1. What is the magnitude of the difference of the solutions for the equation $(x+5)(x-1)=0$?

A. 3
B. 6
C. 5
D. 4
E. 2

2. Which value of x is a solution to the equation $x^2+7x-14=-26$?

A. 2
B. 5
C. −2
D. 3
E. −4

3. What is the complete factorization of $4x+8xy+16x^3y$?

A. $4x+8xy(1+2x^2)$
B. $4x(1+2y+4x^2y)$
C. $4x(2+y+2x^2y)$
D. $2x(2+4y+8x^2y)$
E. $x(4+8y+16x^2y)$

4. If $(x+9)$ is a factor of $3x^2+kx+36$, what is the value of k?

A. −31
B. 31
C. 9
D. −9
E. 15

5. The equation $x^2-16x+k=0$ has exactly one real solution for what value of k?

A. 16
B. −16
C. −64
D. 64
E. 8

6. Which of the following quadratic expressions has a solution at $n=4a$ and $n=-5b$?

A. $n^2+n(4a-5b)-20ab$
B. $n^2-n(4a-5b)-20ab$
C. $n^2+n(4a+5b)-20ab$
D. $n^2+n(4a-5b)+20ab$
E. $n^2-n(4a+5b)+20ab$

7. For the quadratic equation $3x^2+20x+K$, what value of K will yield $\frac{1}{3}$ and -7 as solutions for x?

A. 7
B. −7
C. 21
D. 12
E. −14

8. What expression is equivalent to $\left(\frac{2}{3}x-\frac{1}{2}y\right)^2$?

A. $\frac{4}{9}x^2+\frac{2}{3}xy+\frac{1}{4}y^2$
B. $\frac{4}{9}x^2-\frac{2}{3}xy-\frac{1}{4}y^2$
C. $\frac{4}{9}x^2+\frac{2}{3}xy-\frac{1}{4}y^2$
D. $\frac{4}{9}x^2-\frac{4}{3}xy+\frac{1}{4}y^2$
E. $\frac{4}{9}x^2-\frac{2}{3}xy+\frac{1}{4}y^2$

9. If $x^2-y^2=169$ and $x+y=13$, then $y=$?

A. 13
B. −13
C. 1
D. 0
E. 6

10. How many pairs of real numbers (x,y) satisfy $xy=5$ and $(x+y)^2=20$?

A. 0
B. 1
C. 2
D. 3
E. 4

11. What expression is equivalent to $(-4x-11)(x+2)$?

A. $(4x-11)(x+2)$

B. $(-4x+11)(-x-2)$

C. $(4x+11)(-x-2)$

D. $-(4x+11)(x-2)$

E. $(4x+11)(x+2)$

12. The trinomial x^2+8x-9 can be factored as the product of 2 linear factors in the form $(x+a)(x+b)$. What is the polynomial sum of these 2 factors?

A. $2x-8$
B. $2x+8$
C. $2x-9$
D. $2x+9$
E. $2x-1$

13. The expression $(4x+2)(x-3)$ is equivalent to:

A. $5x-1$

B. $5x+1$

C. $4x^2-6$

D. $4x^2-10x-6$

E. $4x^2+5x-6$

14. $(7a+2b)(3b-a)$ is equivalent to:

A. $11ab$
B. $7ab$
C. $21a^2-ab-2b^2$
D. $-7a^2+19ab+6b^2$
E. $7a^2+19ab+6b^2$

15. Which of the following is the factored form of the expression $3x^2-14x+8$?

A. $(x-2)(3x+4)$

B. $(x-4)(3x-2)$

C. $(x-4)(3x+2)$

D. $(x+4)(3x-2)$

E. $(x+2)(3x-4)$

16. Let a and b be real numbers. If $(a-b)^2=a^2-b^2$, it *must* be true that:

A. Either a or b is zero.
B. Both a and b are zero.
C. Both a and b are positive.
D. Both a and b are negative
E. $a=b$

17. The trinomial x^2+x-20 can be factored as the product of 2 linear factors, in the form $(x+a)(x+b)$. What is the polynomial sum of these 2 factors?

