

Reasoning and Problem Solving

Step 8: Two-Step Equations

National Curriculum Objectives:

Mathematics Year 6: (6A1) [Express missing number problems algebraically](#)

Differentiation:

Questions 1, 4 and 7 (Problem Solving)

Developing Use number cards with all 4 operations to create three balanced one and two-step equations. Includes whole numbers only.

Expected Use number cards with all 4 operations to create three balanced two-step equations. Includes whole numbers, with some decimals and fractions.

Greater Depth Use number cards with all 4 operations to create three balanced two-step equations. Includes whole numbers, decimals, fractions and negative numbers.

Questions 2, 5 and 8 (Problem Solving)

Developing Choose a value for y and find three possible ways to balance the two-step equation. Includes whole numbers only and all 4 operations. Some bar models provided for support.

Expected Choose a value for y and find three possible ways to balance the two-step equation. Includes whole numbers, with some decimals and fractions and all 4 operations. Some bar models provided for support.

Greater Depth Choose a value for y and find three possible ways to balance the two-step equations. Includes whole numbers, decimals, fractions and negative numbers and all four operations.

Questions 3, 6 and 9 (Reasoning)

Developing Explain which statement about a two-step equation is correct. Includes whole numbers and all 4 operations.

Expected Explain which statement about a two-step equation is correct. Includes whole numbers, with some decimals and fractions and all 4 operations.

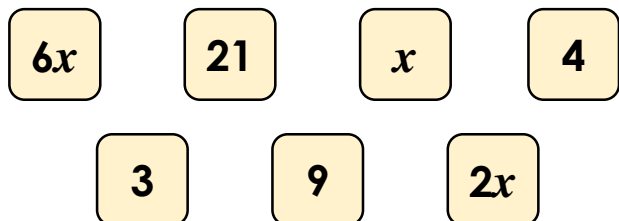
Greater Depth Explain which statement about a two-step equation is correct. Includes whole numbers, decimals, fractions and negative numbers and all four operations.

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Two-Step Equations

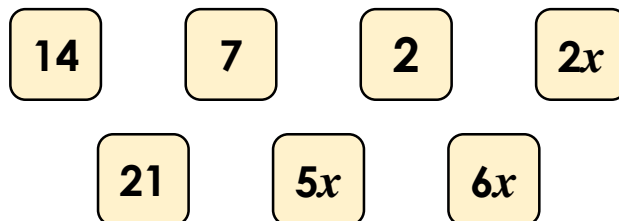
1a. Use the cards below to create three balanced equations where $x = 6$. You must use a different operation in each equation.



PS

Two-Step Equations

1b. Use the cards below to create three balanced equations where $x = 7$. You must use a different operation in each equation.



PS

2a. Choose a value for y and find three possibilities to complete the following equation.

$$2y - \square = \square$$

7		
y	y	$- ?$



PS

2b. Choose a value for y and find three possibilities to complete the following equation.

$$4y + \square = \square$$

27				
y	y	y	y	$+ ?$



PS

3a. Scott and Mia are solving the following algebraic equation.

$$2x + 6 = 19 + 5$$



Scott

x must be 6 for this equation to be balanced.

x must be 9 for this equation to be balanced.



Mia

Who is correct? Prove it.



R

3b. Ben and Freya are solving the following algebraic equation.

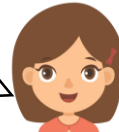
$$3x + 3 = 16 + 8$$



Ben

x must be 7 for this equation to be balanced.

x must be 5 for this equation to be balanced.



Freya

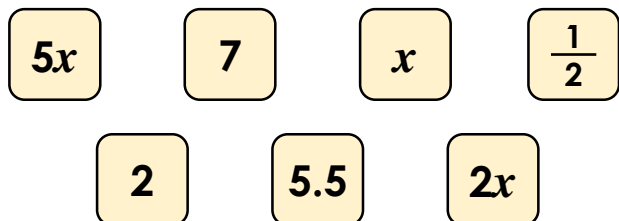
Who is correct? Prove it.



R

Two-Step Equations

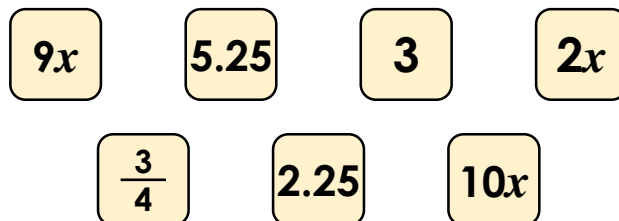
4a. Use the cards below to create three balanced equations where $x = 2.5$. You must use a different operation in each equation.



PS

Two-Step Equations

4b. Use the cards below to create three balanced equations where $x = 0.75$. You must use a different operation in each equation.



PS

5a. Choose a value for y and find three possibilities to complete the following equation.

$$\square y + \square = 6$$

6		
y	y	+ ?



PS

5b. Choose a value for y and find three possibilities to complete the following equation.

$$\square y - \square = 12$$

12			
y	y	y	- ?



PS

6a. James and Lily are solving the following algebraic equation.

$$0.5x - 9 = 5$$



James

This equation is impossible because 9 is smaller than 0.5.

x must be 28 for this equation to be balanced.



Lily

Who is correct? Prove it.



