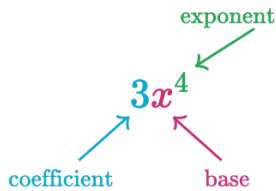# Day 15. 7/19 Monday Exponents

Exponents- In Class Notes

$3x^4$ is a monomial. We'll also frequently see binomials and trinomials.

- $3x^4 + 2x$ is a binomial. The exponent of the term $2x$ is 1 ($x = x^1$).

- $3x^4 + 2x + 7$ is a trinomial. 7 is a constant term. We can also think of 7 as an exponential term with an exponent of 0. Since $x^0 = 1$, 7 is equivalent to $7x^0$.

True or False Exercises

1. (True or False) $((2^2)^3) = 2^5$.

2. (True or False) The slope of a vertical line is undefined.

3. (True or False) Two lines with positive slopes can be perpendicular.

11. (True or False) $-2^3 = (-2)^3$.

12. (True or False) 30% of x is equal to 0.03x

13. (True or False) **"x is at most equal to 9"** is written mathematically as x < 9.

14. (True or False) $3^{20} + 3^{20} + 3^{20} = 3^{21}$

15. (True or False) 1.5×10^{-5} is the scientific notation of the number 0.0000015.

16. (True or False) 1000/0 = 0.

17. (True or False) 0/1000 = 0.

18. (True or False) $0.0000001^0 = 1$.

19. (True or False) $1 / ((-2)^{-4}) = 16$.

Exponents & Radicals Rules

$x^0 =$	
$x^a \cdot x^b =$	
$x^a / x^b =$	
$(x^a)^b = \quad (x^{ab})^n =$	
$(x + y)^n =$	
$x^{-n} =$	
$x^{1/n} =$	
$x^{m/n} =$	
$\sqrt{a} \cdot \sqrt{b} =$	

Simplify each expression.

1. $a^6 \cdot a^3$

2. $\left(x^5\right)^2$

3. $\left(4a^2b^3\right)^5$

4. $\dfrac{x^8}{x^6}$

5. $\dfrac{x^5}{x^8}$

6. $\dfrac{x^6}{x^6}$

7. $\left(\dfrac{4a^3}{2b^4}\right)^2$

8. $\left(2^3x^2\right)^5$

9. $\left(x^4y^7\right)^{-3}$

10. $\dfrac{x^{11}y^{10}}{x^{-3}y^{-1}}$

11. $-3x^{-4}y^0$

12. $\dfrac{5x^3y^9}{20x^2y^{-2}}$

13. $\dfrac{x^5}{x^{-2}}$

14. $\dfrac{x^5y^2}{x^4y^0}$

15. $\left(x^3\right)^0$

16. $\left(10x^5y^3\right)^{-3}$

17. $\dfrac{x^{-1}y}{xy^{-2}}$

18. $\left(4x^2y^5\right)^{-2}$

19. $\dfrac{2x^2y}{6xy^{-1}}$

20. $\dfrac{xy^9}{3y^{-2}} \cdot \dfrac{-7y}{21x^5}$

21. $\dfrac{12xy}{7x^4} \cdot \dfrac{7x^5y^2}{4y}$

Exponents- Class Work

PRACTICE 1

$$x^2 * x^b = x^{15}, b = ?$$

PRACTICE 2

$$(2^3)^b = 256, b = ?$$

PRACTICE 3

$$3^{-a} = 81, a = ?$$

PRACTICE 4

$$\frac{a^3 b^7 c^{11}}{a^5 b^2 c^4} =$$

PRACTICE 5

$$\frac{a^3 b^{-7} c^{-11}}{a^{-5} b^2 c^{-4}} =$$

Radicals - Class Work

PRACTICE 1

$$2\sqrt{50} - 5\sqrt{32}$$

PRACTICE 2

$$7\sqrt{x} + 3 = 14, x =$$

Exponents- Homework

1. Go to the following link:
https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:rational-exponents-radicals/x2f8bb11595b61c86:exponent-properties-review/e/properties-of-integer-exponents
Take the quiz.

