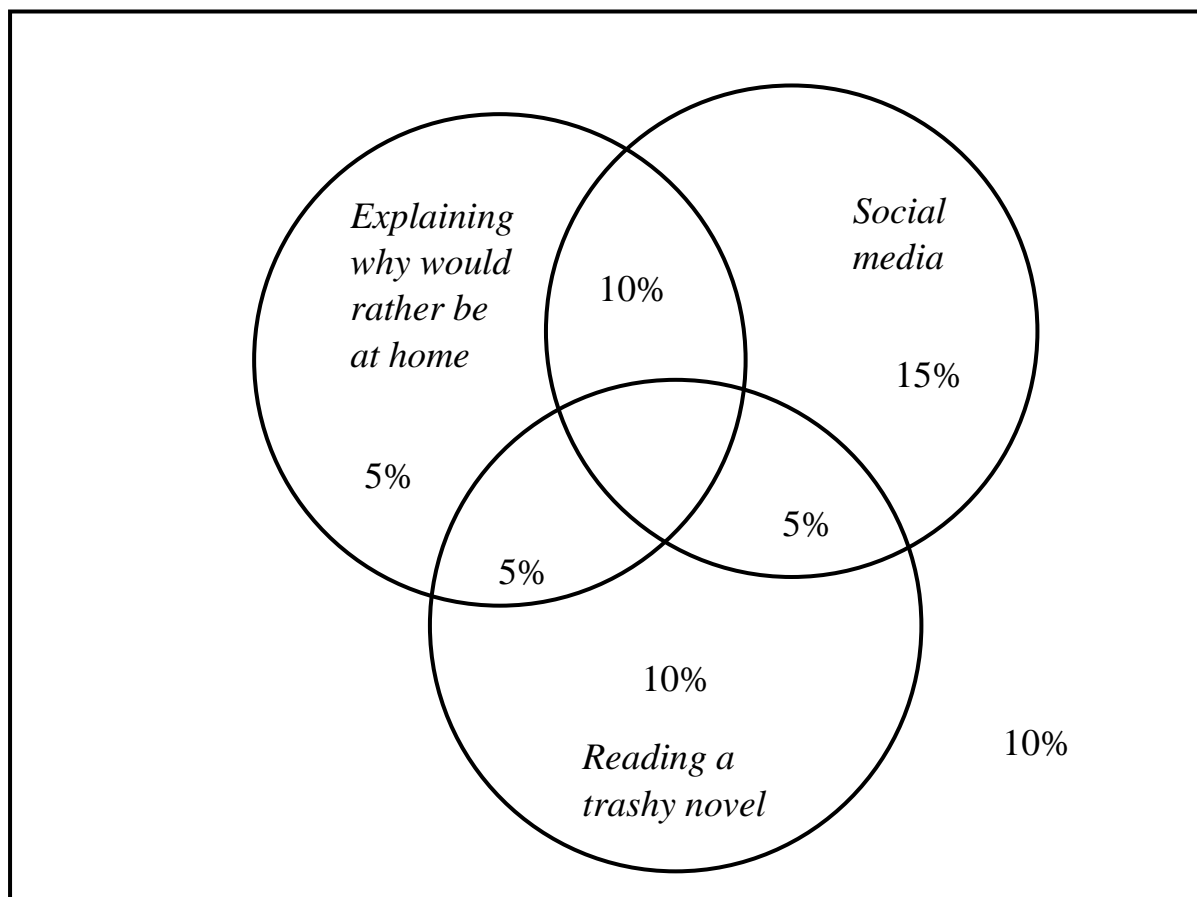
(b) Nicoletta says that buying four eggs costs the same, whichever farm you buy them from. Marco says this isn't true.

Who is right?

- | | | |
|---|-----------------|--------------------------|
| A | Nicoletta | <input type="checkbox"/> |
| B | Marco | <input type="checkbox"/> |
| C | Neither of them | <input type="checkbox"/> |
| D | Both of them | <input type="checkbox"/> |

5. *Sun-lounger Sales Figures*, an interesting magazine for the sun-lounger industry, carried out a survey in which they asked people to write down their favourite holiday activities. They interviewed 240 people, all of whom said that they enjoyed going on holiday.

Here are their results as a Venn diagram, using percentages. One number is missing.



(a) One result is missing. What is the missing percentage, and where should it go?

- A 40%, in the centre ☐
- B 40%, outside the box ☐
- C 60%, in the centre ☐
- D 60%, outside the circles ☐

(b) 10% of results are inside the box above, but outside the circles.

(i) How many people does this percentage represent?

- A 14 ☐
- B 16 ☐
- C 24 ☐
- D 36 ☐

(ii) Choose a possible answer to the survey which would belong in this 10%.

- A Reading trashy novels & social media ☐
- B Fishing & social media ☐
- C Social media ☐
- D Swimming & reading comic books ☐

(c) *Sun-lounger Sales Figures* say this:

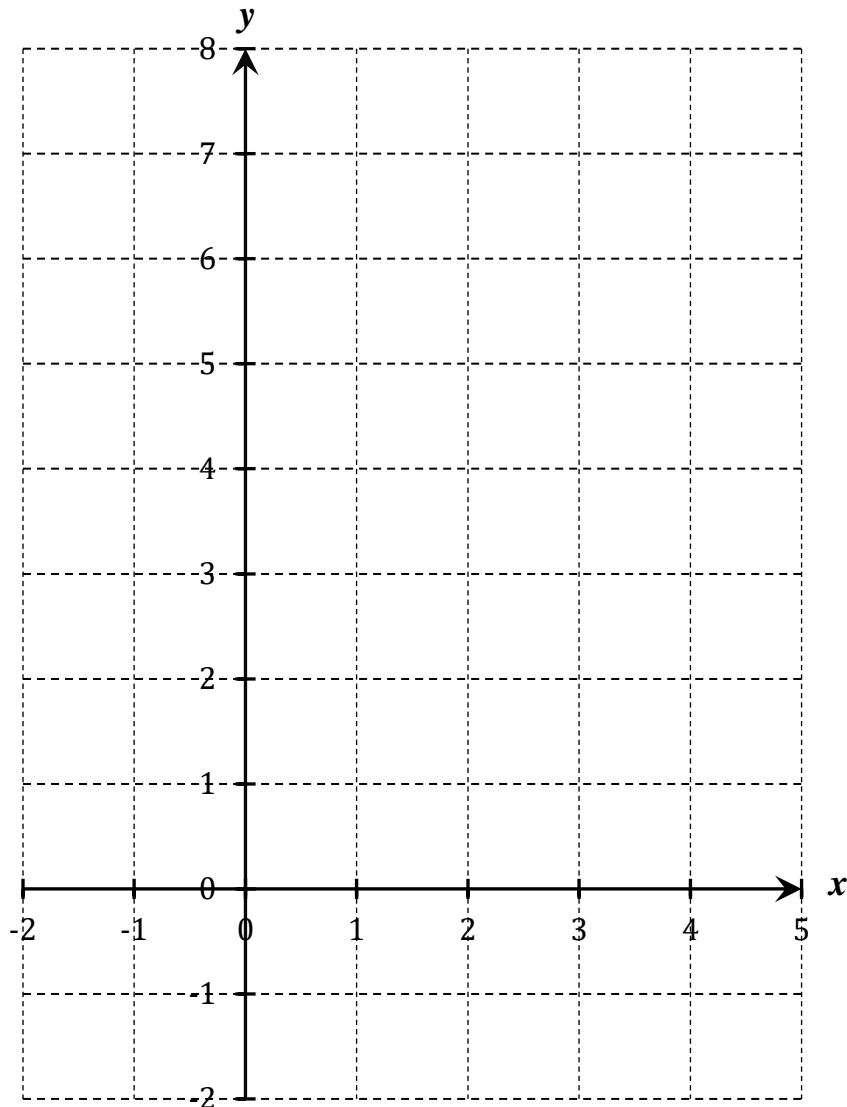
"These results are bad news for the sun-lounger industry."

Which of the following options **is not** a reasonable comment on this statement?

