# MATH LEVEL 1 – ARITHMETIC (ACCUPLACER)

This test measures your ability to perform basic arithmetic operations and to solve problems that involve fundamental arithmetic concepts. There are 17 questions on the Arithmetic tests, divided into three types.

• Operations with whole numbers and fractions: Topics included in this category are addition, subtraction, multiplication, division, recognizing equivalent fractions and mixed numbers, and estimating.

• Operations with decimals and percents: Topics include addition, subtraction, multiplication, and division with decimals. Percent problems, recognition of decimals, fraction and percent equivalencies, and problems involving estimation are also given.

• Applications and problem solving: Topics include rate, percent, and measurement problems; simple geometry problems; and distribution of a quantity into its fractional parts.

Arithmetic Sample Questions

For each of the questions below, choose the best answer from the four choices given. You may use the paper you received as scratch paper.

1. 2.75 + .003 + .158 = **A.** 4.36 **B.** 2.911 **C.** 0.436 **D.** 2.938

2. 7.86 × 4.6 = **A.** 36.156 **B.** 36.216 **C.** 351.56 **D.** 361.56

3. $\dfrac{7}{20}$ = **A.** 0.035 **B.** 0.858 **C.** 0.35 **D.** 3.5

4. Which of the following is the least?
   A. 0.105 **B.** 0.501 **C.** 0.015 **D.** 0.15

5. All of the following are ways to write 25 percent of N EXCEPT

   A. 0.25 N **B.** $\dfrac{25N}{100}$ **C.** $\dfrac{1}{4}N$ **D.** 25 N

6. Which of the following is closest to 27.8 x 9.6?
   A. 280 **B.** 300 **C.** 2,800 **D.** 3,000

7. A soccer team played 160 games and won 65 percent of them. How many games did it win?
   A. 94 **B.** 104 **C.** 114 **D.** 124

8. Three people who work full-time are to work together on a project, but their total time on the project is to be equivalent to that of only one person working full-time. If one of the people is budgeted for one-half of his time to the project and a second person for one-third of her time, what part of the third worker's time should be budgeted to this project?

   A. $\dfrac{1}{3}$ **B.** $\dfrac{3}{5}$ **C.** $\dfrac{1}{6}$ **D.** $\dfrac{1}{8}$
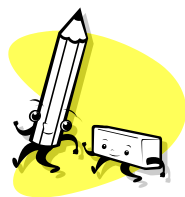
9. 32 is 40 percent of what number?

    A. 12.8   **B.** 128   **C.** 80   **D.** 800

10. $3\frac{1}{3} - 2\frac{2}{5} =$ **A.** $1\frac{1}{2}$ **B.** $\frac{1}{15}$ **C.** $\frac{14}{15}$ **D.** $1\frac{1}{15}$

11. $2\frac{1}{2} + 4\frac{2}{3} =$ **A.** $6\frac{1}{6}$ **B.** $6\frac{5}{6}$ **C.** $7\frac{1}{6}$ **D.** $7\frac{5}{6}$

12. What is $\frac{1,345}{99}$ rounded to the nearest integer?

    A. 12   **B.** 13   **C.** 14   **D.** 15

13. Three of four numbers have a sum of 22. If the average of the four numbers is 8, what is the fourth number?

    A. 4   **B.** 6   **C.** 8   **D.** 10

14. $46.2 \times 10^{-2} =$ **A.** 0.0462   **B.** 0.462   **C.** 4.62   **D.** 462

15. If $\frac{3}{2} \div \frac{1}{4} = n$, then n is between

    A. 1 and 3   **B.** 3 and 5   **C.** 5 and 7   **D.** 7 and 9

16. What is 12% of 120?

    A. 10   **B.** 14.4   **C.** 18.4   **D.** 28.8

17. A box in a college bookstore contains books, and each book in the box is a history book, an English book or a science book. If one-third of these books are history books and one-sixth are English books, what fraction of the books are science books?

    A. $\frac{1}{3}$ **B.** $\frac{1}{2}$ **C.** $\frac{2}{3}$ **D.** $\frac{3}{4}$

18. The measures of two angles of a triangle are 35° and 45°. What is the measure of the third angle of the triangle?

    A. 95°   **B.** 100°   **C.** 105°   **D.** 110°

19. Erica bought $3\frac{1}{2}$ yards of fabric. If she uses $\frac{2}{3}$ of the fabric to make a curtain, how much will she have left?

    A. $\frac{1}{6}$ yd.   **B.** $\frac{1}{3}$ yd.   **C.** $1\frac{1}{6}$ yd.   **D.** $2\frac{1}{3}$ yd.

20. Jen wants to tile the floor of her kitchen. The floor is rectangular and measures 12 feet by 8 feet. If it costs $2.50 per square foot for the materials, what is the total cost of the materials for tiling the kitchen floor?

    A. $160   **B.** $200   **C.** $220   **D.** $240

ARITHMETIC ANSWERS: 1(B); 2(A); 3(C); 4(C); 5(D); 6(A); 7(B); 8(C); 9(C); 10(C); 11(C); 12(C); 13(D); 14(B); 15(C); 16(B); 17(B); 18(B); 19(C); 20(D)

A total of 12 questions of three types are administered in this test.

- The first type involves operations with integers and rational numbers, and includes computation with integers and negative rationals, the use of absolute values, and ordering.
- The second type involves operations with algebraic expressions using evaluation of simple formulas and expressions, and adding and subtracting monomials and polynomials. Questions involve multiplying and dividing monomials and polynomials, the evaluation of positive rational roots and exponents, simplifying algebraic fractions, and factoring.
- The third type of question involves translating written phrases into algebraic expressions and solving equations, inequalities, word problems, linear equations and inequalities, quadratic equations (by factoring), and verbal problems presented in an algebraic context.

Elementary Algebra Sample Questions

For each of the questions below, choose the best answer from the four choices given. You may use the paper you received as scratch paper.

1. If A represents the number of apples purchased at 15 cents each, and B represents the number of bananas purchased at 10 cents each, which of the following represents the total value of the purchases in cents?
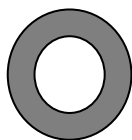
    A. $A + B$ **B.** $25(A + B)$ **C.** $10A + 15B$ **D.** $15A + 10B$

2. $\sqrt{2} \times \sqrt{15} = ?$ **A.** 17 **B.** 30 **C.** $\sqrt{30}$ **D.** $\sqrt{17}$

3. What is the value of the expression $2x^2 + 3xy - 4y^2$ when $x = 2$ and $y = -4$?

    A. - 80   **B.** 80   **C.** - 32   **D.** 32

4. In the figure below, both circles have the same center, and the radius of the larger circle is R. If the radius of the smaller circle is 3 units less than R, which of the following represents the area of the shaded region?