2. Go to the following link:
https://www.khanacademy.org/kmap/no231-the-real-and-complex-number-systems-231/no231-rational-exponents-radicals

Finish all skill summary

3. Finish Quiz Homework in the following pages.

Decide whether the expression has been simplified correctly.

1) $(ab)^8 = ab^8$

    A) Yes   B) No

2) $\left(\dfrac{a}{4}\right)^5 = \dfrac{a^5}{4}$

    A) No   B) Yes

Apply the product rule for exponents, if possible.

3) $(-3x^5y)(-4x^9y^2)$

    A) $12x^{45}y^2$ B) $-12x^{14}y^2$ C) $12x^{15}y^3$ D) $12x^{14}y^3$

Evaluate the expression.

4) $10^0 + 5^0$

    A) 0   B) 1   C) 15   D) 2

5) -10^0

    A) -10 B) 1   C) -1 D) 0

Write the expression with only positive exponents. Assume all variables represent nonzero numbers. necessary.

6) $5x^{-2}$

    A) $\dfrac{1}{5x^2}$ B) $-10x$ C) $\dfrac{5}{x^2}$ D) $\dfrac{1}{25x^2}$

7) $(-a)^{-18}$

    A) $\dfrac{1}{a^{18}}$ B) $18a$ C) $\dfrac{1}{-a^{18}}$ D) $\dfrac{1}{a^{-18}}$

Evaluate the expression.

8) $\dfrac{5^{-4}}{6^{-3}}$

    A) $\dfrac{1296}{3125}$ B) $\dfrac{216}{625}$ C) $\dfrac{3125}{1296}$ D) $\dfrac{625}{216}$

9) $\dfrac{1}{-3^{-3}}$

    A) -9 B) -27 C) 9   D) 27

10) $\left(\dfrac{2}{7}\right)^{-3}$

    A) $-\dfrac{343}{8}$ B) $\dfrac{8}{343}$ C) $-\dfrac{8}{343}$ D) $\dfrac{343}{8}$

Apply the quotient rule for exponents, if applicable, and write the result using only positive exponents. variables represent nonzero numbers.

11) $\dfrac{x^{-16}}{x^{-4}}$

     A) $\dfrac{1}{x^{12}}$ B) x^{12} C) $\dfrac{1}{x^{20}}$ D) $-x^{20}$

Simplify the expression. Write your answer with only positive exponents. Assume that all variables repre real numbers.

12) $\left(\dfrac{-3w^3}{x}\right)^4$

     A) $\dfrac{-81w^{12}}{x^4}$ B) $\dfrac{-81w^{12}}{x}$ C) $\dfrac{81w^{12}}{x^4}$ D) $\dfrac{81w^7}{x^4}$

Simplify the expression so that no negative exponents appear in the final result. Assume all variables rep numbers.

13) $m^{-9}m^5m^{-1}$

     A) $\dfrac{1}{m^5}$ B) $\dfrac{1}{m^4}$ C) m^7 D) m^5

14) $(2^{-2} \cdot 5^{-5})^{-4}$

     A) $2^8 \cdot 5^{20}$ B) $\dfrac{1}{2^7 \cdot 5^7}$ C) $\dfrac{1}{2^8 \cdot 5^{20}}$ D) $2^7 \cdot 5^7$

15) $\dfrac{4r^3(r^4)^3}{15(r^3)^{-2}}$

     A) $\dfrac{4}{15r^{21}}$ B) $\dfrac{4r^{21}}{15}$ C) $\dfrac{4r^9}{15}$ D) $\dfrac{4}{15r^9}$

Express the number in scientific notation.

16) 430,581

     A) 4.30581×10^6 B) 4.30581×10^5 C) 4.30581×10^{-5} D) 4.30581×10^1

17) 634.92

     A) 6.3492×10^1 B) 6.3492×10^{-2} C) 6.3492×10^{-1} D) 6.3492×10^2

18) 0.000654

     A) 6.54×10^{-5} B) 6.54×10^4 C) 6.54×10^{-4} D) 6.54×10^{-3}

19) 0.000000013002

     A) 1.3002×10^{-7} B) 1.3002×10^8 C) 1.3002×10^{-9} D) 1.3002×10^{-8}

Write the polynomial in descending powers of the variable.

