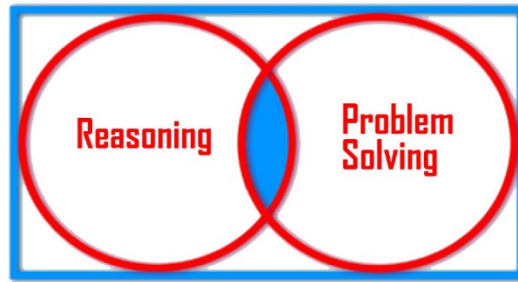


GCSE Foundation (5 – 1)



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Mathematical Reasoning Questions

(Linear Equations) – Set 1

Solutions

The questions are repeated here for your convenience

1 Show that if $3x + 5 = 17$ then x must be 4

Solution

$$3x = 12 \text{ \{Subtract 5 from both sides\}}$$

$$x = 4 \text{ \{Divide both sides by 3\}}$$

Alternatively,

Substitute $x = 4$ into the LHS to check whether your answer will be 17

$$3 \times 4 + 5$$

$$12 + 5 = 17$$

Therefore, x must be 4

[1mark]

2 Explain how you would solve the equation

$$3^x + 5^x = 152$$

Solution

Use Trial and improvement by substituting different values for x

Try $x = 4$

$$5^4 = 625, \text{ so } x \text{ must be less than 4}$$

$$3^1 + 5^1 = 8 \text{ \{Test } x = 1\}}$$

$$3^2 + 5^2 = 34 \text{ \{Test } x = 2\}}$$

$$3^3 + 5^3 = 152 \text{ \{Test } x = 3\}}$$

Therefore, $x = 3$

[1mark]

3 Here are three equations

a) $6x - \frac{1}{2} = 22$

b) $20 - 2x = 13$

c) $3x + 5 = 7x - 8$

One of these equations has an answer of 3.5

Which one is it?

Solution

Substitute 3.5 for x in each equation to check if both sides are equal or you could solve the equations in turn to find which one will give an answer of 3.5

a) $6x - \frac{1}{2} = 22$

$21 - \frac{1}{2} \neq 22$ { x does not equal 3.5 in this equation}

b) $20 - 7 = 13$ { x equals 3.5 in this equation}

c) $3 \times 3.5 + 5 = 15.5$ and $7 \times 3.5 - 8 = 16.5$
 $15.5 \neq 16.5$

Therefore, only the second equations has $x = 3.5$

Correct Answer: B [1mark]

4 Here is an equation $5(x + 2) + 2(x - 3) = 25$

Ryan says 'since there are two 'x's, the equation will have two answers. Is Ryan correct? Justify your answer

Solution

The equation can be simplified as follows:

$5(x + 2) + 2(x - 3) = 5x + 10 + 2x - 6 = 7x + 4$

$7x + 4 = 25$ {Subtract 4 from each side}

$7x = 21$ {Divide each side by 7}

$x = 3$

Therefore, Ryan is incorrect since $x = 3$ is the only correct answer
[2marks]

<p>5</p>	<p>Here is Nala's answer to the equation $3(2x + 1) = 21$ $6x + 3 = 21$ $6x = 18$ $x = 3$ Use a different method to solve the same equation <p style="text-align: center;"><u>Solution</u></p> $2x + 1 = 7$ {start by dividing both sides by 3} $2x = 6$ $x = 3$</p> <p style="text-align: right;">[1mark] [1mark]</p>
<p>6</p>	<p>Given that $10^a - 15 = 9985$ Then a must be? a) 2.5 b) -4 c) -3 d) 4</p> <p style="text-align: center;"><u>Solution</u></p> <p>Add 15 to both sides $10^a = 10000$ [1mark]</p> <p>Now you can try different values of a</p> <p>$a = 4$ {$10^1 = 10, 10^2 = 100 \dots 10^4 = 10000$}</p> <p>Correct Answer: D</p> <p style="text-align: right;">[1mark]</p>

7 Solve the equation $6x - 5 = 3x + 20$

Lilly's Answer

$$3x = 15$$

$$x = 5$$

Lilly is wrong. Find her mistake and correct it.

Solution

Lilly subtracted 5 from 20 instead of adding it.

Correct answer:

$$3x = 25$$

$$x = \frac{25}{3}$$

[2marks]

8 Trisha is solving the equation below

$$5(3 - 4x) + 6x - 7 = 35$$

Here is her Answer

Expand the brackets first: $15 - 4x + 6x - 7 = 35$

Simplify by collecting the like terms: $8 - 2x = 35$

Subtract 8 from both sides: $-2x = 27$

Divide both sides by -2 : $x = -13.5$

Identify the two mistakes Trisha made and give the correct solution

Solution

Mistake in expanding the bracket, should have $15 - 20x$

Another mistake in the sum of $-4x + 6x$, Should be $2x$ not $-2x$

[1mark]

Expand the brackets first: $15 - 20x + 6x - 7 = 35$

Simplify by collecting the like terms: $8 - 14x = 35$

[1mark]

$$-14x = 27$$

$$x = -\frac{27}{14}$$

[1mark]

9 Answer **True** or **False**

- a) If $20 - x = 30$ then x must be less than 0
b) If $5.7 + 2x = 6.3$ then x is exactly 0.6
c) If $-7x + 20 = 34$ then x is greater than -3

Solution

a) $20 - x = 30$

$-x = 10 : x = -10$ Therefore, **True** [1mark]

b) $5.7 + 2x = 6.3$ {Subtract 0.6 from each side}

$2x = 0.6 : x = 0.3$ {Divide both sides by 2}

Therefore, **False** [1mark]

c) $-7x + 20 = 34$ {minus 20 from each side}

$-7x = 14 : x = -2$ {divide both sides by -7}

Therefore, **True** [1mark]

10



Given that $x + y = \frac{2}{3}$ and $y - z = 5$ and $z = -3$

Find the value of $x - y - z$

Solution

Substitute $z = -3$ into $y - z = 5$

$y - (-3) = 5$ so $y + 3 = 5$ {Subtract 3 from both sides}

$y = 2$ [1mark]

Now substitute $y = 2$ into $x + 2 = \frac{2}{3}$ {Multiply both sides by 3}

[1mark]

$3x + 6 = 2$ {Subtract 6 from each side}

$3x = -4$ {Divide both sides by 3} [1mark]

$x = -\frac{4}{3}$ [1mark]

Therefore, $x - y - z = -\frac{4}{3} - 2 - 3$

$= -\frac{4}{3} + 1 = -\frac{1}{3}$ [1mark]