Numerical Skills/Pre-algebra

1. $54 - 6 \div 2 + 6 = ?$

    A.   6
    B.   24
    C.   27
    D.   30
    E.   57

2. The lowest temperature on a winter morning was $-8°$F. Later that same day the temperature reached a high of $24°$F. By how many degrees Fahrenheit did the temperature increase?

    A. $3°$
    B. $8°$
    C. $16°$
    D. $24°$
    E. $32°$

3. If $\left(\frac{3}{4} - \frac{2}{3}\right) + \left(\frac{1}{2} + \frac{1}{3}\right)$ is calculated and the answer reduced to simplest terms, what is the denominator of the resulting fraction?

    A.   24
    B.   12
    C.   6
    D.   4
    E.   3

4. $\frac{1}{2} + \left(\frac{2}{3} \div \frac{3}{4}\right) - \left(\frac{4}{5} \times \frac{5}{6}\right) = ?$

    A. $\frac{1}{16}$
    B. $\frac{17}{27}$
    C. $\frac{13}{18}$
    D. $\frac{7}{9}$
    E. $\frac{5}{6}$

5. Mr. Brown went grocery shopping to buy meat for his annual office picnic. He bought $7\frac{3}{4}$ pounds of hamburger, 17.85 pounds of chicken, and $6\frac{1}{2}$ pounds of steak. How many pounds of meat did Mr. Brown buy?

    A. 32.10
    B. 31.31
    C. 26.25
    D. 22.10
    E. 21.10

6. Four students about to purchase concert tickets for $18.50 for each ticket discover that they may purchase a block of 5 tickets for $80.00. How much would each of the 4 save if they can get a fifth person to join them and the 5 people equally divide the price of the 5-ticket block?

    A. $ 1.50
    B. $ 2.50
    C. $ 3.13
    D. $10.00
    E. $12.50

7. In scientific notation, $20,000 + 3,400,000 = ?$

    A. 3.42×10^6
    B. 3.60×10^6
    C. 3.42×10^7
    D. 3.60×10^7
    E. 3.60×10^{12}

8. Saying that $4 < \sqrt{x} < 9$ is equivalent to saying what about x ?

    A. $0 < x < 5$
    B. $0 < x < 65$
    C. $2 < x < 3$
    D. $4 < x < 9$
    E. $16 < x < 81$

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9. What value of x solves the following proportion?

$$\frac{9}{6} = \frac{x}{8}$$

    A. $5\frac{1}{3}$

    B. $6\frac{3}{4}$

    C. $10\frac{1}{2}$

    D.   11

    E.   12

10. If the total cost of x apples is b cents, what is a general formula for the cost, in cents, of y apples?

    A. $\frac{b}{xy}$

    B. $\frac{x}{by}$

    C. $\frac{xy}{b}$

    D. $\frac{by}{x}$

    E. $\frac{bx}{y}$

11. On a math test, 12 students earned an A. This number is exactly 25% of the total number of students in the class. How many students are in the class?

    A.   15
    B.   16
    C.   21
    D.   30
    E.   48

12. This year, 75% of the graduating class of Harriet Tubman High School had taken at least 8 math courses. Of the remaining class members, 60% had taken 6 or 7 math courses. What percent of the graduating class had taken fewer than 6 math courses?

    A.   0%
    B.   10%
    C.   15%
    D.   30%
    E.   45%

13. Adam tried to compute the average of his 7 test scores. He mistakenly divided the correct sum of all of his test scores by 6, which yielded 84. What is Adam's correct average test score?

    A.   70
    B.   72
    C.   84
    D.   96
    E.   98

14. A total of 50 juniors and seniors were given a mathematics test. The 35 juniors attained an average score of 80 while the 15 seniors attained an average of 70. What was the average score for all 50 students who took the test?

    A.   73
    B.   75
    C.   76
    D.   77
    E.   78

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Correct Answers for Sample Numerical Skills/Pre-algebra Questions

Item Number	Correct Answer	Content Category
1	E	Operations with Integers
2	E	Operations with Integers
3	B	Operations with Fractions
4	C	Operations with Fractions
5	A	Operations with Decimals
6	B	Operations with Decimals
7	A	Exponents
8	E	Exponents
9	E	Ratios and Proportions
10	D	Ratios and Proportions
11	E	Percentages
12	B	Percentages
13	B	Averages
14	D	Averages

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Algebra

1. If $x = -3$, what is the value of $\frac{x^2 - 1}{x + 1}$?

    A. -4

    B. -2

    C. 2

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

    E. 5

2. Doctors use the term *maximum heart rate* (*MHR*) when referring to the quantity found by starting with 220 beats per minute and subtracting 1 beat per minute for each year of a person's age. Doctors recommend exercising 3 or 4 times each week for at least 20 minutes with your heart rate increased from its *resting heart rate* (*RHR*) to its *training heart rate* (*THR*), where

    $$THR = RHR + .65(MHR - RHR)$$

    Which of the following is closest to the *THR* of a 43-year-old person whose *RHR* is 54 beats per minute?