23) $-30 - x^5 - 25x^2 + 40x$

    A) $x^5 + 25x^2 - 40x - 30$ B) $-30 + 40x - 25x^2 - x^5$

    C) $40x - 30 - 25x^2 - x^5$ D) $-x^5 - 25x^2 + 40x - 30$

Give the numerical coefficient and the degree of the term.

24) $-mn^6$

    A) Coefficient: -1; degree: 7   B) Coefficient: $-m$; degree: 6

    C) Coefficient: $-m$; degree: 7   D) Coefficient: -1; degree: 6

Identify the polynomial as a monomial, binomial, trinomial, or none of these. Also give the degree.

25) $-12y^9 - 1$

    A) Binomial; 9   B) Binomial; 10   C) Monomial; -12 D) Binomial; 0

26) $9x^4 - 2w^3 - 5w + 4y^5 - 3$

    A) Binomial; 14   B) Trinomial; 5

    C) None of these; 13   D) None of these; 5

Add or subtract as indicated.

27) $(5a^5 - 8a^3) + (8a^5 + 4a^3)$

    A) $9a^8$ B) $13a^{10} - 4a^6$ C) $13a^5 - 4a^3$ D) $9a^{16}$

28) $(5n^5 - 5n - 9n^3) + (-9n^3 + 3n^5 - 7n)$

    A) $-22n^9$ B) $8n - 18n^5 - 12n^3$

    C) $8n^5 - 18n^3 - 12n$ D) $-2n^5 - 4n^3 - 16n$

29) $(-4x^3 + 3x^5 + 6 - 5x^4) - (-4 + 3x^4 + 7x^5 + 2x^3)$

    A) $-4x^5 - 2x^4 - 2x^3 + 2$ B) $-4x^5 - 8x^4 - 6x^3 + 10$

    C) $10x^5 - 2x^4 - 2x^3 + 10$ D) $10x^5 - 2x^4 - 2x^3 + 2$

30) $(-6x^3 + 9x^2 + 4) - (-5x^3 + 2x - 5)$

    A) $-x^3 + 9x^2 + 2x - 1$ B) $-11x^3 + 9x^2 + 2x - 1$

    C) $-x^3 + 9x^2 - 2x + 9$ D) $-x^6 + 9x^4 - 2x^2 + 9$

Tell whether the statement is true always, sometimes, or never.

31) A binomial is a polynomial.

    A) Always   B) Never   C) Sometimes

32) A monomial has no coefficient.

    A) Sometimes   B) Always   C) Never

33) A polynomial of degree 8 has 8 terms.

    A) Always   B) Sometimes   C) Never

For the polynomial function, find the requested value.

34) $f(x) = 10x^2 - 4x - 5$; $f(-2)$

    A) 39   B) 43   C) -17   D) 33

35) $f(x) = 3x^5 + 6x^4 + 4x^3 - x^2$; $f(-2)$

    A) -41   B) -40   C) -7   D) -36

Solve the problem.

36) $A(x) = -0.015x^3 + 1.05x$ gives the alcohol level in an average person's bloodstream x hours after drinking 8 oz of 100-proof whiskey. If the level exceeds 1.5 units, a person is legally drunk. Would a person be drunk after 5 hours?

    A) Yes   B) No

For the given pair of functions, find the requested function.

37) $f(x) = 4x - 4$, $g(x) = -7x + 6$; $(f - g)(x)$

    A) -3x - 2   B) 11x - 10   C) 11x + 10   D) $-3x^2 + 10$

Give the domain and range of the function.

38) $f(x) = -5x - 9$

    A) Domain: $(0, \infty)$; range: $(-\infty, 0)$ B) Domain: $(-\infty, \infty)$; range: $(-\infty, \infty)$

    C) Domain: $(-5, \infty)$; range: $(-\infty, 9)$ D) Domain: $(-\infty, \infty)$; range: $(-\infty, -9)$

Find the product.