    A. πR^2

    B. $\pi(R - 3)^2$

    C. $\pi R^2 - \pi \times 3^2$

    D. $\pi R^2 - \pi(R - 3)^2$

5. $(3x - 2y)^2 =$

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

6. If $x > 2$, then $\dfrac{x^2 - x - 6}{x^2 - 4} =$ **A.** $\dfrac{x-3}{2}$ **B.** $\dfrac{x-3}{x-2}$ **C.** $\dfrac{x-3}{x+2}$ **D.** $\dfrac{3}{2}$

7. $\dfrac{4 - (-6)}{-5} =$ **A.** $\dfrac{2}{5}$ **B.** $-\dfrac{2}{5}$ **C.** 2   **D.** -2

8. If $2x - 3(x + 4) = -5$, then $x =$ **A.** 7   **B.** -7 **C.** 17   **D.** -17

9. $-3(5-6)-4(2-3) =$

   A. -7 **B.** 7   **C.** -1 **D.** 1

10. Which of the following expressions is equivalent to $20 - \dfrac{4}{5}x \geq 16$?

   A. $x \leq 5$ **B.** $x \geq 5$ **C.** $x \geq 32\frac{1}{2}$ **D.** $x \leq 32\frac{1}{2}$

11. Which of the following lists of numbers is ordered from least to greatest?

   A. $-\dfrac{1}{3}, -\dfrac{3}{5}, \dfrac{2}{3}, \dfrac{3}{5}$ **B.** $-\dfrac{3}{5}, -\dfrac{1}{3}, \dfrac{3}{5}, \dfrac{2}{3}$ **C.** $-\dfrac{1}{3}, -\dfrac{3}{5}, \dfrac{3}{5}, \dfrac{2}{3}$ **D.** $-\dfrac{3}{5}, -\dfrac{1}{3}, \dfrac{2}{3}, \dfrac{3}{5}$

12. If $5t + 2 = 6$, then $t =$

   A. 8   **B.** $\dfrac{5}{4}$ **C.** $\dfrac{4}{5}$ **D.** -8
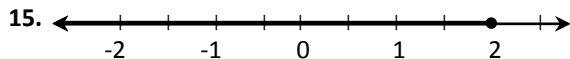
13. For which of the following equations are $x = 5$ and $x = -5$ both solutions?

   A. $x2 - x^2 - 5x - 25 = 0$ **B.** $x^2 + 25 = 0$

   C. $x^2 + 10x - 25 = 0$ **D.** $x^2 - 25 = 0$

14. If x ≠ 0, then $\dfrac{u}{x} + \dfrac{5u}{x} - \dfrac{u}{5x} =$

   A. $\dfrac{7x}{5u}$ **B.** $\dfrac{5u}{7x}$ **C.** $\dfrac{29u}{5x}$ **D.** $\dfrac{31u}{5x}$

15.

The solution set of which of the following inequalities is graphed on the number line above?

   A. $2x - 4 \geq -3$ **B.** $2x + 5 \leq 6$ **C.** $3x - 1 \leq 5$ **D.** $4x - 1 \geq 7$

16. $2x + 6y = 5$

   $x + 3y = 2$

How many solutions (x, y) are there to the system of equations above?

   A. None   **B.** One   **C.** Two   **D.** More than two

17. Which of the following is a factor of both $x^2 - x - 6$ and $x^2 - 5x + 6$?

   A. $x - 3$ **B.** $x + 3$ **C.** $x - 2$ **D.** $x + 2$

18. $\dfrac{10x^6 + 8x^4}{2x^2} =$

   A. $9x^{12}$ **B.** $14x^4$ **C.** $5x^4 + 4x^2$ **D.** $5x^3 + 2x^2$

19. A rectangular yard has area 96 square feet. If the width of the yard is 4 feet less than the length, what is the perimeter, in feet, of the yard?

   A. 40   **B.** 44   **C.** 48   **D.** 52

20. On Monday, it took Helen 3 hours to do a page of science homework exercises. The next day she did the same number of exercises in 2 hours. If her average rate on Monday was p exercises per hour, what was her average rate the next day, in terms of p?

A. $2(p+1)$ exercises per hour

B. $3(p-1)$ exercises per hour

C. $\dfrac{2}{3}p$ exercises per hour

D. $\dfrac{3}{2}p$ exercises per hour

ELEMENTARY ALGEBRA ANSWERS: 1(D); 2(C); 3(A); 4(D); 5(D); 6(B); 7(D); 8(B); 9(B); 10(A); 11(B); 12(C); 13(D); 14(C); 15(C); 16(A); 17(A); 18(C); 19(A); 20(D)

MATH LEVEL 3 – COLLEGE-LEVEL MATHEMATICS (ACCUPLACER)   20 Questions
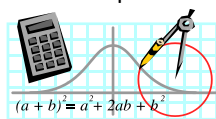
The College-Level Mathematics test measures your ability to solve problems that involve college-level mathematics concepts. There are six content areas measured on this test: (a) Algebraic Operations, (b) Solutions of Equations and Inequalities, (c) Coordinate Geometry, (d) Applications and other Algebra Topics, (e) Functions and (f) Trigonometry.

- The Algebraic Operations content area includes the simplification of rational algebraic expressions, factoring and expanding polynomials, and manipulating roots and exponents. The Solutions of Equations and Inequalities content area includes the solution of linear and quadratic equations and inequalities, systems of equations, and other algebraic equations.
- The Coordinate Geometry content area presents questions involving plane geometry, the coordinate plane, straight lines, conics, sets of points in the plane, and graphs of algebraic functions.
- The Functions content area includes questions involving polynomial, algebraic, exponential and logarithmic functions.
- The Trigonometry content area includes trigonometric functions. The Applications and other Algebra Topics content area contains complex numbers, series and sequences, determinants, permutations and combinations, factorials, and word problems.

A total of 20 questions are administered on this test.

College-Level Mathematics Sample Questions

For each of the questions below, choose the best answer from the four choices given. You may use the paper you received as scratch paper.
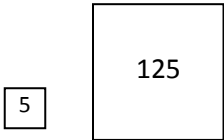
$(a+b)^2 = a^2 + 2ab + b^2$

1. $2^{\frac{5}{2}} - 2^{\frac{3}{2}} =$ **A.** $2^{\frac{1}{2}}$ **B.** 2   **C.** $2^{\frac{3}{2}}$ **D.** $2^{\frac{5}{3}}$ **E.** 2^2

2. If $a \neq b$ and $\dfrac{1}{x} + \dfrac{1}{a} = \dfrac{1}{b}$, then $x =$

A. $\dfrac{1}{b} - \dfrac{1}{a}$ **B.** $b - a$ **C.** $\dfrac{1}{ab}$ **D.** $\dfrac{a-b}{ab}$ **E.** $\dfrac{ab}{a-b}$

3. If $3x^2 - 2x + 7 = 0$, then $\left(x - \dfrac{1}{3}\right)^2 =$

A. $\dfrac{20}{9}$ **B.** $\dfrac{7}{9}$ **C.** $-\dfrac{7}{9}$ **D.** $-\dfrac{8}{9}$ **E.** $-\dfrac{20}{9}$

4. The graph of which of the following equations is a straight line parallel to the graph of $y = 2x$?

A. $4x - y = 4$ **B.** $2x - 2y = 2$ **C.** $2x - y = 4$ **D.** $2x + y = 2$ **E.** $x - 2y = 4$

5. An equation of the line that contains the origin and the point (1, 2) is

A. $y = 2x$ **B.** $2y = x$ **C.** $y = x - 1$ **D.** $y = 2x + 1$ **E.** $\dfrac{y}{2} = x - 1$

6. An apartment building contains 12 units consisting of one- and two-bedroom apartments that rent for $360 and $450 per month, respectively. When all units are rented, the total monthly rental is $4,950. What is the number of two-bedroom apartments?

