<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Method mark</td>
</tr>
<tr>
<td>A</td>
<td>Accuracy mark</td>
</tr>
<tr>
<td>B</td>
<td>Mark awarded independent of method</td>
</tr>
<tr>
<td>oe</td>
<td>Or equivalent</td>
</tr>
<tr>
<td>ft</td>
<td>Follow through</td>
</tr>
<tr>
<td>cao</td>
<td>Correct answer only</td>
</tr>
<tr>
<td>Question</td>
<td>Working</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
</tr>
</tbody>
</table>
| 1 a b c d e f | $D = 7w$
$C = pn$
$Y = \frac{m}{12}$
$P = 100D$
$A = lw$
$P = nl$ |  | B1 | 3 | B1 oe | B |
| 2 a b | $C = 80h$
$C = 80h + 50$ |  | B1 | 3 | B1 cao | B |
| 3 a b | No
To be able to work out what the number thought of, you need to know the answer.
Yes
Because I can write an equation from the information and solve it.
$x + 15 = 26$
so $x = 11$ |  | B1 | 2 | B1 for No and a reason | B |
| 4 | For example, in the rule pay $= 15 \times$ hours.
As hours varies, so will the calculation to calculate pay.
Yes, there will be others, there will be hundreds of different possible calculations. |  | B1 | 2 | B1 for an explanation of why it is possible for more than one calculation to match with the same rule | B |
| 5 | We use $(x, y)$ to describe the position, where the first part, $x$, is along the $x$-axis. Then the second part, $y$, is along the $y$-axis.
Example, e.g.
The convention for point A is $(2, 3)$. If we didn’t have the convention then we could use $(3, 2)$ but that could be confused now with point B. |  | B1 | 2 | B1 for clear explanation | B |
| 6 a b | Yes
For example we could write as $2x = y - 6$
Rearranging an equation.
Yes
The first equation has been divided by 2 throughout. |  | B1 | 2 | B1 for Yes with an example to illustrate | B |
### 7

Substitute \( x = 3 \) in the equation to give
\[
y = 3 + 2 = 5
\]
so when \( x = 3, \ y = 5 \), hence (2, 6) is not on the line or. The constant term is 2 so the line crosses the \( y \)-axis at the point (0, 2). Then for every point across it goes up 1 (gradient is 1) so by the time \( x = 3, \ y \) will = 5.

### 8 a

Money spent = \( 2 \times £14.99 + 2 \times £2.50 + (12 \times £0.80 + £2.50) = £29.98 + £5 + (£9.60 + £2.50) = £34.98 + £12.10 = £47.08 \)

Money left = £70 – money spent

This is less than £70 so she can afford the taxi.

### 9

Look for the words that will represent variables and if possible, use appropriate letters to represent those variables. e.g.

Area = height multiplied by breadth

Formula could be \( A = bh \)

### 10 a

\( 2n \) means 2 times \( n \) while \( n + 2 \) means add 2 to \( n \).

\( 3(c + 5) \) means add 5 to \( c \) and then multiply the answer by 3, \( 3c + 5 \) means multiply \( c \) by 3 and then add 5 to the answer.

\( n^2 \) means multiply \( n \) by itself, \( 2n \) means multiply \( n \) by 2.

### 11

Perimeter = \( 2 \times l + 2 \times 3l \)

\( = 2l + 6l = 8l \)

So \( 8l = 48 \)

\( l = 6 \) cm

Area = length \times width

\( = l \times 3l \)

\( = 6 + 3 \times 6 \)

\( = 6 + 18 = 24 \) cm\(^2\)
### Question 12

\[
\frac{(32 - 24)}{4} = 8 \div 4 = 2
\]

\[
24 - 2 \times 4 = 24 - 8 = 16
\]

- **Mark Scheme:**
  - **M1** for the correct process of working out \( C \)
  - **A1 cao**

### Question 13

Plot the three points and draw the two sides. You can then complete the missing sides of the rectangle to complete the shape as shown in the diagram. Hence find the fourth vertex as in the diagram as \((4, 8)\).