39) $-8x^4(-11x - 6)$

    A) $136x^5$ B) $88x^4 + 48$ C) $88x^5 + 48x^4$ D) $-88x^5 - 48x^4$

40) $3x^2(10x^7 + 6x^2)$

    A) $30x^9 - 18x^4$ B) $30x^9 + 6x^2$ C) $30x^9 + 18x^4$ D) $30x^{14} + 18x^4$

41) $(2x + 3)(x - 9)$

    A) $2x^2 - 15x - 27$ B) $2x^2 - 24x - 27$ C) $x^2 - 27x - 15$ D) $x^2 - 15x - 24$

42) $(x + 4y)(x + 4y)$

    A) $x^2 + 5xy + 16y^2$ B) $x + 8xy + 16y$ C) $x^2 + 8xy + 16y^2$ D) $x^2 + 8xy + 8y^2$

43) $(9 + x)(4x - 12)$

    A) $4x^2 - 108x + 24$ B) $x^2 + 24x + 24$ C) $4x^2 + 23x - 108$ D) $4x^2 + 24x - 108$

44) $(7y - 3)(49y^2 + 21y + 9)$

    A) $49y^3 + 27$ B) $343y^3 + 27$

    C) $343y^3 - 27$ D) $343y^3 + 63y^2 - 27$

45) $(3x^2 + 3x + 1)(x^2 + 2x + 3)$

    A) $3x^4 + 6x^3 + 15x^2 + 11x + 3$ B) $3x^4 + 9x^3 + 15x^2 + 11x + 3$

    C) $3x^4 + 6x^3 + 16x^2 + 11x + 3$ D) $3x^4 + 9x^3 + 16x^2 + 11x + 3$

46) $3x(3x - 1)(2x + 9)$

    A) $14x^3 + 77x^2 - 25x$ B) $18x^3 + 75x^2 - 27x$

    C) $16x^2 + 76x - 27$ D) $6x^3 + 25x^2 - 9x$

47) $(a - 10)(a + 10)$

    A) $a^2 + 20a - 100$ B) $a^2 - 20a - 100$ C) $a^2 - 100$ D) $a^2 - 20$

48) $(7p + 10)(7p - 10)$

    A) $49p^2 - 140p - 100$ B) $49p^2 - 100$

    C) $49p^2 + 140p - 100$ D) $p^2 - 100$

49) $(7m - 5w)(7m + 5w)$

    A) $7m^2 - 5w^2$ B) $49m^2 - 70mw - 25w^2$

    C) $49m^2 - 25w^2$ D) $49m^2 + 70mw - 25w^2$

50) $(n + 9)^2$

    A) $81n^2 + 18n + 81$ B) $n^2 + 81$ C) $n^2 + 18n + 81$ D) $n + 81$

51) $(2m + 5)^2$

    A) $4m^2 + 25$ B) $2m^2 + 25$ C) $4m^2 + 20m + 25$ D) $2m^2 + 20m + 25$

1) B
2) A
3) D
4) D
5) C
6) C
7) A
8) B
9) B
10) D
11) A
12) C
13) A
14) A
15) B
16) B
17) D
18) C
19) D
20) B
21) D
22) A
23) D
24) A
25) A
26) D
27) C
28) C
29) B
30) C
31) A
32) C
33) B
34) B
35) D
36) A
37) B
38) B
39) C
40) C
41) A
42) C
43) D
44) C
45) D
46) B
47) C
48) B
49) C
50) C
51) C

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. Which of the following is a square root of 196?
   A. 98
   B. -14
   C. 392
   D. 16