A. 3   **B.** 4   **C.** 5   **D.** 6   **E.** 7

7. If the two square regions in the figures below have the respective areas indicated in square yards, how many yards of fencing are needed to enclose the two regions?

125

5

**A.** $4\sqrt{130}$ **B.** $20\sqrt{10}$ **C.** $24\sqrt{5}$

D. 100   **E.** $104\sqrt{5}$

8. If $\log_{10}x = 3$, then $x =$

A. 3^{10} **B.** 1,000   **C.** 30   **D.** $\dfrac{10}{3}$ **E.** $\dfrac{3}{10}$

9. If $f(x) = 2x + 1$ and $g(x) = \dfrac{x-1}{2}$, then $f(g(x)) =$

A. x **B.** $\dfrac{x-1}{4x+2}$ **C.** $\dfrac{4x+2}{x-1}$ **D.** $\dfrac{5x+1}{2}$ **E.** $\dfrac{(2x+1)(x-1)}{2}$

10. If θ is an acute angle and $\sin\theta = \dfrac{1}{2}$, then $\cos\theta =$

A. -1   **B.** 0   **C.** $\dfrac{1}{2}$ **D.** $\dfrac{\sqrt{3}}{2}$ **E.** 2

11. $5y(2y - 3) + (2y - 3) =$

A. $(5y + 1)(2y + 3)$ **B.** $(5y + 1)(2y - 3)$ **C.** $(5y - 1)(2y + 3)$
D. $(5y - 1)(2y - 3)$ **E.** $10y(2y - 3)$

12. For what real numbers x is $x^2 - 6x + 9$ negative?

A. $-3 < x < 3$ **B.** $x < -3$ or $x > 3$ **C.** $x = -3$ or $x = 3$
D. $0 < x < 6$ **E.** For no real numbers x

13. A root of $x^2 - 5x - 1 = 0$ is

A. $\dfrac{1 - \sqrt{29}}{2}$ **B.** $\dfrac{5 - \sqrt{17}}{2}$ **C.** $\dfrac{1 + \sqrt{29}}{2}$ **D.** $\dfrac{5 + \sqrt{17}}{2}$ **E.** $\dfrac{5 + \sqrt{29}}{2}$

14. In the $x\,y$ - plane, the graph of $y = x^2$ and the circle with center (0,1) and radius 3 have how many points of intersection?

A. None **B.** One **C.** Two **D.** Three **E.** More than three

15.
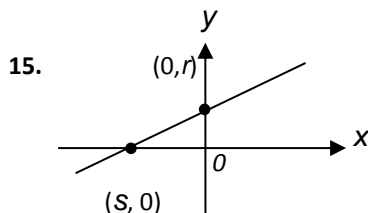
If an equation of the linear function in the figure above is $y = mx + b$, then $m =$

A. $-\dfrac{r}{s}$ **B.** $\dfrac{r}{s}$ **C.** rs **D.** r **E.** $-s$

16. One ordering of the letters T, U, V and W from left to right is $UTVW.$ What is the total number of orderings of these letters from left to right, including $UTVW$?

A. 8 **B.** 12 **C.** 16 **D.** 20 **E.** 24

17. If $f(x) = \dfrac{3x - 1}{2}$ and f^{-1} is the inverse of f, what is the value of $f^{-1}(3)$?

A. $\dfrac{1}{3}$ **B.** $\dfrac{2}{3}$ **C.** 1 **D.** 2 **E.** $\dfrac{7}{3}$

18. The sequence $\{a_n\}$ is defined by $a_0 = 1$ and $a_{n+1} = 2a_n + 2$ for $n = 0, 1, 2, \ldots$.

What is the value of a_3 ?

A. 8 **B.** 10 **C.** 16 **D.** 20 **E.** 22

19. From 5 employees at a company, a group of 3 employees will be chosen to work on a project. How many different groups of 3 employees can be chosen?

A. 3 **B.** 5 **C.** 6 **D.** 10 **E.** 15

20. If $f(x) = \left(\dfrac{1}{3}\right)^x$ and $a < b$, which of the following must be true?

A. $f(a) + f(b) = 3$ **B.** $f(a) + \dfrac{1}{3} = f(b)$ **C.** $f(a) = f(b)$

D. $f(a) < f(b)$ **E.** $f(a) > f(b)$

COLLEGE-LEVEL MATHEMATICS ANSWERS: 1(C); 2(E); 3(E); 4(C); 5(A); 6(E); 7(C); 8(B); 9(A); 10(D); 11(B); 12(E); 13(E); 14(C); 15(A); 16(E); 17(E); 18(E); 19(D); 20(E)

For each of the questions below, choose the best answer from the four choices given. You may use the paper you received as scratch paper.

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1. $2.75 + .003 + .158 =$

   A. 4.36   **B.** 2.911

   C. 0.436   **D.** 2.938

SOLUTION:

$$\begin{array}{r} 2.750 \\ 0.003 \\ +\ 0.158 \\ \hline 2.911 \end{array}$$

NOTE: *Remember to line up the decimal points when you Add or Subtract decimals.*

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2. $7.86 \times 4.6 =$

   A. 36.156   **B.** 36.216

   C. 351.56   **D.** 361.56

SOLUTION:

$$\begin{array}{r} 7.86 \\ \times\ \ 4.6 \\ \hline 4716 \\ +\ 31440 \\ \hline 36.156 \end{array}$$

← 2 decimal places
← 1 decimal place

← 3 decimal places

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3. $\dfrac{7}{20} =$

   A. 0.035   **B.** 0.858

   C. 0.35   **D.** 3.5

SOLUTION:

   NOTE: *To convert fractions to decimals, divide the numerator by the denominator.*

denominator | numerator

$$\begin{array}{r} 0.35 \\ 20\ \overline{)\ 7.00} \\ -6.0 \\ \hline 1.00 \\ -1.00 \\ \hline 0 \end{array}$$

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4. Which of the following is the **least**?

   A. 0.105   **B.** 0.501

   C. 0.015   **D.** 0.15

SOLUTION: least means smallest

NOTE: *Compare digits in the same place value from left to right. When 2 digits are not equal, the number with the larger digit is the larger decimal.*

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5. All of the following are ways to write 25 percent of N EXCEPT

   A. 0.25 N   **B.** $\dfrac{25N}{100}$

   A. $\dfrac{1}{4}N$ **B.** 25 N

SOLUTION:

25% of N

$= 25\% \cdot N$

$= 0.25N$

or $= \dfrac{25N}{100}$

or $= \dfrac{1}{4} \cdot N$

25% = 0.25

$25\% = \dfrac{25}{100}$

$25\% = \dfrac{25}{100} = \dfrac{1}{4}$

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6. Which of the following is <u>**closest**</u> to 27.8 x 9.6?

A. 280   **B.** 300

C. 2,800   **D.** 3,000

SOLUTION:

Approximation

$27.8 \approx 28$
$9.6 \approx 10$

$$\begin{array}{r} 28 \\ \times\ 10 \\ \hline 00 \\ +\ 280 \\ \hline 280 \end{array}$$

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7. A soccer team played 160 games and won 65 percent of them. How many games did it win?