    A.   197
    B.   169
    C.   162
    D.   134
    E.   80

3. When getting into shape by exercising, the subject's maximum recommended number of heartbeats per minute (h) can be determined by subtracting the subject's age (a) from 220 and then taking 75% of that value. This relation is expressed by which of the following formulas?

    A. $h = .75(220 - a)$
    B. $h = .75(220) - a$
    C. $h = 220 - .75a$
    D. $.75h = 220 - a$
    E. $220 = .75(h - a)$

4. An airplane flew for 8 hours at an airspeed of x miles per hour (mph), and for 7 more hours at 325 mph. If the average airspeed for the entire flight was 350 mph, which of the following equations could be used to find x ?

    A. $x + 325 = 2(350)$
    B. $x + 7(325) = 15(350)$
    C. $8x - 7(325) = 350$
    D. $8x + 7(325) = 2(350)$
    E $8x + 7(325) = 15(350)$

5. Which of the following is equivalent to
    $3a + 4b - (-6a - 3b)$?

    A. $16ab$
    B. $-3a + b$
    C. $-3a + 7b$
    D. $9a + b$
    E. $9a + 7b$

6. What is the sum of the polynomials $3a^2b + 2a^2b^2$ and
    $-ab^2 + a^2b^2$?

    A. $3a^2b - ab^2 + 3a^2b^2$
    B. $3a^2b - ab^2 + 2a^2b^2$
    C. $2a^2b + 3a^2b^2$
    D. $2a^2b^3 + 2a^4b^4$
    E. $-3a^3b^3 + 2a^4b$

7. Which of the following is a factor of the polynomial
    $x^2 - x - 20$?

    A. $x - 5$
    B. $x - 4$
    C. $x + 2$
    D. $x + 5$
    E. $x + 10$

8. Which of the following is a factor of $x^2 - 5x - 6$?

    A. $(x + 2)$
    B. $(x - 6)$
    C. $(x - 3)$
    D. $(x - 2)$
    E. $(x - 1)$

9. If $2(x - 5) = -11$, then $x = $?

   A. $-\frac{21}{2}$
   B. -8
   C. $-\frac{11}{2}$
   D. -3
   E. $-\frac{1}{2}$

10. If $\frac{4}{5} + \left(-\frac{3}{10}\right) = x + 1\frac{1}{2}$, then $x = $?

   A. 2
   B. 1
   C. -1
   D. -2
   E. -10

11. For all nonzero r, t, and z values, $\frac{16r^3tz^5}{-4rt^3z^2} = $?

   A. $-\frac{4z^3}{r^2t^2}$
   B. $-\frac{4r^2z^3}{t^2}$
   C. $-\frac{4rz}{t}$
   D. $-4r^4t^4z^7$
   E. $-4r^2t^2z^3$

12. For all $x > 0$ and $y > 0$, the radical expression $\frac{\sqrt{x}}{3\sqrt{x} - \sqrt{y}}$ is equivalent to:

   A. $\frac{3x - \sqrt{xy}}{9x + y}$
   B. $\frac{3x - \sqrt{xy}}{3x + y}$
   C. $\frac{3x + \sqrt{xy}}{9x - y}$
   D. $\frac{3x + \sqrt{xy}}{3x - y}$
   E. $\frac{x}{3x - y}$

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13. For all $x \neq -4$, which of the following is equivalent to the expression below?

$$\frac{x^2 + 12x + 32}{x + 4}$$

   A. $x +\ \ 3$
   B. $x +\ \ 8$
   C. $x + 11$
   D. $x + 16$
   E. $x + 28$

14. Which of the following is a simplified expression equal to $\frac{9 - x^2}{x - 3}$ for all $x < -3$?

   A. $3x$
   B. $x + 3$
   C. $x - 3$
   D. $-x + 3$
   E. $-x - 3$

15. What is the slope of the line with the equation $2x + 3y + 6 = 0$?

   A. -6
   B. -3
   C. -2
   D. $-\frac{2}{3}$
   E. $\frac{2}{3}$

16. Point A $(-4,1)$ is in the standard (x,y) coordinate plane. What must be the coordinates of point B so that the line $x = 2$ is the perpendicular bisector of $\overline{AB}$?

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