- **Mark Scheme:**
  - **B1** for clear explanation
  - **B1 for including a sketch alongside the explanation**

### Question 14

Let the smaller number be \( n \), then the next even number will be \((n + 2)\).

\[
n + (n + 2) = 50
\]

\[
2n + 2 = 50
\]

\[
n = 24
\]

The lower number will be 24 so the larger number will be 26.

- **Mark Scheme:**
  - **B1** for stating starting points
  - **M1** for method of setting up the equation
  - **A1 cao**

### Question 15

Example 1

As \( 24 = 6 \times 4 \)

\[
= 6 \times 2^2
\]

\[
t = ba^2
\]

Will give 24 when \( b = 6 \) and \( a = 2 \)

Example 2

As \( 24 = 3 \times 8 \)

\[
= 3 \times (2 + 6)
\]

\[
i = 3(a + b)
\]

Will give 24 when \( a = 2 \) and \( b = 6 \)

- **Mark Scheme:**
  - **B1** for first formula that works
  - **B1 for clear explanation of how it was found**

- **M for second formula that works**
  - **B1 for clear explanation of how it was found**
### 16 a

\[5(c + 4) = 5c + 20\]
Feedback 'Don’t forget to multiply out both terms in the brackets.'

### 16 b

\[6(i - 2) = 6i - 12\]
Feedback ‘Don’t forget 6(…..) means multiply both terms by 6.’

### 16 c

\[-3(4 - x) = -12 + 3x\]
Feedback ‘Don’t forget -3(…..) means multiply both terms by 6 and a minus \(\times\) minus = …

### 16 d

\[15 - (n - 4) = 15 - n + 4 = 15 + 4 - n = 19 - n\]
Feedback ‘Don’t forget - (n - 4) means multiply each term in the bracket by -1 and that the – in the bracket belongs to the 4 to make it – 4.’

### 17

Any equation in the form \(y = mx + 1\) will pass through (0, 1)

So \(y = 2x + 1\)
\(y = 3x + 1\)
will both pass through (0, 1)

### 18 a

A correct example e.g. \(2(z - 3) + 5y\)

A correct example e.g. \(\frac{10x - 4y}{2}\)

### 19 a

<table>
<thead>
<tr>
<th>(x)</th>
<th>(12x)</th>
<th>(2x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(7x)</td>
<td>(5x)</td>
<td></td>
</tr>
<tr>
<td>(8x)</td>
<td>(10x)</td>
<td>(-2x)</td>
</tr>
</tbody>
</table>

### 19 b

Own example that works.

B1 for each correct entry in the table

B1 for their own correct example that works
20

\[ Z = 3A \]
\[ Z = A + 18 \]
So \(3A = A + 18\)
\[ 2A = 18 \]
\[ A = 9 \]
Substitute \(A = 9\) into \(Z = A + 18\) to give \(Z = 27\)
Check
\[ 3 \times 9 = 27 \] which is correct.

Zoe has 27 and Alyssa has 9.

21

\[ n + n + 20 = 2n + 20 \]
\[ 2n + 20 = 90 \]
\[ 2n = 70 \]
\[ n = 35 \]
So 35 on first shelf and 35 + 20 = 55 on second.
Need 90 ÷ 3 = 30 on each shelf.
So need to move 5 from first shelf onto third shelf and 25 from second to third shelf.

22

Select \(x\) values less than 0 and substitute into the equation.

23

a

b

Using \(y = mx + c\) and
\[ m = \frac{\text{change in } y}{\text{change in } x} \]
\[ m = \frac{6 - (-4)}{3 - (-2)} = \frac{6 + 4}{3 + 2} \]
\[ = \frac{10}{5} = 2 \]
Giving \(y = 2x + c\)
You know the point \((1, 2)\) is on the line, so substitute into \(y = 2x + c\).
\[ 2 = 2 \times 1 + c \] so \(c = 0\).
So the equation of the line is \(y = 2x\).

\[ y = 3 \]

M1 for correct process of finding gradient in using \(y = mx + c\)
M1 for correct process to find \(c\)

M1 for correctly only using negative values of \(x\)
A1 for three correct coordinates
### Question 24

Since \( y = 2x + 2 \)

\( y = 2(x + 1) \)

Hence for any integer value of \( x \), \( y \) will be an even number.