2. Between what two consecutive whole numbers does $\sqrt{31}$ lie?

   A. 4 and 5

   B. 6 and 7

   C. 5 and 6
   D. 7 and 8

3. Subtract. $15\sqrt{5} - 17\sqrt{5}$

   A. $32\sqrt{10}$
   B. $32\sqrt{5}$
   C. $-2\sqrt{5}$
   D. -2

4. Find the square root. $\sqrt{64}$
   A. -8
   B. 32
   C. 8
   D. 4096

5. Evaluate $-3\sqrt{20} - \sqrt{5}$
   A. $-\sqrt{5}$
   B. $-7\sqrt{5}$
   C. $-3\sqrt{15}$
   D. already simplified

   B. $(15 + 12\sqrt{7})$ cm
   C. $(15 + 24\sqrt{7})$ cm
   D. $27\sqrt{7}$ cm

7. Simplify the expression $\sqrt{8y} + 5\sqrt{50y} - 2\sqrt{18y}$.
   A. $13\sqrt{2y}$
   B. $21\sqrt{2y}$
   C. $\left(\sqrt{8} + 5\sqrt{50} - 2\sqrt{18}\right)\sqrt{y}$
   D. $882y$

8. Simplify the expression
   $\sqrt{125d} + 5\sqrt{20d} - 3\sqrt{45d}$.
   A. $180d$
   B. $12\sqrt{5d}$
   C. $6\sqrt{5d}$
   D. $\left(\sqrt{125} + 5\sqrt{20} - 3\sqrt{45}\right)\sqrt{d}$

9. Simplify the expression $\sqrt{18x} + 4\sqrt{8x} - \sqrt{50x}$.
   A. $13\sqrt{2x}$
   B. $6\sqrt{2x}$
   C. $72x$
   D. $\left(\sqrt{18} + 4\sqrt{8} - \sqrt{50}\right)\sqrt{x}$

10. Simplify the expression
    $\sqrt{45b} + 4\sqrt{20b} - 2\sqrt{125b}$.
    A. $\sqrt{5b}$
    B. $12\sqrt{5b}$
    C. $5b$
    D. $\left(\sqrt{45} + 4\sqrt{20} - 2\sqrt{125}\right)\sqrt{b}$

1) $3x^2(x^2 - 4xy + y) =$

(A) $-12x^5y^2$

(B) $3x^4 - 24x^3y$

(C) $3x^4 - 4xy + y$

(D) $3x^4 + 12x^3y + 3x^2y$

(E) $3x^4 - 12x^3y + 3x^2y$

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2) Find the compound inequality that represents this graph.
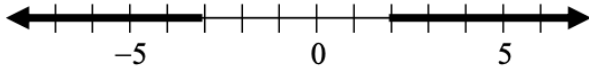
(A) $x > -3$ or $x < 2$

(B) $-3 < x < 2$

(C) $x < -3$ and $x > 2$

(D) $-3 \leq x \leq 2$

(E) $x < -3$ or $x > 2$

---

3) $(2x^4y^2)^3 =$

(A) $6x^7y^5$

(B) $6x^{12}y^6$

(C) $8x^7y^5$

(D) $8x^{12}y^6$

(E) $8x^{12}y^5$

---

4) If $3x + 6 = 0$, what is the value of $x + 7$?

(A) -11

(B) -9

(C) -2

(D) 5

(E) 9

---

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

(A) $-2y^2 + y + 1$

(B) $-2y^2 - 13y + 1$

(C) $-2y^2 - y + 3$

(D) $-2y^2 + y - 3$

(E) $-2y^2 - 13y + 3$

---

6) $\dfrac{(x^2y^3)^5}{x^7y^9} =$

(A) x^3y^6

(B) $x^{17}y^{24}$

(C) x^0y^{-1}

(D) x^3y^{17}

(E) $x^{14}y^6$

---

7) One solution of $(x - 5)(3x + 4) = 0$ is

(A) -5

(B) $-\dfrac{4}{3}$

(C) $-\dfrac{3}{4}$

(D) $\dfrac{4}{3}$

(E) $\dfrac{3}{4}$

8) One factor of $3x^2 - x - 2$ is

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

---

9) If $\begin{cases} x + 2y = 5 \\ 3x - 2y = 7 \end{cases}$, then $x =$

(A) 12   (B) 3   (C) 8   (D) 4   (E) 16

---

10) $\sqrt{48} - \sqrt{12} =$

(A) 2   (B) $\sqrt{3}$ (C) $2\sqrt{3}$ (D) $4\sqrt{3}$ (E) 6

---

11) Factor completely: $3x^2 - 75$

(A) $3(x^2 - 25)$ (B) $(x + 5)(x - 5)$ (C) $(3x + 5)(x - 5)$ (E) $3(x + 5)(x - 5)$

