Year 8 substitution worksheet

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Name: _____ Date: _____

Question 1

Evaluate $3 - (-2)^3 \div 4 \times (-1)$.

Answer: _____

Question 2

Evaluate $3a^2 - 2b$ when $a = -2$ and $b = 5$.

Answer: _____

Question 3

Calculate $(-5) \times (-3) + (-8) \div 2$.

Answer: _____

Question 4

Evaluate $(p + q)/(p - q)$ when $p = 7$ and $q = -3$.

Answer: _____

Question 5

Evaluate $(-3)^2 - 20 \div (-4) + (-7)$.

Answer: _____

Question 6

Are $4(x + 3)$ and $4x + 3$ equivalent expressions? Use $x = 1$ to help explain your answer.

Answer: _____

Question 7

Follow these steps.

1. Start with 5. 2. Multiply by 3. 3. Subtract 4. 4. Square the result.

What is the final answer?

Answer: _____

Question 8

Consider these five expressions:

A: 2x + 3x B: 5x C: x + 5 D: 6x - x E: 5 + x

(a) Substitute x = 2 into each expression.

(b) Sort the expressions into groups of equivalent expressions.

Answer: _____

Question 9

Ethan worked out 20 - 4 × 3 + 2 and got 50.

(a) Explain what Ethan did wrong.

(b) Find the correct answer.

Answer: _____

Question 10

Evaluate 4m - 3n when m = -2 and n = 5.

Answer: _____

Year 8 substitution: answers and worked solutions

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Question 1

Key idea: Follow BODMAS: evaluate the power first, then division and multiplication left to right, then subtraction.

1. Evaluate the power: $(-2)^3 = -8$, so the expression becomes $3 - (-8) \div 4 \times (-1)$ 2. Division (left to right): $(-8) \div 4 = -2$, giving $3 - (-2) \times (-1)$ 3. Multiplication: $(-2) \times (-1) = 2$, giving $3 - 2$ 4. Subtract: $3 - 2 = 1$

Answer: 1

Question 2

Key idea: Substitute using brackets around negative numbers, then follow the order of operations.

1. $3 \times (-2)^2 - 2 \times 5$ 2. $= 3 \times 4 - 10$ 3. $= 12 - 10 = 2$

Answer: 2

Question 3

Key idea: Apply order of operations (multiplication and division before addition), then use sign rules for each step.

1. Work out the multiplication first: $(-5) \times (-3) = 15$ (same signs give a positive result). 2. Work out the division next: $(-8) \div 2 = -4$ (different signs give a negative result). 3. Now add the two results: $15 + (-4) = 15 - 4 = 11$.

Answer: 11

Question 4

Key idea: The fraction line acts like brackets: evaluate the numerator and denominator first.

1. Numerator: $7 + (-3) = 4$ 2. Denominator: $7 - (-3) = 10$ 3. $4/10 = \frac{2}{5}$

Answer: $\frac{2}{5}$

Question 5

Key idea: Follow BODMAS: power first, then division, then addition and subtraction left to right.

1. Evaluate the power: $(-3)^2 = 9$, giving $9 - 20 \div (-4) + (-7)$ 2. Division: $20 \div (-4) = -5$, giving $9 - (-5) + (-7)$ 3. Rewrite: $9 - (-5) = 9 + 5 = 14$, giving $14 + (-7)$ 4. Evaluate: $14 + (-7) = 7$

Answer: 7

Question 6

Key idea: Equivalent expressions give the same value for every value of the pronumeral, so one value that gives different results shows they are not equivalent.

1. $4(1 + 3) = 4 \times 4 = 16$ 2. $4 \times 1 + 3 = 7$ 3. $16 \neq 7$, so the expressions are not equivalent (in fact $4(x + 3) = 4x + 12$)

Answer: No, they are not equivalent: when $x = 1$ they give 16 and 7

Question 7

Answer: 121 ($5 \times 3 - 4 = 11$, $11^2 = 121$)

Question 8

Key idea: Simplifying each expression shows which ones are always equal; substituting a value is a quick check.

1. (a) A: $4 + 6 = 10$; B: 10; C: $2 + 5 = 7$; D: $12 - 2 = 10$; E: $5 + 2 = 7$ 2. (b) A simplifies to $5x$ and D simplifies to $5x$, the same as B 3. (b) C and E are both $x + 5$ (adding can be done in any order)

Answer: (a) A 10, B 10, C 7, D 10, E 7 (b) A, B and D are equivalent; C and E are equivalent

Question 9

Answer: (a) He subtracted before multiplying; multiplication must be done first (b) 10 ($20 - 12 + 2$)

Question 10

Key idea: Replace each pronumeral with its value, using brackets around negatives.

1. $4(-2) - 3(5) = -8 - 15$ 2. $= -23$

Answer: -23