- A *It is fully supported by the survey results, which are bad news for the industry.* ☐
- B *The survey results do not conclusively support or undermine the statement.* ☐
- C *It may be true, because people don't seem to place a high priority on sunbathing.* ☐
- D *It may be wrong, because all the activities named can be done while lying on a sun-lounger.* ☐

6. The following three coordinates are points on the centimetre grid below:

(1, 3) (1, 6) (3, 3)



- (a) These three points form a triangle. What is its area?

- A 3 cm² ☐
 B 3.5 cm² ☐
 C 4 cm² ☐
 D 4.5 cm² ☐

- (b) (i) By adding one new point to the three already given, you can form a **rectangle**.

Which of the following coordinate pairs describe this new point?

- A $(-1, 6)$ ☐
B $(5, 6)$ ☐
C $(3, 6)$ ☐
D $(6, 3)$ ☐

(ii) Instead of forming a rectangle, you could form a different **parallelogram** by adding one new point. There are two different ways of doing this.

Select the **two** possible coordinate points.

- A $(0, 6)$ ☐
B $(-1, 6)$ ☐
C $(3, 0)$ ☐
D $(0, 3)$ ☐

(iii) Think about either one of the parallelograms from your answer to part (ii).

How many lines of symmetry does it have?

- A 0 ☐
B 1 ☐
C 2 ☐
D 4 ☐

7. Seven friends are having a competition to see who can talk for longest without pausing.

The following table shows their results:

	Time (seconds)
Chris	18
Terri	18
Stacey	9
Olivier	16
Stephanie	25
Alex	6
Nick	13

(a) What is the range of the results?

- A 18 seconds ☐
- B 15 seconds ☐
- C 5 seconds ☐
- D 19 seconds ☐

(b) What is the mode?

- A 18 seconds ☐
- B 15 seconds ☐
- C 5 seconds ☐
- D 19 seconds ☐

(c) Olivier says that his result is the same as the mean. Terri says that he is silly: in her opinion he has the median result.

Choose the correct answer.

- A They are both right ☐
- B They are both wrong ☐
- C Terri is right ☐
- D Olivier is right ☐

(d) Leo says that he can talk for longer than Stephanie. She says he has to prove it, so he joins the competition. After he has had his go, the mean talking time is 16 seconds.

Did Leo talk for longer than Stephanie?

- A Yes ☐
- B No ☐
- C The times are equal ☐
- D Impossible to determine ☐

8. The Gran Zebrù is a mountain in Italy. Its highest point is 3900 metres above sea level.

Mary decides to climb the Gran Zebrù. She starts climbing at Martell, a village which is 1300 metres above sea level.

(a) What is 3900 metres in kilometres?

- A 390 km ☐
- B 39 km ☐
- C 3.9 km ☐
- D 0.39 km ☐

(b) What fraction of the whole 3900 metre height does Mary climb?

- A $\frac{1}{4}$ ☐
- B $\frac{1}{3}$ ☐
- C $\frac{3}{5}$ ☐
- D $\frac{2}{3}$ ☐

(c) Vlada wants to get to the top before Mary. She hires a helicopter to take her up the other side of the mountain, before climbing the last 520 metres.

What percentage of the whole 3900 metre height does Vlada climb, to the nearest percent?

- A 13% ☐
- B 30% ☐
- C 53% ☐
- D 55% ☐

(d) "Mary climbs 400% further than Vlada."

Is this correct?

- A Yes ☐
- B No ☐
- C Not possible to know ☐

9. If the following fractions are written in order, from smallest to largest, what is the result?

$$\frac{4}{7} \quad \frac{7}{4} \quad 1\frac{5}{8} \quad \frac{27}{16} \quad \frac{5}{9}$$

- A $\frac{4}{7}$ $\frac{7}{4}$ $\frac{5}{9}$ $\frac{27}{16}$ $1\frac{5}{8}$ ☐
- B $\frac{5}{9}$ $\frac{7}{4}$ $1\frac{5}{8}$ $\frac{27}{16}$ $\frac{4}{7}$ ☐
- C $\frac{4}{7}$ $\frac{7}{4}$ $\frac{27}{16}$ $1\frac{5}{8}$ $\frac{5}{9}$ ☐
- D $\frac{5}{9}$ $\frac{4}{7}$ $1\frac{5}{8}$ $\frac{27}{16}$ $\frac{7}{4}$ ☐

10. (a) I take a number, add 62 and divide by 6. My answer is 16.5.

What number did I start with?

- A -273 ☐
B 37 ☐
C 64.75 ☐
D 13.08 ☐

- (b) I square a number then divide the result by 28.438. My answer is 28.438.

What number did I start with?

- A 28.438 ☐
B 808.7 ☐
C 5.33 ☐
D 5 ☐

- (c) Based on the following facts, what is my number?

- It has a square root which is a prime number.
- Multiply my number by 4, and the result is a multiple of 10.
- My number is below 100.

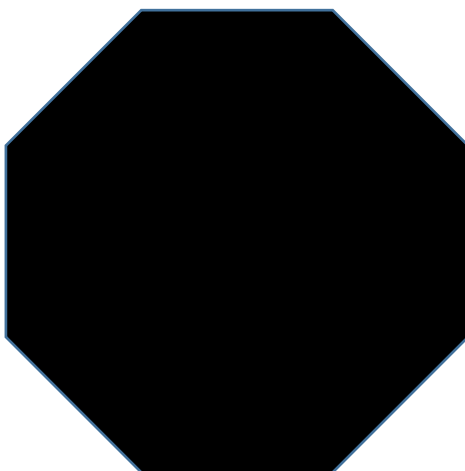
- A 9 ☐
B 5 ☐
C 40 ☐
D 25 ☐

- (d) I add 5 to a positive integer, divide the result by 2, multiply by 10, add four, divide by 11, then subtract 1. I end up with my original number.

What number did I start with?

- A 1 ☐
B 2 ☐
C 3 ☐
D 4 ☐

11. (a) What is the order of rotational symmetry of the following shape?



- | | | |
|---|---|--------------------------|
| A | 1 | <input type="checkbox"/> |
| B | 2 | <input type="checkbox"/> |
| C | 4 | <input type="checkbox"/> |
| D | 8 | <input type="checkbox"/> |

- (b) Bola makes the following statement:

"The shape from part (a) has eight lines of symmetry, because there is one line of symmetry running from the middle of each side."

Which comment on Bola's statement is most accurate?

- | | | |
|---|----------------------------------------------------------|--------------------------|
| A | <i>She is wrong, though with some correct reasoning.</i> | <input type="checkbox"/> |
| B | <i>She is right, but for the wrong reasons.</i> | <input type="checkbox"/> |
| C | <i>She is wrong, with incorrect reasoning.</i> | <input type="checkbox"/> |
| D | <i>She is right, for the reasons she gives.</i> | <input type="checkbox"/> |

12. (a) Choose the three numbers which correctly complete each of the following sequences.

(i)	24	12	6	_____	_____	_____	
A	3	0	-3				<input type="checkbox"/>
B	3	$\frac{3}{2}$	$\frac{3}{4}$				<input type="checkbox"/>
C	0	-6	-12				<input type="checkbox"/>
D	-6	-12	-18				<input type="checkbox"/>

(ii)	20	2	17	5	14	8	_____	_____	
A	2		-4						<input type="checkbox"/>
B	6		2						<input type="checkbox"/>
C	17		5						<input type="checkbox"/>
D	11		11						<input type="checkbox"/>

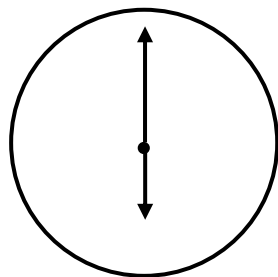
- (b) Select all the sequences below which follow this rule:

The first number must be a positive factor of 5. Each subsequent number is found by subtracting 4 from the previous number, then multiplying the result by 3.

A	5	3	-3	-21	-75	<input type="checkbox"/>
B	5	11	29	83	245	<input type="checkbox"/>
C	1	-1	-7	-25	-79	<input type="checkbox"/>
D	1	-9	-39	-129	-399	<input type="checkbox"/>

13. (a) What is the angle in degrees between the hands of a clock at the following times?

