



KS3.M-A18 Inequalities and Number Lines

AQA KS3.M-A18 · Calculators not allowed · about 60 minutes

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Write down the inequality shown on the number line. A filled dot at 3 and an arrow to the right.

Figure (to be drawn): Number line with a filled dot at 3 and arrow to the right indicating values greater than or equal to 3.

(2)

- 2** Write down the inequality shown on the number line. An open circle at -1 and arrow to the left.

Figure (to be drawn): Number line with an open circle at -1 and arrow to the left indicating values less than -1.

(2)

- 3** On the number line, a filled dot at 0 and arrow to the right. Write the inequality and give three example values that satisfy it.

Figure (to be drawn): Number line with filled dot at 0 and arrow right indicating values ≥ 0 .

(2)

- 4 Draw on a number line the inequality $x > 2$. Use an open circle at the boundary and an arrow to show direction.

(2)

- 5 Write the inequality represented by the shaded section between -2 and 4, including both endpoints.

Figure (to be drawn): Number line with filled dots at -2 and 4 and the section between shaded.

(2)

- 6 Write the inequality shown: shading from 1 (open circle) to the right but not including 5 (open circle).

Figure (to be drawn): Number line with open circle at 1 and open circle at 5, shading between them and to the right of 1 up to but not including 5.

(2)

- 7 Solve the inequality $3x + 2 < 11$. Show your working and give the final answer in inequality form.

(3)

- 8 Solve the inequality $5 - 2x \geq 1$. Give your answer in inequality form.

(3)

- 9** Solve and represent on a number line: $2x - 7 > 1$. Give the final answer and a short description of the number line representation.

(3)

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- 10** Solve the inequality and give the answer in simplest form: $-3x \leq 12$.

(2)

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- 11** Solve $4(x - 3) > 8$. Show your steps and give the solution as an inequality.

(2)

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- 12** Solve the inequality $2x + 5 \leq 2x + 9$. State any special conclusion.

(2)

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- 13** Solve the inequality $3(x + 2) < 3x + 6$ and state what this tells you about the solution set.

(2)

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- 14** Solve the compound inequality and give the solution in inequality form: $1 \leq 2x + 1 < 7$.

(2)

- 15** A shop only allows customers aged at least 16 but under 65 for a day pass. Represent this rule as an inequality and give two ages that are not allowed.

(2)

- 16** Solve the inequality $7 - 2x > 1$ and write the solution in inequality form.

(2)

- 17** Find all integer values of x that satisfy $-2 \leq x < 4$. List them.

(2)

- 18** Stretch: Solve the inequality and give the answer in inequality form: $2(3x - 1) \leq 5x + 7$. Show working.

(3)

Mark scheme · KS3.M-A18 Inequalities and Number Lines

Question 1

- **M1** identifies $\geq$ relation and correct variable form such as $x \geq 3$
- **A1** $x \geq 3$ cao
- **Answer: $x \geq 3$**

Question 2

- **M1** identifies $<$ relation and correct variable form such as $x < -1$
- **A1** $x < -1$ cao
- **Answer: $x < -1$**

Question 3

- **M1** states inequality $x \geq 0$ or similar
- **A1** gives three correct examples (eg 0, 1, 5) cao
- **Answer: $x \geq 0$; examples: 0, 1, 5**

Question 4

- **M1** open circle at 2 placed
- **A1** arrow to the right from the open circle or shading to the right shown
- **Answer: Open circle at 2 with arrow to the right**

Question 5

- **M1** recognises inclusive endpoints and writes compound inequality
- **A1** $-2 \leq x \leq 4$ cao
- **Answer: $-2 \leq x \leq 4$**

Question 6

- **M1** formulates strict inequality with upper bound not included
- **A1** $1 < x < 5$ cao
- **Answer: $1 < x < 5$**

Question 7

- **M1** subtracts 2 from both sides or equivalent method: $3x < 9$
- **M1** divides by 3 or equivalent: $x < 3$
- **A1** $x < 3$ cao
- **Answer: $x < 3$**

Question 8

- **M1** subtracts 5 from both sides: $-2x \geq -4$ or equivalent
- **M1** divides by -2 and reverses inequality: $x \leq 2$
- **A1** $x \leq 2$ cao
- **Answer: $x \leq 2$**

Question 9

- **M1** adds 7 to both sides and divides by 2: $2x > 8$ then $x > 4$
- **M1** identifies open circle at 4 on number line
- **A1** $x > 4$; number line: open circle at 4 with arrow to the right cao
- **Answer: $x > 4$**

Question 10

- M1 divides both sides by -3 and reverses inequality sign: $x \geq -4$
- A1 $x \geq -4$ cao
- Answer: **$x \geq -4$**

Question 11

- M1 expand or divide: $4x - 12 > 8$ then $4x > 20$
- A1 $x > 5$ cao
- Answer: **$x > 5$**

Question 12

- M1 subtracts $2x$ from both sides and simplifies: $5 \leq 9$
- A1 $5 \leq 9$ is true so all real numbers satisfy the inequality, answer: all real x or $(-\infty, \infty)$ cao
- Answer: **All real numbers**

Question 13

- M1 expand both sides or simplify: $3x + 6 < 3x + 6$ leading to $6 < 6$ or $0 < 0$
- A1 contradiction so no solution; answer: no values of x satisfy the inequality cao
- Answer: **No solution**

Question 14

- M1 subtracts 1 across: $0 \leq 2x < 6$ then divides by 2 correctly
- A1 $0 \leq x < 3$ cao
- Answer: **$0 \leq x < 3$**

Question 15

- M1 writes inequality $16 \leq \text{age} < 65$ or equivalent
- A1 gives two correct disallowed ages such as 15 and 65 cao
- Answer: **$16 \leq \text{age} < 65$; not allowed: 15 and 65**

Question 16

- M1 subtracts 7: $-2x > -6$ then divides by -2 and reverses inequality sign
- A1 $x < 3$ cao
- Answer: **$x < 3$**

Question 17

- M1 lists integers from -2 up to 3 inclusive
- A1 -2, -1, 0, 1, 2, 3 cao
- Answer: **-2, -1, 0, 1, 2, 3**

Question 18

- M1 expand left side or apply distributive law: $6x - 2 \leq 5x + 7$ or equivalent rearrangement
- M1 collect x terms and simplify: $6x - 5x \leq 7 + 2$ leading to $x \leq 9$
- A1 $x \leq 9$ cao
- Answer: **$x \leq 9$**