

13. When  $\frac{1}{3}k + \frac{1}{4}k = 1$ , what is the value of  $k$  ?

A.  $\frac{1}{7}$

B.  $\frac{12}{7}$

C.  $\frac{7}{2}$

D. 6

E. 12

11. For all  $x$ ,  $(3x + 7)^2 = ?$

A.  $6x + 14$

B.  $6x^2 + 14$

C.  $9x^2 + 49$

D.  $9x^2 + 21x + 49$

E.  $9x^2 + 42x + 49$

**15.** If  $3^x = 54$ , then which of the following must be true?

**A.**  $1 < x < 2$

**B.**  $2 < x < 3$

**C.**  $3 < x < 4$

**D.**  $4 < x < 5$

**E.**  $5 < x$

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

A.  $9x^2 - 16y^4$

B.  $9x^2 - 8y^4$

C.  $9x^2 + 16y^4$

D.  $6x^2 - 16y^4$

E.  $6x^2 - 8y^4$



**22.** If  $a$ ,  $b$ , and  $c$  are positive integers such that  $a^b = x$  and  $c^b = y$ , then  $xy = ?$

**F.**  $ac^b$

**G.**  $ac^{2b}$

**H.**  $(ac)^b$

**J.**  $(ac)^{2b}$

**K.**  $(ac)^{b^2}$

47. If  $r$  and  $s$  can be any integers such that  $s > 10$  and  $2r + s = 15$ , which of the following is the solution set for  $r$ ?

A.  $r \geq 3$

B.  $r \geq 0$

C.  $r \geq 2$

D.  $r \leq 0$

E.  $r \leq 2$

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**59.** For all real numbers  $b$  and  $c$  such that the product of  $c$  and 3 is  $b$ , which of the following expressions represents the sum of  $c$  and 3 in terms of  $b$  ?

**A.**  $b + 3$

**B.**  $3b + 3$

**C.**  $3(b + 3)$

**D.**  $\frac{b+3}{3}$

**E.**  $\frac{b}{3} + 3$

23. Which of the following expressions is equivalent to  $\frac{1}{2}y^2(6x + 2y + 12x - 2y)$  ?

A.  $9xy^2$

B.  $18xy$

C.  $3xy^2 + 12x$

D.  $9xy^2 - 2y^3$

E.  $3xy^2 + 12x - y^3 - 2y$

42. For all real  $x$  and  $m$ , if  $(x - 1)(x + m) = x^2 + kx - m$ ,  
then  $k = ?$

F. 0

G. 1

H.  $m$

J.  $m + 1$

→ K.  $m - 1$

The  $k$  coefficient results from adding  
the  $x$  products together

24. For nonzero numbers  $x$  and  $y$ , which of the following expressions is NOT equivalent to  $\frac{-x}{y}$ ?

*"Which of the following"*

*Questions require you to test EACH ONE*

F.  $\frac{-x}{-y} \rightarrow = \frac{-1(x)}{-1(y)}$

G.  $\frac{x}{-y}$

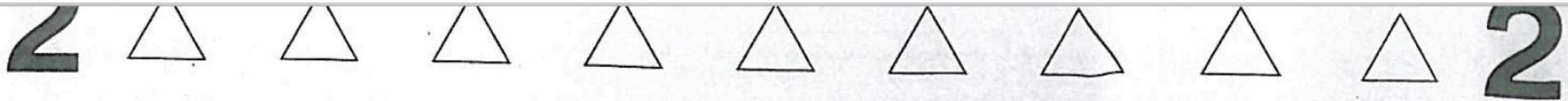
H.  $\frac{-x}{y}$

J.  $\frac{-\pi x}{\pi y}$

K.  $-\frac{1}{\frac{y}{x}}$

$$-\frac{x}{y} = -\frac{x}{y} = -1\left(\frac{x}{y}\right) = \frac{x}{-y} = \frac{-1(x)}{y} = \frac{x}{-1(y)}$$

*reciprocal*



37. Which of the following is NOT a factor of  $z^5 - 16z$ ?

- A.  $z^2 - 1$
- B.  $z^2 - 4$
- C.  $z + 2$
- D.  $z$
- E.  $z - 2$

DO YOUR FIGURING HERE.

**FACTORS**

Factoring  $z^5 - 16z$  becomes  $z(z^4 - 16)$   
Difference of two squares →  $z(z^2 - 4)(z^2 + 4) = z(z - 2)(z + 2)(z^2 + 4)$

38. What is the sine of  $\alpha$  in the right triangle shown in the



19.  $(2x - 3y)^2$  is equivalent to:

- A.  $4x^2 - 12xy + 9y^2$   
B.  $4x^2 - 10xy + 9y^2$   
C.  $4x^2 - 9y^2$   
D.  $4x^2 + 9y^2$   
E.  $4x - 6y$