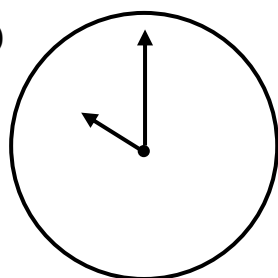
(i)



6 o'clock

- A 90° ☐
 B 180° ☐
 C 270° ☐
 D 45° ☐

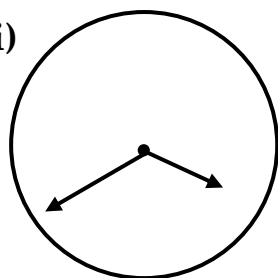
(ii)



10 o'clock

- A 45° ☐
 B 60° ☐
 C 75° ☐
 D 90° ☐

(iii)



20 to 4 o'clock

- A 150° ☐
 B 180° ☐
 C 130° ☐
 D 120° ☐

(b) At what time between 9 and 10 o'clock is there an angle of 50° between the clock hands?

- | | | |
|---|------|--------------------------|
| A | 9:15 | <input type="checkbox"/> |
| B | 9:30 | <input type="checkbox"/> |
| C | 9:40 | <input type="checkbox"/> |
| D | 9:45 | <input type="checkbox"/> |
-

14. Three positive integers (whole numbers) add up to 460.

The third integer is three times the second and five times the first.

Which of the following numbers is **not** one of the three integers?

- | | | |
|---|-----|--------------------------|
| A | 60 | <input type="checkbox"/> |
| B | 100 | <input type="checkbox"/> |
| C | 150 | <input type="checkbox"/> |
| D | 300 | <input type="checkbox"/> |
-

15. A woman pushes a briefcase into my hand, then vanishes into the crowd without letting me see her face. I open the briefcase and find a large number of unused £10 notes, numbered consecutively (in order, without gaps) from 39,989,298 to 40,003,246.

How much money does the briefcase contain?

- | | | |
|---|----------|--------------------------|
| A | £139,049 | <input type="checkbox"/> |
| B | £139,480 | <input type="checkbox"/> |
| C | £139,490 | <input type="checkbox"/> |
| D | £139,048 | <input type="checkbox"/> |
-

TOTAL MARKS: 48

Solutions

1. (a) Subtract 35 from 128.

- | | |
|------------------|-------------------------------------|
| A 94 | <input type="checkbox"/> |
| B 93 | <input checked="" type="checkbox"/> |
| C 163 | <input type="checkbox"/> |
| D 83 | <input type="checkbox"/> |

C can clearly be ruled out.

You should do some quick paper working-out, to avoid a mistake:

$$\begin{array}{r} 128 \\ - 35 \\ \hline 93 \end{array}$$

(b) What is the remainder when 544 is divided by 3?

- | | |
|------------------|-------------------------------------|
| A 0 | <input type="checkbox"/> |
| B 1 | <input checked="" type="checkbox"/> |
| C 2 | <input type="checkbox"/> |
| D 181 | <input type="checkbox"/> |

Remember to give the **remainder**, not the solution to the division (181), as your answer!

$$\begin{array}{r} 181 \\ 3 \overline{) 544} \\ \hline \end{array} \quad \text{r } 1$$

It's always wise to re-check the question before choosing your answer.

(c) What is the product of 6 and -5 ?

- | | | |
|--------------|---------------|-------------------------------------|
| A | -30 | <input checked="" type="checkbox"/> |
| B | -1 | <input type="checkbox"/> |
| C | 1 | <input type="checkbox"/> |
| D | 30 | <input type="checkbox"/> |

Remember that *a positive multiplied by a negative gives a negative*.

This rules out C and D.

(d) Choose a positive factor of 40.

- | | | |
|--------------|---------------|-------------------------------------|
| A | 0 | <input type="checkbox"/> |
| B | 80 | <input type="checkbox"/> |
| C | 15 | <input type="checkbox"/> |
| D | 8 | <input checked="" type="checkbox"/> |

A factor of 40 is any whole number which can be multiplied by another whole number to give 40.

0 is not a factor of any number, and 80 is greater than 40. These options can be eliminated.

2. Heidi has 322 chickens. 177 of them are male and the rest are female.

(a) (i) How many female chickens does Heidi have, correct to the nearest 10?

- | | | |
|---|-----|-------------------------------------|
| A | 140 | <input type="checkbox"/> |
| B | 150 | <input checked="" type="checkbox"/> |
| C | 170 | <input type="checkbox"/> |
| D | 180 | <input type="checkbox"/> |

The number of female chickens is the total number of chickens minus the number of male chickens:

$$\begin{array}{r} 282 \\ - 177 \\ \hline 145 \end{array} \quad \underline{\underline{150}}$$

145, rounded to the nearest 10, goes up to 150.

(ii) What is the value of the 3 in 322?

- | | |
|-----------------|-------------------------------------|
| A 3 | <input type="checkbox"/> |
| B 30 | <input type="checkbox"/> |
| C 300 | <input checked="" type="checkbox"/> |
| D 10 | <input type="checkbox"/> |

The 3 is worth 300, just as the first 2 is worth 20 and the second 2 is worth 2.

(b) How many male chickens would Heidi need to sell in order for exactly half of her chickens to be female?

- | | |
|------|-------------------------------------|
| A 16 | <input type="checkbox"/> |
| B 32 | <input checked="" type="checkbox"/> |
| C 35 | <input type="checkbox"/> |
| D 64 | <input type="checkbox"/> |

You know that there are 145 females, so you need 145 males as well:

$$\begin{array}{r} 177 \\ - 145 \\ \hline 32 \end{array} \quad \underline{\underline{32}}$$

However ... did you make **the following mistake?**

$$\begin{array}{r} 161 \\ 2 \overline{) 322} \\ \underline{322} \\ 0 \end{array} \quad \begin{array}{r} 177 \\ -161 \\ \hline 16 \end{array} \quad \underline{\underline{16}}$$

This gives the number of male chickens who would need to change sex and become female, in order for half to be female!

3. Here is a number pattern, with a number missing:

25 18 12 7 3 —

(a) From the five numbers given above, select:

(i) a factor of 100

- | | | |
|---|----|-------------------------------------|
| A | 25 | <input checked="" type="checkbox"/> |
| B | 18 | <input type="checkbox"/> |
| C | 12 | <input type="checkbox"/> |
| D | 7 | <input type="checkbox"/> |
| E | 3 | <input type="checkbox"/> |

$25 \times 4 = 100$, so 25 is a factor of 100.

(ii) a multiple of 6

- | | | |
|---|----|-------------------------------------|
| A | 25 | <input type="checkbox"/> |
| B | 18 | <input checked="" type="checkbox"/> |
| C | 12 | <input type="checkbox"/> |
| D | 7 | <input type="checkbox"/> |
| E | 3 | <input type="checkbox"/> |

OR

- | | | |
|---|----|-------------------------------------|
| A | 25 | <input type="checkbox"/> |
| B | 18 | <input type="checkbox"/> |
| C | 12 | <input checked="" type="checkbox"/> |
| D | 7 | <input type="checkbox"/> |
| E | 3 | <input type="checkbox"/> |

18 and 12 are in the 6-times table.

(iii) two prime numbers

- | | | |
|---|----|-------------------------------------|
| A | 25 | <input type="checkbox"/> |
| B | 18 | <input type="checkbox"/> |
| C | 12 | <input type="checkbox"/> |
| D | 7 | <input checked="" type="checkbox"/> |
| E | 3 | <input checked="" type="checkbox"/> |

These are prime because each one has **no factors other than itself and 1**.

This question is worth 1 mark in total, and 0 marks if either answer is wrong or missing.

(b) What is the median of the five numbers given above?

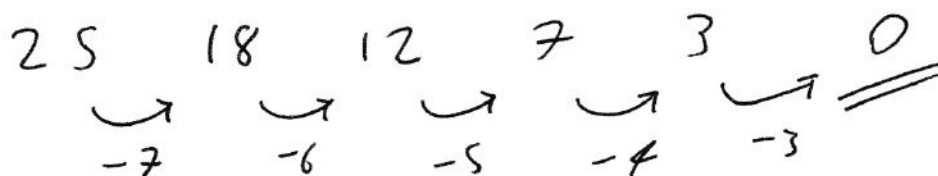
- | | | |
|---|----|-------------------------------------|
| A | 7 | <input type="checkbox"/> |
| B | 12 | <input checked="" type="checkbox"/> |
| C | 13 | <input type="checkbox"/> |
| D | 18 | <input type="checkbox"/> |

The median is **the middle number** when a list is written from lowest to highest, or vice versa.

