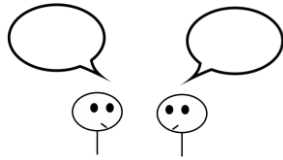# 8 Algebra CC          ANSWER KEY

## Unit 4 – Applications with Equations ("Word Problems")

Let's work together.

## Multiple Choice

1.  Michael has 7 more dimes than nickels. Which expression represents the amount of money he has if $x$ represents the number of nickels?

    **x**: number of nickels
    **x + 7**: number of dimes
    *There are 7 more dimes than nickels so to find the number of dimes, add 7 to the amount of nickels (x)*

    (a) $0.05(x - 7) + 0.10x$          (b) $0.05(x + 7) + 0.10x$

    (c) $0.05x + 0.10(x - 7)$          **(d)** $0.05x + 0.10(x + 7)$

2.  If $x - 3$ represents the largest value of three consecutive integers, which expression represents the smallest value?

    (a) $x - 1$          **(b)** $x - 5$

    (c) $x - 2$          (d) $x - 4$

    **x – 3**: largest integer
    **x – 4**: middle integer          **-1**
    **x – 5**: smallest integer
    *Subtract 1 to go from the largest integer to the smallest integer*

3.  Sue has a total of 15 coins made up of dimes and quarters. If $x$ represents the number of dimes, represent the number of quarters Sue has in terms of $x$.

    (a) $15 + x$          (b) $15x$

    **(c)** $15 - x$          (d) $x - 15$

    15 coins in total
    **x**: # of dimes
    **15 – x**: # of quarters
    *Subtract the amount of dimes (x) from the total amount of coins to represent the number of quarters*

4.  Jeremy bought flowers for a price that can be represented by $8x$. Represent 5 less than half that amount.

    ½ (8x) – 5
    half the     5 less than
    amount

    (a) $8x - 5$          **(b)** $4x - 5$

    (c) $5 - 8x$          (d) $5 - 4x$          *Simplifies to 4x – 5*

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**Solve the following problems <u>algebraically</u>. Remember to…**

1) **Read the problem carefully and make sense of the situation.**
2) **Define all unknowns in terms of one variable.**
3) **Set up an equation that reflects the situation.**
4) **Solve the equation and make sense of the solution.**
5) **Answer the question.**
6) **Make sure your answer(s) are complete, correct and reasonable.**

### TURN OVER TO GET STARTED!

5.  Ryan is thinking of two rational numbers in the ratio of 7:9.  If ten is subtracted from twice their sum, the result is 38.  Find both numbers.

**7x**: 1st rational number        7(1.5) = 10.5
**9x**: 2nd rational number        9(1.5) = 13.5

**If 10 is subtracted from twice their sum the result is 38**
**2(7x + 9x) − 10 = 38**

2(16x) − 10 = 38
32x − 10 = 38
32x = 48
x = 1.5        **The rational numbers are 10.5 and 13.5**


6.  Of two consecutive integers, four times the smaller is 30 more than three times the larger. Find both integers.

**x**: 1st integer        (33)
**x + 1**: 2nd integer        (33 + 1 = 34)

**four times the smaller is 30 more than three times the larger**
**4(x) = 3(x + 1) + 30**

4x = 3x + 3 + 30
4x = 3x + 33
x = 33

**The integers are 33 and 34**


7.  There are three consecutive even integers such that twice the middle number decreased by 20 is equal to the third number. Find all the integers.

**x**: 1st consecutive even integer        (20)
**x + 2**: 2nd consecutive even integer        (20 + 2 = 22)
**x + 4**: 3rd consecutive even integer        (20 + 4 = 24)

**twice the middle number decreased by 20 is equal to the third number**
**2(x + 2) − 20 = x + 4**

2x + 4 − 20 = x + 4
2x − 16 = x + 4
x − 16 = 4
x = 20

**The integers are 20, 22 and 24**

8. Gary's lemonade stand sold small cups of lemonade for $1.25 each and large cups of lemonade for $2.50 each. If 155 cups of lemonade were sold, and Gary collected $265, how many small cups of lemonade were sold?

| Lemonade | value of one (cost per cup) | QTY (how many cups) | $ |
|---|---|---|---|
| Small cups | $1.25 | x | 1.25x |
| Large cups | $2.50 | 155 – x | 2.50(155 – x) |

**x**: the number of small cups of lemonade sold      (98)
**155 – x**: The number of large cups of lemonade sold     (155 – 98 = 57)

1.25x + 2.50(155 – x) = 265
1.25x + 387.50 – 2.50x = 265
-1.25x + 387.50 = 265
-1.25x = -122.50
x = 98      **Gary sold 98 small cups and 57 large cups of lemonade.**

9. Sixteen years from now, Sophia's age will be twice her age 12 years ago. Find her present age. Let $x$ represent Sophia's present age.

| | PAST | PRESENT (NOW) | FUTURE |
|---|---|---|---|
| Pia's age | x – 12 | x | x + 16 |

**x**: Sophia's age now

Sophia's future age = 2(past age)
x + 16 = 2(x – 12)
x + 16 = 2x – 24
16 = x – 24
40 = x

**Sophia is 40 years old**

10. Greg paid $26.25 in taxi fare from the train station to the hotel. The cab charged $3.75 for the first mile plus $1.50 for each additional mile. How many miles was it from the train station to the hotel?

m = the total number of miles

**3.75 + 1.50(m – 1) = 26.25**

↑ The charge for the first mile

↑ The charge for each additional mile after the first

The number of miles after the first

3.75 + 1.50(m – 1) = 26.25
3.75 + 1.5m – 1.5 = 26.25
2.25 + 1.5m = 26.25
1.5m = 24
m = 16
**It was 16 miles from the train station to the hotel.**

**PIPS QUESTION** – *PERSEVERE IN PROBLEM SOLVING!*

The sandboxes at Winston Elementary School are being adjusted to fit more sand in them.  The original square shape sandbox is being adjusted by doubling one side in length and decreasing the other side by 1 meter.  The perimeter of the new sandbox is 4 meters more than the perimeter of the original sandbox.  Determine the side length, in meters, of the original square shaped sandbox.
*HINT:  Draw and label a diagram of both sandboxes.*
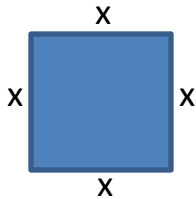


x: side length of the original square sandbox

Perimeter = x + x + x + x
P = 4x
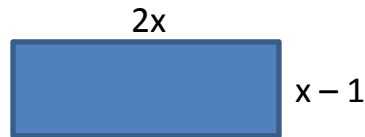
**2x**: length of the new sandbox
**x − 1**: width of the new sandbox

Perimeter = 2x + 2x + (x − 1) + (x − 1)
P = 6x − 2

**Perimeter of new sandbox is 4 meters more than the perimeter of the original sandbox**

**6x − 2 = 4x + 4**

6x − 2 = 4x + 4
2x − 2 = 4
   2x = 6
    x = 3

**The side length of the original square sandbox is 3 meters**