2.18 Inequalities and Number Lines: 2-hour Pack

Calculators not allowed · about 120 minutes

Name: _____ Date: ____ / ____ / _____

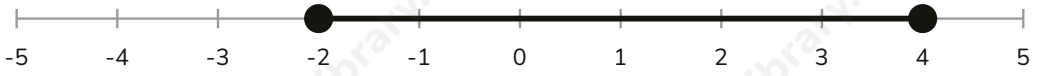
Answer ALL questions. Show all your working.

1 Solve $2k + 2 \geq 6$

(2)

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



(2)

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3 m is an integer. Write down all the values of m that satisfy $-5 < m < 2$.

(2)

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4 (a) Solve $3x + 2 < 17$.
(b) x is an integer greater than or equal to -1. Write down all the values of x that satisfy the inequality.

(3)

---

5 Solve $-16 < 4m - 4 < 8$

(3)

---

6 The integer x is greater than 3 and at most 6. Write this as an inequality.

(2)

---

7 A number line has a solid circle at 1 and a open circle at 5, with the line between the circles shaded.
Write down the inequality shown.

(2)

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8 Solve $-6x \geq 30$

(3)

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9 m is an integer. Write down all the values of m that satisfy $-3 < m < 0$.

(2)

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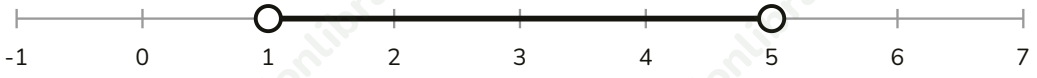
10 (a) Solve $4x + 2 \leq 22$.

(b) x is an integer greater than or equal to -3. Write down all the values of x that satisfy the inequality.

(3)

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



(2)

---

12 Solve $6 - 5x > -9$

(3)

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13 Solve $2y + 1 \geq -3$

(2)

---

14 x is an integer. Write down all the values of x that satisfy $-5 < x \leq -1$.

(2)

---

15 (a) Solve $2x + 4 < 10$.
(b) x is an integer greater than or equal to -1. Write down all the values of x that satisfy the inequality.

(3)

---

16 Solve $-2 < 2m \leq 2$

(3)

---

17 The integer x is at least 2 and less than 4. Write this as an inequality.

(2)

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18 Solve $-2 \leq 4m - 2 \leq 10$

(3)

---

19 Solve $-3 \leq 2n - 1 \leq 5$

(3)

---

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

(3)

---

21 Solve $4 - 2x < -4$

(3)

---

22 Solve $y + 5 > 5$

(1)

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23 Solve $-4x \geq -32$

(3)

---

24 x is an integer. Write down all the values of x that satisfy $-1 < x \leq 3$.

(2)

---

25 m is an integer. Write down all the values of m that satisfy $1 < m \leq 6$.

(2)

---

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

(3)

---

27 Write down the inequality shown on the number line: a filled dot at 5 with an arrow pointing right.

(1)

---

28 Solve the inequality $7 - x > 2$.

(2)

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29 Solve the inequality $-2x < 8$.

(2)

---

30 Solve the inequality $3x + 5 \leq x + 13$.

(2)

---

31 Solve the inequality $4(x - 1) > 8$.

(3)

---

32 Solve the compound inequality and give the solution in inequality form: $3 \leq 2x - 1 < 9$.

(3)

---

33 Solve the inequality $3(2x - 1) \leq 4x + 9$. Then describe how the solution would be shown on a number line (state the type of dot used and the direction of the arrow).

(4)

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34 A courier's box already weighs 4 kg. Extra identical items are added, each weighing 1.5 kg. The total weight must stay under 13 kg to qualify for standard postage. Using n for the number of extra items, form an inequality and solve it to find the greatest whole number of extra items that can be added.

(4)

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35 Write down the inequality shown on the number line: an open circle at -2 with an arrow pointing left.

(1)

---

36 Solve the inequality $x + 4 > 9$.

(1)

---

37 Solve the inequality $x - 2 < 6$.

(1)

---

38 Solve the inequality $3x > 12$.

(1)

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39 Solve the inequality $2x + 3 < 11$.

(2)

---

40 Solve the inequality $5x - 4 \geq 16$.

(2)

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Mark scheme · 2.18 Inequalities and Number Lines: 2-hour Pack

Question 1

correct first step with an inequality sign kept or an equation solved	M1
$k \geq 2$ cao	A1

Answer: **$k \geq 2$**

Question 2

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

Answer: **$-2 \leq x \leq 4$**

Question 3

at least half of the values or all values with one extra or missing	M1
-4, -3, -2, -1, 0, 1 cao	A1

Answer: **-4, -3, -2, -1, 0, 1**

Question 4

correct first step	M1
(a) $x < 5$	A1
(b) -1, 0, 1, 2, 3, 4	B1

Answer: **(a) $x < 5$, (b) -1, 0, 1, 2, 3, 4**

Question 5

subtracts the number term from all three parts	M1
divides all three parts by the coefficient	M1
$-3 < m < 3$ cao	A1

