Maths GCSE Problem Solving Questions Workbook

Inequalities

GRADES 4 – 6

MATHS-SCHOOL
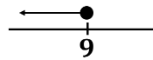
Solving inequalities with 1 or 2 variables

EXAMPLE

a) Solve the inequality 3x < 12 $x < \dfrac{12}{3}$ $x < 4$

b) Show the solution of x + 4 ≤ 13 on the number line.

$x \leq 13 - 4$ $x \leq 9$

9

c) Write the first 3 integers in ascending orders that satisfy the inequality 7 ≤ x + 2

$-7 - 2 \leq x$ $-9 \leq x$ $x \geq -9$ $-9, -8, -7$

1   (a) Solve the inequality $5x < 15$

(b) Show the solution of x - 5 ≤ 14 on a number line

(c) Write the first 3 integers in ascending orders that satisfy the inequality $12 < x - 8$

2   12cm thick bricks can be stacked. To remain safe, the stacks must be kept less than 2.2m tall.
This can be written using inequality 12n < 220
What is the maximum number of bricks than be stacked safely?

3   Steve picks 2 numbers during Bingo. The first number is 29. The 2nd number is a prime number
The total of the 2 numbers is **less** than 52.
What is the largest the second number could be?

4   Black and White Taxi charges a £1.75 flat rate in addition to £0.65 per mile.
Katie has no more than $10 to spend on a ride. Use an inequality to represents Katie's
situation to determine how many miles Katie travel without exceeding her budget?

Solving inequalities with 1 or 2 variables

EXAMPLE

A car costs £x
If Carol buys 4 cars and pays £1000 deposit and the total amount she
has left to pay is less than £53,000
Write the cost of the 4 cars in terms of x as an inequality

$$4x - 1000 < 53,000 \quad \text{or} \quad 4x < 54000$$

Hence, find the maximum price of the cars
(assuming they all cost the same)

$$4x < 54000 \qquad x < \frac{54000}{4} \qquad x < 13500$$

1 Chad needs to build a fence for his garden. The perimeter of his garden is 24m in total and he needs to leave a 2.5 m gap for a gate. Fencing comes in 3m sections.

a) Write an inequality to represent the minimum number sections Chad would need to buy

b) Hence, find the minimum number of sections he would need to buy

2 A 300ml bottle already has 120ml of water in it. A tap starts dripping water into the bottle at a rate of 1.5ml per minute.

a) Write an inequality to represent the time (in minutes) when the bottle will not be full

b) Hence, find the minimum number of sections he would need to buy

3 Dixie eats cereal in the morning as part of her calorie-controlled diet which is 200 calories. She needs to try and eat less than 1500 calories per day. She will be having 2 meals later in the day which equate to a total of 750 calories, but she like to snack on fruit bars, (which are 80 calories a bar).

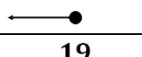a) Write an inequality to represent the number of fruit bars she can have.

b) Hence, find the maximum number of fruit packs she can have that day

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EXAMPLE

The speed of a falling object is given as V = 10t
(were V = speed and t = time (seconds)
If an object is dropped, between what times will the speed be
between 48 and 98 (m/s)

$$48 < 10t < 96$$

$$48 \div 10 < t < 96 \div 10$$

$$4.8 < t < 9.8$$

1 Zack is filling a bath. He prefers the water to be between 25cm and 35cm deep.

It is currently 10cm deep and its depth is rising at a rate of 0.6cm per minute.

How long from now, will the bath be within the depths that Zack prefers (mins)?

2 A triangular sign has an area between 360 and 420cm^2.

The base width is to be standardised to 24cm.

If they want the range of the triangles' area to remain the same,

calculate the range in perpendicular height of the new triangular signs.

3 A trapezium has an area between 60 and 80cm^2.

The height is always 4cm.

The difference between the two parallel sides is 2cm.

Find the range of the length of the **shorter** of the two parallel sides **(b)**

Page 1 – Solving inequalities with 1 or 2 variables

1. a) $x < 3 : x < \frac{15}{5}$

   b) $216 : x \leq 14 + 5 \qquad x \leq 19$ **19**

   c) $12 + 8 < x \rightarrow 20 < x$ or $x > 20 \rightarrow 21, 22, 23$

2. a) 18 bricks : $n < \frac{220}{12} \rightarrow n < 18\frac{1}{3}$

3. 19 : $x + 29 < 52$, $x < 52 - 29$, $x < 23$

   Highest prime number less than 23

4. 12 miles : $1.75 + 0.65x < 10 \rightarrow 0.65x < 8.25$

   $x < 8.25 \div 0.65 \rightarrow 12.69$

Page 2 – Solving inequalities with 1 or 2 variables

1. a) $3x + 2.5 > 24$ or $3x > 21.5$

   b) 8 sections : $3x > 21.5 \rightarrow x > \frac{21.5}{3} \rightarrow x > 7.1\dot{6}$

2. a) $1.5t + 120 < 300$ or $1.5t < 180$ or $t < 120$

   b) 5pm : $1.5t < 180 \rightarrow t < \frac{180}{1.5} \rightarrow t < 120$

3. 6 fruit bars : $80x + 950 < 1500$

   $80x < 550 \rightarrow x < \frac{550}{80} \rightarrow x < 6.88$

Page 3 – Solving inequalities with 1 or 2 variables

1. 25 mins $< t <$ 41mins 40 seconds :

$25 < 10 + 0.6t < 35,$

$25 - 10 < 0.6t < 35 - 10$

$15 < 0.6t < 25 \rightarrow 15 \div 0.6 < t < 25 \div 0.6$

$25 < t < 41\frac{2}{3}$

2. 30cm $<$ h $<$ 35cm : $360 < \frac{1}{2}bh < 420$

$720 < 24 \times h < 840,$

$720 \div 24 <$ h $< 840 \div 24$

$30 <$ h < 35

3. 14cm $<$ b $<$ 19cm : $60 < \frac{1}{2}(a+b)h < 80$

$120 < (a+b) \times 4 < 160,$

$120 \div 4 < (a+b) < 160 \div 4$

$30 < (a+b) < 40,$ Given that $a = b + 2$

$30 < (b + 2 + b) < 40$

$30 < 2b + 2 < 40, \qquad 28 < 2b < 38$

$14 < b < 19$