<table>
<thead>
<tr>
<th>B1</th>
<th>2</th>
<th>B1 for clear explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

### Question 25

**a)**

- 1st term of first sequence is \( 6n - 1 \)
- 1st term of second sequence is \( 3n - 2 \)

So for a common term:
- \( 6n - 1 = 3n - 2 \)
- \( 3n = -1 \)

So \( n \) is not a whole number. And hence there is no term in both sequences.

<table>
<thead>
<tr>
<th>B1</th>
<th>2</th>
<th>B1 for ( n )th term of first sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>B1 for ( n )th term of second sequence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M1 for method of putting both ( n )th terms equal to each other</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B1 correctly finding ( n ) to be non-integer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A1</th>
<th></th>
<th>A1 for No alongside clear solution</th>
</tr>
</thead>
</table>

### Question 26

**a)**

- \( D (5, 1) \)

Area of trapezium = \( \frac{1}{2} \times (4 + 10) \times 5 \)

\[ = \frac{1}{2} \times 14 \times 5 \]

\[ = 35 \text{ cm}^2 \]

<table>
<thead>
<tr>
<th>B1</th>
<th>3</th>
<th>B1 cao</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td></td>
<td>M1 for correct method in finding area of trapezium</td>
</tr>
</tbody>
</table>

### Question 27

Sketch a graph:

<table>
<thead>
<tr>
<th>B1</th>
<th>3</th>
<th>B1 for showing runner on graph or explaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td></td>
<td>B1 for showing cyclist on graph or explaining</td>
</tr>
<tr>
<td>B1</td>
<td></td>
<td>B1 for showing where the two lines meet on graph or explaining</td>
</tr>
</tbody>
</table>

### Question 28

100, 96, 92, 88, 84, 80, 76, 72, 68, 64, 60, 56, 52, 48, 44, 40, 36, 32, 28, 24, 20, 16, 12, 8, 4, 2, 8, 14, 20, 26, 32, 38, 44, 50, 56, 62, 68, 74, 80, 86, 92, 98

Those in common 8, 20, 32, 44, 56, 68, 80, 92

<table>
<thead>
<tr>
<th>M1</th>
<th>3</th>
<th>M1 for process of accounting for first sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td></td>
<td>M1 for process of accounting for second sequence</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A1</th>
<th></th>
<th>A1 for all 8 correct terms</th>
</tr>
</thead>
</table>
### 29

- **Left hand graph is** \( x + y = 5 \)
- **Right hand graph is** \( y = z + 1 \)
- **Substitute** \( y \) **into first equation**
  \[ x + z + 1 = 5 \]
  \[ x + z = 4 \]
- **B1** first graph equation
- **B1** second graph equation
- **M1** substituting to eliminate \( y \)
- **A1** cao
- **B1** for graph drawn with \( x \) on vertical axis. Allow \( x \) on horizontal axis
- **B1** for \( x + z = 4 \) drawn correctly

### 30

- **a**
  - Distance = \( 2 \times 25 \text{ km} = 50 \text{ km} \)
  - \( 50 \text{ km} \div 8 \text{ hours} = 6.25 \text{ km per hour} \)
  - **M1** for division of total distance by time
  - **A1** cao
- **b**
  - e.g. What is Philip's highest speed?
  - **B1** for an example of a questions that could be asked about this situation
- **c**
  - What times did Philip have a rest?
  - **B2** for a two part question using the graph with increase in difficulty
  - **B1** for suitable mark scheme

### 31

- **Own story**
- **Sketch graph**
- **Question for the graph**

### 32

- **a i**
  - \( 35 \times 8 + 10 = 290 \)
  - **M1** for the correct method
  - **A1** cao
- **a ii**
  - \( 35 \times 14 = 490 \)
  - **M1** for correct method
  - **A1** cao
- **b**
  - \( 35n + 10 = 220 \)
  - \( 35n = 210 \)
  - \( n = \frac{210}{35} = 6 \)
  - **M1** for process of sorting which rule to use
  - **A1** cao
- **c**
  - \( (7 \times 35) + 20 = 265 \)
  - \( (7 \times 35) = 10 = 255 \)
  - **M1** for finding suitable calculations to find the difference
  - **A1** cao