Answer: **$-3 < m < 3$**

Question 6

$3 < x$	B1
$x \leq 6$	B1

Answer: **$3 < x \leq 6$**

Question 7

$1 \leq x$	B1
$x < 5$	B1

Answer: **$1 \leq x < 5$**

Question 8

correct first step	M1
divides by the negative number	M1
$x \leq -5$ cao (inequality sign reversed)	A1

Answer: **$x \leq -5$**

Question 9

at least half of the values or all values with one extra or missing	M1
-2, -1 cao	A1

Answer: **-2, -1**

Question 10

correct first step	M1
(a) $x \leq 5$	A1
(b) -3, -2, -1, 0, 1, 2, 3, 4, 5	B1

Answer: **(a) $x \leq 5$, (b) -3, -2, -1, 0, 1, 2, 3, 4, 5**

Question 11

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

Answer: **$1 < x < 5$**

Question 12

correct first step	M1
divides by the negative number	M1
$x < 3$ cao (inequality sign reversed)	A1

Answer: **$x < 3$**

Question 13

correct first step with an inequality sign kept or an equation solved	M1
$y \geq -2$ cao	A1

Answer: **$y \geq -2$**

Question 14

at least half of the values or all values with one extra or missing	M1
-4, -3, -2, -1 cao	A1

Answer: **-4, -3, -2, -1**

Question 15

correct first step	M1
(a) $x < 3$	A1
(b) -1, 0, 1, 2	B1

Answer: **(a) $x < 3$, (b) -1, 0, 1, 2**

Question 16

subtracts the number term from all three parts	M1
divides all three parts by the coefficient	M1
$-1 < m \leq 1$ cao	A1

Answer: **$-1 < m \leq 1$**

Question 17

$2 \leq x$	B1
$x < 4$	B1

Answer: **$2 \leq x < 4$**

Question 18

subtracts the number term from all three parts	M1
divides all three parts by the coefficient	M1
$0 \leq m \leq 3$ cao	A1

Answer: **$0 \leq m \leq 3$**

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Question 19

subtracts the number term from all three parts	M1
divides all three parts by the coefficient	M1
$-1 \leq n \leq 3$ cao	A1

Answer: **$-1 \leq n \leq 3$**

Question 20

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

Answer: **$x < 3$**

Question 21

correct first step	M1
divides by the negative number	M1
$x > 4$ cao (inequality sign reversed)	A1

Answer: **$x > 4$**

Question 22

$y > 0$ cao	B1

Answer: **$y > 0$**

Question 23

correct first step	M1
divides by the negative number	M1
$x \leq 8$ cao (inequality sign reversed)	A1

Answer: **$x \leq 8$**

Question 24

at least half of the values or all values with one extra or missing	M1
0, 1, 2, 3 cao	A1

Answer: **0, 1, 2, 3**

Question 25

at least half of the values or all values with one extra or missing	M1
2, 3, 4, 5, 6 cao	A1

Answer: **2, 3, 4, 5, 6**

Question 26

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

Answer: **$x \leq 2$**

Question 27

$x \geq 5$ cao	B1

Answer: **$x \geq 5$**

Question 28

correct rearrangement, e.g. $-x > -5$	M1
$x < 5$ cao (inequality sign flipped correctly)	A1

Answer: **$x < 5$**

Question 29

divides both sides by -2 and identifies the sign must flip	M1
$x > -4$ cao	A1

Answer: **$x > -4$**

Question 30

collects x terms on one side, e.g. $2x + 5 \leq 13$	M1
$x \leq 4$ cao	A1

Answer: **$x \leq 4$**

Question 31

expands the bracket correctly, e.g. $4x - 4 > 8$	M1
correct rearrangement, e.g. $4x > 12$	M1
$x > 3$ cao	A1

Answer: **$x > 3$**

Question 32

adds 1 to all three parts, e.g. $4 \leq 2x < 10$	M1
divides all three parts by 2 correctly	M1
$2 \leq x < 5$ cao	A1

Answer: **$2 \leq x < 5$**

Question 33

expands the bracket correctly, e.g. $6x - 3 \leq 4x + 9$	M1
collects x terms correctly, e.g. $2x \leq 12$	M1
$x \leq 6$ cao	A1
correctly describes a filled (closed) dot at 6 with an arrow pointing left	B1

Answer: **$x \leq 6$; filled dot at 6, arrow pointing left**

Question 34

correct inequality formed: $4 + 1.5n < 13$	M1
correct rearrangement, e.g. $1.5n < 9$	M1
$n < 6$ cao	A1
greatest whole number of items is 5	A1

Answer: **$n < 6$; the greatest whole number of extra items is 5**

Question 35

$x < -2$ cao	B1

Answer: **$x < -2$**

Question 36

$x > 5$ cao	B1

Answer: **$x > 5$**

Question 37

$x < 8$ cao	B1

Answer: **$x < 8$**

Question 38

$x > 4$ cao	B1

Answer: **$x > 4$**

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Question 39

correct rearrangement, e.g. $2x < 8$	**M1**
$x < 4$ cao	**A1**

Answer: **$x < 4$**

Question 40

correct rearrangement, e.g. $5x \geq 20$	**M1**
$x \geq 4$ cao	**A1**

Answer: **$x \geq 4$**

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