R

6b. Danny and Bella are solving the following algebraic equation.

$$20 \div 8x = 10$$



Bella

x must be $\frac{1}{4}$ for this equation to be balanced.

This equation is impossible because $20 \div 8 = 2.5$.



Danny

Who is correct? Prove it.



R

Two-Step Equations

7a. Use the cards below to create three balanced equations where $x = 0.2$. You must use a different operation in each equation.

-0.25
2.5
5x
-0.5
1.5
10x
1 $\frac{1}{2}$



PS

Two-Step Equations

7b. Use the cards below to create three balanced equations where $x = 0.25$. You must use a different operation in each equation.

-2.5
12x
15x
 $\frac{1}{2}$
25x
1.5
8 $\frac{3}{4}$



PS

8a. Choose a value for y and find three possibilities for each of the following equations.

A. $y \div$ $= 6.5$

B. $y -$ $= -2.5$



PS

8b. Choose a value for y and find three possibilities for each of the following equations.

A. $y \div$ $= 1.75$

B. $y -$ $= -0.75$



PS

9a. Alex and Priya are solving the following algebraic equation.

$$21x - 11.5 = -1$$



Alex

This equation is impossible as the answer is a whole number.

x must be 0.5 for this equation to be balanced.



Priya

Who is correct? Prove it.



R

9b. Oscar and Kelly are solving the following algebraic equation.

$$24x - 20.4 = -2.4$$



Kelly

This equation is incorrect because 24 is larger than 20.4 so there will not be a negative answer.

x must be 0.75 for this equation to be balanced.



Oscar

Who is correct? Prove it.



R

Reasoning and Problem Solving Two-Step Equations

Developing

1a. Various answers, for example:

$$x + 3 = 9; 21 - 2x = 9; 6x \div 4 = 9$$

2a. Various answers, for example: if $y = 4$, then $2y - 1 = 7$; if $y = 5$ then, $2y - 3 = 7$, if $y = 6$, then $2y - 5 = 7$.

3a. Mia is correct because you can take 5 away from both sides, leaving $2x + 1 = 19$; $19 - 1 = 18$ and $18 \div 2 = 9$.

Expected

4a. Various answers, for example:

$$5x - 5.5 = 7; x \div \frac{1}{2} + 2 = 7; 2x + 2 = 7$$

5a. Various answers, for example: if $y = 2$, then $2y + 2 = 6$; if $y = 0.5$, then $2y + 5 = 6$; if $y = 0.25$, then $2y + 5.5 = 6$.

6a. Lily is correct because $0.5 \times 28 = 14$ and $14 - 9 = 5$. James is incorrect because 9 doesn't need to be bigger than the number it is subtracting as it will be multiplied by x first.

Greater Depth

7a. Various answers, for example:

$$10x - 2.5 = -0.5; 5x \times 1.5 = 1.5; -0.5 + 10x = 1.5$$

8a. Various answers, for example:

$$\text{Calculation A: if } y = 3.25, 14y \div 7 = 6.5; 12y \div 6 = 6.5; 10y \div 5 = 6.5; \text{Calculation B: } 2y - 9 = -2.5; 3y - 12.25 = -2.5; 4y - 15.5 = -2.5$$

9a. Priya is correct because $21 \times 0.5 = 10.5$ and $10.5 - 11.5 = -1$. Alex is incorrect because subtracting a decimal number does not mean you cannot get a whole number for the answer.

Reasoning and Problem Solving Two-Step Equations

Developing

1b. Various answers, for example:

$$2x + 7 = 21; 5x - 14 = 21; 6x \div 2 = 21$$

2b. Various answers, for example: if $y = 6$, then $4y + 3 = 27$; if $y = 5$, then $4y + 7 = 27$; if $y = 4$, then $4y + 11 = 27$.

3b. Ben is correct because you can take away 3 from both sides leaving $3x = 16 + 5$; $16 + 5 = 21$. $21 \div 3 = 7$.

Expected

4b. Various answers, for example:

$$10x - 5.25 = 2.25; 9x \div 3 = 2.25; 2x + \frac{3}{4} = 2.25$$

5b. Various answers, for example: if $y = 5$, then $3y - 3 = 12$; if $y = 5.5$, then $3y - 4.5 = 12$; if $y = 5.75$, then $3y - 5.25 = 12$.

6b. Bella is correct because $\frac{1}{4} \times 8 = 2$ and $20 \div 2 = 10$. Danny is incorrect because 8 is multiplied by x before dividing 20 by $8x$.

Greater Depth

7b. Various answers, for example:

$$25x - 8.75 = -2.5; -2.5 + 12x = \frac{1}{2}; 12x \times \frac{1}{2} = 1.5$$

8b. Various answers, for example:

$$\text{Calculation A: if } y = 0.5, 17.5y \div 5 = 1.75; 14y \div 4 = 1.75; 10.5y \div 3 = 1.75; \text{Calculation B: } 4y - 2.75 = -0.75; 7y - 4.25 = -0.75; 2y - 1.75 = -0.75$$

9b. Oscar is correct because $24 \times 0.75 = 18$ and $18 - 20.4 = -2.4$. Kelly is incorrect because the starting number can be made smaller when multiplying by a number less than 1 so there can be a negative answer.