### 33

- \( 10 + 15 = 25 = 5^2 \)
- \( 15 + 21 = 36 = 6^2 \)

- **B4** for each correct part of the number pattern provided correct signs and symbols are present

- **M**
<table>
<thead>
<tr>
<th>34 a</th>
<th>Triangle drawn</th>
<th>B1</th>
<th>B1 for diagram drawn for all shapes</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>36 cm</td>
<td>B1</td>
<td>B1 cao</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>48 cm</td>
<td>B1</td>
<td>B1 cao</td>
<td></td>
</tr>
<tr>
<td>d/e</td>
<td>63 139 143 806 710 cm</td>
<td>B1</td>
<td>B1 cao</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 a</td>
<td>Same difference of 2.4 but starting value is different.</td>
<td>B1</td>
<td>B1 cao</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>What are the differences</td>
<td>B1</td>
<td>B1 cao</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What is the starting value.</td>
<td>B1</td>
<td>B1 cao</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36 a</td>
<td>Multiple of 4</td>
<td>B1</td>
<td>B1 cao</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>No</td>
<td>B1</td>
<td>B1 for no</td>
<td></td>
</tr>
<tr>
<td></td>
<td>because we need to know the starting value as well.</td>
<td>B1</td>
<td>B1 for reason alongside no</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Boys</td>
<td>B1</td>
<td>B1 for explanation of 4 red</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Get a red egg each from each of 4 girls: 4 red</td>
<td>B1</td>
<td>B1 for explanation of 2 green</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One green egg each other: 2 green</td>
<td>B1</td>
<td>B1 for explanation of 2 blue</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>B1</td>
<td>B1 for explanation of 12 yellow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Get a blue egg from each of the 2 boys: 2 blue</td>
<td>B1</td>
<td>B1 for complete clear solution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One yellow egg from each other will be 3 yellow eggs each: 12 yellow</td>
<td>B1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Example</td>
<td>A1</td>
<td>A1 for an explanation. An example could be given to support the argument</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>$2n^2 = 2 \times (3^2) = 2 \times 9 = 18$</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(2 \times 3)^2 = 6 \times 6 = 36$</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 39

A letter, say $f$, stands for an unknown if it is in an equation such as $3f + 2 = 14$. Then $f = 4$ is the only number that satisfies this equation.

A letter stands for a variable if it is part of an equation that has more than two letters. E.g. $A = \pi r^2$, where both $A$ and $r$ are variables that will be different for different values of $A$ or $r$.

<p>| | | |</p>
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
</table>

### 40 a

ii, v and vi might be difficult as they all involve squaring a term. The classic error made in ii will be to calculate half of $at$ and then to square that. The same error can be found in vi where $2\pi r$ can be calculated first and then squared.

ii and vi are also difficult to rearrange as they involve a quadratic element and it’s not easy to make each variable the subject of the formula.

Classic errors in rearranging $s = ut + \frac{1}{2} at^2$ to make $a$ the subject include:

1. Incorrect sign when changing sides, e.g. $s + ut = \frac{1}{2} at^2$
2. Incorrect removal of fraction e.g. $\frac{1}{2} (s + t) = at^2$

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

### 40 b

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
### Question 41

Start with numbers that work
\[
\frac{(6 - 1)}{2} = 2.5
\]
So \( z = \frac{(s - 1)}{r} \) will satisfy the conditions.

Start with a formula say
\[
z = \frac{(3s - 4t + x)}{2}
\]
Substitute \( z = 2.5, s = 6, t = 2 \) to find \( x \).
\[
5 = 18 - 8 + x, x = -5
\]
\[
z = \frac{(3s - 4t - 5)}{2}
\]
satisfies the conditions.

