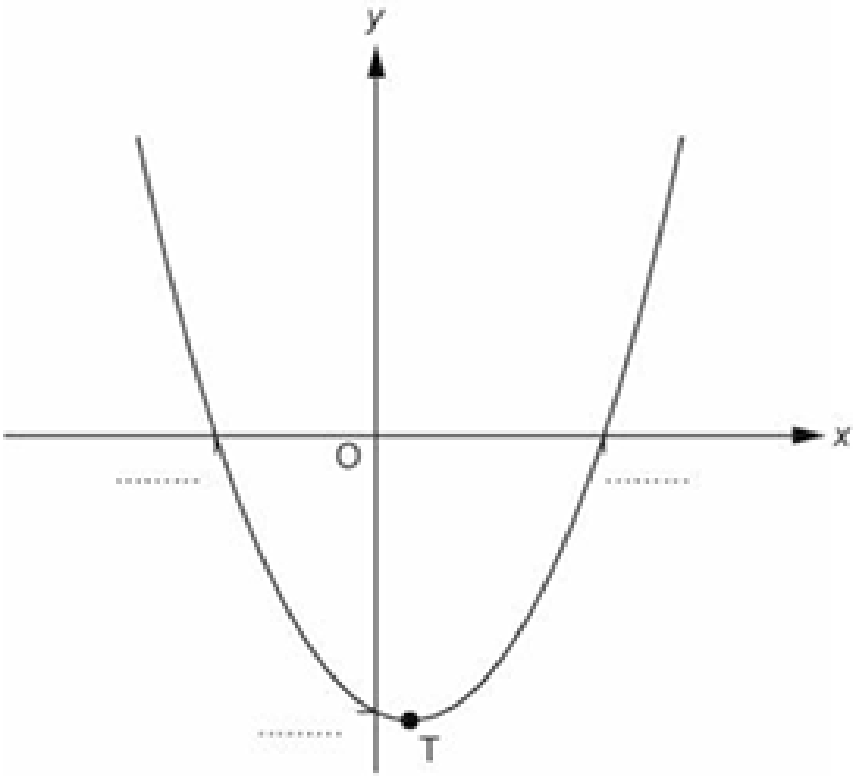
**1(a).**

Show that $(x + 5)(x – 7) = x^2 – 2x – 35$.

**[1]**

**(b).** The diagram shows a sketch of the graph $y = (x + 5)(x – 7)$.




Complete the diagram by adding the values of the **three** intercepts with the axes.

**[2]**

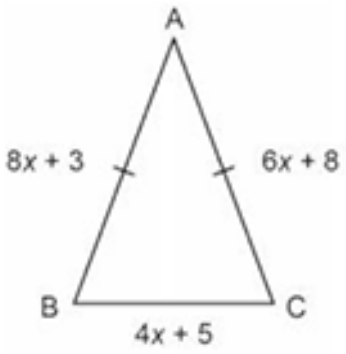
**(c).** The minimum point on the graph is marked T.

Write down the coordinates of the point T.

(..... , .....) **[2]**

**2.** In this question, all lengths are in centimetres.

The diagram shows an isosceles triangle ABC.
AB = AC.




Not to scale

Find the perimeter of the triangle.
You must show your working.

..... cm **[6]**

**3.** Simplify.

$y^{20} \div y^{4}$

.....**[1]**

**4(a).** A sequence is generated using the rule:

- multiply the previous term by 3
- then subtract 1.

The **2nd** term of the sequence is 26.

i. Find the **3rd** term of the sequence.

.....**[1]**

ii. Find the **1st** term of the sequence.

.....**[2]**

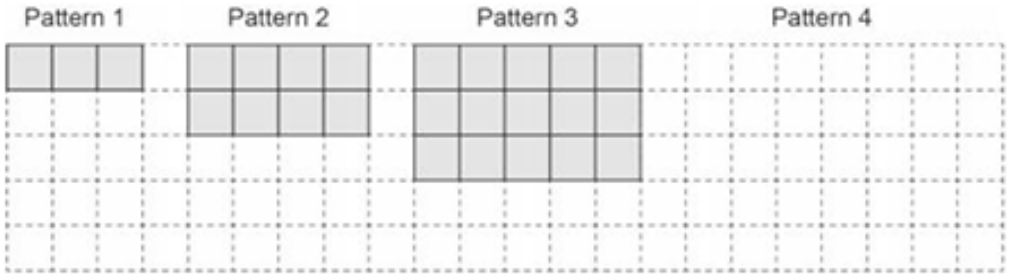
**(b).** Here are the first four terms of a sequence.

4 8 12 16

Find the *n*th term of the sequence.

.....**[1]**

**5(a).** Here are the first three tile patterns of a sequence.




Draw Pattern 4 in the space above.

**[1]**

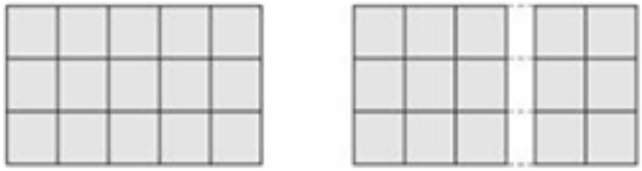
**(b).** Complete this table.

| Pattern | Calculation | Number of tiles |
|---|---|---|
| 1 | 1 × 3 | 3 |
| 2 | 2 × 4 | 8 |
| 3 | 3 × 5 | 15 |
| 4 | | |
| 5 | | |
| | | |
| 10 | | |
| | | |
| $n$ | | $n^2 + 2n$ |

**[4]**

**(c).** Each pattern in the sequence can be split into a square of tiles and a double column of tiles.

For example, Pattern 3:



The square in Pattern $n$ contains 4225 tiles.

Since number of tiles is equal to $n^2 + 2n$, out how many tiles are in Pattern $n$.

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

**6.** Complete this function machine to show the equation $y = 6 + 4x$.

**[2]**

**7.**

Rearrange this formula to make $w$ the subject.

$p = 5w$

..... **[1]**

**8.** This is a function machine.


i. Find the output when the input is 9.

..... **[1]**

ii. Find the input when the output is 36.

..... **[2]**

**9.**

Rearrange this formula to make $x$ the subject.

$y = x - 4$

..... **[1]**

**10.** Kobe invests £$x$ at a rate of 1.5% per year simple interest for 6 years.
Shanti also invests £$x$ but at a rate of 1.1% per year simple interest for 7 years.

Kobe earns £156 more interest than Shanti.

Work out the value of $x$.
You must show your working.

$x$ = ..... **[6]**

**11.** For each statement, tick (✓) whether the value of $x$ is true or false.
The first one is done for you.

| Statement | Value of $x$ | True | False |
|---|---|---|---|
| $x > -1$ | 3 | ✓ | |
| $x \leqslant -2$ | $-2$ | | |
| $\frac{x}{10} = 0.5$ | 50 | | |
| $x - 2 \neq 1$ | 3 | | |
| $-2 < x < -0.7$ | 0 | | |

**[3]**

**12.** The circumference of a circle is 21 cm.

Calculate the diameter of the circle.
Give your answer correct to **1** decimal place.

..... cm **[3]**

**13.** Simplify.

$5j + 2k - 9j + 7k$

..... **[2]**

**14.** Six adults and two children go to a theme park.
The cost of an adult ticket is £13 more than the cost of a child ticket.
The total cost of the eight tickets is £118.

Work out the cost of an adult ticket.
You must show your working.

£ ..... **[5]**

**15.** Kai invests some money in a savings account that pays 5% simple interest per year.
After 4 years the total interest that Kai's investment has earned is £360.

Find the total value of Kai's investment after 4 years.

You must show your working.

£ ..... **[5]**

**16(a).** Simplify.

$h \times h \times h \times h \times h$

..... **[1]**

**(b).** Factorise fully.

$4fg + 12f$

..... **[2]**

**17(a).** Choose a word from this list which best describes the statement.

| Equation | Expression | Formula | Identity | Inequality | Term |
|---|---|---|---|---|---|

$x^2 + 4x + 3 = 0$

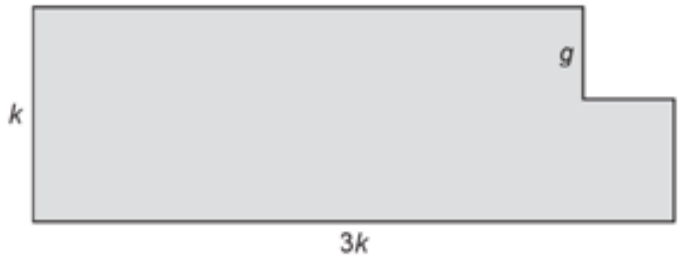
..... **[1]**

**(b).** $x^2 + 4x + 3 > 0$.

..... **[1]**

**18(a).** In this question all measurements are in centimetres.

The shaded shape is made by cutting a square from the corner of a rectangle.




The width of the rectangle is $k$.
The length of the rectangle is $3k$.
Each side of the square is $g$.

Write down the relationship between the length and the width of the rectangle.

---------- **[1]**

**(b).** Find an expression for the area of the shaded shape.
Give your answer in its simplest form.

..... **[2]**

**(c).**

i. Find an expression for the perimeter of the shaded shape.
Give your answer in its simplest form.