(c) What is the missing number?

- | | | |
|---|----|-------------------------------------|
| A | -2 | <input type="checkbox"/> |
| B | -1 | <input type="checkbox"/> |
| C | 0 | <input checked="" type="checkbox"/> |
| D | 1 | <input type="checkbox"/> |

When you need to complete a sequence, *write the differences in the gaps*, and the pattern is likely to become clear:



(d) Find the median of all six numbers in the pattern.

- | | |
|-----------------|-------------------------------------|
| A 7 | <input type="checkbox"/> |
| B 9 | <input type="checkbox"/> |
| C 9.5 | <input checked="" type="checkbox"/> |
| D 12 | <input type="checkbox"/> |

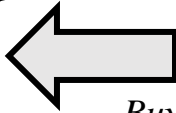
Now that you have six numbers, there are **two numbers in the middle**, so it is less simple to find the median than in part (b).

You need to go **half way between these two numbers**:


$$\frac{12 + 7}{2} = \frac{19}{2} = \underline{\underline{9.5}}$$

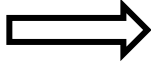
The easiest way to do this is to add them together, then divide the result by 2.

4.




Stinky Farm
Buy 3 eggs, get 1 free!
Eggs 20p each



Beauvoir Dairy 

Buy 6 eggs, get 2 free!
Eggs 15p each



(a) Marco sees these signs and decides to buy some eggs.

(i) If he collects five eggs from Stinky Farm, how much money will he spend?

- | | |
|---------|-------------------------------------|
| A 60p | <input type="checkbox"/> |
| B 80p | <input checked="" type="checkbox"/> |
| C £1 | <input type="checkbox"/> |
| D £1.20 | <input type="checkbox"/> |

Because of the 'buy 3 get 1 free' offer, one of Marco's eggs is free:

4 eggs @ 20p each + 1 free
∴ 80p

(ii) If he collects five eggs from Beauvoir Dairy and pays with a £2 coin, how much change will he get back?

- | | |
|---------|-------------------------------------|
| A £1 | <input type="checkbox"/> |
| B £1.20 | <input type="checkbox"/> |
| C £1.25 | <input checked="" type="checkbox"/> |
| D £1.55 | <input type="checkbox"/> |

None of the eggs are free this time:

$$\begin{array}{r}
 15 \\
 \times 5 \\
 \hline
 75
 \end{array}
 \qquad
 \begin{array}{r}
 1250 \\
 - 75 \\
 \hline
 125
 \end{array}
 \qquad
 \underline{\underline{\pounds 1.25}}$$

(b) Nicoletta says that buying four eggs costs the same, whichever farm you buy them from. Marco says this isn't true.

Who is right?

- | | |
|-------------------|-------------------------------------|
| A Nicoletta | <input checked="" type="checkbox"/> |
| B Marco | <input type="checkbox"/> |
| C Neither of them | <input type="checkbox"/> |
| D Both of them | <input type="checkbox"/> |

Stinky: 3 eggs @ 20p + 1 egg free
 \therefore 4 eggs for 60p

Beauvoir: 4 eggs @ 15p = 60p

Nicoletta is right

5. (a) One result is missing. What is the missing percentage, and where should it go?

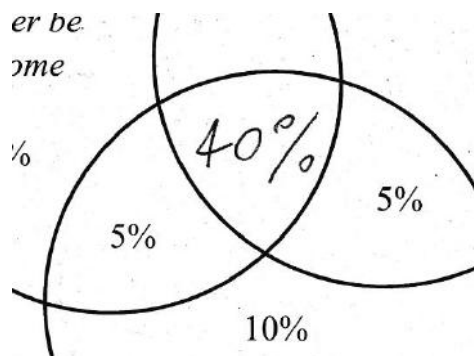
- A 40%, in the centre ☒
 B 40%, outside the box ☐
 C 60%, in the centre ☐
 D 60%, outside the circles ☐

The total of the percentages must add up to 100%: one whole.

$$5 + 10 + 15 + 5 + 10 + 10 + 5 = 60$$

$$100 - 60 = 40$$

The missing entry belongs here:



- (b) 10% of results are inside the box above, but outside the circles.

- (i) How many people does this percentage represent?

- A 14 ☐
 B 16 ☐
 C 24 ☒
 D 36 ☐

10% of 240 is 24.

There are several easy ways to calculate this, but the easiest of all is simply to divide 240 by 10, removing the final zero:

$$\frac{240}{10} = 24$$

(ii) Choose a possible answer to the survey which would belong in this 10%.

- ~~A Reading trashy novels & social media~~ ☐
- ~~B Fishing & social media~~ ☐
- ~~C Social media~~ ☐
- D Swimming & reading comic books ☒

Neither of the activities in D is shown in the Venn diagram, so this activity would lie outside the circles.

(c) *Sun-lounger Sales Figures say this:*

"These results are bad news for the sun-lounger industry."

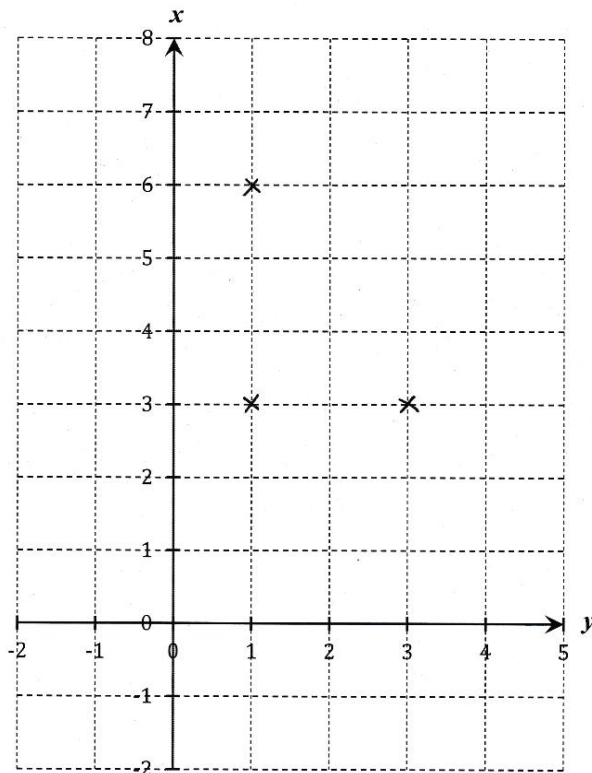
Which of the following options is not a reasonable comment on this statement?

- A *It is fully supported by the survey results, which are bad news for the industry.* ☒
- B *The survey results do not conclusively support or undermine the statement.* ☐
- C *It may be true, because people don't seem to place a high priority on sunbathing.* ☐
- D *It may be wrong, because all the activities named can be done while lying on a sun-lounger.* ☐

B, C and D are all reasonable interpretations. However, it is impossible to jump directly from the survey data to the statement, and say that the data clearly proves it.

6. The following three coordinates are points on the centimetre grid below:

(1, 3) (1, 6) (3, 3)



- (a) These three points form a triangle. What is its area?

- A 3 cm²
B 3.5 cm²
C 4 cm²
D 4.5 cm²

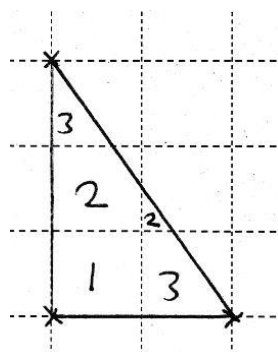
☒
☐
☐
☐

Remember that **Cartesian coordinates** are written in the form (x,y): the horizontal, then the vertical position (you go *along the corridor, then up the stairs*).