A. 94   **B.** 104

C. 114   **D.** 124

SOLUTION:

Total: **160** games
Won **65%**

Number of games won = $160 \cdot 65\%$
$= 160\ (0.65)$
$=$ **104**

$$\begin{array}{r} 160 \\ \times\ 0.65 \\ \hline 800 \\ +\ 9600 \\ \hline 104.00 \end{array}$$

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8. Three people who work full-time are to work together on a project, but their total time on the project is to be equivalent to that of only one person working full-time. If one of the people is budgeted for <u>one-half</u> of his time to the project and a second person for <u>one-third</u> of her time, what part of the third worker's time should be budgeted to this project?

A. $\dfrac{1}{3}$ **B.** $\dfrac{3}{5}$

C. $\dfrac{1}{6}$ **D.** $\dfrac{1}{8}$

SOLUTION:

1st person: $\dfrac{1}{2}$

2nd person: $\dfrac{1}{3}$

3rd person: x

$$\frac{1}{2} + \frac{1}{3} + x = 1 \qquad \text{LCD: 6}$$

$$6 \cdot \frac{1}{2} + 6 \cdot \frac{1}{3} + 6 \cdot x = 6 \cdot 1$$

$$3 + 2 + 6x = 6$$
$$5 + 6x = 6$$
$$6x = 1$$
$$x = \frac{1}{6}$$

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9. 32 is 40 percent of what number?

A. 12.8   **B.** 128

C. 80   **D.** 800

SOLUTION:

"**is**" → equal
"**of**" → multiply
"**what number**" → unknown

x: the number

$$32 = 40\% \cdot x$$

$$\frac{32}{0.4} = \frac{0.4}{0.4}x$$

$$80 = x$$

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10. $3\dfrac{1}{3} - 2\dfrac{2}{5} =$

A. $1\dfrac{1}{2}$ **B.** $\dfrac{1}{15}$

C. $\dfrac{14}{15}$ **D.** $1\dfrac{1}{15}$

SOLUTION:
Convert to improper fraction:

$$3\frac{1}{3} = \frac{3 \cdot 3 + 1}{3} = \frac{10}{3}$$

$$2\frac{2}{5} = \frac{2 \cdot 5 + 2}{5} = \frac{12}{5}$$

$$3\frac{1}{3} - 2\frac{2}{5} = \frac{10}{3} - \frac{12}{5}$$

$$= \frac{10}{3} \cdot \frac{5}{5} - \frac{12}{5} \cdot \frac{3}{3}, \text{ LCD: 15}$$

$$= \frac{50}{15} - \frac{36}{15}$$

$$= \frac{14}{15}$$

11. $2\dfrac{1}{2} + 4\dfrac{2}{3} =$

A. $6\dfrac{1}{6}$ **B.** $6\dfrac{5}{6}$

C. $7\dfrac{1}{6}$ **D.** $7\dfrac{5}{6}$

SOLUTION:

$$\dfrac{43}{6} = 7\dfrac{1}{6}$$

$$6\ \overline{)\ 43}$$
$$\underline{-42}$$
$$1$$

$$2\dfrac{1}{2} + 4\dfrac{2}{3} = \dfrac{5}{2} + \dfrac{14}{3}$$

$$= \dfrac{5}{2}\cdot\dfrac{3}{3} + \dfrac{14}{3}\cdot\dfrac{2}{2}$$

$$= \dfrac{15}{6} + \dfrac{28}{6}$$

$$= \dfrac{43}{6} = 7\dfrac{1}{6}$$

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12. What is $\dfrac{1,345}{99}$ rounded to the nearest integer?

A. 12   **B.** 13

C. 14   **D.** 15

SOLUTION:

NOTE: *We can easily eliminate 12 and 15 as the answer, but it's very hard to tell whether the answer is 13 or 14.*

$$\dfrac{1345}{99} = 13.5\ldots$$

$$\approx 14$$

5 or greater

$$99\ \overline{)\ 1345.0} \quad 13.5$$
$$\underline{-99}$$
$$355$$
$$\underline{-297}$$
$$58\,0$$
$$\underline{-49\,5}$$
$$8\,5$$

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13. Three of four numbers have a sum of 22. If the average of the four numbers is 8, what is the fourth number?

A. 4   **B.** 6

C. 8   **D.** 10

SOLUTION:

1st #
2nd #
3rd # } **Sum = 22**
4th # = x

Average

$$\dfrac{1^{st}\,\#\,+\,2^{nd}\,\#\,+\,3^{rd}\,\#\,+\,4^{th}\,\#}{4} = 8$$

$$\cancel{4}\cdot\dfrac{22+x}{\cancel{4}} = 8\cdot 4$$

$$22 + x = 32$$

$$x = 10$$

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14. $46.2 \times 10^{-2} =$

A. 0.0462   **B.** 0.462

C. 4.62   **D.** 462

SOLUTION:

Note: $10^{-2} = \dfrac{1}{10^{2}} = \dfrac{1}{100} = 0.01$

$$46.2$$
$$\underline{\times\ 0.01}$$
$$0.462$$

OR: *Move the decimal point to the left 2 times.*

15. If $\dfrac{3}{2} \div \dfrac{1}{4} = n$, then n is between

A. 1 and 3   B. 3 and 5

C. 5 and 7   D. 7 and 9

SOLUTION:

NOTE: *When dividing fractions, write the 1st fraction times the reciprocal of the 2nd fraction. Then multiply and simplify.*

$$\frac{3}{2} \div \frac{1}{4} = \frac{3}{2} \cdot \frac{4}{1} = 6$$

Between 5 and 7

---

16. What is 12% of 120?

A. 10   B. 14.4

C. 18.4   D. 28.8

SOLUTION:

"**what**" → unknown x	x : **unknown**
"**is**" → =	$x = 12\% \cdot 120$
"**of**" → multiply	$= 0.12 (120)$
	$= 14.4$

$$\begin{array}{r} 120 \\ \times\ 0.12 \\ \hline 240 \\ +\ 1200 \\ \hline 14.40 \end{array}$$

---

17. A box in a college bookstore contains books, and each book in the box is a **history book**, an **English book** or a **science book**. If one-third of these books are history books and one-sixth are English books, what fraction of the books are science books?

A. $\dfrac{1}{3}$ B. $\dfrac{1}{2}$

C. $\dfrac{2}{3}$ D. $\dfrac{3}{4}$

SOLUTION:

History = $\dfrac{1}{3}$

English = $\dfrac{1}{6}$

Science = x

$$\frac{1}{3} + \frac{1}{6} + x = 1 \qquad \text{(LCD: } 6\text{)}$$

$$6 \cdot \frac{1}{3} + 6 \cdot \frac{1}{6} + 6 \cdot x = 6 \cdot 1$$
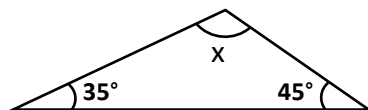
$$2 + 1 + 6x = 6$$

$$3 + 6x = 6$$

$$6x = 3$$

$$\frac{6x}{6} = \frac{3}{6} = \frac{1}{2}$$

---

18. The measures of two angles of a triangle are 35° and 45°. What is the measure of the third angle of the triangle?

A. 95°   B. 100°

C. 105°   D. 110°

SOLUTION:

1st angle: **35°**
2nd angle: **45°**
3rd angle: x

NOTE: *The sum of the measures of the three angles is **180°.***

$$35 + 45 + x = 180$$

$$80 + x = 180$$

$$x = 180 - 80$$

$$x = 100$$

19. Erica bought $3\frac{1}{2}$ yards of fabric. If she uses $\frac{2}{3}$ of the fabric to make a curtain, how much will she have left?