**Marks Breakdown:**
- M1 for first method, e.g. starting with numbers
- A1 for an example that works
- M1 for second method, e.g. starting with a formula
- A1 for an example that works
- B1 for clear complete solution showing two different methods and two examples

### Question 42

\[
\frac{(2n + 6)}{2} = 2(n + 3) = n + 3
\]

**Marks Breakdown:**
- M1 for factorising
- A1 for any correct expression
- A1 for any correct expression

### Question 43

Let base length be \( b \), then height will be \( 3b \)

Area of triangle = \( \frac{1}{2} \times \text{base} \times \text{height} \)
\[
= \frac{1}{2} \times b \times 3b
\]
\[
= \frac{3b^2}{2}
\]
Where \( A = 6 \)
\[
\frac{1}{2} b^2 = 6
\]
\[
b^2 = 2 \times \frac{6}{3} = 4
\]
\[
b = 2
\]
so height is \( 3 \times 2 \) which is \( 6 \) cm.

**Marks Breakdown:**
- B1 for stating variables
- B1 for stating triangle formula
- B1 for correct expression
- M1 for equating 6 with found expression
- A1 for \( b = 2 \)
- A1 for 6 cm
### 44 a

**b**

<table>
<thead>
<tr>
<th>$x$</th>
<th>$x^2$</th>
<th>$x + x^2$</th>
<th>Too...</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>small</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>6</td>
<td>small</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>12</td>
<td>big</td>
</tr>
<tr>
<td>2.5</td>
<td>6.25</td>
<td>8.75</td>
<td>small</td>
</tr>
<tr>
<td>2.6</td>
<td>6.76</td>
<td>9.36</td>
<td>big</td>
</tr>
<tr>
<td>2.55</td>
<td>6.4025</td>
<td>8.955</td>
<td>small</td>
</tr>
</tbody>
</table>

You could use trial and improvement or a graph to help you decide where to start.

Use trial and improvement to solve both problems.

Number is 2.6

Width is 7.3 cm

‘I think of a number and double it’ just has an expression of $2x$ where $x$ is the number I thought of – still unknown at the moment.

‘I think of a number and double it – the answer is 12’ has a solution that I know is 6.

One
e.g. $10 = p + 3$

Because each solution is $p = 7$

### 45 a

### b i

### ii

### iii

<table>
<thead>
<tr>
<th>$x$</th>
<th>$x + 2$</th>
<th>$x(x + 2)$</th>
<th>Too...</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>9</td>
<td>63</td>
<td>small</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td>80</td>
<td>big</td>
</tr>
<tr>
<td>7.5</td>
<td>9.5</td>
<td>71.25</td>
<td>big</td>
</tr>
<tr>
<td>7.3</td>
<td>9.3</td>
<td>67.89</td>
<td>exact</td>
</tr>
</tbody>
</table>

You could use trial and improvement or a graph to help you decide where to start.

Use trial and improvement to solve both problems.

Number is 2.6

Width is 7.3 cm

‘I think of a number and double it’ just has an expression of $2x$ where $x$ is the number I thought of – still unknown at the moment.

‘I think of a number and double it – the answer is 12’ has a solution that I know is 6.

One
e.g. $10 = p + 3$

Because each solution is $p = 7$
Looking at total counters needed for each step, he uses:

<table>
<thead>
<tr>
<th>Step</th>
<th>Counters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>$n$</td>
<td>$6n$</td>
</tr>
</tbody>
</table>

Adding how many counters he needs in total:

<table>
<thead>
<tr>
<th>Step</th>
<th>Counters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>36</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
</tr>
</tbody>
</table>

Looking at the pattern suggests products being involved, I see that this pattern can be written as

<table>
<thead>
<tr>
<th>Step</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$3 \times 1 \times 2 = 6$</td>
</tr>
<tr>
<td>2</td>
<td>$3 \times 2 \times 3 = 18$</td>
</tr>
<tr>
<td>3</td>
<td>$3 \times 3 \times 4 = 36$</td>
</tr>
<tr>
<td>4</td>
<td>$3 \times 4 \times 5 = 60$</td>
</tr>
<tr>
<td>$n$</td>
<td>$3n(n + 1)$</td>
</tr>
</tbody>
</table>