A. $2x+1$
B. $2x-1$
C. $2x-9$
D. $2x+9$
E. $2x-20$

ANSWER KEY

1. B **2. E** **3. B** **4. B** **5. D** **6. B** **7. B** **8. E** **9. D** **10. C** **11. C** **12. B** **13. D** **14. D** **15. B** **16. E** **17. A**

ANSWER EXPLANATIONS

1. **B.** $(x+5)(x-1)=0$ means that $(x+5)=0 \rightarrow x=-5$ or $(x-1)=0 \rightarrow x=1.$ So, the difference between the possible values for x is $1-(-5)=1+5 \rightarrow 6$, or $-5-1=-6$. Only 6 is an answer given, so B is correct.

2. **E.** To factor $x^2+7x-14=-26,$ we first move everything to the same side (the left side) of the equal sign, so that the sum of the terms equals zero. By adding 26 on both sides, we get $x^2+7x+12=0.$ Now, we factor the expression by finding two integers that add up to 7 and multiply to be 12. The numbers 3 and 4 work. We factor to $(x+3)(x+4)=0.$ Thus, the values -3 and -4 are solutions to the equation. Only -4 is one of the choices given, so that is the answer.

3. **B.** Every term in the expression is a multiple of $4x,$ so we can factor out $4x$ to get:
$$4x+8xy+16x^3y=4x\left(1+2y+4x^2y\right).$$

4. **B.** If $(x+9)$ is a factor of $3x^2+kx+36,$ then that means $(x+9)(ax+b)=3x^2+kx+36$. Foiling out $(x+9)(ax+b),$ we get $ax^2+9ax+bx+9b=3x^2+kx+36.$ Comparing the two sides, we can conclude that $ax^2=3x^2 \rightarrow a=3$ and $9b=36 \rightarrow b=4.$ Lastly, $9ax+bx=kx,$ and plugging in $a=3$ and $b=4,$ we get $9ax+bx=9(3)x+4x=(27+4)x=31x=kx.$ So, $k=31.$

5. **D.** $x^2-16x+k=0$ has exactly one real solution if it is a perfect square. So, we can write $x^2-16x+k=0$ in the form $(x+a)(x+a)=0$ where $a^2=k$ and $2ax=-16x.$ Solving for $a,$ we get $2ax=-16x \rightarrow 2a=-16 \rightarrow a=-8.$ Now we can plug in $a=-8$ to solve for $k.$ $a^2=k \rightarrow (-8)^2=k \rightarrow 64=k.$

6. **B.** If $n=4a$ and $n=-5b$ are two solutions to the equation, that means that when $n=4a$ or $n=-5b,$ the equation equals zero. This means the equation can be written as $(n-4a)(n-(-5b)) \rightarrow (n-4a)(n+5b).$ Foiling this out, we get $n^2-4an+5bn-20ab=n^2-n(4a-5b)-20ab.$

7. **B.** Using the quadratic formula, we plug in $a=3,$ $b=20,$ and $c=K$ to get :
$$x=\frac{-20\pm\sqrt{20^2-4(3)(K)}}{2(3)}=\frac{-20\pm\sqrt{400-12K}}{6}=-\frac{10}{3}\pm\frac{\sqrt{400-12K}}{6}.$$
Setting this expression (with the radical in its positive form since $\frac{1}{3}>-7$) to $\frac{1}{3},$ we get:
$$\frac{1}{3}=-\frac{10}{3}+\frac{\sqrt{400-12K}}{6} \rightarrow \frac{11}{3}=+\frac{\sqrt{400-12K}}{6} \rightarrow 22=\sqrt{400-12K} \rightarrow 484=400-12K \rightarrow 84=-12K \rightarrow -7=K.$$
To check that this value of K is correct, we check if this value of K also makes the second solution true. Plugging in $K=-7$ and $x=-7,$ we get $3(-7)^2+20(-7)+(-7)=0 \rightarrow 3(49)-140-7=0 \rightarrow 147-140-7=0 \rightarrow 0=0$ is true.