---

12) $\dfrac{x^2 - 9}{x + 2} \div \dfrac{x^2 + x - 6}{x^2 - 4} =$

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

---

13) If $\dfrac{3}{x - 1} = 2$, then $x =$

(A) $\dfrac{3}{5}$ (B) $\dfrac{5}{3}$ (C) 2   (D) $\dfrac{5}{2}$ (E) 3

---

14) $\dfrac{x^{-5}y^9}{x^{-2}y^{2^{-3}}} =$

(A) $\dfrac{x^{11}}{y^{15}}$ (B) $\dfrac{y^3}{x}$ (C) xy^3 (D) $\dfrac{y^{15}}{x^{11}}$ (E) $\dfrac{y^{15}}{x}$

---

15) If $y = 3x$ and $4x - 2y = 5$, then $x =$

(A) $-\dfrac{15}{2}$ (B) $-\dfrac{5}{2}$ (C) $\dfrac{11}{6}$ (D) $\dfrac{5}{2}$ (E) $\dfrac{15}{2}$

16) Find the common denominator of: $\dfrac{3}{2x-4} + \dfrac{x}{x+2}$

(A) $2(x+2)(x-2)$ (B) $(x+2)(x-2)$ (C) $2x-4$ (D) $x-2$

---

17) Rationalize the denominator (reduce fraction to lowest terms): $\sqrt{\dfrac{7}{8}}$

(A) $\dfrac{\sqrt{120}}{8}$ (B) $\sqrt{\dfrac{14}{16}}$ (C) $\dfrac{\sqrt{14}}{4}$ (D) $\sqrt{\dfrac{120}{64}}$ (E) $\dfrac{\sqrt{14}}{8}$

---

18) Solve: $\dfrac{x^2}{x-5} + \dfrac{25}{5-x} = -2$

(A) $\{-7, 5\}$ (B) $\{7, -5\}$ (C) $\{7\}$ (D) $\{-7\}$ (E) no solution

---

19) If point A(3, 1) and B(2, −3), what is the slope of line AB?

(A) 4   (B) −4   (C) $\dfrac{1}{4}$ (D) $-\dfrac{1}{4}$ (E) undefined

---

20) Factor: $2ac + ad + 6bc + 3bd$ (A) $(2c+d)(a+3b)$

(B) $2a(c) + d(a+3b) + b$ (C) $2ac + ad + 6cd + 3d^2$ (D) $5abcd$

---

21) Which equation is parallel to $y = 3x$?

(A) $y - 3x = 2$ (B) $3x + y = 0$ (C) $3y = x$ (D) $3y - x = 2$

---

22) Divide using long division: $(6x^2 - x - 4) \div (2x + 1)$

(A) $3x - 2 - \dfrac{2}{2x+1}$ (B) $3x + 1 - \dfrac{3}{2x+1}$ (C) $3x - 2$ (D) $3x - 2 - \dfrac{6}{2x+1}$

For problems #23 – 25, use the graph below.
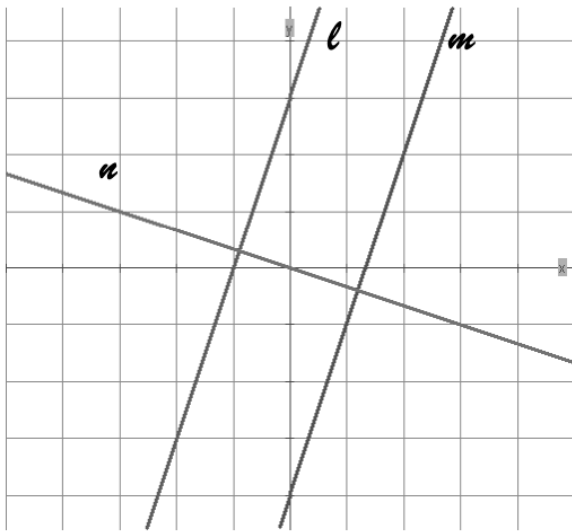
23) The equation for line ℓ is:

