Q1

Solve using the skills you would for an equation.
(Remember the exception is that when multiplying or dividing by a negative, the inequality sign gets reversed.
However, it's best to avoid this if possible by taking all terms to one side of the inequality instead.)

$$14n > 11n + 6$$
$$-11n \qquad\qquad -11n$$
$$3n > 6$$
$$\div 3 \qquad\quad \div 3$$
$$n > 2$$

[1]

$n > 2$ [1]

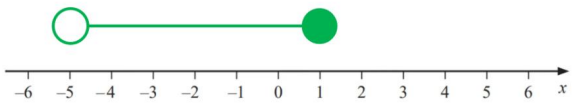
1b

First simplify the inequality to isolate the x term.

$$-2 < x + 3 \leq 4$$
$$-3 \quad -3 \quad -3$$
$$-5 < x \leq 1$$

[1]

To show the set of values on the number line use solid circles for ≥ and ≤, 'empty' circles for < and >.



Either end correct [1]
Fully correct and joined [1]

Q2

2a

"n is an integer" means n is a whole number

"$-1 \leq n$" means n includes -1

"$n < 4$" means n does **not** include 4

−1, 0, 1, 2, 3 [2]
including 4, or missing off one number loses one mark
missing more than one number, or including more than one additional number scores no marks

2b

Open circle means "not including", closed circle means "including"
We assume that the missing numbers continue with the same scale, so the closed circle is above "3"

$-4 < x \leq 3$

"$-4 < x$" or equivalent [1]
"$x \leq 3$" or equivalent [1]

2c

Add 2 to both sides

$y > 7$ [1]
"=" or an incorrect inequality sign in the final answer will lose the mark

Q3

3a

"n is an integer" means n is a whole number

"$-3 < n$" means n does **not** include -3

"$n \leq 1$" means n **does** include 1

−2, −1, 0, 1 [2]
including −3, or missing off one number loses one mark
missing more than one number, or including more than one additional number scores no marks

3b

Add 7 to both sides

$$3p > 18$$

[1]

Divide both sides by 3

$p > 6$ [1]
"=" or an incorrect inequality sign in the final answer will lose a mark

Q4

4

Add 5 to both sides

$$3x < 21$$

[1]

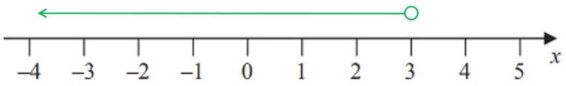
Divide both sides by 3

$y < 7$ [1]
"=" or an incorrect inequality sign in the final answer will lose a mark

Q5

5a

< and > are represented by open circles on a number line



unshaded circle at 3 [1]
arrowed line going left from 3 [1]

5b

Add 7 to both sides

$$4x \geq 20$$

[1]

Divide both sides by 4

$y \geq 5$ [1]
"=" or an incorrect inequality sign in the final answer will lose a mark

Q6

6a

Subtract 5 from both sides

$$6y > 3$$

[1]

Divide both sides by 6

$y > \frac{1}{2}$ [1]

"=" or an incorrect inequality sign in the final answer will lose a mark

6b

Open circle means "not including", closed circle means "including"

$-3 < x \leq 4$

"$-3 < x$" or equivalent [1]
"$x \leq 4$" or equivalent [1]

Q7

7

This is a double inequality so any operations need to be carried out on all three 'sides'.
To isolate y we need to divide (each 'side') by 2.

$$-\frac{4}{2} \leq \frac{2y}{2} < \frac{6}{2}$$
$$-2 \leq y < 3$$

Integers are whole numbers and include zero.
≤ means 'including' (so -2 is included) and < means 'excluding' (so 3 is not included).

$-2, -1, 0, 1, 2$
Four correct values only or all five with one extra [1]
Fully correct [1]

Q8

8a

This is a double inequality so any operations need to happen to all three 'sides' of the inequality.
To isolate x start by adding 3 (to all 3 'sides').

$$-7 + 3 \leq 2x - 3 + 3 < 5 + 3$$

[1]

$$-4 \leq 2x < 8$$

Now divide by 2.

$$\frac{-4}{2} \leq \frac{2x}{2} < \frac{8}{2}$$

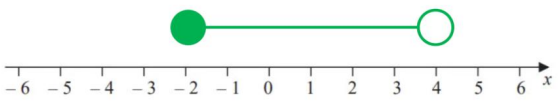
[1]

$$-2 \leq x \leq 4$$

$-2 \leq x < 4$ [1]

8b

To show $-2 \leq x < 4$ on the number line use solid circles for ≤ (at -2) and 'empty' circles for < (at 4).



Either end correct [1]
Fully correct and joined [1]

Q9

9

Solve using the skills you would for an equation.
(Remember the exception is that when multiplying or dividing by a negative, the inequality sign gets reversed.
However, it's best to avoid this if possible by taking all terms to one side of the inequality instead.)

$$5x - 7 \leq 2$$
$$+7 \qquad +7$$
$$5x \leq 9$$
$$\div 5 \qquad \div 5$$
$$x \leq \frac{9}{5}$$

[1]

$x \leq \frac{9}{5}$ [1]

Q10

10a

"n is an integer" means n is a whole number

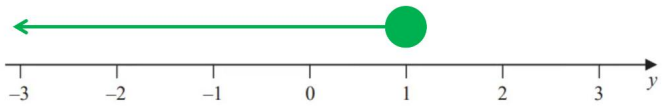
"$-2 \leq n$" means n includes -2

"$n < 3$" means n does **not** include 3

−2, -1, 0, 1, 2 [2]
Any 4 with no repeats or extras [1]
Fully correct [1]

10b

To show '≤' on a number line use a solid circle (at 1).
To show that all values of y (less than or equal to 1) are valid, draw a line to the appropraite end of the diagram and draw an arrow.



[1]

Q11

11

Method 1

Expand the brackets.

$$5x + 15 < 60$$

[1]

Subtract 15 from both sides.

$$5x < 45$$

Divide both sides by 5.

$x < 9$ [1]

Method 2

60 is divisible by 5 so divide both sides by 5.

$$x + 3 < 12$$

[1]

Subtract 3 from both sides.

$x < 9$ [1]

Q12

12

Method 1

Divide both sides by −3. Remember that when multiplying or dividing by a negative number, reverse the inequality sign.

$x < -2$ [1]

Method 2

Add $3x$ to both sides.

$$0 > 3x + 6$$

Subtract 6 from both sides.

$$-6 > 3x$$

Divide both sides by 3.

$$-2 > x$$

$-2 > x$ or $x < -2$ [1]

Both answers are valid though '$x <$ ...' is clearer

Q13-15

13

$<$ and $>$ are represented by open circles on a number line.
$\leq$ and $\geq$ are represented by open circles on a number line.

There is an open circle at -4 so we are looking for $-4 < x$.
This rules out options 1 and 2.

There is a closed circle at 5 so we are looking for $x \leq 5$.
This rules out option 3.

The correct option is option four, $-4 < x \leq 5$ [1]

14

The graph is of the function $f(x)$ so $f(x) > 0$ where the graph is **above** the x- axis.

The graph is above the x- axis between the values of -2.5 and 1, so when $x > -2.5$ and when $x < 1$.

The correct option is option three, $-2.5 < x < 1$ [1]

15

Add 2 to both sides

$$3x > 12$$

[1]

Divide both sides by 4

$x > 4$ [1]

Q16

16

First solve the inequality in the normal way

Add 1 to both sides

$$5x < 11$$

Divide both sides by 5

$$x < 2.2$$

So the largest integer that satisfies this is 2

2 [1]