The area of a triangle is given by $\frac{1}{2} \times \text{base} \times \text{height}$:

$$\frac{1}{2} \times 2 \times 3 = \frac{1}{2} \times 6 = \underline{\underline{3 \text{ cm}^2}}$$

Of course, you could also solve this problem by counting squares:



- (b) (i) By adding one new point to the three already given, you can form a rectangle.

Which of the following coordinate pairs describe this new point?

- | | | |
|---|-----------|-------------------------------------|
| A | $(-1, 6)$ | <input type="checkbox"/> |
| B | $(5, 6)$ | <input type="checkbox"/> |
| C | $(3, 6)$ | <input checked="" type="checkbox"/> |
| D | $(6, 3)$ | <input type="checkbox"/> |

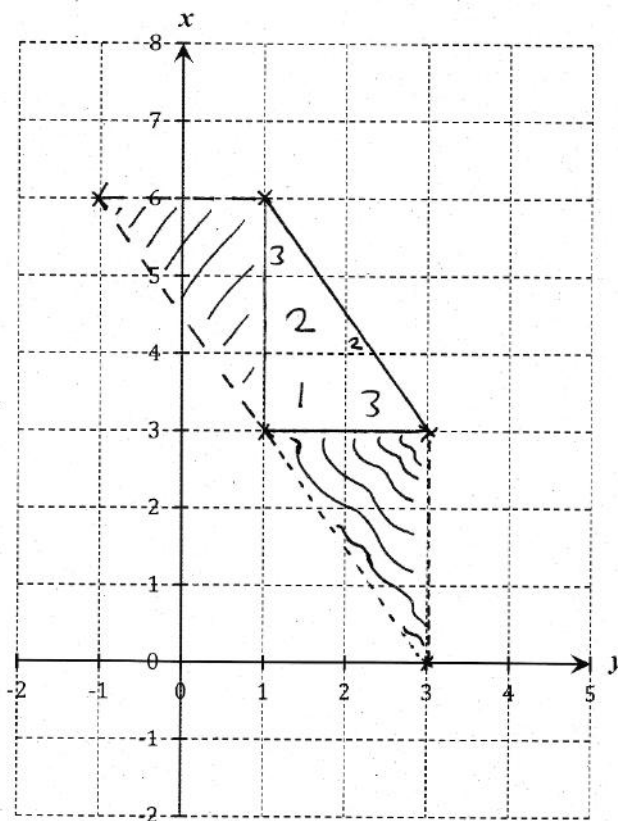
If you've marked the three points on the grid (as shown above), this should be fairly straightforward.

- (ii) Instead of forming a rectangle, you could form a different parallelogram by adding one new point. There are two different ways of doing this.

Select the two possible coordinate points.

- | | | |
|---|-----------|-------------------------------------|
| A | $(0, 6)$ | <input type="checkbox"/> |
| B | $(-1, 6)$ | <input checked="" type="checkbox"/> |
| C | $(3, 0)$ | <input checked="" type="checkbox"/> |
| D | $(0, 3)$ | <input type="checkbox"/> |

The illustration below shows the two different options:



A **parallelogram** is a quadrilateral with two pairs of parallel sides. (A rectangle is a kind of parallelogram, as is a square.)

- A rhombus, which has four sides the same length and no right angles, is also a kind of parallelogram.

(iii) Think about either one of the parallelograms from your answer to part (ii).

How many lines of symmetry does it have?

- A 0
B 1
C 2
D 4

☒
☐
☐
☐

Drawing lines of symmetry on a parallelogram is a very common mistake. However, it doesn't work unless the parallelogram is a square, rectangle or rhombus!

Try drawing mirror lines on the following parallelogram, and you will see what I mean:



7. Seven friends are having a competition to see who can talk for longest without pausing.

The following table shows their results:

	Time (seconds)
Chris	18
Terri	18
Stacey	9
Olivier	16
Stephanie	25
Alex	6
Nick	13

(a) What is the range of the results?

- A 18 seconds ☐
- B 15 seconds ☐
- C 5 seconds ☐
- D 19 seconds ☒

The **range** is the largest result minus the smallest:

$$25 - 6 = \underline{\underline{19 \text{ seconds}}}$$

(b) What is the mode?

- | | | |
|---|------------|-------------------------------------|
| A | 18 seconds | <input checked="" type="checkbox"/> |
| B | 15 seconds | <input type="checkbox"/> |
| C | 5 seconds | <input type="checkbox"/> |
| D | 19 seconds | <input type="checkbox"/> |

The **mode** is the most common result.

(c) Olivier says that his result is the same as the mean. Terri says that he is silly: in her opinion he has the median result.

Choose the correct answer.

- | | | |
|---|---------------------|-------------------------------------|
| A | They are both right | <input type="checkbox"/> |
| B | They are both wrong | <input type="checkbox"/> |
| C | Terri is right | <input checked="" type="checkbox"/> |
| D | Olivier is right | <input type="checkbox"/> |

To revise **medians**, see Question 3.

The **mean** is found by adding all the numbers together, then dividing your result by the total number of numbers.

Median: ~~6~~, ~~9~~, ~~13~~, 16, ~~18~~, ~~18~~, ~~25~~

$$\begin{aligned} \text{Mean: } & 6 + 9 + 13 + 16 + 18 + 18 + 25 \\ & = 15 + 29 + 36 + 25 \\ & = 44 + 61 = 105 \end{aligned} \quad \frac{105}{7} = 15 \text{ seconds}$$

Terri is right

The total is 105, and there are 7 people. $\frac{105}{7} = 15$ seconds.

(d) Leo says that he can talk for longer than Stephanie. She says he has to prove it, so he joins the competition. After he has had his go, the mean talking time is 16 seconds.

Did Leo talk for longer than Stephanie?

- A Yes ☐
- B No ☒
- C The times are equal ☐
- D Impossible to determine ☐

We know that the new mean, when Leo has joined in, is 16 seconds. We need to *work back from this* and find out how long Leo talked for.

$$\frac{105 + x}{8} = 16$$

$$105 + x = 16 \times 8$$

$$105 + x = 128$$

$$x = 128 - 105 = 23 \text{ seconds}$$

No

You don't **need** to use algebra, but in my opinion it is the clearest way to set things out:

- 105 (the total of everybody's time without Leo), plus Leo's time, divided by the number of people (8 when we include Leo), gives 16 seconds (the new mean).
- Therefore, if you **don't** divide by 8, the total time will be 128 seconds.
- This means that Leo's time must have been 23 seconds.

This is **not longer than Stephanie's time** (25 seconds).

8. The Gran Zebrù is a mountain in Italy. Its highest point is 3900 metres above sea level.

Mary decides to climb the Gran Zebrù. She starts climbing at Martell, a village which is 1300 metres above sea level.

(a) What is 3900 metres in kilometres?

- A 390 km ☐
 B 39 km ☐
 C 3.9 km ☒
 D 0.39 km ☐

To convert metres to km, *divide by 1000* (because there are 1000 metres in 1 km).

(b) What fraction of the whole 3900 metre height does Mary climb?

- ~~A $\frac{1}{4}$~~ ☐
~~B $\frac{1}{3}$~~ ☐
 C $\frac{3}{5}$ ☐
 D $\frac{2}{3}$ ☒

She climbs 2600m of the 3900m total height:

$$\begin{array}{r} 3900 \\ - 1300 \\ \hline 2600 \end{array} \quad \frac{2600}{3900} = \frac{2}{3}$$

A and B are evidently wrong, because 2600m is clearly the majority of the 3900m overall height.

(c) Vlada wants to get to the top before Mary. She hires a helicopter to take her up the other side of the mountain, before climbing the last 520 metres.

What percentage of the whole 3900 metre height does Vlada climb, to the nearest percent?

- | | |
|------------------|-------------------------------------|
| A 13% | <input checked="" type="checkbox"/> |
| B 30% | <input type="checkbox"/> |
| C 53% | <input type="checkbox"/> |
| D 55% | <input type="checkbox"/> |

She climbs 520m out of the 3900m total height.

You might be able to get straight to the answer, because 520 is evidently less than a quarter of 3900.

If you need to calculate, your working might look like this:

$$\frac{520}{3900} = \frac{4}{30} = \frac{2}{15}$$

$$15 \overline{) 2.0500}$$

$$0.133$$

$$13.3\%$$

Let's break this into stages.

