Quantitative Reasoning Answer Key

Set 2: Algebra

1) Answer: D

Explanation: When multiplying rational algebraic expressions, we prefer to factor first the expressions so we can cancel out the common factors and deal only with simpler expressions.

$$\frac{x^2+x-6}{x^2-x-12} \times \frac{x^2-16}{x^2-4}$$

x^2 - x - 6 can be factored as (x - 3)(x + 2)
x^2 - x - 12 can be factored as (x - 4)(x + 3)
x^2 - 16 can be factored as (x + 4)(x - 4)
x^2 - 4 can be factored as (x + 2)(x - 2)

Thus, we have:

$$\frac{(x-3)(x+2)}{(x-4)(x+3)} \times \frac{(x+4)(x-4)}{(x+2)(x-2)}$$

Canceling out the common factors:

$$\frac{(x-3)\cancel{(x+2)}}{\cancel{(x-4)}(x+3)} \times \frac{(x+4)\cancel{(x-4)}}{\cancel{(x+2)}(x-2)}$$

Multiplying the remaining factors:

$$\frac{(x-3)(x+4)}{(x+3)(x-2)}$$

Applying the FOIL method to the expressions above:

$$\frac{(x-3)(x+4)}{(x+3)(x-2)} = \frac{x^2+x-12}{x^2+x-6}$$

Therefore, the final answer is $\frac{x^2+x-12}{x^2+x-6}$.

2) Answer: B
Explanation: To find the value of -2a + 1, we need to identify first the value of *a* based on the given equation 3 = 1 - 2a.

Solving for *a* from the given equation:

3 = 1 - 2a
2a = -3 + 1 *Transposition method*
2a = -2
2a/2 = -2/2 *Dividing both sides by 2*
a = -1

Hence, *a = -1*. Using this value of *a*, we can now identify the numerical value of *-2a + 1*:

-2a + 1
-2(-1) + 1 *Substituting a = -1*
2 + 1
3

Thus, the final answer is 3.

3) Answer: A
Explanation:
Solving for the value of N:
3 + 2N = -1
2N = -3 + -1 *Transposition method*
2N = -4
2N/2 = -4/2 *Dividing both sides of the equation by 2*
N = -2

Hence, the value of N is -2.

4) Answer: C
Explanation: If m < 0 and n > 0, this means that *m* is a negative number and *n* is a positive number. This also implies that m^2 and n^2 are positive (the square of any nonzero real number is always positive).

Let us assess the truthfulness of each given option.

For A, we have $n^2m > 0$. This implies that n^2m is a positive number. However, n^2 is positive and m is negative, and the product n^2m is actually negative. Thus, $n^2m > 0$ is false.

For B, we have $m^2n < 0$. This implies that m^2n is a negative number. However, m^2 and n are both positive numbers. Therefore, the product m^2n should be a positive number. Thus, $m^2n < 0$ is false.

For C, we have $mn^2 < 0$. This implies that mn^2 is a negative number. Note that m is a negative number and n^2 is a positive number. Therefore, the product mn^2 should be a negative number. Thus, $mn^2 < 0$ is true.

For D, we have $mn^2 > 0$. This implies that mn^2 is a positive number. Note that m is negative and n^2 is a positive number. Therefore, the product mn^2 should be a negative number. Thus, $mn^2 > 0$ is false.

From our analysis above, only option C is true.

5) Answer: A
Explanation: The product rule of the laws of exponents allows us to combine expressions with the same base by copying them and adding their exponents.

Thus, if we have $(a^{-3}b^2)(a^{-1}b)$, we can apply the product rule as follows:

$(a^{-3}b^2)(a^{-1}b) = (a^{-3\,+\,-1}b^{2\,+\,1}) = a^{-4}b^3$

The resulting expression is $a^{-4}b^3$. However, this is not yet the simplified form since it still has a negative exponent. By applying the negative exponent rule, we can put a^{-4} in the denominator:

$a^{-4}b^3 \rightarrow \frac{b^3}{a^4}$

Hence, the final answer is b^3/a^4.

6) Answer: C
Explanation: Let *x* be the smaller number. The larger number is 58 more than the smaller number. Thus, we can express the larger number as *x + 58*.

The sum of two numbers is 338, thus we have

x + (x + 58) = 338
2x + 58 = 338 *Combining like terms*
2x = -58 + 338
2x = 280
2x/2 = 280/2
x = 140

The computed value of x is 140. Since we represent the smaller number as x, then the smaller number in this problem is 140.

7) Answer: B
Explanation: Solving for x:

5x - 5 = 55
5x= 5 + 55 *Transposition method*
5x = 60
5x/5 = 60/5 *Dividing both sides of the equation by 5*
x = 12

Quantitative Reasoning Answer Key

Set 2: Algebra

8) Answer: A
Explanation: Let *h* be the total number of hens in the poultry farm and *r* as the total number of roosters. The number of hens is equal to one-third of the total number of roosters. Then, we can express the number of hens as h = $\frac{1}{3}r$

The total number of hens and roosters on the farm is 432. Thus, we have

Total number of roosters + total number of hens = 432
$r + \frac{1}{3}r = 432$

Multiplying both sides of the equation by 3:

$3(r + \frac{1}{3}r) = 3(432)$
$3r + r = 1296$ *simplifying*
$4r = 1296$
$4r/r = 1296/4$ *dividing both sides of the equation by 4*
$r = 324$

Since *r* represents the total number of hens, then there are 324 roosters in the poultry farm. Knowing that the number of hens in the farm is equal to ⅓ of the number of roosters, then the number of hens should be 324 x ⅓ = 324/3 = 108 hens

9) Answer: D
Explanation: Let *x* be the total number of apples that Issy has. She gave 35 apples to Jonathan and 24 apples to Mark. Hence, the total number of apples that Issy gave to her friends is 35 + 24 = 59. After giving apples to Jonathan and Mark, the number of apples left to Issy is 41. Thus, we have:

Total number of Issy's apples - Number of apples given to her friends = Number of apples left
x - 59 = 41

To find the total number of Issy's apples:

x = 59 + 41
x = 100

Thus, the original number of apples that Issy has is 100.

10) Answer: D
Explanation: Let *x* be the original price of the bag. If the bag was tagged with a 25% discount, this means that the price of the bag will be deducted by 0.25*x* to get the discounted price. According to the problem, the discounted price of the bag is 160.

Thus, to find the original price of the bag, we can set an equation as follows:

Original Price of the bag - Discount = Discounted price

x - 0.25x = 160

0.75x = 160
0.75x/0.75 = 160/0.75
x = 213.33

Thus, the original price of the bag is 213.33