SOLUTION:

A. $\frac{1}{6}$ yd. **B.** $\frac{1}{3}$ yd.

C. $1\frac{1}{6}$ yd. **D.** $2\frac{1}{3}$ yd.

Used:

$\frac{2}{3}$ of $3\frac{1}{2}$ yards $\rightarrow$ $\frac{2}{3} \cdot 3\frac{1}{2}$ = $\frac{2\!\!\!/}{3} \cdot \frac{7}{2\!\!\!/}$ = $\frac{7}{3}$

$= 2\frac{1}{3}$ yards

Left: $3\frac{1}{2} - 2\frac{1}{3}$

$= 3\frac{1}{2} \cdot \frac{3}{3} - 2\frac{1}{3} \cdot \frac{2}{2}$

$= 3\frac{3}{6} - 2\frac{2}{6} = 1\frac{1}{6}$ **yd.**

20. Jen wants to tile the floor of her kitchen. The floor is rectangular and measures 12 feet by 8 feet. If it costs $2.50 per square foot for the materials, what is the total cost of the materials for tiling the kitchen floor?

A. $160 **B.** $200

C. $220 **D.** $240

SOLUTION:

Rectangle — **8** feet — **12** feet
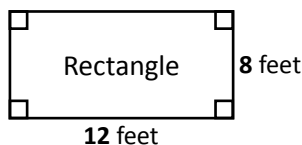
Area = *length • width*
= **12 (8)**
= **96** square feet

Total Cost = $2.50 (96)
= **$240**

ARITHMETIC ANSWERS: 1(B); 2(A); 3(C); 4(C); 5(D); 6(A); 7(B); 8(C); 9(C); 10(C); 11(C); 12(C); 13(D); 14(B); 15(C); 16(B); 17(B); 18(B); 19(C); 20(D)

LEVEL 2 – ELEMENTARY ALGEBRA (ACCUPLACER)

PROBLEM SOLVED!

Elementary Algebra Sample Questions

For each of the questions below, choose the best answer from the four choices given. You may use the paper you received as scratch paper.

1. If A represents the number of apples purchased at 15 cents each, and B represents the number of bananas purchased at 10 cents each, which of the following represents the total value of the purchases in cents?

A. A + B **B.** 25(A + B)

C. 10A + 15B **D.** 15A + 10B

SOLUTION:

A: # of apple (15¢ each)
B: # of bananas (10¢ each)

Total Cost = 15A + 10B

2. $\sqrt{2} \times \sqrt{15}$ = ?

   A. 17   **B.** 30

   C. $\sqrt{30}$ **D.** $\sqrt{17}$

SOLUTION:

$\sqrt{2} \times \sqrt{15} = \sqrt{2 \bullet 15}$

$= \sqrt{30}$

Property: $\sqrt{A} \bullet \sqrt{B}$

$= \sqrt{A+B}$

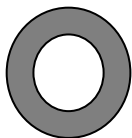**3.** What is the value of the expression $2x^2 + 3xy - 4y^2$ when $x = 2$ and $y = -4$?

   A. -80 **B.** 80

   C. -32 **D.** 32

SOLUTION:

$2x^2 + 3xy - 4y^2$

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

$= 2 \bullet 4 - 24 - 4 \bullet 16$

$= 8 - 24 - 64$

$= -80$

---

4. In the figure below, both circles have the same center, and the radius of the larger circle is R. If the radius of the smaller circle is 3 units less than R, which of the following represents the area of the shaded region?
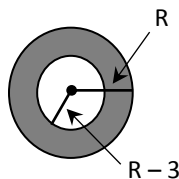

SOLUTION:

   A. πR^2 **B.** $\pi (R-3)^2$

   C. $\pi R^2 - \pi \times 3^2$ **D.** $\pi R^2 - \pi (R-3)^2$

Big circle: Radius = R
Small circle: Radius = R – 3

Area of shaded region
= Area of Big circle − Area of Small circle
$= \pi R^2 - \pi(R - 3)^2$

---

5. $(3x - 2y)^2$ =

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

   B. $9x^2 + 4y^2$

   C. $9x^2 + 4y^2 - 6xy$

   D. $9x^2 + 4y^2 - 12xy$

SOLUTION:

$(3x - 2y)^2 = (3x - 2y)(3x - 2y)$

$= 9x^2 - 6xy - 6xy + 4y^2$

$= 9x^2 - 12xy + 4y^2$

FOIL

You may use the formula:
$(A - B)^2 = A^2 - 2AB + B^2$

6. If $x > 2$, then $\dfrac{x^2 - x - 6}{x^2 - 4} =$

A. $\dfrac{x-3}{2}$

B. $\dfrac{x-3}{x-2}$

C. $\dfrac{x-3}{x+2}$

D. $\dfrac{3}{2}$

SOLUTION:

$$\frac{x^2 - x - 6}{x^2 - 4} = \frac{(x-3)\overset{1}{(x+2)}}{(x-2)\underset{1}{(x+2)}}$$

$$= \frac{(x-3)}{(x-2)}$$

---

7. $\dfrac{4-(-6)}{-5} =$

A. $\dfrac{2}{5}$

B. $-\dfrac{2}{5}$

C. 2

D. -2

SOLUTION:

$$\frac{4-(-6)}{-5} = \frac{4+6}{-5}$$

$$= \frac{10}{-5}$$

$$= -2$$

---

8. If $2x - 3(x+4) = -5$, then $x =$

A. 7

B. -7

C. 17

D. -17

SOLUTION:

$$2x - 3(x+4) = -5$$
$$2x - 3x - 12 = -5$$
$$-x - 12 = -5$$
$$-x = -5 + 12$$
$$-x = 7$$
$$x = -7$$

---

9. $-3(5-6) - 4(2-3) =$

A. -7

B. 7

C. -1

D. 1

SOLUTION:

$$-3(5-6) - 4(2-3)$$
$$= -3(-1) - 4(-1)$$
$$= 3 + 4$$
$$= 7$$

---

10. Which of the following expressions is equivalent to $20 - \dfrac{4}{5}x \geq 16$?

A. $x \leq 5$

B. $x \geq 5$

C. $x \geq 32\frac{1}{2}$

D. $x \leq 32\frac{1}{2}$

NOTE: *When multiplying or dividing by a negative number on both sides, the inequality sign reverses.*