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

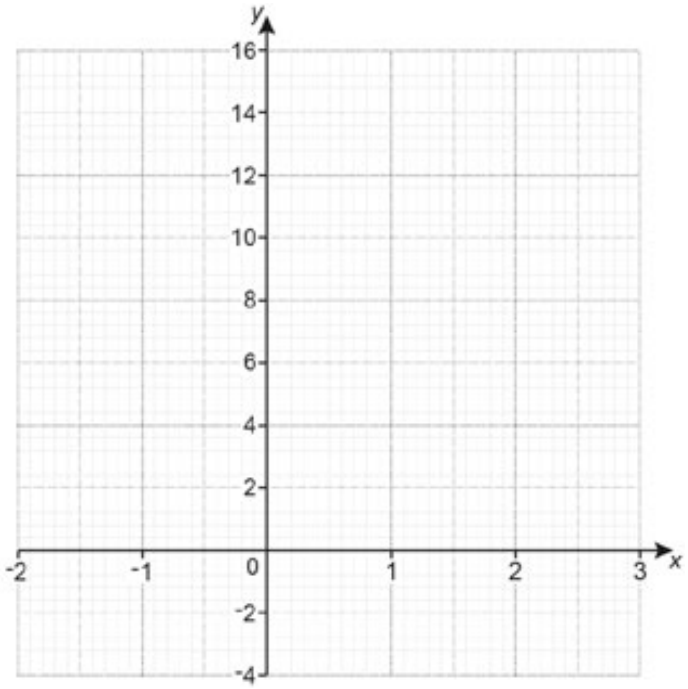
ii. Find the value of $k$ when the perimeter of the shaded shape is 81.6.

$k$ = ..... **[2]**

**19(a).** Here is a table of values for $y = 2x^2 - 4x$.

| $x$ | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| $y$ | 16 | 6 | 0 | -2 | 0 | 6 |

Draw the graph of $y = 2x^2 - 4x$ for values of $x$ from -2 to 3.




**[3]**

**(b).** Use your graph to find the $x$-coordinates of the points where the graph of $y = 2x^2 - 4x$ crosses the line $y = 4$.

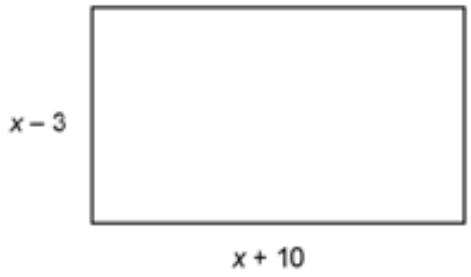
$x$ = ..... and $x$ = ..... **[2]**

**20.** A circle has radius 6 cm.

Work out the area of the circle.

..... cm$^2$ **[2]**

**21(a).** In this question, all lengths are in centimetres.




**Not to scale**

The area of the rectangle is 90 cm$^2$.

Show that $x^2 + 7x - 120 = 0$.

**[4]**

**(b).**

i. Solve by factorising.

$x^2 + 7x - 120 = 0$

$x$ = ..... or $x$ = ..... **[3]**

ii. Find the length of the shorter side of the rectangle.

..... cm **[1]**

**22.** In the Fibonacci sequence below, the next term is found by adding the two previous terms.
The second term is 8, the third term is 11 and the fourth term is 19.

Work out the first and fifth terms of the sequence.

..... 8 11 19 .....

**[2]**

**23.** Use the formula

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

to find the final velocity when

- the initial velocity is 5 m/s
- the acceleration is 3 m/s$^2$
- the distance travelled is 4 m.

..... m/s **[3]**

**24(a).** Simplify.

$9a + 3b - 2a + b$

**..... [2]**

**(b).** $3w \times 8y$

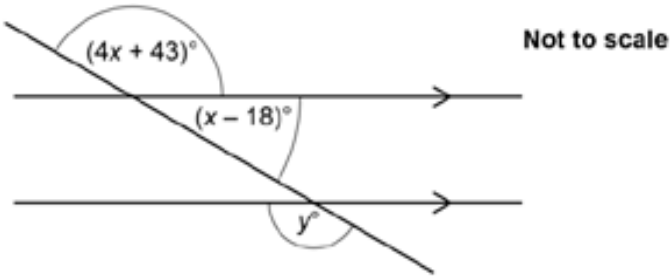
**..... [1]**

**25.** Work out the next term in this sequence.

2 5 9 14 .....

**[1]**

**26.** The diagram shows a straight line crossing two parallel lines.




Find the value of $y$.
You must show your working.

$y$ = ..... **[5]**

**27.** Solve the simultaneous equations.

$6x - 2y = 22$
$3x + 4y = 16$

$x$ = .....
$y$ = ..... **[3]**

**28(a).** Here is a formula.

$a = b\,(c - d)$

Find the value of $a$ when $b = 4$, $c = 8$ and $d = 6$.

$a$ = ..... **[1]**

**(b).** Find the value of $c$ when $a = 26$, $b = 4$ and $d = 3$.

$c$ = ..... **[3]**

**29.** Solve $8x + 17 > 1$.

Show your solution on the number line.


**[4]**

**30(a).** Here are the first three dot patterns in a sequence.


Draw Pattern 4 in the sequence.

**[1]**

**(b).** Without drawing, work out how many dots are in Pattern 10 of the sequence.

Explain how you worked out your answer.

---

---

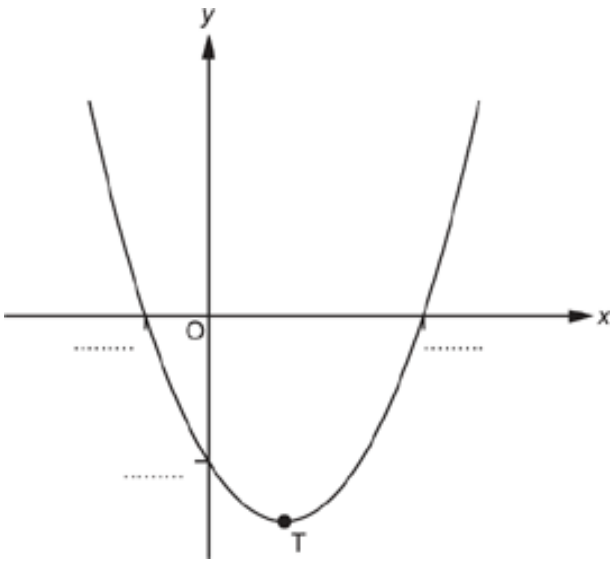
---**[2]**

**31(a).**

Show that $(x + 3)(x – 5) = x^2 – 2x – 15$.

**[1]**

**(b).** The diagram shows a sketch of the graph $y = (x + 3)(x – 5)$.




Complete the diagram by adding the values of the **three** intercepts with the axes.

**[2]**

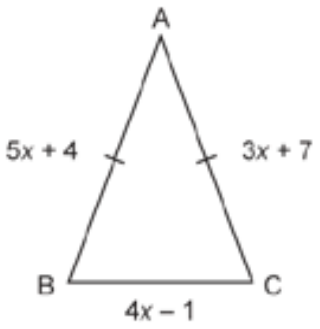
**(c).** The minimum point on the graph is marked T.

Write down the coordinates of the point T.

(..... , .....) **[2]**

**32.** In this question, all lengths are in centimetres.

The diagram shows an isosceles triangle ABC. AB = AC.




**Not to scale**

Find the perimeter of the triangle.
You must show your working.

..... cm **[6]**

**33(a).** A sequence is generated using the rule:

- multiply the previous term by 3
- then subtract 1.

The **2nd** term of the sequence is 20.

i. Find the **3rd** term of the sequence.

..... **[1]**

ii. Find the **1st** term of the sequence.

..... **[2]**

**(b).** Here are the first four terms of a sequence.

5 10 15 20

Find the *n*th term of the sequence.

..... **[1]**

**34.** Simplify.

$y^{12} \div y^4$

..... **[1]**

**35(a).** This is a function machine.

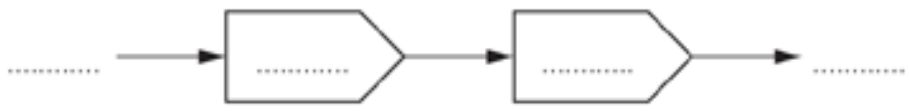

i. Find the output when the input is 9.

..... **[1]**

ii. Find the input when the output is 36.