Binomial Squared

Take 1<sup>st</sup> Term & Square it  $(2x)^2 = 4x^2$

Take 2<sup>nd</sup> Term And Square it  $(-3y)^2 = 9y^2$

Take both terms and multiply

them and then double the product

$$2x * -3y = -6xy * 2 = -12xy$$

ACT-63E-SAMPLE



**18.** When  $y = x^2$ , which of the following expressions is equivalent to  $-y$  ?

**F.**  $(-x)^2$

**G.**  $-x^2$

**H.**  $-x$

**J.**  $x^{-2}$

**K.**  $x$

**8.** What is the simplified form of  $-(3x + 5)^2$ ?

f.  $9x^2 + 30x + 25$

g.  $-9x^2 - 25$

h.  $9x^2 + 25$

i.  $-9x^2 - 30x - 25$

j.  $-39x^2 - 25$

13. For what value of  $a$  is  $x = 3$  a solution to the equation

$$x + 3 = ax + 9?$$

- A. 1.5
- B. 1
- C. -1
- D. -1.5
- E. -3

MAKE  $x \rightarrow 3$

$$3 + 3 = a \cdot 3 + 9$$

$$6 - 9 = 3a$$

$$-3 = 3a \quad 16$$

$$-1 = a$$

33. If  $\sqrt{2x} - 5 = 1$ , then  $x = ?$

- A. -8
- B. 8
- C. 9
- D. 12
- E. 18

*You can  
do in  
your head*

**DO YOUR FIGURING HERE.**

*Solving for x*

$$(\sqrt{2x})^2 = (6)^2$$
$$2x = 36$$
$$x = 18$$

## POLYNOMIALS

15.  $(4x^2 - 3x + 7) - (-1 + 5x + 2x^2)$  is equivalent to:

- A.  $2x^2 - 8x + 8$   
B.  $2x^2 + 2x + 8$   
C.  $2x^4 + 2x^2 + 6$   
D.  $6x^2 - 8x + 6$   
E.  $6x^4 - 8x^2 + 6$

$$4x^2 - 3x + 7 + 1 - 5x - 2x^2$$
$$2x^2 - 8x + 8$$

DO YOUR FIGURING HERE.

Make sure you distribute the negative properly.

19.  $(2x - 3y)^2$  is equivalent to:

- A.  $4x^2 - 12xy + 9y^2$   
B.  $4x^2 - 10xy + 9y^2$   
C.  $4x^2 - 9y^2$   
D.  $4x^2 + 9y^2$   
E.  $4x - 6y$

Binomial Squared

Take 1<sup>st</sup> Term & Square it  $(2x)^2 = 4x^2$

Take 2<sup>nd</sup> Term And Square it  $(-3y)^2 = 9y^2$

Take both terms and multiply

them and the double the product

$$2x * -3y = -6xy * 2 = -12xy$$

ACT-63E-SAMPLE

9.0 20-1 CAN HAVE 0.1 OF A plant 20+20-20

31. What are the  $(x,y)$  coordinates of the unique point on the graph of  $x + 4y = 18$  such that the  $y$ -coordinate of that point is twice the  $x$ -coordinate?

- A. (1,2)
- B. (2,4)
- C. (3,6)
- D. (4,8)
- E. (9,18)

You can quickly try each one and see what works. Start with the small ones first (B) works

48. What is the value of  $(x+2)(x-3)+5$  when  $x^2-x-6=-4$ ?

- F. -2
- G. -1
- H. 1
- J. 2
- K. 3

$$(x+2)(x-3) = x^2 - x - 6 = -4$$

Substitute  $(x+2)(x-3)$  with  $-4$

$$(-4) + 5 = \underline{1}$$



54. If  $(x + m)^2 = x^2 + 12x + n$ , where  $m$  and  $n$  are integers, what is the value of  $n$ ?

- F. 36
- G. 30
- H. 24
- J. 18
- K. 12

Therefore

$$2xm = 12x$$
$$m = 6$$

$y$  could be  $-1$  so  $z = 6z$

$$x^2 + 2xm + m^2 \text{ is same as}$$
$$x^2 + 12x + n$$

If  $m = 6$ , then  $n = 6^2$   
 $n = 36$



57. If  $x + y = 6$ , then  $x^2 = ?$







- E
- A.  $y^2 - 12y - 36$
  - B.  $y^2 - 36$
  - C.  $6 - y^2$
  - D.  $36 - y^2$
  - E.  $36 - 12y + y^2$

$$x + y = 6$$
$$x = 6 - y$$

therefore

$$x^2 = (6 - y)^2 = 36 - 12y + y^2$$

**DO YOUR FIGURING HERE.**

15. What polynomial must be added to  $x^2 - 2x + 6$  so that the sum is  $3x^2 + 7x$  ?

A.  $4x^2 + 5x + 6$

B.  $3x^2 + 9x + 6$

C.  $3x^2 + 9x - 6$

D.  $2x^2 + 9x - 6$

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

**21.**  $(a + 2b + 3c) - (4a + 6b - 5c)$  is equivalent to:

**A.**  $-4a - 8b - 2c$

**B.**  $-4a - 4b + 8c$

**C.**  $-3a + 8b - 2c$

**D.**  $-3a - 4b - 2c$

**E.**  $-3a - 4b + 8c$