You first need to find what fraction of the mountain Vlada climbs: $\frac{2}{15}$.

- Once you know this, you **convert the fraction to a decimal** in the usual way (2 divided by 15).
- Then **multiply by 100**, by moving the decimal place two digits to the right, to get the result as a percentage.

Of course, there are other ways of performing on-paper percentage calculations, but this is likely to be the simplest approach for this question.

When calculating 2 divided by 15, you could also use long division:

$$\begin{array}{r}
 0.133 \\
 15 \overline{) 2.000} \\
 \underline{15} \\
 50 \\
 \underline{45} \\
 50
 \end{array}$$

(d) "Mary climbs 400% further than Vlada."

Is this correct?

- A Yes ☒
- B No ☐
- C Not possible to know ☐

By dividing 2600 (the height Mary climbs) by 520 (the height Vlada climbs), we find how many times as far Mary climbs:

$$\frac{2600}{520} = \frac{130}{26} = \frac{65}{13} = 5$$

\therefore Mary climbs 5x as far

1x	as far	= 0% further
2x	" "	= 100% "
3x	" "	= 200% "
4x	" "	= 300% "
5x	" "	= 400% "

\therefore Yes: Mary climbs 400% further than Vlada

The trick here is to realise that climbing **500% (5 times) as far** actually means the same as climbing **400% further**.

- This is because the first 100% doesn't get you any *further*: if I travel 100% as far as you do, this means that I travel the same distance.

9. If the following fractions are written in order, from smallest to largest, what is the result?

$$\frac{4}{7} \quad \frac{7}{4} \quad 1\frac{5}{8} \quad \frac{27}{16} \quad \frac{5}{9}$$

- A $\frac{4}{7} \quad \frac{7}{4} \quad \frac{5}{9} \quad \frac{27}{16} \quad 1\frac{5}{8}$ ☐
- B $\frac{5}{9} \quad \frac{7}{4} \quad 1\frac{5}{8} \quad \frac{27}{16} \quad \frac{4}{7}$ ☐
- C $\frac{4}{7} \quad \frac{7}{4} \quad \frac{27}{16} \quad 1\frac{5}{8} \quad \frac{5}{9}$ ☐
- D $\frac{5}{9} \quad \frac{4}{7} \quad 1\frac{5}{8} \quad \frac{27}{16} \quad \frac{7}{4}$ ☒

With a multiple-choice problem such as this, you can simply rule out any options in which there are two fractions in reverse order. For example, in **B** $1\frac{5}{8}$ comes before $\frac{4}{7}$, so this cannot be the right answer. This would be the most rapid route to the correct answer.

If you want to work out the answer from scratch, a good starting point would be to compare the fractions worth less than 1:

$$\begin{array}{r} \frac{4}{7} \\ 36 \\ \hline 63 \end{array} \quad \frac{7}{4} \quad 1\frac{5}{8} \quad \frac{27}{16} \quad \begin{array}{r} \frac{5}{9} \\ 35 \\ \hline 63 \end{array}$$

Their **lowest common denominator** is 63 ($7 \times 9 = 63$), which allows a simple comparison.

This means that we have $\frac{5}{9}$ and then $\frac{4}{7}$.

Next, you can look at the fractions worth more than 1:

$$\begin{array}{ccccc} \frac{4}{7} & \frac{7}{4} & 1\frac{5}{8} & \frac{27}{16} & \frac{5}{9} \\ & \swarrow & \downarrow & \downarrow & \\ 1\frac{3}{4} = 1\frac{12}{16} & & 1\frac{10}{16} & & 1\frac{11}{16} \end{array}$$

They have a common denominator of 16. I make sure to turn them all into **mixed numbers** for the sake of comparison (I could also have turned them all into **improper/top heavy fractions**).

This allows me to put the rest of the fractions in order.

- With questions of this sort, working in stages like this is a very effective technique.
- It usually isn't a good idea to find the lowest common denominator of all the fractions at once, because this might be a very large number!

10. (a) I take a number, add 62 and divide by 6. My answer is 16.5.

What number did I start with?

- | | |
|--------------------|-------------------------------------|
| A 273 | <input type="checkbox"/> |
| B 37 | <input checked="" type="checkbox"/> |
| C 64.75 | <input type="checkbox"/> |
| D 13.08 | <input type="checkbox"/> |

The easiest method is simply to reverse the process. Multiply by six, then subtract 62:

$$\begin{array}{r} 16.5 \\ \times 6 \\ \hline 99.0 \\ 3 \end{array} \quad \begin{array}{r} 99 \\ - 62 \\ \hline 37 \end{array} \quad \underline{\underline{37}}$$

You could also use algebra, if that's an approach you're comfortable with:

$$\frac{x + 62}{6} = 16.5$$

$$x + 62 = 99$$

$$x = \underline{\underline{37}}$$

However, you may be able to see without calculating that none of the other options can produce the required result.

(b) I square a number then divide the result by 28.438. My answer is 28.438.

What number did I start with?

- A 28.438
- B 808.7
- C 5.33
- D 5

☒
☐
☐
☐

A clue is the very difficult decimal: it's unlikely that you will be expected to calculate the square of a number such as 28.438.

Here is an explanation of why the answer is 28.438, using algebra:

$$\frac{x^2}{28.438} = 28.438$$

$$x^2 = 28.438 \times 28.438$$

$$x^2 = 28.438^2$$

$$x = \underline{\underline{28.438}}$$

–28.438 would also be a correct solution.

(c) Based on the following facts, what is my number?

- It has a square root which is a prime number.
- Multiply my number by 4, and the result is a multiple of 10.
- My number is below 100.

- | | | |
|---|----|-------------------------------------|
| A | 9 | <input type="checkbox"/> |
| B | 5 | <input type="checkbox"/> |
| C | 40 | <input type="checkbox"/> |
| D | 25 | <input checked="" type="checkbox"/> |

$$\sqrt{25} = 5 \quad (\text{prime})$$

$$25 \times 4 = 100 \quad (\text{multiple of } 10)$$

$$25 < 100$$

25

A first step might be to write a list of those squares of prime numbers which are below 100: 4, 9, 25 and 49.

Of these, **only 25** multiplies by 4 to give a multiple of 10 (100).

(d) I add 5 to a positive integer, divide the result by 2, multiply by 10, add four, divide by 11, then subtract 1. I end up with my original number.

What number did I start with?

- | | | |
|---|---|-------------------------------------|
| A | 1 | <input type="checkbox"/> |
| B | 2 | <input type="checkbox"/> |
| C | 3 | <input checked="" type="checkbox"/> |
| D | 4 | <input type="checkbox"/> |

As this is a multiple-choice paper, the fastest approach is likely to involve trying the various options.

The number 3 works like this:

$$\left(\frac{3+5}{2} \times 10 + 4\right) \div 11 - 1 = (40 + 4) \div 11 - 1 = 4 - 1 = 3$$

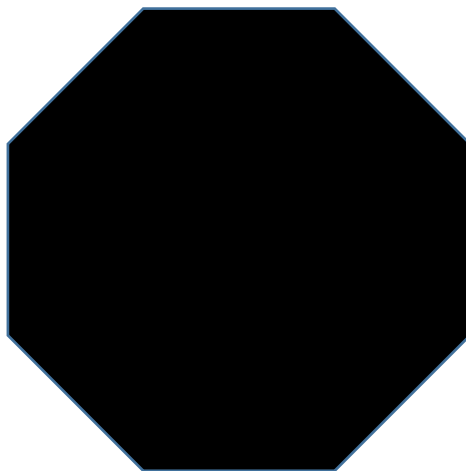
In practice, you are more likely to work this out in stages than to write the whole calculation in one go.

In case you're curious, **here's an algebraic solution:**

$$\begin{aligned} \frac{10 \times \frac{1}{2}(x+5) + 4}{11} - 1 &= x \\ \frac{10 \times \frac{1}{2}(x+5) + 4}{11} &= x + 1 \\ 10 \times \frac{1}{2}(x+5) + 4 &= 11x + 11 \\ 5(x+5) + 4 &= 11x + 11 \\ 5(x+5) &= 11x + 7 \\ 5x + 25 &= 11x + 7 \\ 5x + 18 &= 11x \\ 18 &= 6x \\ 3 &= x \end{aligned}$$

Even if you are comfortable with this maths, it may not be the fastest method available to you.