SOLUTION:

$$20 - \frac{4}{5}x \geq 16$$

$$-\frac{4}{5}x \geq 16 - 20$$

$$5 \cdot -\frac{4}{5}x \geq -4 \cdot 5$$

$$-4x \geq -20$$

$$\frac{-4x}{-4} \leq \frac{-20}{-4}$$

$$x \leq 5$$

11. Which of the following lists of numbers is ordered from <u>least to greatest</u>?

A. $-\dfrac{1}{3}, -\dfrac{3}{5}, \dfrac{2}{3}, \dfrac{3}{5}$ **B.** $-\dfrac{3}{5}, -\dfrac{1}{3}, \dfrac{3}{5}, \dfrac{2}{3}$ **C.** $-\dfrac{1}{3}, -\dfrac{3}{5}, \dfrac{3}{5}, \dfrac{2}{3}$ **D.** $-\dfrac{3}{5}, -\dfrac{1}{3}, \dfrac{2}{3}, \dfrac{3}{5}$

SOLUTION:

Common denominator: 15

$-\dfrac{1}{3} = -\dfrac{5}{15}$ $\dfrac{2}{3} = \dfrac{10}{15}$

$-\dfrac{3}{5} = -\dfrac{9}{15}$ $\dfrac{3}{5} = \dfrac{9}{15}$

Order:

$-\dfrac{9}{15}, -\dfrac{5}{15}, \dfrac{9}{15}, \dfrac{10}{15}$

$-\dfrac{3}{5}, -\dfrac{1}{3}, \dfrac{3}{5}, \dfrac{2}{3}$

12. If $5t + 2 = 6$, then $t =$

A. 8   **B.** $\dfrac{5}{4}$

C. $\dfrac{4}{5}$ **D.** -8

SOLUTION:

$5t + 2 = 6$

$5t = 6 - 2$

$5t = 4$

$t = \left(\dfrac{4}{5}\right)$

13. For which of the following equations are $x = 5$ and $x = -5$ both solutions?

A. $x2 - x^2 - 5x - 25 = 0$ **B.** $x^2 + 25 = 0$

C. $x^2 + 10x - 25 = 0$ **D.** $x^2 - 25 = 0$

SOLUTION:

$x = 5$ → $(x - 5)$ is a factor

$x = -5$ → $(x + 5)$ is a factor

→ equation: $(x - 5)(x + 5) = 0$

$x^2 - 5x + 5x - 25 = 0$

$x^2 - 25 = 0$

NOTE: *You may also solve each equation to get the correct answer.*

14. If $x \neq 0$, then $\dfrac{u}{x} + \dfrac{5u}{x} - \dfrac{u}{5x} =$

A. $\dfrac{7x}{5u}$ **B.** $\dfrac{5u}{7x}$

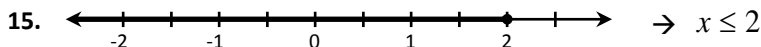**C.** $\dfrac{29u}{5x}$ **D.** $\dfrac{31u}{5x}$

SOLUTION:

$\dfrac{u}{x} + \dfrac{5u}{x} - \dfrac{u}{5x}$

$= \dfrac{5u}{5x} + \dfrac{25u}{5x} - \dfrac{u}{5x}$

$= \dfrac{5u + 25u - u}{5x} = \dfrac{29u}{5x}$

15.

$\rightarrow x \le 2$

The solution set of which of the following inequalities is graphed on the number line above?

A. $2x - 4 \ge -3$ **B.** $2x + 5 \le 6$ **C.** $3x - 1 \le 5$ **D.** $4x - 1 \ge 7$

SOLUTION: *Solve each:*

$2x - 4 \ge -3$	$2x + 5 \le 6$	$3x - 1 \le 5$	$4x - 1 \ge 7$
$2x \ge -3 + 4$	$2x \le 6 - 5$	$3x \le 5 + 1$	$4x \ge 7 + 1$
$2x \ge 1$	$2x \le 1$	$3x \le 6$	$4x \ge 8$
$x \ge \dfrac{1}{2}$	$x \le \dfrac{1}{2}$	$x \le 2$	$x \ge 2$

---

16. $2x + 6y = 5$

$x + 3y = 2$

How many solutions (x, y) are there to the system of equations above?

A. None   **B.** One   **C.** Two   **D.** More than two

SOLUTION:

NOTE: *The 1ˢᵗ equation is a multiple of the 2ⁿᵈ equation for the left side, but not the right side. That is, these two lines are parallel.*

Hence, there is no solution.

OR

We can try to solve it

$\begin{cases} 2x + 6y = 5 \\ x + 3y = 2 \end{cases}$ multiply by -2

$\begin{cases} 2x + 6y = 5 \\ -2x - 6y = -4 \end{cases}$ (+)

$0 = 1$ False → No Solution

---

17. Which of the following is a factor of both $x^2 - x - 6$ and $x^2 - 5x + 6$?

A. $x - 3$ **B.** $x + 3$

C. $x - 2$ **D.** $x + 2$

SOLUTION:

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

$x^2 - 5x + 6$
$= (x - 3)(x - 2)$

Common factor: $(x - 3)$

---

18. $\dfrac{10x^6 + 8x^4}{2x^2} =$

A. $9x^{12}$ **B.** $14x^4$

C. $5x^4 + 4x^2$ **D.** $5x^3 + 2x^2$

SOLUTION:

$\dfrac{10x^6 + 8x^4}{2x^2} = \dfrac{10x^6}{2x^2} + \dfrac{8x^4}{2x^2}$

Use: $\dfrac{a^m}{a^n} = a^{m-n}$

$= 5x^4 + 4x^2$

19. A rectangular yard has area <u>96 square feet</u>. If the width of the yard is <u>4 feet less than the length</u>, what is the perimeter, in feet, of the yard?

A. 40   **B.** 44

C. 48   **D.** 52

Width = W

Length = L

Length **= L**
Width **= L − 4**

SOLUTION: **Area** = *Length • Width*

$$96 = L(L-4)$$
$$96 = L^2 - 4L$$
$$0 = L^2 - 4L - 96$$
$$0 = (L-12)(L+8)$$

L − 12 = 0   or   L + 8 = 0

L = 12   L = − 8 (not possible)

So, Length = 12ft   **Perimeter** = *2•L + 2•W*

Width = 8ft   = 2•12 + 2•8

= 24 + 16

= **40**

---

20. On Monday, it took Helen 3 hours to do a page of science homework exercises. The next day she did the same number of exercises in 2 hours. If her average rate on Monday was p exercises per hour, what was her average rate the next day, in terms of p ?

A. $2(p+1)$ exercises per hour

B. $3(p-1)$ exercises per hour

C. $\dfrac{2}{3}p$ exercises per hour

D. $\dfrac{3}{2}p$ exercises per hour

SOLUTION:

Let x be the # of exercises

Monday: Rate = $\dfrac{x}{3}$ $= p$

x $= 3p$

Tuesday: Rate = $\dfrac{x}{2}$

$\rightarrow \dfrac{3p}{2} = \left(\dfrac{3}{2}\,p\right)$

ELEMENTARY ALGEBRA ANSWERS: 1(D); 2(C); 3(A); 4(D); 5(D); 6(B); 7(D); 8(B); 9(B); 10(A); 11(B); 12(C); 13(D); 14(C); 15(C); 16(A); 17(A); 18(C); 19(A); 20(D)

LEVEL 3 – COLLEGE-LEVEL MATHEMATICS (ACCUPLACER)

College-Level Mathematics Sample Questions

For each of the questions below, choose the best answer from the four choices given. You may use the paper you received as scratch paper.

