Reasoning and Problem Solving
Step 4: Substitution

National Curriculum Objectives:

Mathematics Year 6: (6A2) Use simple formulae
Mathematics Year 6: (6A3) Generate and describe linear number sequences
Mathematics Year 6: (6A4) Find pairs of numbers that satisfy an equation with two unknowns

Differentiation:

Questions 1, 4 and 7 (Reasoning)
Developing Explain whether a statement is correct. 2 substitutions with whole numbers only and all 4 operations.
Expected Explain whether a statement is correct. 2 or 3 substitutions using whole numbers, some decimals, fractions and all 4 operations. Some examples may require knowledge of the order of operations.
Greater Depth Explain whether a statement is correct. 3 or 4 substitutions using whole numbers, decimals, fractions, mixed numbers and all 4 operations. Some examples require knowledge of the order of operations.

Questions 2, 5 and 8 (Problem Solving)
Developing Use the equation to calculate the 2 values. 2 substitutions with whole numbers only and all 4 operations.
Expected Use the equation to calculate the 2 values. 2 or 3 substitutions using whole numbers, some decimals, fractions and all 4 operations. Some examples may require knowledge of the order of operations.
Greater Depth Use the equation to calculate the 2 values. 3 or 4 substitutions using whole numbers, decimals, fractions, mixed numbers and all 4 operations. Some examples require knowledge of the order of operations.

Questions 3, 6 and 9 (Reasoning)
Developing Explain if a statement is true or false. 2 substitutions with whole numbers only and all 4 operations.
Expected Explain if a statement is true or false. 2 or 3 substitutions using whole numbers, some decimals, fractions and all 4 operations. Some examples may require knowledge of the order of operations.
Greater Depth Explain if a statement is true or false. 3 or 4 substitutions using whole numbers, negative numbers, decimals, fractions, mixed numbers and all 4 operations. Some examples require knowledge of the order of operations.

More Year 6 Algebra resources.

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Substitution

1a. Hafsa is looking at the values below.

$$d = 2e + 5$$
$$f = d - 2$$

She says,

If $e = 7$ then $f = 17$.

Is she correct?

Explain your answer.

D R

Substitution

1b. Will is looking at the values below.

$$d = 2e$$
$$f = 9 + d$$

He says,

If $e = 12$ then $f = 3$.

Is he correct?

Explain your answer.

D R

2a. Use the equation below to work out the value of a and b.

$$a = 15 - 2b$$

$$b = 16 \div 4 + 3$$

$a =$ ☐ $b =$ ☐

D PS

2b. Use the equation below to work out the value of a and b.

$$a = 2b + 2$$

$$b = 5 \times 4 - 6$$

$a =$ ☐ $b =$ ☐

D PS

3a. True or false?

$$e = 2f - 15$$

When $f = 20$, $e = 5$.

Explain your answer.

D R

3b. True or false?

$$e = f + 10$$

When $f = 25$, $e = 35$.

Explain your answer.

D R

Substitution

4a. Evie is looking at the values below:

$$a = 3b - 4$$
$$c = a + 10$$

She says,

If $b = 5$ then $c = 20$.

Is she correct?

Explain your answer.

E R

Substitution

4b. Jaxon is looking at the values below:

$$a = 10b \div 2$$
$$c = 25 + a$$

He says,

If $b = 0.5$ then $c = 15$.

Is he correct?

Explain your answer.

E R

5a. Use the equation below to work out the value of a and b.

$$a = 2b - 5$$

$$b = 6 \times 4 + \frac{1}{2}$$

$a =$ ☐ $b =$ ☐

E PS

5b. Use the equation below to work out the value of a and b.

$$a = 3b + 7$$

$$b = 2 + 8 \times \frac{1}{4}$$

$a =$ ☐ $b =$ ☐

E PS

6a. True or false?

$$a = bc - 5$$

When $b = 10$ and $c = 9$,
$a = 14$.

Explain your answer.

E R

6b. True or false?

$$a = (b - 10c) \times 11$$

When $b = 25$ and $c = 2.5$,
$a = 11$.

Explain your answer.

E R

Substitution

7a. Lucy is looking at the values below:

$$a = (b^2 \div 10) + 1.25$$
$$c = a + 10$$

She says,

If $b = 9$ then $c = 19.5$.

Is she correct?

Explain your answer.

GD R

Substitution

7b. Harry is looking at the values below:

$$a = 55 \div 8b$$
$$c = 0.25 + 4a$$

He says,

If $b = \frac{1}{4}$ then $c = 220.25$

Is he correct?

Explain your answer.

GD R

8a. Use the equation below to work out the value of a and b.

$$a = 8b \div 2$$

$$b = 6 \times 1\frac{1}{3} + 3$$

$a =$ ☐ $b =$ ☐

GD PS

8b. Use the equation below to work out the value of a and b.

$$a = 2b \times 3$$

$$b = 17 - 12 \times 1\frac{1}{2}$$

$a =$ ☐ $b =$ ☐

GD PS

9a. True or false?

$$a = 100b \div (c - 2.5)$$

When $b = 0.55$ and $c = 13.5$,
$a = 0.5$

Explain your answer.

GD R

9b. True or false?

$$a = (b^3 \times 5) - 4c$$

When $b = 2$ and $c = 8.5$,
$a = -4$

Explain your answer.

GD R

Reasoning and Problem Solving Substitution

Developing

1a. Yes; $d = 14 + 5 = 19$, so $f = 19 - 2 = 17$

2a. $a = 1$; $b = 7$

3a. False; $2f = 40$, so $e = 40 - 15 = 25$

Expected

4a. No; $a = 15 - 4 = 11$, so $c = 11 + 10 = 21$

5a. $a = 44$; $b = 24.5$

6a. False; $a = (10 \times 9) - 5$, so $90 - 5 = 85$

Greater Depth

7a. No; $a = (81 \div 10) + 1.25 = 9.35$, so $c = 9.35 + 10 = 19.35$

8a. $a = 44$; $b = 11$

9a. False; $a = 55 \div 11 = 5$

Reasoning and Problem Solving Substitution

Developing

1b. No; $d = 2 \times 12 = 24$, so $f = 9 + 24 = 33$

2b. $a = 30$; $b = 14$

3b. True; $e = 25 + 10 = 35$

Expected

4b. No; $a = 5 \div 2 = 2.5$, so $c = 25 + 2.5 = 27.5$

5b. $a = 19$; $b = 4$

6b. False; $a = (25 - 25) \times 11$, so $0 \times 11 = 0$

Greater Depth

7b. No; $a = 55 \div 2 = 27.5$, so $c = 0.25 + 110 = 110.25$

8b. $a = -6$; $b = -1$

9b. False; $a = (8 \times 5) - 34 = 6$