

Inequalities on a Number Line and Solving - Worksheet

Skill

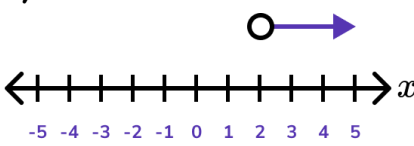
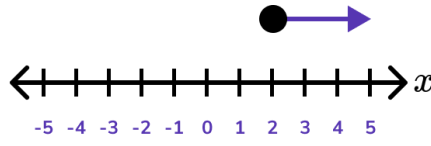
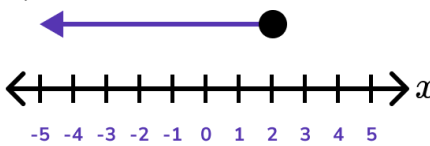
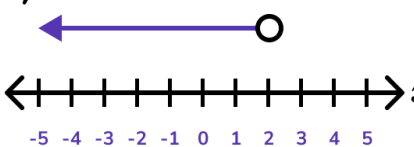
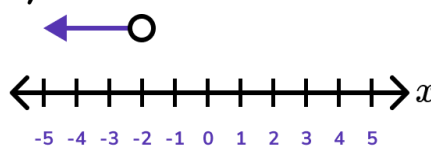
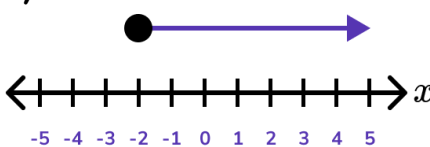
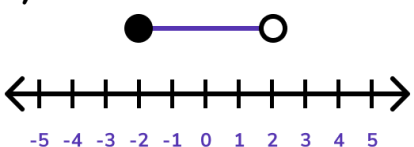
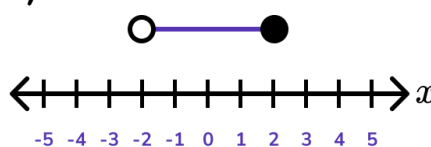
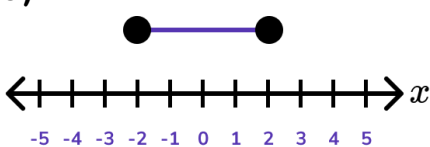
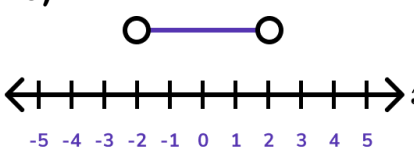
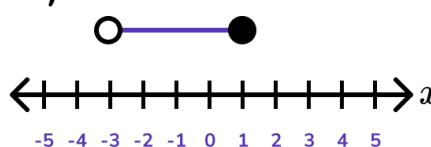
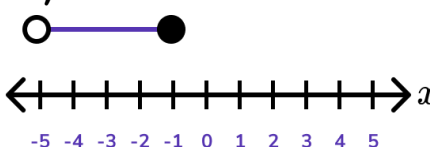
Group A - Inequalities on a number line

Represent these inequalities on a number line

- | | | |
|------------------------|----------------------|----------------------|
| 1) $x < 3$ | 2) $3 > x$ | 3) $3 < x$ |
| 4) $x \leq 3$ | 5) $x \geq 3$ | 6) $x \geq -3$ |
| 7) $1 < x \leq 3$ | 8) $1 \leq x \leq 3$ | 9) $1 \leq x < 3$ |
| 10) $-1 \leq x \leq 3$ | 11) $-3 < x \leq 1$ | 12) $-3 < x \leq -1$ |

Group B - Writing inequalities from a number line

Write an inequality for each of these representations

- | | | |
|---|--|---|
| 1)  | 2)  | 3)  |
| 4)  | 5)  | 6)  |
| 7)  | 8)  | 9)  |
| 10)  | 11)  | 12)  |