1. $2^{\frac{5}{2}} - 2^{\frac{3}{2}} =$

A. $2^{\frac{1}{2}}$ **B.** 2   **C.** $2^{\frac{3}{2}}$

D. $2^{\frac{5}{3}}$ **E.** 2^2

SOLUTION:

$2^{\frac{5}{2}} - 2^{\frac{3}{2}} = 2^{\frac{3}{2}}(2^1 - 1)$ **Factor out GCF**

$= 2^{\frac{3}{2}}$

2. If $a \neq b$ and $\dfrac{1}{x} + \dfrac{1}{a} = \dfrac{1}{b}$, then $x =$

A. $\dfrac{1}{b} - \dfrac{1}{a}$ **B.** $b - a$ **C.** $\dfrac{1}{ab}$ **D.** $\dfrac{a-b}{ab}$ **E.** $\dfrac{ab}{a-b}$

SOLUTION:

$\dfrac{1}{x} + \dfrac{1}{a} = \dfrac{1}{b}$, LCD: xab

$xab \left(\dfrac{1}{x} + \dfrac{1}{a} \right) = xab \cdot \dfrac{1}{b}$

$ab + xb = xa$

$xb - xa = -ab$

$x(b - a) = -ab$

$x = \dfrac{-ab}{b-a} = \dfrac{ab}{a-b}$

---

3. If $3x^2 - 2x + 7 = 0$, then $\left(x - \dfrac{1}{3}\right)^2 =$

A. $\dfrac{20}{9}$ **B.** $\dfrac{7}{9}$ **C.** $-\dfrac{7}{9}$ **D.** $-\dfrac{8}{9}$ **E.** $-\dfrac{20}{9}$

SOLUTION:

$3x^2 - 2x + 7 = 0$

$3x^2 - 2x = -7$

$x^2 - \dfrac{2}{3}x = -\dfrac{7}{3}$

$x^2 - \dfrac{2}{3}x + \left(\dfrac{1}{3}\right)^2 = -\dfrac{7}{3} + \left(\dfrac{1}{3}\right)^2$

$\left(x - \dfrac{1}{3}\right)^2 = -\dfrac{7}{3} + \dfrac{1}{9}$

$\left(x - \dfrac{1}{3}\right)^2 = -\dfrac{21}{9} + \dfrac{1}{9}$

$\left(x - \dfrac{1}{3}\right)^2 = -\dfrac{20}{9}$

NOTE: *Complete the square to get the answer.*

---

4. The graph of which of the following equations is a straight line <u>parallel</u> to the graph of $y = 2x$?

A. $4x - y = 4$ **B.** $2x - 2y = 2$ **C.** $2x - y = 4$ **D.** $2x + y = 2$ **E.** $x - 2y = 4$

SOLUTION:

Parallel lines → same slopes

y = 2x → slope m = 2

$4x - y = 4$

$-y = -4x + 4$

$y = 4x - 4$

m = 4

$2x - 2y = 2$

$-2y = -2x + 2$

$y = x - 1$

m = 1

$2x - y = 4$

$-y = -2x + 4$

$y = 2x - 4$

m = 2

5. An equation of the line that contains the origin and the point (1, 2) is

A. $y = 2x$ **B.** $2y = x$ **C.** $y = x - 1$ **D.** $y = 2x + 1$ **E.** $\dfrac{y}{2} = x - 1$

SOLUTION:

(0, 0) and (1, 2)

$m = \dfrac{2 - 0}{1 - 0}$ $y = mx + b$

$= 2$ $y = 2x$

---

6. An apartment building contains 12 units consisting of one- and two-bedroom apartments that rent for $360 and $450 per month, respectively. When all units are rented, the total monthly rental is $4,950. What is the number of two-bedroom apartments?

A. 3   **B.** 4   **C.** 5   **D.** 6   **E.** 7

SOLUTION:

x: # of one-bedroom apartments $90y = 630$

y: # of two-bedroom apartments $y = 7$ (two-bedroom)

$\begin{cases} x + y = 12 \\ 360x + 450y = 4950 \end{cases}$ *multiply by "-360"* $x + y = 12$

$x + 7 = 12$

$\begin{cases} -360x - 360y = -4320 \\ 360x + 450y = 4950 \end{cases}$ (+) $x = 5$ (one-bedroom)

So, there are 7 two-bedroom apartments.

---

7. If the two square regions in the figures below have the respective areas indicated in square yards, how many yards of fencing are needed to enclose the two regions?

A. $4\sqrt{130}$ **B.** $20\sqrt{10}$ **C.** $24\sqrt{5}$

125

D. 100   **E.** $104\sqrt{5}$

5

SOLUTION:

Small Square: **Larger Square:**   **Perimeter:**

Let x be the length   Let y be the length $= 4 \cdot \sqrt{5} + 4 \cdot 5\sqrt{5}$

$\rightarrow x^2 = 5$ $\rightarrow y^2 = 125$ $= 4\sqrt{5} + 20\sqrt{5}$

$x = \sqrt{5}$ $y = 5\sqrt{5}$ $= 24\sqrt{5}$ yards

8. If $\log_{10}x = 3$, then $x =$

A. 3^{10} **B.** 1,000   **C.** 30   **D.** $\dfrac{10}{3}$ **E.** $\dfrac{3}{10}$

SOLUTION:

$$\log_{10}x = 3$$
$$x = 10^{3}$$
$$x = \boxed{1000}$$

$$\log_b x = a \iff x = b^a$$

---

9. If $f(x) = 2x + 1$ and $g(x) = \dfrac{x-1}{2}$, then $f(g(x)) =$

A. x

B. $\dfrac{x-1}{4x+2}$

C. $\dfrac{4x+2}{x-1}$

D. $\dfrac{5x+1}{2}$

E. $\dfrac{(2x+1)(x-1)}{2}$

SOLUTION:
$$f(g(x)) = f\left(\frac{x-1}{2}\right)$$
$$= 2\left(\frac{x-1}{2}\right) + 1$$
$$= x - 1 + 1$$
$$= \boxed{x}$$

---

10. If θ is an acute angle and $\sin\theta = \dfrac{1}{2}$, then $\cos\theta =$

A. - 1   **B.** 0   **C.** $\dfrac{1}{2}$ **D.** $\dfrac{\sqrt{3}}{2}$ **E.** 2

SOLUTION:
$$\sin\theta = \frac{1}{2} \;\rightarrow\; \theta = 30° \;\rightarrow\; \cos\theta = \boxed{\frac{\sqrt{3}}{2}}$$

---

11. $5y(2y - 3) + (2y - 3) =$

A. $(5y + 1)(2y + 3)$ **B.** $(5y + 1)(2y - 3)$ **C.** $(5y - 1)(2y + 3)$

D. $(5y - 1)(2y - 3)$ **E.** $10y(2y - 3)$

SOLUTION:

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

*Factor out $(2y - 3)$

$$= \boxed{(2y - 3)(5y + 1)}$$

---

12. For what real numbers x is $x^2 - 6x + 9$ negative?

A. $-3 < x < 3$ **B.** $x < -3$ or $x > 3$ **C.** $x = -3$ or $x = 3$

D. $0 < x < 6$ **E.** For no real numbers x

SOLUTION:

$x^2 - 6x + 9 < 0$ negative

$(x - 3)^2 < 0$

$\rightarrow$ No solution as square cannot be negative.