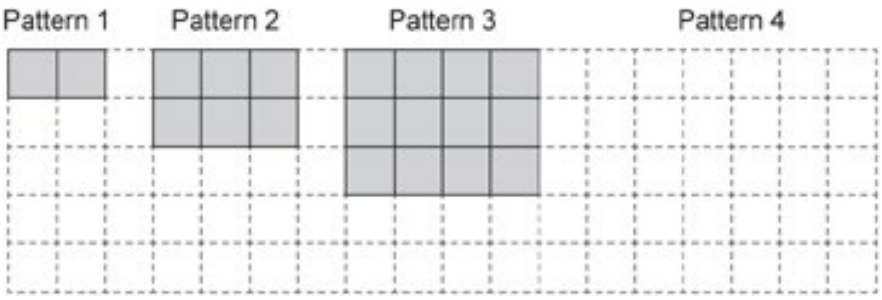
..... **[2]**

**(b).** Complete this function machine to show the equation $y = 8 + 3x$.



**[2]**

**36(a).** Here are the first three tile patterns of a sequence.



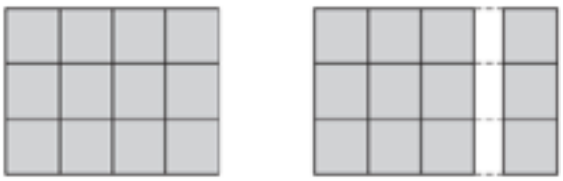

Complete this table.

| Pattern | Calculation | Number of tiles |
|---|---|---|
| 1 | 1 × 2 | 2 |
| 2 | 2 × 3 | 6 |
| 3 | 3 × 4 | 12 |
| 4 | | |
| 5 | | |
| | | |
| 10 | | |
| | | |
| $n$ | | $n^2 + n$ |

**[4]**

**(b).** Each pattern in the sequence can be split into a square of tiles and a single column of tiles.

For example, Pattern 3:



The square in Pattern $n$ contains 4096 tiles.

Since number of tiles is equal to $n^2 + n$, work out

how many tiles are in Pattern $n$.

**(c)** ..... **[3]**

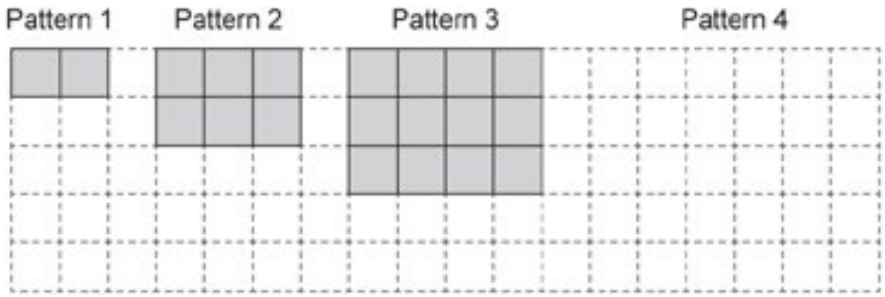
**37.** Darcie invests £$x$ at a rate of 1.5% per year simple interest for 5 years.
Ivan also invests £$x$ but at a rate of 1.1% per year simple interest for 6 years.

Darcie earns £108 more interest than Ivan.

Work out the value of $x$.
You must show your working.

$x$ = ..... **[6]**

**38.** Here are the first three tile patterns of a sequence.




Draw Pattern 4 in the space above.

**[1]**

**39(a).** Rearrange this formula to make $x$ the subject.

$y = x + 3$

..... **[1]**

**(b).** Rearrange this formula to make $w$ the subject.

$p = 3w$

..... **[1]**

**40.** For each statement, tick (✓) whether the value of $x$ is true or false.
The first one is done for you.

| Statement | Value of $x$ | True | False |
|---|---|---|---|
| $x > -1$ | 5 | ✓ | |
| $x \leq -1$ | -1 | | |
| $\frac{x}{10} = 0.7$ | 70 | | |
| $x - 2 \neq 5$ | 3 | | |
| $-1 < x < 0.7$ | 0 | | |

**[3]**

**41.** The circumference of a circle is 17cm.

Calculate the diameter of the circle.
Give your answer correct to **1** decimal place.

..... cm **[3]**

**42.** Simplify.

$8j + 4k - 10j + 7k$

..... **[2]**

**43.** Five adults and two children go to a theme park.
The cost of an adult ticket is £6 more than the cost of a child ticket.
The total cost of the seven tickets is £142.

Work out the cost of an adult ticket.
You must show your working.

£ ..... **[5]**

**44(a).** Simplify.

i. $3a + a + 5a$

..... **[1]**

ii. $3x - 4y - 4x + 6$

..... **[2]**

**(b).** Solve.

$p - 6 = {}^{-}3$

$p$ = ..... **[1]**

**45(a).** Factorise.

$7x - 21$

..... **[1]**

**(b).** Factorise fully.

$15x + 5x^2$

..... **[2]**

**46(a).** Show that the formula $a = \frac{v - u}{t}$ can be rearranged to $v = u + at$.

**[1]**

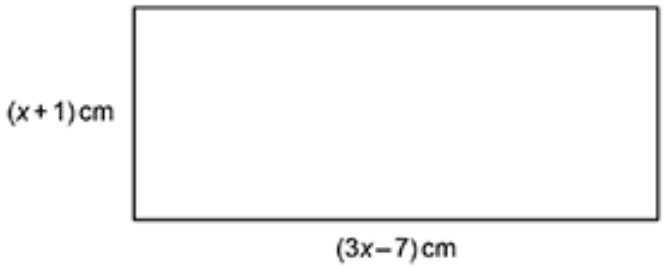
**(b).** Use the formula

$v = u + at$

to find the final velocity, $v$ m/s, when a particle accelerates for 6 seconds at $2\text{m/s}^2$ from an initial velocity of 3 m/s.

$v$ = ..... m/s **[2]**

**47.** The diagram shows a rectangle with length $(3x - 7)$ cm and width $(x + 1)$ cm.




**Not to scale**

The length of the rectangle is twice the width of the rectangle.

Calculate the area of the rectangle.
You must show your working.

..... $\text{cm}^2$ **[6]**

**48(a).** Choose a word from this list which best describes each statement.

Equation Expression Formula Inequality Term

$2\pi d = 45$

…… **[1]**

**(b).** $6a - 2b$

…… **[1]**

**49(a).** Simplify.

$\frac{8x^3}{x}$

…… **[1]**

**(b).** Rearrange this formula to make $x$ the subject.

$y = \frac{x}{3} + 5$

…… **[2]**

**50(a).** Here are the first five terms of a sequence.

6 12 18 24 30

i. Write down the next term of the sequence.

…… **[1]**

ii. Beth says

*All of the terms in the sequence are even numbers.*
*604 is an even number.*
*Therefore, if the sequence is continued, 604 will be in the sequence.*

Is Beth correct?
Give a reason for your decision.

_____ because _____

_____ **[1]**

**(b).** Here are the first five terms of another sequence.

32 16 8 4 2

i. Write down the next term of the sequence.

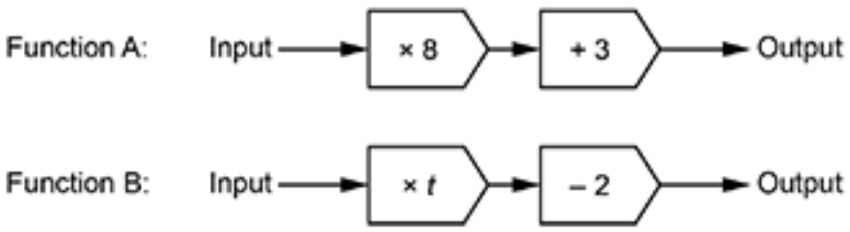
…… **[1]**

ii. Explain how you worked out your answer.

_____

---**[1]**

**51.** Here are two functions.



When the input of each function is 5, the output of Function A is equal to the output of Function B.

Work out the value of $t$ in Function B.

$t$ = ..... **[4]**

**52(a).** Multiply out.

$3a(4 - a)$

..... **[2]**

**(b).** Solve.

$4x + 8 > 11$

..... **[2]**

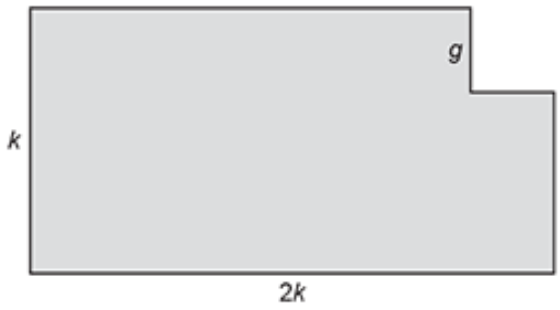
**(c).** Solve by factorising.

$x^2 + 9x + 20 = 0$

$x$ = ..... or $x$ = ..... **[3]**

**53(a).** In this question all measurements are in centimetres.

The shaded shape is made by cutting a square from the corner of a rectangle.




The width of the rectangle is $k$.
The length of the rectangle is $2k$.
Each side of the square is $g$.

Write down the relationship between the length and the width of the rectangle.

---------- **[1]**

**(b).** Find an expression for the area of the shaded shape.
Give your answer in its simplest form.

..... **[2]**

**(c).**

i. Find an expression for the perimeter of the shaded shape.
Give your answer in its simplest form.