(A) $y = 3x - 4$ (B) $y = 3x + 3$

(C) $y = 3x$ (D) $y = 3x - 1$

─────────────────────────

24) The equation for line n is:

(A) $y = -\dfrac{1}{3}x$ (B) $y = -\dfrac{1}{3}x + 3$

(C) $-\dfrac{1}{3}x + y = 0$ (D) $-\dfrac{1}{3}x - y = 2$

25) Which statement is true for lines ℓ, m, and n ?

(A) ℓ is perpendicular to m (B) ℓ is parallel to n

(C) m is parallel to n (D) ℓ is parallel to m

───

26) Solve: $n^3 + 2n^2 - 35n = 0$

(A) $\{-7, 0, 5\}$ (B) $\{-5, 0, 7\}$ (C) $\{-5, 7\}$ (D) $\{-7, 5\}$

───

27) Factor completely: $6x^2 + 20x - 16$ (A) $(x + 4)(6x - 4)$

(B) $(2x + 4)(3x + 4)$ (C) $2(3x - 2)(x + 4)$ (D) $2(3x + 4)(x + 2)$

───

28) Solve: $x^2 - 8x + 11 = 0$

(A) $8 \pm \sqrt{5}$ (B) $4 \pm 2\sqrt{5}$ (C) $8 \pm 2\sqrt{5}$ (D) $4 \pm \sqrt{5}$ (E) $-4 \pm \sqrt{5}$

───

29) If y varies directly as x and $y = 28$ and $x = 18$, find y when $x = 9$.

(A) 56   (B) 14   (C) 18   (D) 28   (E) 9

30) Simplify: $5\sqrt{8}\,(2\sqrt{18}+3\sqrt{10})$

(A) $120+\sqrt{5}$ (B) $120+6\sqrt{5}$ (C) $120+60\sqrt{5}$ (D) $120+15\sqrt{5}$

---

31) For $\dfrac{a+bt}{c}=m$, solve for **t**.

(A) $\dfrac{cm-a}{b}$ (B) $\dfrac{cm+a}{b}$ (C) $\dfrac{cm-b}{a}$ (D) $\dfrac{cm}{b}-a$

---

32) If $f(x)=x^2-3x+5$, find $f(a+2)$

(A) a^2+a-3 (B) a^2-3a+3 (C) a^2+a+9 (D) a^2+a+3

---

33) Simplify: $\sqrt{45x^{16}y^7}$

(A) $9x^6y^3\sqrt{5y}$ (B) $3x^8y^3\sqrt{5y}$ (C) $9x^4y^3\sqrt{5y}$ (D) $9x^6y^3\sqrt{5}$

---

34) Solve: $|x+3|=5$

(A) $\{2\}$ (B) $\{-8\}$ (C) $\{2, 8\}$ (D) $\{-2, 8\}$ (E) $\{2, -8\}$

---

35) Solve: $\sqrt{8x+1}-5=0$

(A) 25   (B) 24   (C) 3   (D) 26   (E) 5

---

36) Find x.

5

30°
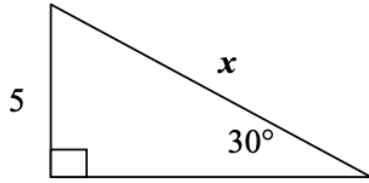
(A) 30 (B) 60

(C) 5 (D) 10

(E) not enough information

37) Find x

8

x

2 15
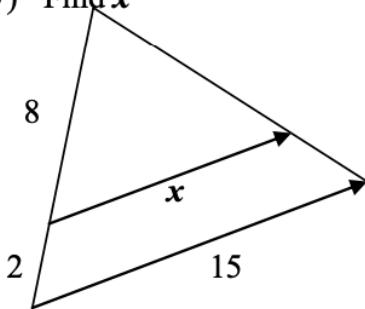
(A) 60 (B) 12

(C) 9 (D) 5

(E) not enough information

38) ABCD is a rhombus. Find its perimeter.

