1) Answer: D

Explanation: Solving for *x* in the given equation:

3(x - 1) + 2x = 5 + 4x
3x - 3 + 2x = 5 + 4x *Distributive property*
3x + 2x - 4x = 5 + 3 *Transposition method*
x = 8

Thus, the value of x is 8.

2) Answer: A

Explanation: We can translate the given statement in the problem into an algebraic expression using the keywords. In the statement "The price of a pencil *p* is equal to ⅕ of the square of the price of an eraser *e,"* the keywords are "equal," "of," and "square." Thus, we are expecting that the translation will have the following mathematical operations or symbols.: =, x or parenthesis (for multiplication), and an exponent.

Note that ⅕ of the square of *e* can be expressed as $\frac{1}{5}e^2$.

Thus, the final answer is $p = \frac{1}{5}e^2$

3) Answer: B

Explanation: Our first goal is to "remove" the denominators of the inequality $3x - \frac{1}{2} < \frac{1}{4}$. We do this by multiplying both sides of the inequality by the least common denominator (which is 4):

$4(3x - \frac{1}{2}) < 4(\frac{1}{4})$

By distributive property:

$12x - 2 < 1$

Applying the transposition method:

$12x < 2 + 1$
$12x < 3$

Dividing both sides of the inequality by 12

$12x/12 < 3/12$
$x < 3/12$ or $\frac{1}{4}$

Thus, the solution set of the inequality is $x < \frac{1}{4}$. This means that all numbers less than $\frac{1}{4}$ are a solution for the given inequality. Among the given options, only $\frac{1}{5}$ is lesser than $\frac{1}{4}$. So, the answer to this question is $\frac{1}{5}$.

4) Answer: D
Explanation: Since we are multiplying binomials, we can apply the FOIL method:

$(3x - 2y)(5x + 4y)$

First terms: $3x(5x) = 15x^2$
Outer terms: $3x(4y) = 12xy$
Inner terms: $(-2y)(5x) = -10xy$
Last terms: $(-2y)(4y) = -8y^2$

Combining the products above:
$15x^2 + 12xy - 10xy - 8y^2$

Combining like terms:
$15x^2 + 2xy - 8y^2$

Therefore, the product of (3x - 2y)(5x + 4y) is $15x^2 + 2xy - 8y^2$

5) Answer: D
Explanation: Recall that the sum of the roots of a quadratic equation is defined by the formula -b/a while the product of the roots is defined by c/a. Note that a, b, and c are the numerical coefficients of the terms of the quadratic equation.

Recall that the standard form of a quadratic equation is given by $ax^2 + bx + c = 0$. If we divide both sides of the equation by a:

$$\frac{ax^2 + bx + c}{a} = \frac{0}{a}$$

$$\frac{ax^2}{a} + \frac{bx}{a} + \frac{c}{a} = \frac{0}{a}$$

$$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$

Notice that we have expressed the standard form of the quadratic equation using b/a and c/a as coefficients. Note that -b/a and c/a are the sum and product of the roots of a quadratic equation respectively. Hence, we can rewrite what we have derived above as follows:

$$x^2 - (sum\ of\ the\ roots)x + (product\ of\ the\ roots) = 0$$

The problem stated that the sum of the roots is ¼ and the product of the roots is ¾. Injecting these values to the formula we have derived above:

$x^2 - \frac{1}{4}x + \frac{3}{4} = 0$

Now, let us "remove" the denominators by multiplying both sides of the equation by 4:

$4(x^2 - \frac{1}{4}x + \frac{3}{4}) = 4(0)$

$4x^2 - x + 3 = 0$

Thus, the quadratic equation is $4x^2 - x + 3 = 0$.

6) Answer: B

Explanation: We can solve this quadratic equation by factoring:

$6x^2 + 7x = 5$		
$6x^2 + 7x - 5 = 0$		*Transposition method*
$(2x - 1)(3x + 5) = 0$		*Factoring*
$2x - 1 = 0$	$3x + 5 = 0$	
$2x - 1 = 0$	$3x + 5 = 0$	
$2x = 1$	$3x = -5$	*Transposition method*
$2x/2 = ½$	$3x/3 = -5/3$	*Division property of equality*
$x = ½$	$x = -5/3$	

Therefore, the roots are ½ and -5/3.

7) Answer: B

Explanation: Let *x* and *y* be the numbers such that *x* is the larger number and *y* is the smaller number. The sum of these numbers is 89. Mathematically, we can express it as $x + y = 89$. Meanwhile, the difference between these numbers is 19. In symbols, $x - y = 19$.

We have two linear equations in two variables in this case. To solve for *x* and *y*, we need to solve for both of these equations simultaneously. The easiest way to solve this is by using the elimination method:

$$
\begin{array}{rcl}
x + \cancel{y} & = & 89 \\
x - \cancel{y} & = & 19 \\
\hline
2x & = & 108
\end{array}
$$

Using the elimination method, we can eliminate *y* so that we only have *x* as the variable in the equation. Now, let us solve for *x*:

$$2x = 108$$
$$2x/2 = 108/2$$
$$x = 54$$

This means that *x* or the larger number is 54. To determine the smaller number, we just subtract 54 from 89: 89 - 54 = 35.

Thus, the smaller number is 35.

8) Answer: B

Explanation: To solve for *b*, we need to input the given value of *a* first in $3ab - 2a^2b - 5 = 0$:

$3ab - 2a^2b - 5 = 0$
$3(-1)b - 2(-1)^2b - 5 = 0$ *Substitute a = -1*
$-3b - 2b - 5 = 0$

Looking at the resulting equation above, the only remaining variable is *b*. This means that we only have a linear equation to solve.

$-3b - 2b - 5 = 0$
$-5b - 5 = 0$ *Combining like terms*

-5b = 5 *Transposition method*
-5b/-5 = 5/-5 *Dividing both sides by -5*
b = -1

Upon our calculation above, the value of *b* is -1.

9) Answer: C
Explanation: We can apply the properties of the logarithm to write the given expression as a single logarithm.

The given is $\log_a x + 2\log_a y + \log_a z$. Let us start with $2\log_a y$; applying the power rule of the logarithm, we have $\log_a y^2$. Thus, the expression becomes $\log_a x + \log_a y^2 + \log_a z$. By the product rule of logarithms, we have $\log_a x + \log_a y^2 + \log_a z = \log_a xy^2z$

10) Suppose that *m* and *n* are the roots of the quadratic equation $x^2 - 9x + 1 = 0$. What is the value of $\frac{n}{2}(m^2 + mn)$?
(a) 10.25
(b) 8.5
(c) 6.25
(d) 4.5

10) Answer: D
Explanation: The given function is a quadratic function whose domain is always the set of all real numbers given that the numerical coefficients are all real numbers and the quadratic term is nonzero.