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

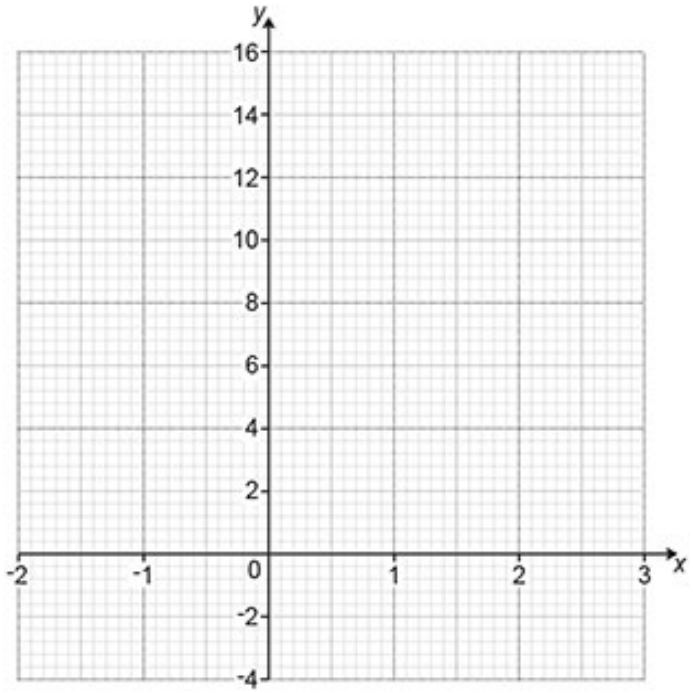
ii. Find the value of $k$ when the perimeter of the shaded shape is 62.4.

$k$ = ..... **[2]**

**54(a).** Here is a table of values for $y = 2x^2 - 3x$

| $x$ | −2 | −1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| $y$ | 14 | 5 | 0 | −1 | 2 | 9 |

Draw the graph of $y = 2x^2 - 3x$ for values of $x$ from $^-2$ to 3.




**[3]**

**(b).** Use your graph to find the $x$-coordinates of the points where the graph of $y = 2x^2 - 3x$ crosses the line $y = 6$.

$x$ = ..... and $x$ = ..... **[2]**

**55.** Riley invests some money in a savings account that pays 4% simple interest per year.
After 5 years the total interest that Riley's investment has earned is £360.

Find the total value of Riley's investment after 5 years.
You must show your working.

£ ..... **[5]**

**56.** A circle has radius 8 cm.

Work out the area of the circle.

..... $cm^2$ **[2]**

**57(a).** Simplify.

$h \times h \times h \times h$

..... **[1]**

**(b).** Factorise fully.

$3fg + 12g$

..... **[2]**

**58(a).** Choose a word from this list which best describes the statement.

| Equation | Expression | Formula | Identity | Inequality | Term |
|---|---|---|---|---|---|

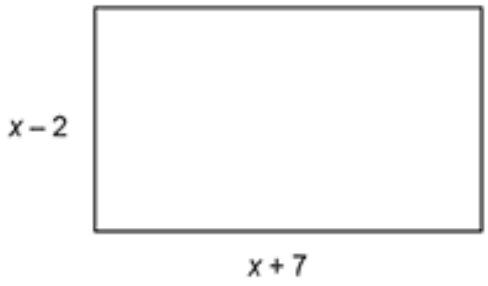
$x^2 + 3x + 2$

..... **[1]**

**(b).** $(x + 1)(x + 2) = x^2 + 3x + 2$

..... **[1]**

**59(a).** In this question, all lengths are in centimetres.




**Not to scale**

The area of the rectangle is $70cm^2$.

Show that $x^2 + 5x - 84 = 0$

**[4]**

**(b).**

i. Solve by factorising.

$x^2 + 5x - 84 = 0$

$x$ = ..... or $x$ = ..... **[3]**

ii. Find the length of the longer side of the rectangle.

..... cm **[1]**

**60(a).** Simplify.

$3y + 6x - y + 5x$

..... **[2]**

**(b).** $5a \times 6b$

..... **[1]**

**61(a).** Work out the next term in this sequence.

1 3 6 10 .....

**[1]**

**(b).** In the Fibonacci sequence below, the next term is found by adding the two previous terms.
The second term is 7, the third term is 10 and the fourth term is 17.

Work out the first and fifth terms of the sequence.

..... 7 10 17 .....

**[2]**

**62.** Use the formula

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

to find the final velocity when

- the initial velocity is 6m/s
- the acceleration is 4m/s$^2$
- the distance travelled is 8m.

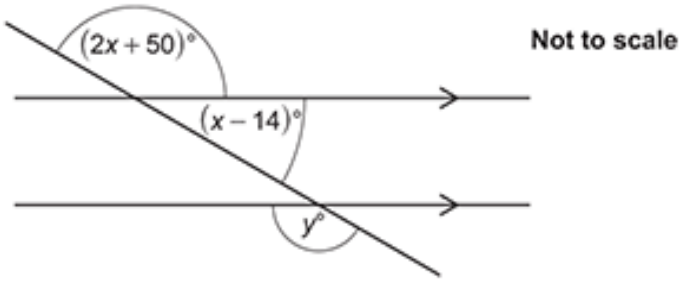
..... m/s **[3]**

**63.** Solve $7x - 3 < 11$.

Show your solution on the number line.


**[4]**

**64.** The diagram shows a straight line crossing two parallel lines.




Find the value of $y$.
You must show your working.

$y$ = ..... **[5]**

**65.** Solve the simultaneous equations.
$4x - y = 24$
$2x + 3y = 26$

$x$ = .....

$y$ = ..... **[3]**

**66(a).** Here are the first three dot patterns in a sequence.


Draw Pattern 4 in the sequence.

**[1]**

**(b).** Without drawing, work out how many dots are in Pattern 10 of the sequence.
Explain how you worked out your answer.

**[2]**

**67(a).** Here is a formula.

$a = b(c + d)$

Find the value of $a$ when $b = 3$, $c = 7$ and $d = 5$.

$a =$ ..... **[1]**

**(b).** Find the value of $c$ when $a = 30$, $b = 4$ and $d = 6$.

$c =$ ..... **[3]**

**68.** Rowan draws a circle and works out its area, in $cm^2$, and circumference, in cm.
The answer for the area is three times the answer for the circumference.

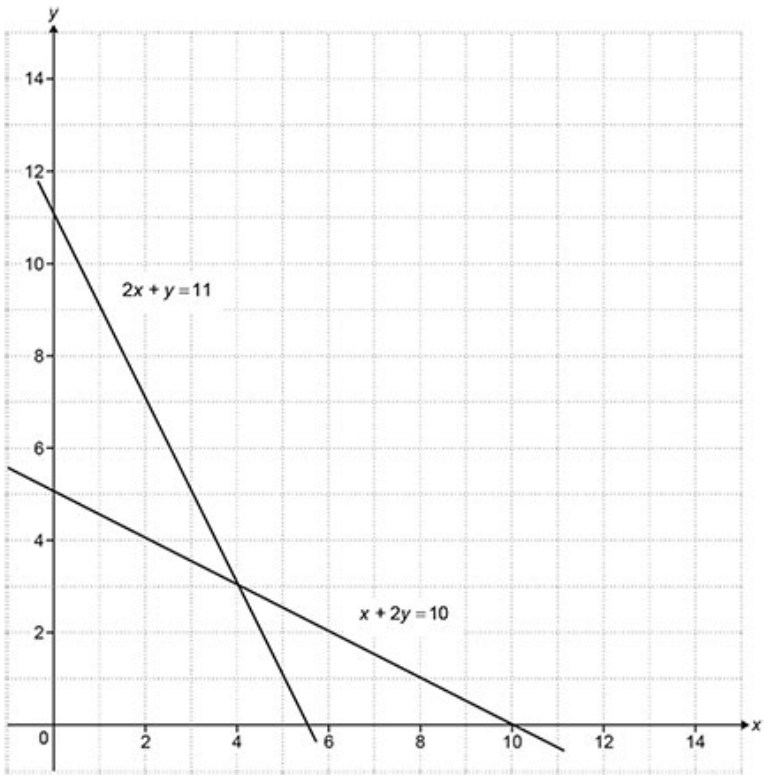
Work out the diameter of the circle.
You must show your working.

…….…….…….. cm **[4]**

**69.** The graph shows the solution to this pair of simultaneous equations.

$2x + y = 11$
$x + 2y = 10$

Use the solution to work out the value of $x + 3y$.
You must show how you work out your answer.




$x + 3y$ = …….…….…….. **[3]**

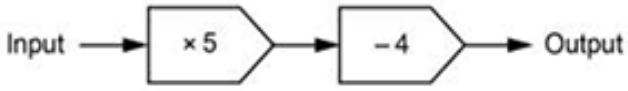
**70.** Solve.

$x^2 + 6x - 135 = 0$

You must show your working.

$x$ = ..... or $x$ = ..... **[3]**

**71(a).** Here is a function machine.




i. Find the output when the input is 10.

..... **[1]**

ii. Find the input when the output is 21.

..... **[2]**

**(b).** The input is $x$ and the output is $y$.

Write an equation for $y$ in terms of $x$.