Group C - Integer values and solution sets

List the integer values satisfied by each of these inequalities

1) $-3 < x \leq 1$

2) $-1 < x \leq 3$

3) $-3 \leq x \leq 1$

4) $-1 \leq x < 3$

5) $-2 \leq x < 6$

6) $-2 < x \leq 6$

7) $-2 \leq 2x < 6$

8) $-3 \leq 3x < 9$

9) $-1 \leq x + 1 < 3$

10) $-1 \leq x - 1 < 3$

11) $-3 < 2x + 1 \leq 7$

12) $-1 < 2x - 1 \leq 5$

Group D - Solving inequalities

Solve the following inequalities:

1) $x + 2 \leq 5$

2) $x - 2 \leq 1$

3) $2x < 6$

4) $3x \geq 9$

5) $2x + 1 \leq 7$

6) $2x - 3 > 7$

7) $3(x + 2) < 18$

8) $6(x - 1) > 24$

9) $5x + 1 \leq x + 13$

10) $6x - 1 < 2x + 1$

11) $\frac{x+3}{4} \geq 2$

12) $\frac{2x+1}{3} \leq 7$

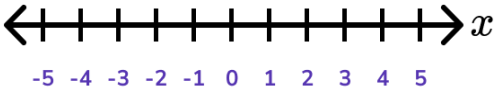
Inequalities on a Number Line and Solving - Worksheet

Applied

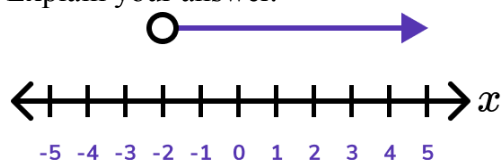
- 1)
 - a) Sam needs to record the heights of any one who is 140cm or shorter. Write this as an inequality.
 - b) Sarah wants to record the heights of anyone who is 150cm or taller but shorter than 170cm. Write this as an inequality.
 - c) James wants to record the heights of anyone shorter than 130cm and taller than 170cm. He thinks it can be written as an inequality like this: $130 < h < 170$. Is he correct? Explain your reasoning.
- 2)
 - a) Karen thinks of a number, doubles it and adds 3. Her solution is lower or equal to 11. What is the highest integer she could be thinking of?
 - b) Tom thinks of a number, triples it and subtracts 2. His solution is lower than doubling his number and adding 3. Is there a number that he could be thinking of that is different to Karen's number? Show your working and explain your reasoning.
- 3)
 - a) Paul measures a distance in centimetres. He multiplies his distance by 4 and adds 7 centimetres. His total distance has to be less than 26cm. He thinks the largest distance that he measures can be 3cm. Why is he wrong?
 - b) Fiona measures a distance and it needs to be greater than or equal to 2cm but less than 4 cm. Represent this inequality on a number line.
- 4)
 - a) Tyra has £40 to spend. She wants to buy 5 books and a magazine. The magazine costs £3. The books all cost the same. Represent this as an inequality.
 - b) What is the most that Tyra can afford to spend on each one of the books?

Inequalities on a Number Line and Solving - Exam Questions

1) (a) Solve $7x - 1 < 20$ (2)

(b) Represent your solution to part (a) on the number line.  (2)
(4 marks)

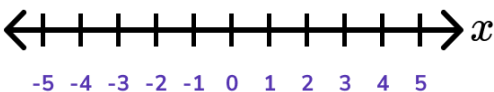
2) Jason's solution to the inequality $4x + 1 \geq -7$ is shown on the number line. Is Jason's solution correct? Explain your answer. (3 marks)



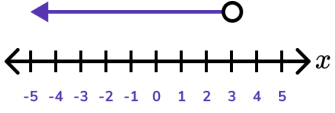
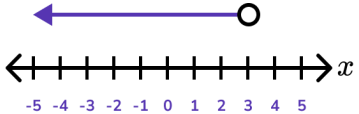
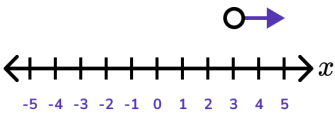
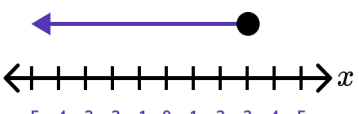
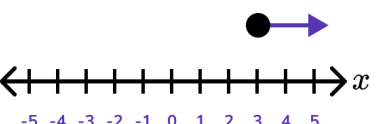
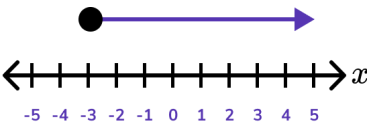
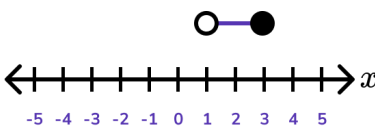
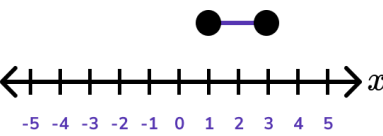
3) (a) Solve $5x - 1 > 3x + 7$ (3)