I need to find a value for $n$ where this total is first over 1000

<table>
<thead>
<tr>
<th>$n$</th>
<th>$n + 1$</th>
<th>$3n(n + 1)$</th>
<th>Too...</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>11</td>
<td>330</td>
<td>small</td>
</tr>
<tr>
<td>20</td>
<td>21</td>
<td>1260</td>
<td>big</td>
</tr>
<tr>
<td>15</td>
<td>16</td>
<td>720</td>
<td>small</td>
</tr>
<tr>
<td>17</td>
<td>18</td>
<td>918</td>
<td>small</td>
</tr>
<tr>
<td>18</td>
<td>19</td>
<td>1026</td>
<td>big</td>
</tr>
</tbody>
</table>

Use trial and improvement

Harry will run out of counters while trying to complete step 18.

No. All the terms will be even.
## Question 48

### Part A

- \( H = 1.10E \)
- \( E = C - 50 \)
- \( D = \frac{2}{3} E \)
- \( C = 500 \)

Charles is in the next round

Substitute \( C = 500 \) into each equation:

- \( E = C - 50 \)
- \( E = 450 \)

Eliza is in the next round

- \( D = \frac{2}{3} \times 450 = 300 \)

Denise will not be in the next round

- \( H = 450 \times 1.10 = 495 \)

Hussein will be in the next round.

### Part B

There will be 3 candidates in the next round.

<table>
<thead>
<tr>
<th>B1</th>
<th>3</th>
<th>B1 for setting up all the equations from the given data</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td></td>
<td>M1 for substituting ( C = 500 )</td>
</tr>
<tr>
<td>A1</td>
<td></td>
<td>A1 for ( E = 450 ) and staying in next round</td>
</tr>
<tr>
<td>M1</td>
<td></td>
<td>A1 for calculating ( D )</td>
</tr>
<tr>
<td>A1</td>
<td></td>
<td>A1 for ( D = 300 ) and not being in the next round</td>
</tr>
<tr>
<td>A1</td>
<td></td>
<td>M1 for calculating ( H )</td>
</tr>
<tr>
<td>B1</td>
<td></td>
<td>A1 for 495 and being in next round</td>
</tr>
<tr>
<td>B1</td>
<td></td>
<td>B1 for stating 3 candidates in next round</td>
</tr>
</tbody>
</table>

## Question 49

\[ (x + 1)^2 = x^2 + 2x + 1 \]

As required.

<table>
<thead>
<tr>
<th>B2</th>
<th>2</th>
<th>B1 for showing the ( x^2 ) in the correct place</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td></td>
<td>B1 for correctly showing ( x, x ) and 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B1 for clearly showing the required result from the diagram</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>H</th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 50 a | 1 6 15 20 15 6 1  
    | 1 7 21 35 35 21 7 1  
    | 1 8 28 56 70 56 28 8 1  |
|------|----------------------|
| b    | Looking at the diagonal rows:  
    | The first diagonal row contains only 1s.  
    | The second diagonal consists of all  
    | counting numbers: 1, 2, 3, 4, 5, etc.  
    | The third row consists of the triangle  
    | numbers: 1, 3, 6, 10, 15, etc.  |
| c    | Triangle numbers  |
| d    | 1, 2, 4, 8, 16, 32 ....  |
| e    | Multiplying by 2 each time, the $n^{th}$ term will  
    | be $2^{n-1}$  |
|      |                      |
| 51   | $6(x - c) = 5x - 4$  
    | $6x - 6c = 5x - 4$  
    | $x = 6c - 4$  
    | $6c$ is always even as even $\times$ odd/even = even  
    | 4 is even  
    | So $x$ must be even $- $ even = even  |
| 52   | $n + 1$  
    | $2n + 1$  
    | $n + 1$  
    | $2n + 1$  
    | $0.66$  
    | $0.571428$  
    | $0.55$  
    | $0.54$  
    | $0.538461$  
    | $0.533$  
    | $0.52941176$  |
|      |                      |
|      | Only $\frac{3}{5}$ is a terminating decimal.  |
| 53 a | even  
    | odd  
    | even  
    | even  
    | even  
    | even  
    | odd  
    | even  |
| b    | B1  
    | B1  
    | B1  
    | B1  
    | B1  
    | B1  
    | B1  
    | B1  |
| c    | B1 for correct next three rows  |
| d    | B1 for first pattern  
    | B1 for second pattern  
    | B1 for third pattern  |
| e    | B1 for triangle numbers  |
| f    | B1 for correct sequence  |
| g    | B1 for clear explanation  |
| h    | B1 for showing the pattern of fractions  |
|      | B1 for showing all the decimals  |
|      | B1 for clear explanation  |
|      | B1 for cao  |
|      | B1 for cao  |
|      | B1 for cao  |
|      | B1 for cao  |
|      | B1 for cao  |
|      | B1 for cao  |
|      | B1 for cao  |
|      | B1 for cao  |
### 54