..... **[2]**

**72(a).** Solve.

$\frac{x}{3} = 6$

$x$ = ..... **[1]**

**(b).** $9 - x = {}^{-}3$

$x$ = ..... **[1]**

**73(a).** Multiply out.

$5\,(x + 2)$

..... **[1]**

**(b).** $4b\,(b - 1)$

..... **[2]**

**74.** Solve.
$4x - 7 = 19 - 6x$

$x$ = ..... **[3]**

**75.** Find all the possible integer values that satisfy the inequality $6 < 3x \leq 15$.

…….. **[3]**

**76.** Find the value of $5x + 4y$ when $x = 2$ and $y = {}^{-}3$.

…….. **[2]**

**77.** A theatre has an adult price and a child price for their shows.

A group of 5 adults and 4 children paid a total of £137.
A group of 2 adults and 3 children paid a total of £73.

Work out the price for one adult and the price for one child.
You must show your working.

Price for one adult £ ……..…….

Price for one child £ …….…….. **[5]**

**78(a).** Simplify.

i. $4r - 8t - 2r + 3t$

…… **[2]**

ii. $a \times a \times a \times a$

…… **[1]**

iii. $8b^4 \div b$

…… **[1]**

**(b).** Factorise.

$3a - 15b$

…… **[1]**

**79(a).** Here are the first four terms of a sequence.

9 15 21 27

Write down the next term of the sequence.

…… **[1]**

**(b).** Explain how you worked out your answer.

_____ **[1]**

**(c).** Explain why 80 is **not** a term in this sequence.

_____ **[1]**

**80(a).** Rearrange this formula to make $d$ the subject.

$f = 4d + 5$

…….. **[2]**

**(b).** Use the formula

$v = u + at$

to find the final velocity, when

- the initial velocity is 4 m/s
- the acceleration is 5.5 m/s$^2$
- the time is 8 seconds.

…….. m/s **[2]**

**81.** Rearrange this formula to make $k$ the subject.

$t = 3k + h$

…….. **[2]**

**82.** The length of a word is classed as short, medium or long depending on the number of characters in the word.
This table shows the percentage, in terms of $x$, of each word length found in a book.

| **Length of word** | **Percentage (%)** |
|---|---|
| Short | $2x + 5$ |
| Medium | $4x - 3$ |
| Long | $x$ |

Find the percentage of words in this book which are classed as short words.
You must show your working.

…….…….…….…… % **[5]**

**83(a).** Simplify.

i. $4a \times 5$

…….…….…….…… **[1]**

ii. $b \times b \times b \times b \times b$

…….…….…….…… **[1]**

iii. $c^3 \times c^5$

…….…….…….…… **[1]**

**(b).** Factorise.

$10 - 8y$

…… **[1]**

**84(a).**

Factorise $x^2 + 11x + 24$.

…… **[2]**

**(b).** Write down the solutions to $x^2 + 11x + 24 = 0$.

$x$ = …… or $x$ = …… **[1]**

**85(a).** Solve

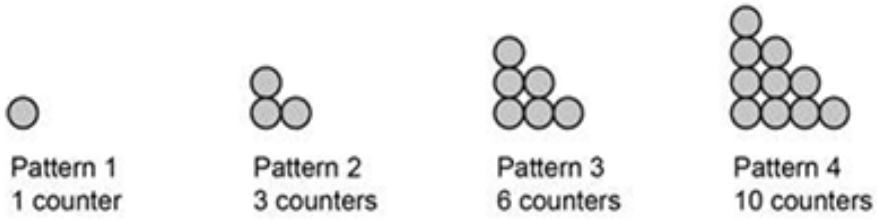
$\frac{x}{5} = 3$

$x$ =…… **[1]**

**(b).** $4x = {}^{-}20$

$x$ =…… **[1]**

**86(a).** Alex is making a sequence of patterns using counters.
Here are the first four patterns in the sequence.




Alex started with 60 counters.

Alex says

I do not have enough counters to make Pattern 5 and Pattern 6.

Is Alex correct?
Show how you decide.

_____ because _____

_____ **[4]**

**(b).**

i. Complete the table below for the addition of counters in consecutive patterns.

| Patterns to add | Counters to add | Total counters |
|---|---|---|
| Pattern 1 + Pattern 2 | 1 + 3 | 4 |
| Pattern 2 + Pattern 3 | 3 + 6 | 9 |
| Pattern 3 + Pattern 4 | | |

**[1]**

ii. The number of counters in Pattern $k$ + Pattern ($k$ + 1) is 100.

Find the value of $k$.

$k$ = ..... **[2]**

**87.** Complete this identity by writing in the missing numbers.

$$3(.....x+4)=10x-4(x-5)-.....$$

**[2]**

**88(a).** Darcie is asked to solve the equation $4x - 6 = 17$.

Darcie's working is shown below.

$$\begin{aligned} 4x-6&=17\\ 4x&=17-6\\ 4x&=11\\ x&=2.75 \end{aligned}$$

Write down the error that Darcie has made.

---

---**[1]**

**(b).** Kareem is asked to use the formula

$v = u + at$

to find the acceleration, when

- the initial velocity is 6 m/s$^2$
- the final velocity is 27 m/s
- the time is 5 seconds.

Kareem's working is shown below.

$$6 = 27 + (a \times 5)$$
$$6 - 27 = 5a$$
$$-21 = 5a$$
$$a = -4.2$$

Write down the error that Kareem has made.

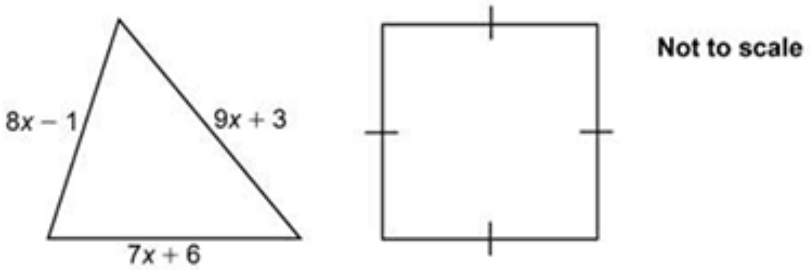
---

**[1]**

**89.** Show the inequality $x < 0$ on this number line.


**[2]**

**90.** The diagram shows a triangle and a square.
The perimeter of the triangle is equal to the perimeter of the square.




Find an expression for the length of one side of the square.
Give your answer in terms of $x$ in its simplest form.

..... **[4]**

**91.** Multiply out and simplify.

$(5x + y)(x + 3y)$

…… **[3]**

**92(a).** Here are the first four terms of a sequence.

3 11 19 27

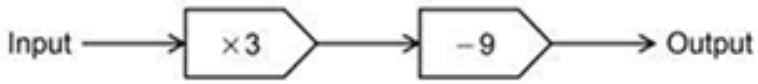
Write down the next term in the sequence.

…… **[1]**

**(b).** Explain how you worked out your answer.

_____ **[1]**

**93(a).** Here is a function.




Find the input when the output is 81.

…… **[2]**

**(b).** The input is $x$ and the output is $y$.

Write an equation for $y$ in terms of $x$.

..... **[2]**

**94.** In a dance competition, four judges award marks to each dancer.
Each judge can award 1, 2, 3, 4 or 5 marks.

The four judges' median mark, $m$, is put into the formula

$S = 10m - 5$

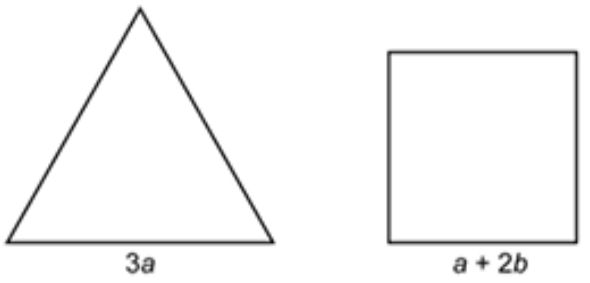
to get the dancer's score, $S$.

Taylor is awarded marks of 3, 1, 2 and 3.
Work out Taylor's score.

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

**95.** In this question, all lengths are in centimetres.

The diagram shows an equilateral triangle and a square.




**Not to scale**

The perimeter of each shape is 72 cm.

Find the value of $b$.

$b$ = ..... **[4]**

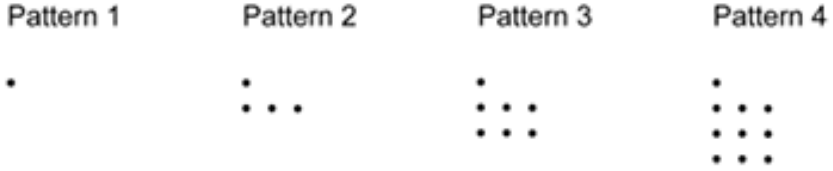
**96.** Solve the simultaneous equations.

$x + 5y = 13$
$x + 3y = 7$

$x$ = .....

$y$ = ..... **[3]**

**97(a).** Here are the first four dot patterns in a sequence.




Draw Pattern 5 in the sequence.

**[1]**

**(b).** Without drawing, work out how many dots are in Pattern 8 of the sequence.
Explain how you worked out your answer.