11. (a) What is the order of rotational symmetry of the following shape?



- | | | |
|---|---|-------------------------------------|
| A | 1 | <input type="checkbox"/> |
| B | 2 | <input type="checkbox"/> |
| C | 4 | <input type="checkbox"/> |
| D | 8 | <input checked="" type="checkbox"/> |

Rotational symmetry measures *how many times a shape fits exactly into its original 'shadow' when rotated through 360° (one complete circle).*

- Because any shape will fit into its own shadow at least once, when it returns to its starting point, the lowest possible order of rotational symmetry is 1.

(b) Bola makes the following statement:

"The shape from part (a) has eight lines of symmetry, because there is one line of symmetry running from the middle of each side."

Which comment on Bola's statement is most accurate?

- | | | |
|---|---------------------------------------------------|-------------------------------------|
| A | She is wrong, though with some correct reasoning. | <input type="checkbox"/> |
| B | She is right, but for the wrong reasons. | <input checked="" type="checkbox"/> |
| C | She is wrong, with incorrect reasoning. | <input type="checkbox"/> |
| D | She is right, for the reasons she gives. | <input type="checkbox"/> |

She's right that there are 8 lines of symmetry – and that there are lines running from the middle of each side.

However, this only makes 4 lines of symmetry, with each one linking 2 sides.

She has missed the lines running between opposite vertices (corners), which give another 4.

12. (a) Choose the three numbers which correctly complete each of the following sequences.

- | | | | | | | | |
|-----|----|----|---------------|---------------|---|---|-------------------------------------|
| (i) | 24 | 12 | 6 | — | — | — | |
| | A | 3 | 0 | –3 | | | <input type="checkbox"/> |
| | B | 3 | $\frac{3}{2}$ | $\frac{3}{4}$ | | | <input checked="" type="checkbox"/> |
| | C | 0 | –6 | –12 | | | <input type="checkbox"/> |
| | D | –6 | –12 | –18 | | | <input type="checkbox"/> |

A common kind of sequence divides or multiplies by the same number at each step.

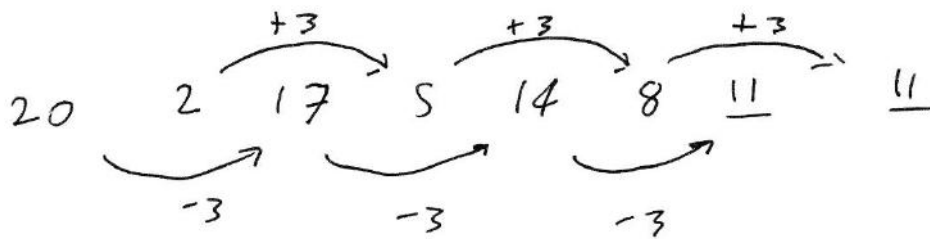
$$24 \xrightarrow{\div 2} 12 \xrightarrow{\div 2} 6 \xrightarrow{\div 2} 3 \xrightarrow{\div 2} \frac{3}{2} \xrightarrow{\div 2} \frac{3}{4}$$

You could also see this as 'minusing half as much each time'.

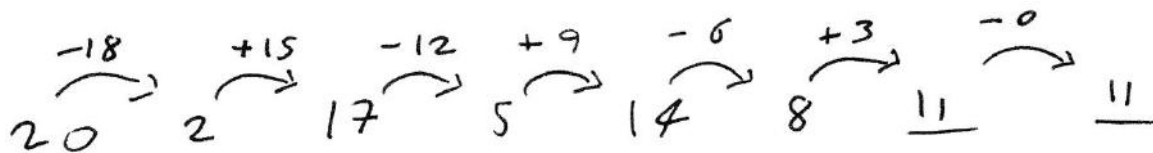
The last two results could be written as 1.5 (or $1\frac{1}{2}$) and 0.75, of course.

- (ii) 20 2 17 5 14 8 ____ ____
- A 2 -4 ☐
- B 6 2 ☐
- C 17 5 ☐
- D 11 11 ☒

When a sequence seems to make no sense, look for **two overlapping sequences** (also keep an eye out for squared/cubed sequences):



You could also work out the sequence like this:



(b) Select all the sequences below which follow this rule:

The first number must be a positive factor of 5. Each subsequent number is found by subtracting 4 from the previous number, then multiplying the result by 3.

- A 5 3 -3 -21 -75 ☒
- B 5 11 29 83 245 ☐
- C 1 -1 -7 -25 -79 ☐
- D 1 -9 -39 -129 -399 ☒

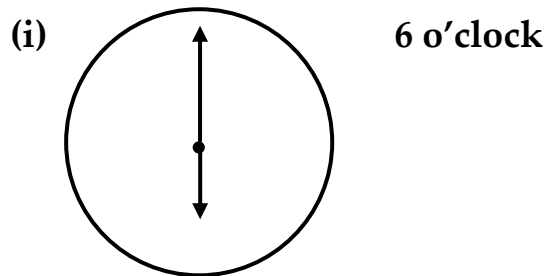
The only positive factors of 5 are 5 and 1, so these need to be your starting numbers.

Be careful when dealing with negative numbers!

- When you subtract from a negative number, you go *more negative*.
- When you multiply a negative number by a positive number, the result is *negative*.

This question is worth 1 mark if entirely correct, and no marks if not.

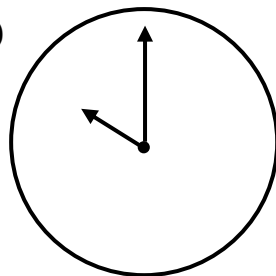
13. (a) What is the angle in degrees between the hands of a clock at the following times?



- | | | |
|---|------|-------------------------------------|
| A | 90° | <input type="checkbox"/> |
| B | 180° | <input checked="" type="checkbox"/> |
| C | 270° | <input type="checkbox"/> |
| D | 45° | <input type="checkbox"/> |

There are 180° in a straight line.

(ii)



10 o'clock

A 45°

☐

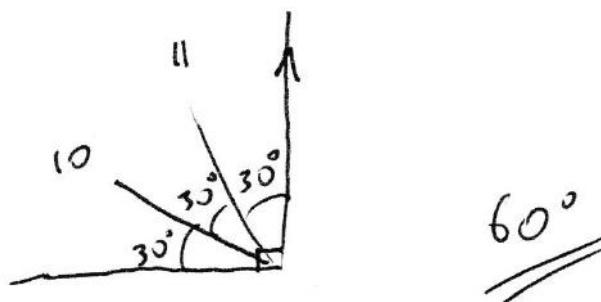
B 60°

☒

C 75°

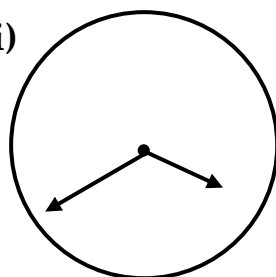
☐

~~D 90°~~

☐


There are 90° in each three-hour quarter of the clock face. Therefore there are 30° between each numbered hour. This means that at 10 o'clock there are 60° between the hands.