8. **E.** Foiling this expression out, we get $\left(\frac{2}{3}x-\frac{1}{2}y\right)^2=\frac{4}{9}x^2-\frac{1}{3}xy-\frac{1}{3}xy+\frac{1}{4}y^2=\frac{4}{9}x^2-\frac{2}{3}xy+\frac{1}{4}y^2.$

9. **D.** $x^2 - y^2$ is a difference of squares, so it can be written as $(x+y)(x-y)$. This gives us $(x+y)(x-y)=169$. Plugging in our given value that $(x+y)=13$, we get $13(x-y)=169 \rightarrow x-y=13$. Now we have two equations $x-y=13$ and $x+y=13$. We can solve for x and substitute: $x=13+y$. $(13+y)+y=13$. $13+2y=13$. $2y=0$. This can only be true if This can only be true if $y=0$.

10. **C.** We expand the polynomial to $x^2+2xy+y^2=20$. Since $xy=5$, $y=\frac{5}{x}$. Plugging this in gives us: $x^2+2x\left(\frac{5}{x}\right)+\frac{25}{x^2}=20$. We can simplify this to: $x^2+\frac{25}{x^2}-10=0$. Multiplying both sides by x^2 gives us: $x^4-10x^2+25=0$. We can express this as $\left(x^2-5\right)^2=0$, and taking the square root of both sides gives us $x^2-5=0$. From this, it's simple to find that $x=\pm\sqrt{5}$, so there are 2 roots, each with their own respective y-values, leading us to our answer of 2 pairs.

11. **C.** We can factor out the negative sign from $(-4x-11)(x+2)$ to get $-(4x+11)(x+2)$. Now, we can redistribute the negative sign to the second factor and get $(4x+11)(-x-2)$.

12. **B.** We factor to get $(x+9)(x-1)$. If we sum the two polynomials, we get: $(x \aleph 9)\aleph\aleph(\aleph x \quad 1) \quad x \quad 9 \quad x \quad 1 \quad 2x \quad 8$.

13. **D.** Simple FOILing gives us $4x^2-12x+2x-6=4x^2-10x-6$.

14. **D.** FOILing gives us $21ab-7a^2+6b^2-2ab$. We rearrange this to $-7a^2+21ab-2ab+6b^2=-7a^2+19ab+6b^2$.

15. **B.** Our expression for $3x^2-14x+8$ will look like $(3x+n)(x+m)$. We need two numbers that multiply to 8 and sum to -14 when one of them is multiplied by 3. Whole number pairs that multiply to 8 are 8 and 1, -8 and -1, 4 and 2, and -4 and -2. Since they have to sum to a negative number, we can discard the positive sets, as the middle term coefficient, -14, is negative, leaving us with -8 and -1 and -4 and -2. If we sum the -8 and -1 pair while multiplying one of them by 3, we either get $-8+3(-1)=-8-3=-11$, or $-1+3(-8)=-1-24=-25$. Neither satisfies our equation. Using -4 and -2, we get either $-4+3(-2)=-4-6=-10$ or $-2+3(-4)=-2-12=-14$. The latter satisfies our equation. In order to have the -4 be multiplied by 3 when we FOIL, we have to put it in the opposite group from the $3x$. Thus, our solution will be $(x-4)(3x-2)$.

16. **E.** FOILing out the left side, we get $a^2-2ab+b^2=a^2-b^2$. This simplifies to $-2ab=-2b^2 \rightarrow ab=b^2 \rightarrow a=b$.

17. **A.** -20 is the product of -4 and 5 or -5 and 4. Only -4 and 5 sum to 1. Thus, x^2+x-20 can factor to $(x+5)(x-4)$. Adding these linear factors together gives us $x+5+x-4=2x+1$.