_____ because _____

_____ **[2]**

**98(a).** Simplify.

$3 \times 4a$

..... **[1]**

**(b).** Simplify.

$\frac{2x^4}{6x}$

..... **[2]**

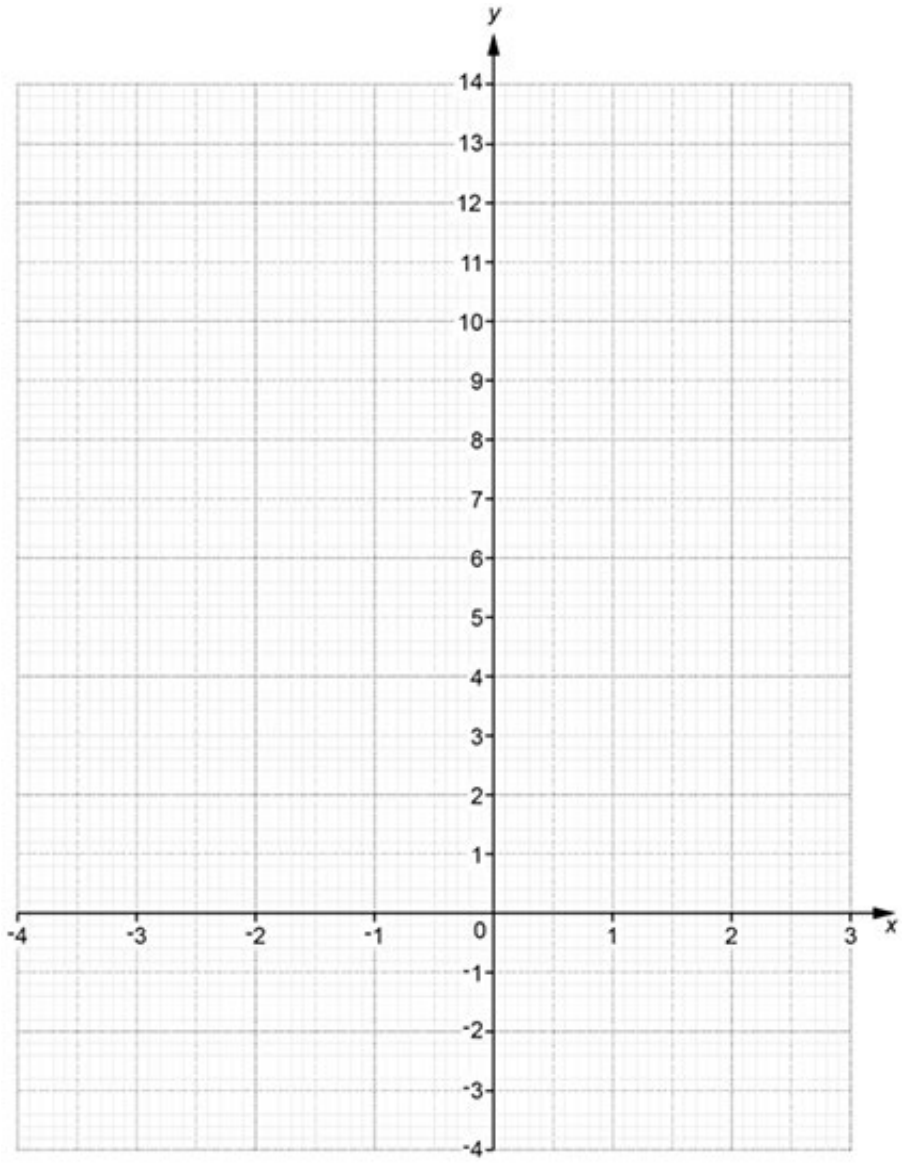
**99(a).**

Complete this table for $y = x^2 - 3$.

| $x$ | $^-4$ | $^-3$ | $^-2$ | $^-1$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|
| $y$ | | 6 | 1 | $^-2$ | | $^-2$ | 1 | 6 |

**[2]**

**(b).** Draw the graph of $y = x^2 - 3$ for the values of $x$ from $^-4$ to 3.




**[3]**

**(c).** Use the graph to solve the equation $x^2 - 3 = 0$.
Give your answers to **1** decimal place.

$x$ = …… or $x$ = …… **[2]**

**100.** This list represents four numbers.

137 $x - 2$ $x$ $3x$

The **mean** of the four numbers is 150.

Work out the numbers.
You must show your working.

137

…… …… …… …… **[5]**

**101(a).** Simplify.

$6t + t - 5t$

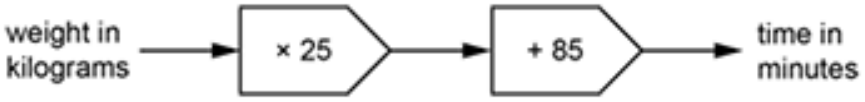
…… **[1]**

**(b).** Factorise.

$y^2 - 5y$

…… **[1]**

**102(a).** Here is a rule to work out the time, in minutes, needed to cook a turkey.




Blake's turkey takes 160 minutes to cook.

Use the rule to work out the weight of Blake's turkey.

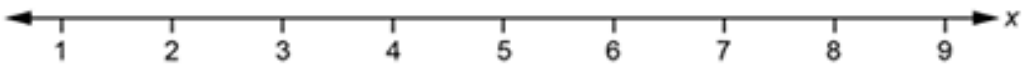
…….…….…… kg **[2]**

**(b).** Jamie cooks a turkey.
His turkey weighs 5 kg.
Jamie wants to take his turkey out of the oven at 2:05 pm.

Use the rule to work out at what time Jamie should put his turkey in the oven.
You must show your working.

…….…….…… **[5]**

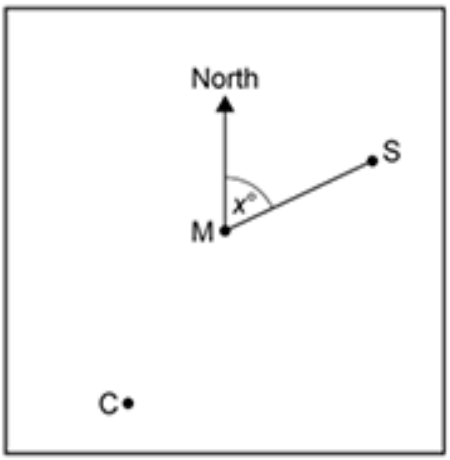
**103.** Solve $3x - 4 \leq 11$.
Show your solution on the number line.




**[4]**

**104(a).** A playground has a maze (M) at the centre.
There is also a climbing frame (C) and a swing (S).

The bearing of the swing from the maze is x°.




**Not to scale**

The bearing of the climbing frame from the maze is 160° more than the bearing of the swing from the maze.

Write down, in terms of $x$, the bearing of the climbing frame from the maze.

……° **[1]**

**(b).** The bearing of the climbing frame from the maze is also five times the bearing of the swing from the maze.

Work out the bearing of the climbing frame from the maze.

……° **[4]**

**105(a).**

$$(x + 3)(x + 5) = x^2 + 8x + 15$$

Morgan says that the statement in the box is an equation.
Taylor says that the statement in the box is an identity.
One of them is correct.

Explain which one of Morgan or Taylor is correct.

_____ is correct because _____

_____

_____

_____ **[2]**

**(b).** Solve by factorising.

$x^2 + 7x - 18 = 0$

$x$ = ……..…….. or $x$ = ……..…….. **[3]**

**106(a).** Multiply out.

$3(x + 5)$

…….…….…….…….. **[1]**

**(b).** Rearrange this formula to make $t$ the subject.

$r = 5t - 3$

…….…….…….…….. **[2]**

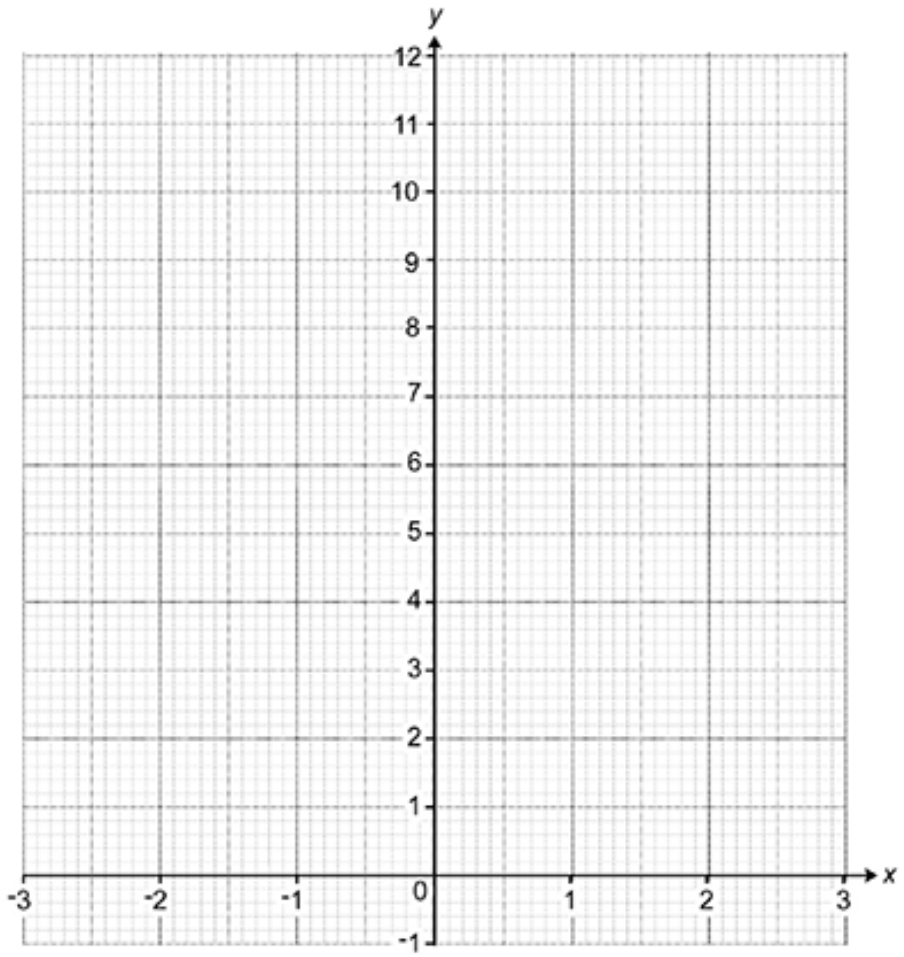
**107(a).**

Complete this table for $y = x^2 + 2$.