| a | \( t = \frac{6}{n} \): Graph B  
One person will take a long time, many people will take a short time. | B2 | 2 | B1 for correct equation  
B1 for correct graph  
B1 for good reason for choice |
| b | \( s = -4.9t^2 + 40t + 80 \): Graph D  
This is a quadratic graph and it shows the value 80 when \( t \) is 0, the height of the cliff. | B1 | 3 | B1 for correct equation  
B1 for correct graph  
B1 for good reason for choice |
| c | \( y = 3x + 320 \): Graph A  
This will be a linear graph and this graph also crosses the vertical axis at (320, 0) showing his starting pay before selling any items. | B1 | 3 | B1 for correct equation  
B1 for correct graph  
B1 for good reason for choice |
| d | \( x^2 + 72x - 225 = 0 \): Graph C  
The area from the dimensions will create a quadratic graph which moves further and further into the first quadrant. | B1 | 3 | B1 for correct equation  
B1 for correct graph  
B1 for good reason for choice |

### 55

| c and d can be difficult because they contain minus signs and this is a point where errors are made, combining minus signs. In substituting \( x = -3 \) into \( t = -2(3 - x) \), a classic error is to assume \( 3 - -3 = 0 \). In substituting \( x = -3 \) into \( z = \frac{-2(x + 2)}{x} \), a classic error is to give a negative divided by a negative a negative answer. A suggestion to avoid these errors is to remember that when multiplying or dividing with positive and negative numbers, same signs means positive, different signs means negative. | B1 | 2 | B1 for identifying some examples with a valid reason |
| B2 | B1 for clear identification of one classic error with one equation  
B1 for another classic error |
| B1 | B1 for a satisfactory suggestion |
The similarities are that both have an equals sign and both require the manipulation of terms.

The difference is that in solving an equation you end up with a numerical answer, but in rearranging you still have a formula.

| 56 | The two straight-line graphs will be parallel, with the same gradient of 2. $y = 2x$ crosses the $y$-axis at the origin and $y = 2x + 6$ crosses the $y$-axis at $y = 6$
| | | B1 | 2 | B1 for clear explanation of similarities
| | | B1 | | B1 for clear explanation of differences
| | The two straight-line graphs will be parallel, with the same gradient of 1. $y = x + 5$ crosses the $y$-axis at $y = 5$, and $y = x - 6$ crosses the $y$-axis at $y = -6$
| | | B2 | 2 | B1 for explanation of parallel
| | | B2 | | B1 for explanation containing points of intersection of axes
| | The two straight-line graphs will cross each other at $(\frac{11}{8},\frac{1}{2})$ and each one is a reflection of the other in a vertical mirror line.
| | | B2 | | B1 for explanation containing point of intersection
| | | B2 | | B1 for explanation of symmetry
| | The two straight-line graphs will both cross the $y$-axis at the origin, one with gradient 2, another with a gradient of $\frac{1}{2}$.
| | | B2 | 8 | B1 for explanation of passing through origin
| | | | | B1 for explanation about gradient

| 57 a | b | c | d |