(iii)



20 to 4 o'clock

A 150°

☐

~~B 180°~~

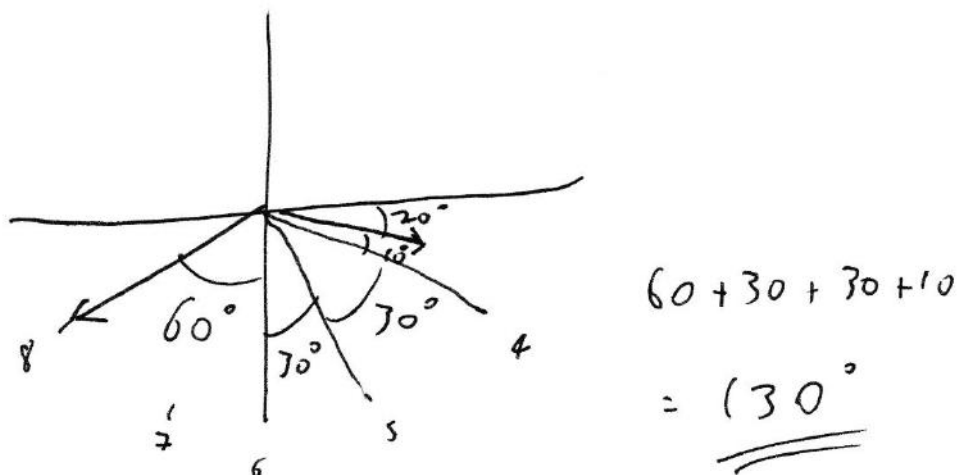
☐

C 130°

☒

D 120°

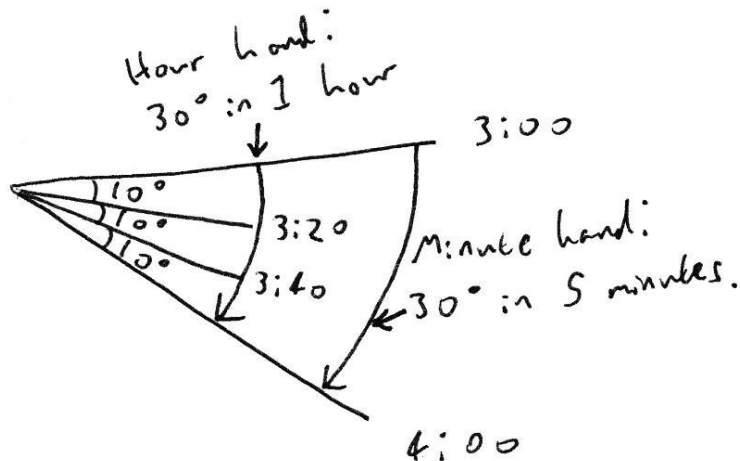
☐



Most of this answer will make sense if you understand the explanation for part (ii).

The only fiddly corner involves the hour hand.

At 20 to 4, the hour hand has moved $\frac{2}{3}$ of the way between 3 and 4 – which is the same as moving 20°:

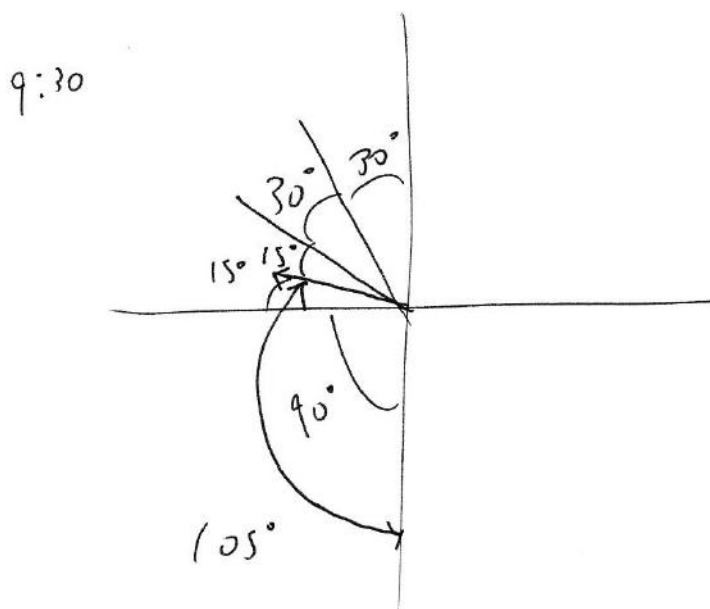


(b) At what time between 9 and 10 o'clock is there an angle of 50° between the clock hands?

- | | |
|--------|-------------------------------------|
| A 9:15 | <input type="checkbox"/> |
| B 9:30 | <input type="checkbox"/> |
| C 9:40 | <input checked="" type="checkbox"/> |
| D 9:45 | <input type="checkbox"/> |

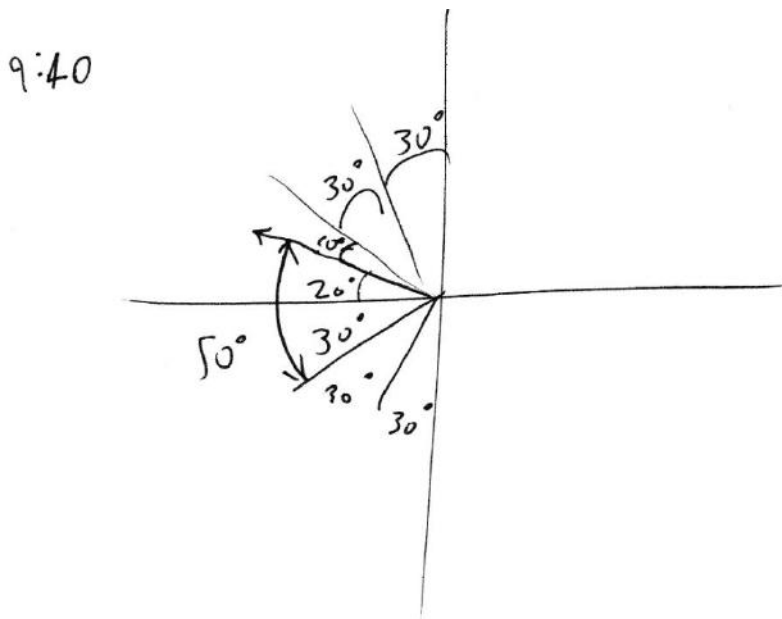
You are given various options, and the best approach is to pick a likely one and see whether it works. If it does not, it will give you an idea of which other one might be better.

For instance, you might try 9:30:



105° is quite a lot too much, so we need to move the minute hand round further.

A reasonable next time to try would be 9:40:



This produces an answer of 50° , so **9:40 is the correct answer.**

I've included my scrappy sketches, drawn without a ruler, to demonstrate the sort of drawing which can be very useful when solving problems like this.

You need to set down your working in a way which can be understood (by you!), but without spending more time than you have to.

14. Three positive integers (whole numbers) add up to 460.

The third integer is three times the second and five times the first.

Which of the following numbers is not one of the three integers?

- | | | |
|----------|-----|-------------------------------------|
| A | 60 | <input type="checkbox"/> |
| B | 100 | <input type="checkbox"/> |
| C | 150 | <input checked="" type="checkbox"/> |
| D | 300 | <input type="checkbox"/> |

If you are interested in how you might calculate this from first principles, have a look at the solutions to the written-answer version of this paper.

However, you need to apply a lot of common sense when answering multiple-choice questions.

The only way to make 460 with three of these numbers is to add 300, 100 and 60, so 150 **must** be the odd one out!

15. A woman pushes a briefcase into my hand, then vanishes into the crowd without letting me see her face. I open the briefcase and find a large number of unused £10 notes, numbered consecutively (in order, without gaps) from 39,989,298 to 40,003,246.

How much money does the briefcase contain?

- A £139,049 ☐
 B £139,480 ☐
 C £139,490 ☒
 D £139,048 ☐

This isn't too difficult, but it's fiddly and needs some concentration. The question also includes a lot of unnecessary background information, which you need to ignore.

The first thing you need to find is the number of banknotes.

$$\begin{array}{r}
 \overset{3}{\cancel{4}} \overset{4}{\cancel{0}} \overset{9}{\cancel{0}} \overset{9}{\cancel{0}} \overset{2}{\cancel{5}} \overset{1}{\cancel{2}} \overset{13}{\cancel{6}} \\
 - 39989298 \\
 \hline
 00013948
 \end{array}
 \quad
 13948 + 1 = 13949$$

$$13949 \times 10 = \underline{\underline{£139,490}}$$

The subtraction is particularly annoying because you have to carry numbers throughout: it's easy to make a mistake here.

The middle step is simple, but so easy to forget:

- When you subtracted 39,989,298 from 40,003,246, you took away all the numbers up to *and including* 39,989,298.
- But we want to count **all** the banknotes from 39,989,298 to 40,003,246, **including both numbers**.
- Therefore, we need to **add 1** to the result of the subtraction.

Each note is worth £10, so you need to **multiply your answer by 10** to find the total sum of money.

END
