



1 n is an integer.

$$-2 < n \leq 3$$

Write down all the possible values of n .

(2 marks)

n must be greater than -2 , so -2 itself is not included

n can be less than or equal to 3 , so 3 is included

The integers are $-1, 0, 1, 2, 3$

$-1, 0, 1, 2, 3$

2 Solve $4x + 3 < 19$

(2 marks)

Subtract 3 from both sides: $4x < 16$

Divide both sides by 4: $x < 4$

$$x < 4$$

3 Write down the inequality shown by each number line.

a. A closed circle at 3 with the arrow pointing left.

b. An open circle at -2 with the arrow pointing right.

(2 marks)

a)

closed circle: 3 included, arrow left: smaller

$$x \leq 3$$

b)

open circle: -2 not included, arrow right: larger

$$x > -2$$

4 Describe how to show each inequality on a number line. Say what kind of circle to use at each end and which way the arrow points.

a. $x \geq 4$

b. $x < -1$

(2 marks)

a)

closed circle at 4, arrow right

b)

open circle at -1 , arrow left

- 5 n is an integer such that $n > -3$ and $2n + 1 \leq 5$

Write down all the possible values of n .

(2 marks)

$$\text{Solve } 2n + 1 \leq 5: 2n \leq 4, \text{ so } n \leq 2$$

Combine with $n > -3$

$$-3 < n \leq 2$$

The integers are $-2, -1, 0, 1, 2$

$-2, -1, 0, 1, 2$

- 6 The diagram shows an inequality on a number line.

Write down the inequality shown, using x .



(2 marks)

The solid circle at -1 means -1 is included, so $x \geq -1$

The open circle at 4 means 4 is not included, so $x < 4$

Together

$$-1 \leq x < 4$$

$-1 \leq x < 4$

- 7 x is an integer.

$$-3 < x \leq 2$$

Write down all the possible values of x .

(2 marks)

-3 not included (open circle)

2 included (closed circle)

$-2, -1, 0, 1, 2$

- 8 Solve $5x - 2 > 3x + 10$

(3 marks)

Subtract $3x$ from both sides: $2x - 2 > 10$

Add 2 to both sides: $2x > 12$

Divide both sides by 2 : $x > 6$

$x > 6$

9 Solve $\frac{2x}{5} - 1 < 3$

(3 marks)

Add 1 to both sides: $\frac{2x}{5} < 4$

Multiply both sides by 5: $2x < 20$

Divide both sides by 2: $x < 10$

$x < 10$

10 a. Solve $3(x - 1) \geq 6$

b. Show your solution on the number line.



(3 marks)

a) Divide both sides by 3

$$\begin{array}{rcl} x - 1 & \geq & 2 \\ +1 & & +1 \\ \hline x & \geq & 3 \end{array}$$

b) Draw a solid circle at 3, because 3 is included, with an arrow pointing right

11 Solve $3x - 5 \geq 10$

Describe how to show your answer on a number line.

(3 marks)

$$\begin{array}{rcl} & \geq & 3x - 5 \geq 10 \\ +5 & & +5 \\ \hline & \geq & 3x \geq 15 \\ \div 3 & & \div 3 \\ \hline & \geq & x \geq 5 \end{array}$$

$x \geq 5$: closed circle at 5, arrow right

12 A number line has an open circle at -1 with the arrow pointing left, and a closed circle at 3 with the arrow pointing right.

a. Write down the inequalities shown by the number line.

b. Is $x = 3$ a solution? Is $x = -1$ a solution?

(3 marks)

a)

$x < -1$ or $x \geq 3$

b)

closed circle at 3: included

open circle at -1 : not included

3 is, -1 is not

13 Chloe wants to show $x > 2$ on a number line.

She draws a solid circle at 2 with an arrow pointing to the right.

a. Explain the mistake Chloe has made.

b. Write down the greatest integer that satisfies $4x - 3 < 18$

(4 marks)

a) A solid circle means the value is included. $x > 2$ does not include 2, so she needs an open circle

b) Solve $4x - 3 < 18$: $4x < 21$, so $x < 5.25$

The greatest integer less than 5.25 is 5

14 a. Solve $-3 < 2x + 1 \leq 9$

b. Write down all the integer values of x that satisfy your answer to part a.

(4 marks)

a) Subtract 1 from all three parts

$$-4 < 2x < = 8$$

Divide all three parts by 2

$$-2 < x < = 4$$

b) The integers strictly greater than -2 and at most 4 are -1, 0, 1, 2, 3, 4

15 Solve $7 - 2x > 1$

Write down the positive integers that satisfy the inequality.

(3 marks)

$$\begin{array}{lcl} & = & 7 - 2x > 1 \\ -7 & = & -2x > -6 \quad -7 \\ \div(-2), \text{ flip sign} & = & x < 3 \quad \div(-2), \text{ flip sign} \end{array}$$

positive integers less than 3

1, 2

16 x is an integer. x satisfies both $2x - 1 > 5$ and $x + 4 \leq 11$.

Solve each inequality and write down all the possible values of x . Describe the number line for the values that satisfy both inequalities.

(4 marks)

$$\begin{array}{lcl} & = & 2x - 1 > 5 \\ +1 & = & 2x > 6 \quad +1 \\ \div 2 & = & x > 3 \quad \div 2 \\ & = & x + 4 \leq 11 \\ -4 & = & x \leq 7 \quad -4 \end{array}$$

$$3 < x \leq 7$$

open circle at 3, closed circle at 7, line between

4, 5, 6, 7

17

a. n is an integer with $-4 < n \leq -1$ Write down all the possible values of n .b. Solve $7y - 3 > 2y + 22$ and show your solution on the number line.

(5 marks)

a) n is greater than -4 but at most -1 , so $n = -3, -2$ or -1 b) Subtract $2y$ from both sides: $5y - 3 > 22$ Add 3 to both sides: $5y > 25$ Divide by 5: $y > 5$

Show with an open circle at 5 and an arrow pointing right

18

a. Solve $5 - 2x \geq 1$ b. Factorise $x^2 + 5x + 6$

(5 marks)

a) Subtract 5 from both sides

$$\begin{array}{rcl} -2x & \geq & -4 \\ \hline x & \leq & 2 \end{array}$$

 $\div -2$ and reverse the inequality sign $\div -2$ and reverse the inequality signDividing by a negative number reverses order: for example $6 > 2$, but $-3 < -1$ after dividing both by -2 . This is why the inequality sign reverses here

b) Find two numbers with product 6 and sum 5: they are 2 and 3

$$x^2 + 5x + 6 = (x + 2)(x + 3)$$

19

a. n is an integer with $-5 \leq n < -1$ Write down all the possible values of n .b. Solve $4(x + 3) > 2x + 17$

c. Write down the smallest integer that satisfies your answer to part b.

(6 marks)

a) n is at least -5 and strictly less than -1 , so $n = -5, -4, -3, -2$ b) Expand: $4x + 12 > 2x + 17$ Subtract $2x$ from both sides: $2x + 12 > 17$ Subtract 12: $2x > 5$, so $x > 2.5$

c) The smallest integer greater than 2.5 is 3