| $x$ | $^-3$ | $^-2$ | $^-1$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| $y$ | | 6 | 3 | | 3 | 6 | 11 |

**[2]**

**(b).** Draw the graph of $y = x^2 + 2$ for values of $x$ from $^-3$ to 3.

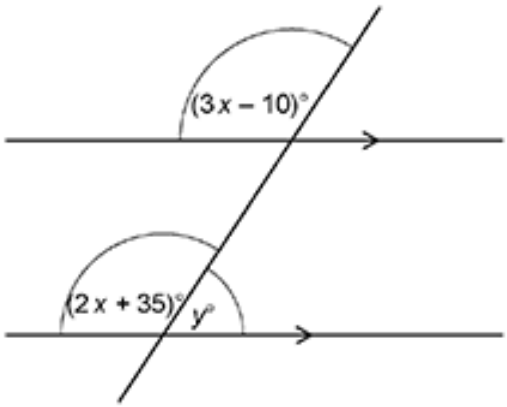



**[3]**

**(c).** Use your graph to solve $x^2 + 2 = 8$.

$x$ = ..... or $x$ = ..... **[2]**

**108.** The diagram shows a straight line crossing two parallel lines.




Not to scale

Find the value of $y$.
You must show your working.

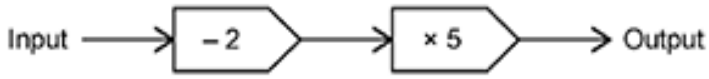
$y$ = ..... **[6]**

**109.** Solve the inequality.

$3(x - 4) > 15$

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

**110(a).** Here is a function.




Find the output when the input is 5.

…….. **[1]**

**(b).** Find the input when the output is 60.

…….. **[2]**

**111.** Morgan buys 4 drinks and 3 cakes for £14.05.
Frankie buys 2 drinks and 5 cakes for £14.55.

Assume that each drink costs the same and that each cake costs the same.

Calculate the cost of one drink and the cost of one cake.
You must show your working.

Cost of one drink £……..…….

Cost of one cake £……..…….. **[5]**

**112.** Solve.

$y - 18 = 20$

$y =$ ..... **[1]**

**113(a).** Simplify.

$2ad^2 \times 4d$

..... **[2]**

**(b).** Factorise.

$45x - 5x^2$

..... **[2]**

**114.** Here are the first four terms of a sequence.

7 15 23 31

i. Write down the next term in the sequence.

..... **[1]**

ii. Explain how you worked out your answer.

**[1]**

**115.** Solve.

$8x + 5 = 41$

$x$ = …… **[2]**

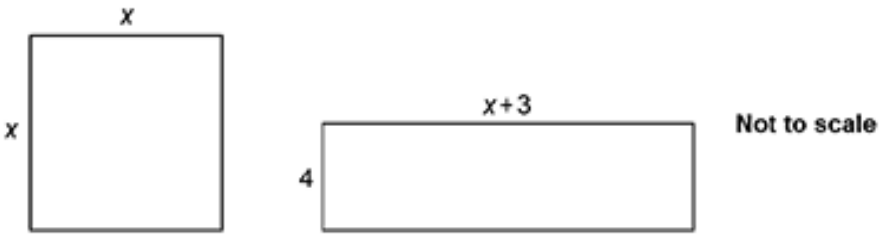
**116.** The $n$th term of a sequence is given by $3n + 1$.

Explain why 32 is **not** a term in this sequence.

---

**[2]**

**117(a).** In this question, all measurements are in centimetres.




The square and the rectangle have the same area.

Show that $x^2 - 4x - 12 = 0$.

**[3]**

**(b).** Solve $x^2 - 4x - 12 = 0$.

$x$ = ..... or $x$ = ..... **[3]**

**(c).** Explain why one of the answers in part **(b)** is not possible in the context of the question.

---

**[1]**

**(d).** Write down the following.

i. The area of the square.

..... $cm^2$ **[1]**

ii. The length of the rectangle.

..... cm **[1]**

**118.** Simplify.

$4p + 3h - p + 2h$

..... **[2]**

**119(a).** Here are some algebraic statements.

$y \geq 3x$ $2(x + 1) = 2x + 2$ $u = v - at$ $3x = 9$ $2x + y$

From the list above, write down an example of the following.

An inequality.

…… **[1]**

**(b).** An equation.

…… **[1]**

**(c).** An expression.

…… **[1]**

**120.** Rearrange this formula to make $b$ the subject.

$A = 2b - 3c$

…… **[2]**

**121(a).** Factorise.

$5x - 20$

..... **[1]**

**(b).** Factorise fully.

$14x + 7x^2$

..... **[2]**

**122(a).** Show that the formula $v = u + at$ can be rearranged to $a = \frac{v-u}{t}$.

**[1]**

**(b).** Use the formula

$a = \frac{v-u}{t}$

to find the acceleration, $a$ m/s$^2$, when a particle takes 4 seconds to increase from an initial velocity of 3 m/s to a final velocity of 9 m/s.

$a$ = ..... m/s$^2$ **[2]**

**123(a).** Simplify.

i. $4a + 2a + a$

..... **[1]**

ii. $2x – 3y – 3x + 4$

..... **[2]**

**(b).** Solve.

$p – 5 = ^-4$

$p$ = ..... **[1]**

**124(a).** Choose a word from this list which best describes each statement.

| Equation | Expression | Formula | Inequality | Term |
|---|---|---|---|---|

2b + 2$w$

..... **[1]**

**(b).** $\pi r^2 = 30$

..... **[1]**

**125(a).** Simplify.

$\frac{5x^2}{x}$

..... **[1]**

**(b).** Rearrange this formula to make *x* the subject.

$y = \frac{x}{5} + 2$

..... **[2]**

**126(a).**

Here are the first five terms of a sequence.

4 8 12 16 20

i. Write down the next term of the sequence.

..... **[1]**

ii. Kai says

*All of the terms in the sequence are even numbers.*
*402 is an even number.*
*Therefore, if the sequence is continued, 402 will be in the sequence.*

Is Kai correct?
Give a reason for your decision.

_____ because _____

---------- **[1]**

**(b).** Here are the first five terms of a sequence.

0.25 0.5 1 2 4

i. Write down the next term of the sequence.

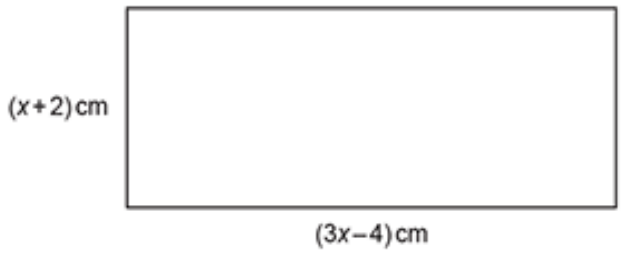
..... **[1]**

ii. Explain how you worked out your answer.

---

**[1]**

**127.** The diagram shows a rectangle with length $(3x - 4)$cm and width $(x + 2)$cm.




Not to scale

The length of the rectangle is twice the width of the rectangle.

Calculate the area of the rectangle.
You must show your working.

..... $cm^2$ **[6]**

**128(a).** Solve.

$5x + 9 > 12$

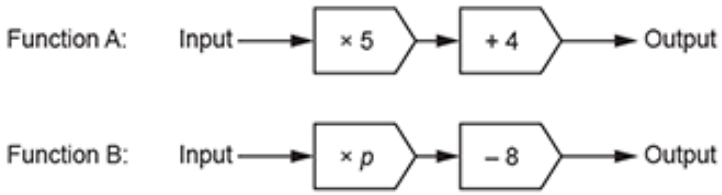
..... **[2]**

**(b).** Solve by factorising.

$x^2 + 7x + 12 = 0$

$x$ = ..... or $x$ = ..... **[3]**

**129.** Here are two functions.




When the input of each function is 6, the output of Function A is equal to the output of Function B.

Work out the value of $p$ in Function B.