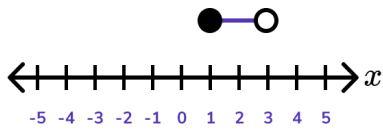
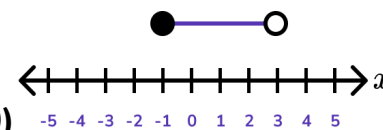
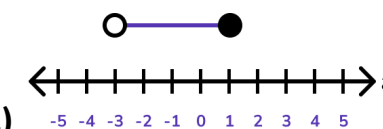
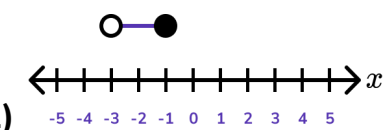
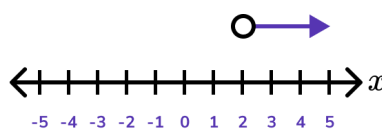
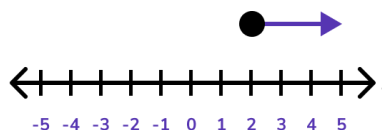
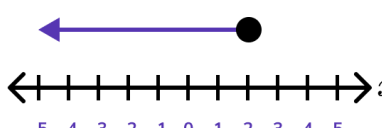
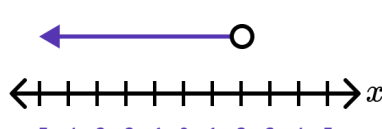
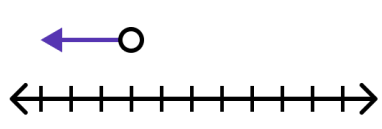
(b) Write down the largest integer that satisfies $5x - 1 > 3x + 7$ (1)
(4 marks)

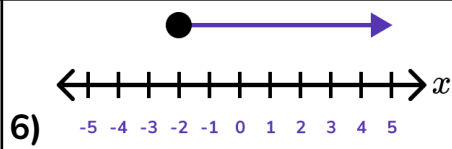
4) (a) n is an integer with $-5 < 2n + 1 \leq 5$ (3)
Write down all the possible values of n

(b) Represent your solution to part (a) on the number line.  (2)
(5 marks)

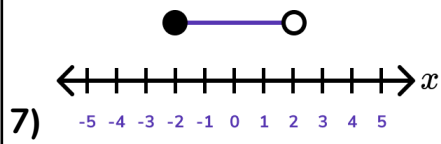
Inequalities on a Number Line and Solving - Answers

	Question	Answer
Group A	Skill Questions	
	Represent these inequalities on a number line	
	1) $x < 3$	1) 
	2) $3 > x$	2) 
	3) $3 < x$	3) 
	4) $x \leq 3$	4) 
	5) $x \geq 3$	5) 
	6) $x \geq -3$	6) 
	7) $1 < x \leq 3$	7) 
	8) $1 \leq x \leq 3$	8) 

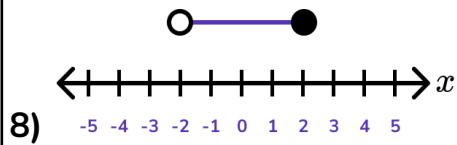
	9) $1 \leq x < 3$ 10) $-1 \leq x \leq 3$ 11) $-3 < x \leq 1$ 12) $-3 < x \leq -1$	 9)  10)  11)  12)
Group B	Write an inequality for each of these representations 1)  2)  3)  4)  5) 	1) $x > 2$ 2) $x \geq 2$ 3) $x \leq 2$ 4) $x < 2$ 5) $x < -2$