13. A root of $x^2 - 5x - 1 = 0$ is

A. $\dfrac{1 - \sqrt{29}}{2}$ **B.** $\dfrac{5 - \sqrt{17}}{2}$ **C.** $\dfrac{1 + \sqrt{29}}{2}$ **D.** $\dfrac{5 + \sqrt{17}}{2}$ **E.** $\dfrac{5 + \sqrt{29}}{2}$

SOLUTION:

$x^2 - 5x - 1 = 0$ $\qquad a = 1,\ b = -5,\ c = -1$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \;=\; \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(-1)}}{2(1)} \;=\; \frac{5 \pm \sqrt{25 + 4}}{2} \;=\; \frac{5 \pm \sqrt{29}}{2}$$

---

14. In the xy - plane, the graph of $y = x^2$ and the circle with center (0, 1) and radius 3 have how many points of intersection?

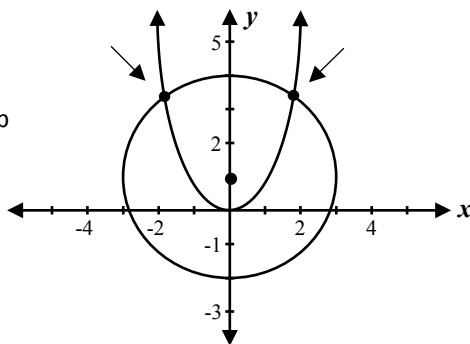**A.** None **B.** One **C.** Two **D.** Three **E.** More than three

SOLUTION:

We can graph the two graphs.
1) $y = x^2$: vertex (0, 0), opens up
2) circle : center (0, 1), r = 3

Intersect at 2 points

We can also solve it.
Circle → $x^2 + (y - 1)^2 = 9$

$\begin{cases} y = x^2 \\ x^2 + (y - 1)^2 = 9 \end{cases}$

→ $y + (y - 1)^2 = 9$

$y + y^2 - 2y + 1 = 9$

$y^2 - y - 8 = 0$

$$y = \frac{-(-1) \pm \sqrt{(1)^2 - 4(1)(-8)}}{2(1)}$$

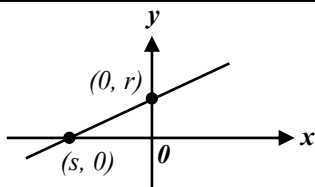$$= \frac{1 \pm \sqrt{1 + 32}}{2} = \frac{1 \pm \sqrt{33}}{2} =$$

$y = \dfrac{1 + \sqrt{33}}{2}$

$x^2 = \dfrac{1 + \sqrt{33}}{2}$

$x = \pm\sqrt{\dfrac{1 + \sqrt{33}}{2}}$

$y = \dfrac{1 - \sqrt{33}}{2}$

$x^2 = \dfrac{1 - \sqrt{33}}{2}$

SOLUTION:

Points: (0, r), (s, 0)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

15. If an equation of the linear function in the figure above is $y = mx + b$, then $m =$

$$= \frac{0 - r}{s - 0}$$

A. $-\dfrac{r}{s}$ **B.** $\dfrac{r}{s}$ **C.** rs

$$= \left(-\frac{r}{s}\right)$$

D. r **E.** $-s$

---

16. One ordering of the letters T, U, V and W from left to right is $UTVW$. What is the total number of orderings of these letters from left to right, including $UTVW$?

A. 8   **B.** 12   **C.** 16   **D.** 20   **E.** 24

SOLUTION:

4 letters to choose from

$\underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1}$

= **24**

We can also compute by permutation

4 letters, taken 4 at a time

$_4P_4 = \dfrac{4!}{0!} = 4! = $ **24**

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17. If $f(x) = \dfrac{3x - 1}{2}$ and f^{-1} is the inverse of f, what is the value of $f^{-1}(3)$?

A. $\dfrac{1}{3}$ **B.** $\dfrac{2}{3}$ **C.** 1   **D.** 2   **E.** $\dfrac{7}{3}$

SOLUTION:

$$f(x) = \frac{3x - 1}{2} = 3$$

$$\cancel{2} \cdot \frac{3x - 1}{\cancel{2}} = 3 \cdot 2$$

$$3x - 1 = 6$$

$$3x = 7$$

$$x = \frac{7}{3}$$

$$f\left(\frac{7}{3}\right) = 3$$

Hence, $f^{-1}(3) = \dfrac{7}{3}$

18. The sequence $\{a_n\}$ is defined by $a_0 = 1$ and $a_{n+1} = 2a_n + 2$ for $n = 0, 1, 2, \ldots$

What is the value of a_3 ?

A. 8   **B.** 10   **C.** 16

D. 20   **E. 22**

SOLUTION:

$a_0 = 1$, $a_{n+1} = 2 a_n + 2$

$a_1 = 2 \cdot a_0 + 2 = 2 \cdot 1 + 2 = 4$

$a_2 = 2 \cdot a_1 + 2 = 2 \cdot 4 + 2 = 10$

$a_3 = 2 \cdot a_2 + 2 = 2 \cdot 10 + 2 = \boxed{22}$

19. From 5 employees at a company, a group of 3 employees will be chosen to work on a project. How many different groups of 3 employees can be chosen?
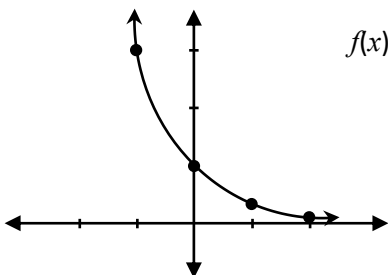
A. 3   **B.** 5   **C.** 6   **D. 10**   **E.** 15

SOLUTION:

Combination of 5. Choose 3 at a time.

$$_5C_3 = \frac{5!}{3!\,(5-3)!}$$

$$= \frac{5!}{3! \cdot 2!}$$

$$= \frac{5 \cdot 4 \cdot \cancel{3 \cdot 2 \cdot 1}}{\cancel{3 \cdot 2 \cdot 1} \cdot (2 \cdot 1)} = \boxed{10}$$

20. If $f(x) = \left(\frac{1}{3}\right)^x$ and $a < b$, which of the following must be true?

A. $f(a) + f(b) = 3$ **B.** $f(a) + \frac{1}{3} = f(b)$ **C.** $f(a) = f(b)$

D. $f(a) < f(b)$ **E.** $f(a) > f(b)$

SOLUTION:

$f(x) = (\frac{1}{3})^x$, decreasing.

So if a < b,
Then $f(a) > f(b)$

COLLEGE-LEVEL MATHEMATICS ANSWERS: 1(C); 2(E); 3(E); 4(C); 5(A); 6(E); 7(C); 8(B); 9(A); 10(D); 11(B); 12(E); 13(E); 14(C); 15(A); 16(E); 17(E); 18(E); 19(D); 20(E)