$p$ = ..... **[4]**

**130.** Multiply out.

$5a(2 - a)$

..... **[2]**

**131.** Rearrange this formula to make k the subject.

$t = 2k - h$

..... **[2]**

**132.** The length of a word is classed as short, medium or long depending on the number of characters in the word.

This table shows the percentage, in terms of x, of each word length found in a book.

| **Length of word** | **Percentage (%)** |
|---|---|
| Short | $2x + 5$ |
| Medium | $3x - 1$ |
| Long | $x$ |

Find the percentage of words in this book which are classed as short words.
You must show your working.

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

**133(a).** Simplify.

i. $3a \times 4$

..... **[1]**

ii. $b \times b \times b \times b$

..... **[1]**

iii. $c^2 \times c^4$

..... **[1]**

**(b).** Factorise.

$9 - 6y$

..... **[1]**

**134(a).** Factorise $x^2 + 10x + 24$.

..... **[2]**

**(b).** Write down the solutions to $x^2 + 10x + 24 = 0$.

$x$ = ..... or $x$ = ..... **[1]**

**135(a).** Solve.

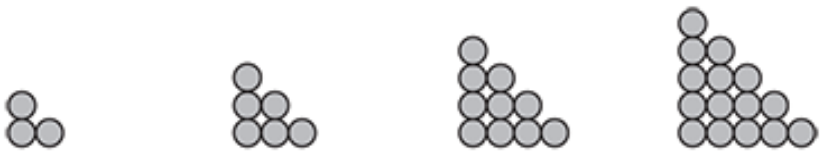
$\frac{x}{3} = 6$

$x$ = ..... **[1]**

**(b).** $2x = {}^{-}14$

$x$ = ..... **[1]**

**136(a).** Ryan is making a sequence of patterns using counters.
Here are the first four patterns in the sequence.



Pattern 1
3 counters

Pattern 2
6 counters

Pattern 3
10 counters

Pattern 4
15 counters

Ryan started with 80 counters.

Ryan says

I still have enough counters to make Pattern 5 and Pattern 6.

Is Ryan correct?
Show how you decide.

_____ because _____

_____ **[4]**

**(b).**

i. Complete the table below for the addition of counters in consecutive patterns.

| Patterns to add | Counters to add | Total counters |
|---|---|---|
| Pattern 1 + Pattern 2 | 3 + 6 | 9 |
| Pattern 2 + Pattern 3 | 6 + 10 | 16 |
| Pattern 3 + Pattern 4 | | |

**[1]**

ii. The number of counters in Pattern $k$ + Pattern ($k$ + 1) is 144.

Find the value of $k$.

$k$ = ..... **[2]**

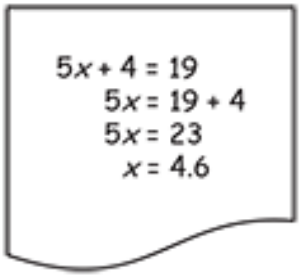
**137.** Complete this identity by writing in the missing numbers.

$$4(\ldots\ldots x+1)=14x-6(x-2)-\ldots\ldots$$

**[2]**

**138(a).** Finley is asked to solve the equation $5x + 4 = 19$.

Finley's working is shown below.




Write down the error that Finley has made.

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**[1]**

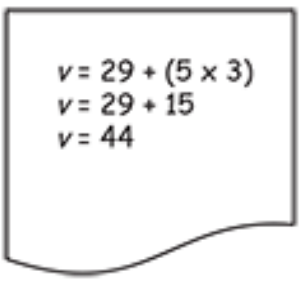
**(b).** Charlie is asked to use the formula

$v = u + at$

to find the initial velocity, when

- the acceleration is 5 $m/s^2$
- the final velocity is 29 m/s
- the time is 3 seconds.

Charlie's working is shown below.




Write down the error that Charlie has made.

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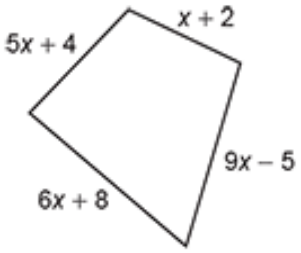
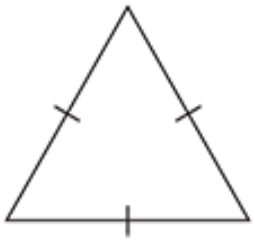
**[1]**

**139.** Show the inequality $x > -2$ on this number line.


**[2]**

**140.** The diagram shows a quadrilateral and an equilateral triangle.
The perimeter of the quadrilateral is equal to the perimeter of the equilateral triangle.



Not to scale

Find an expression for the length of one side of the equilateral triangle.
Give your answer in terms of x in its simplest form.

..... **[4]**

**141.** Multiply out and simplify.

$(3x + y)(x + 2y)$

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

**142(a).** Here are the first four terms of a sequence.

5 12 19 26

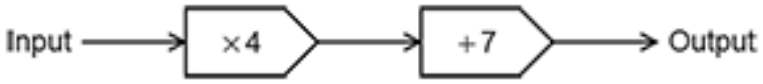
Write down the next term in the sequence.

..... **[1]**

**(b).** Explain how you worked out your answer.

_____ **[1]**

**143(a).** Here is a function.




Find the input when the output is 87.

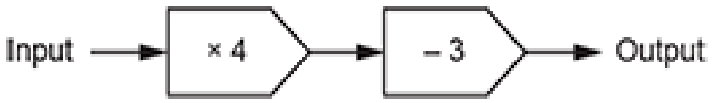
..... **[2]**

**(b).** The input is $x$ and the output is $y$.

Write an equation for $y$ in terms of $x$.

..... **[2]**

**144.** Here is a function machine.




The input is $x$ and the output is $y$.

Write an equation for $y$ in terms of $x$.

..... **[2]**

**145.** Frankie draws a circle and works out its area, in $cm^2$, and circumference, in cm.
The answer for the area is two times the answer for the circumference.

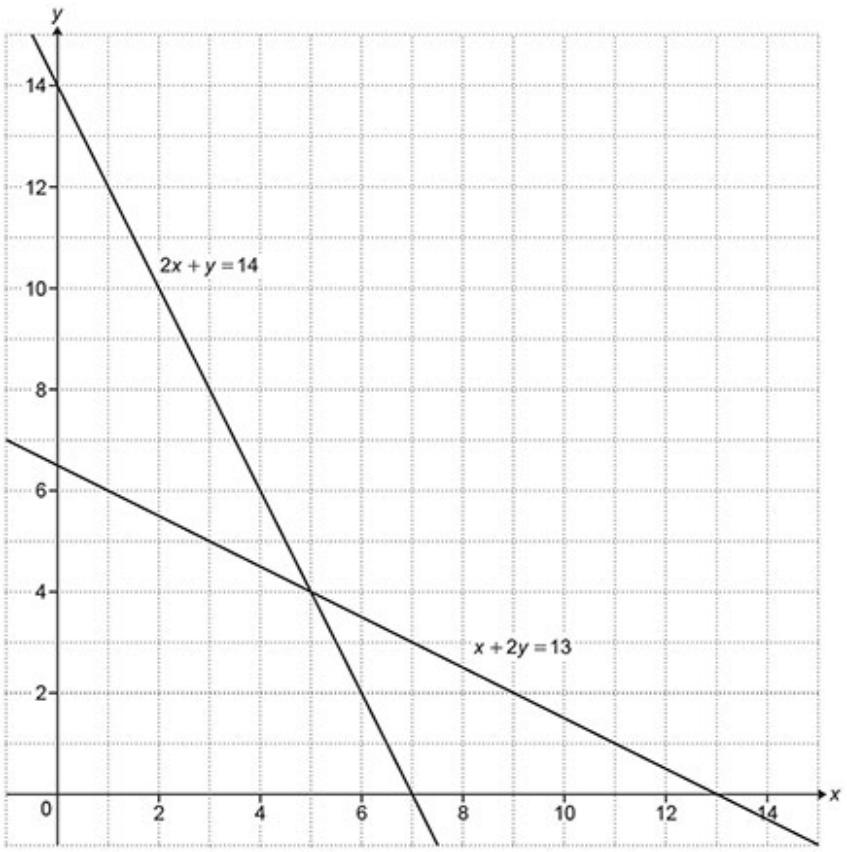
Work out the diameter of the circle.
You must show your working.

..... cm **[4]**

**146.** The graph shows the solution to this pair of simultaneous equations.

$2x + y = 14$
$x + 2y = 13$

Use the solution to work out the value of $3x + y$.
You must show how you work out your answer.



$3x + y =$ ..... **[3]**

**147.** Solve.

$x^2 - 4x - 165 = 0$

You must show your working.

$x =$ ..... or $x =$ ..... **[3]**

**148(a).** Solve.

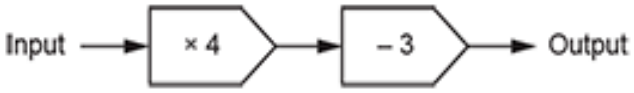
$\frac{x}{4} = 8$

$x =$ ..... **[1]**

**(b).** $8 - x = {}^{-}2$

$x =$ ..... **[1]**

**149.** Here is a function machine.




i. Find the output when the input is 10.

..... **[1]**

ii. Find the input when the output is 17.

..... **[2]**

**150.** Multiply out.

$3(x + 1)$

..... **[1]**

**END OF QUESTION PAPER**