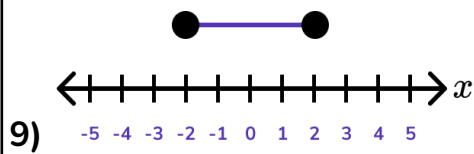
6) $x \geq -2$



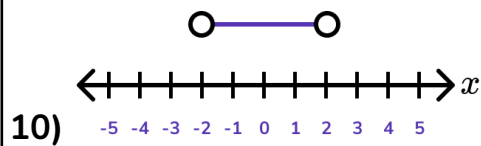
7) $-2 \leq x < 2$



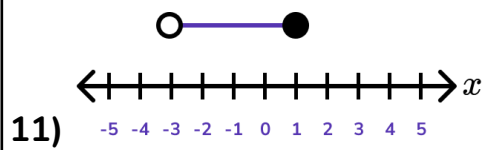
8) $-2 < x \leq 2$



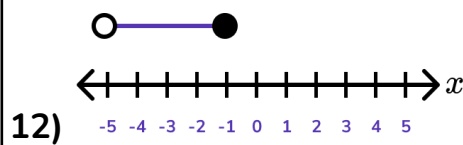
9) $-2 \leq x \leq 2$



10) $-2 < x < 2$



11) $-3 < x \leq 1$



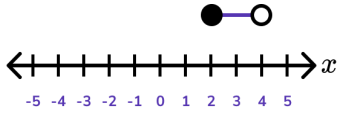
12) $-5 \leq x < -1$

Inequalities on a Number Line and Solving - Answers

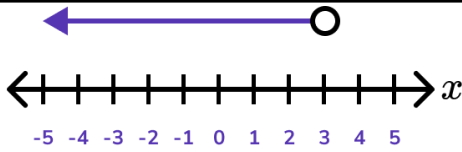
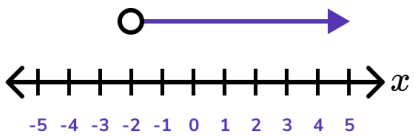
	Question	Answer
Group C	Skill Questions	
	List the integer values satisfied by each of these inequalities 1) $-3 < x \leq 1$ 2) $-1 < x \leq 3$ 3) $-3 \leq x \leq 1$ 4) $-1 \leq x < 3$ 5) $-2 \leq x < 6$ 6) $-2 < x \leq 6$ 7) $-2 \leq 2x < 6$ 8) $-3 \leq 3x < 9$ 9) $-1 \leq x + 1 < 3$ 10) $-1 \leq x - 1 < 3$ 11) $-3 < 2x + 1 \leq 7$ 12) $-1 < 2x - 1 \leq 5$	1) -2, -1, 0, 1 2) 0, 1, 2, 3 3) -3, -2, -1, 0, 1 4) -1, 0, 1, 2 5) -2, -1, 0, 1, 2, 3, 4, 5 6) -1, 0, 1, 2, 3, 4, 5, 6 7) -1, 0, 1, 2 8) -1, 0, 1, 2 9) -2, -1, 0, 1 10) 0, 1, 2, 3 11) -1, 0, 1, 2, 3 12) 1, 2, 3
Group D	Solve the following inequalities: 1) $x + 2 \leq 5$ 2) $x - 2 \leq 1$ 3) $2x < 6$ 4) $3x \geq 9$ 5) $2x + 1 \leq 7$ 6) $2x - 3 > 7$ 7) $3(x + 2) < 18$ 8) $6(x - 1) > 24$ 9) $5x + 1 \leq x + 13$ 10) $6x - 1 < 2x + 1$ 11) $\frac{x+3}{4} \geq 2$ 12) $\frac{2x+1}{3} \leq 7$	1) $x \leq 3$ 2) $x \leq 3$ 3) $x < 3$ 4) $x \geq 3$ 5) $x \leq 3$ 6) $x > 5$ 7) $x < 4$ 8) $x > 5$ 9) $x \leq 3$ 10) $x < 0.5$ 11) $x \geq 5$ 12) $x \leq 10$

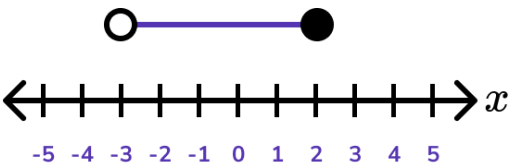
Inequalities on a Number Line and Solving - Answers

	Question	Answer
	Applied Questions	
1)	a) Sam needs to record the heights of any one who is 140cm or shorter. Write this as an inequality. b) Sarah wants to record the heights of anyone who is 150cm or taller but shorter than 170cm. Write this as an inequality. James wants to record the heights of anyone shorter than 130cm and taller than 170cm. He thinks it can be written as an inequality like this: $130 < h < 170$. Is he correct? Explain your reasoning.	a) $h < 140$ b) $150 \leq h < 170$ c) $130 < h < 170$ is anyone between 130 and 170cm. James should write what he records as two separate inequalities. $h < 130$ and $h > 170$
2)	a) Karen thinks of a number, doubles it and adds 3. Her solution is lower or equal to 11. What is the highest integer she could be thinking of? b) Tom thinks of a number, triples it and subtracts 2. His solution is lower than doubling his number and adding 3. Is there a number that he could be thinking of that is different to Karen's number? Show your working and explain your reasoning.	a) $2x + 3 \leq 11$ $x \leq 4$ The highest integer that satisfies this inequality is 4 b) $3x - 2 < 2x + 3$ $x < 5$ Yes, because although the highest integer that satisfies both is '4', Tom could be thinking of a number that is greater than 4 but not an integer. E.g. 4.6
3)	a) Paul measures a distance in centimetres. He multiplies his distance by 4 and adds 7	a) $4d + 7 < 26$ $4d < 19$

	centimetres. His total distance has to be less than 26cm. He thinks the largest distance that he measures can be 3cm. Why is he wrong? b) Fiona measures a distance and it needs to be greater than or equal to 2cm but less than 4 cm. Represent this inequality on a number line.	$d < \frac{19}{4}$ $d < 4.75$ 4 is the largest integer that satisfies this inequality is '4'. There could also be a distance that is a real number and larger. b) 
4)	Tyra has £40 to spend. She wants to buy 5 books and a magazine. The magazine costs £3. The books all cost the same. Represent this as an inequality. What is the most that Tyra can afford to spend on each one of the books?	a) $5b + 3 \leq 40$ $5b \leq 37$ $b \leq \frac{37}{5}$ $b \leq 7.6$ b) £7.60

Inequalities on a Number Line and Solving - Answers

	Question	Answer
	Exam Questions	
1) (a)	Solve $7x - 1 < 20$	(a) M1 for attempting to isolate x or solving correctly but incorrect or missing inequality sign. $7x < 21$ A1 Cao $x < 3$
(b)	Represent your solution to part (a) on the number line.	(b)  M1 for '3' indicates A1 cao
2)	Jason's solution to the inequality $4x + 1 \geq -7$ is shown on the number line.  Is Jason's solution correct? Explain your answer.	(a) M1 for attempting to isolate x or solving correctly but incorrect or missing inequality sign. $4x \geq -8$ M1 for solving the inequality correctly $x \geq -2$
3) (a)	Solve $5x - 1 > 3x + 7$	(a) M1 for first step to solve such as $2x - 1 > 7$ M1 for attempting to isolate x or solving correctly but incorrect or missing inequality sign. $2x > 8$ A1 Cao $x > 4$
(b)	Write down the largest integer that satisfies $5x - 1 > 3x + 7$	(b) A1 Cao 5
4) (a)	n is an integer with $-5 < 2n + 1 \leq 5$ Write down all the values of n	(a) M1 for first step to solve such as $-6 < 2n \leq 4$ M1 for solving for n $-3 < n \leq 2$ A1 Cao $-2, -1, 0, 1, 2$

b)	Represent your solution to part (a) on the number line.	 M1 for '-3' and '2' indicated A1 cao
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