(A) 48 (B) 20

(C) 68 (D) 52

(E) not enough information

A B

5 12

D C
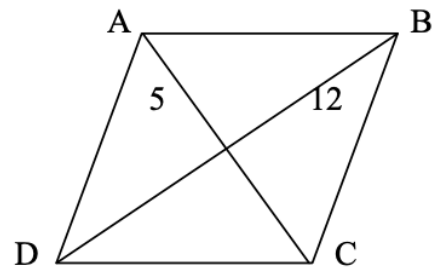
39) MATH is a rectangle. Find x

M 4x − 5 A

8

H 19 T

(A) 19 (B) 6

(C) 24 (D) 8

(E) not enough information
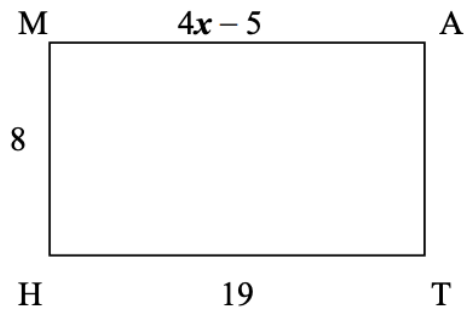
40) ABC is an isosceles triangle. Find x

A

70°

13 13

B x° C
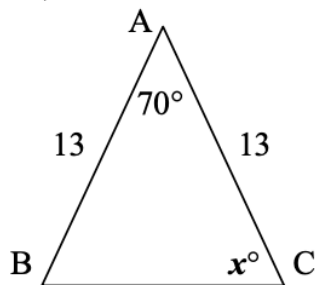
(A) 110° (B) 70°

(C) 180° (D) 55°

(E) not enough information

For problems #41 – 42, use the diagram: AB ∥ CD

41) Find the measure of angle 1.

(A) 100°   (B) 80°

(C) 20°   (D) 160°

42) Find the measure of angle 2.

(A) 100°   (B) 80°

(C) 20°   (D) 160°
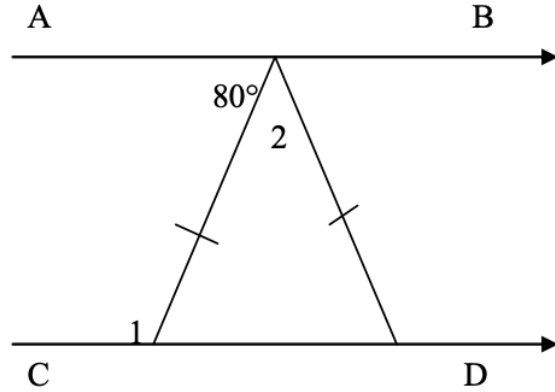
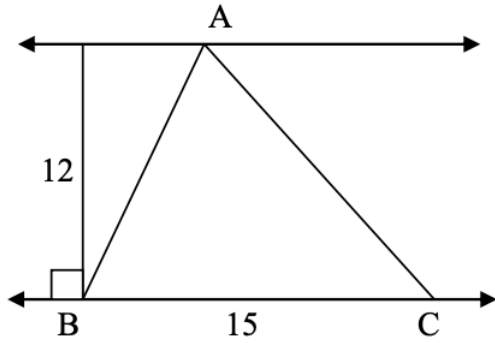43) What congruence postulate could be used to prove that the 2 triangles are congruent?
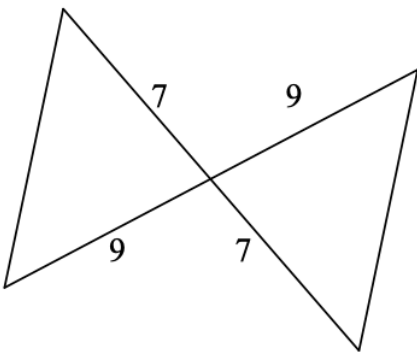
(A) AAS   (B) ASA

(C) SSS   (D) SAS

(E) the triangles are not congruent

---

44) ABCD ~ WXYZ and are similar rectangles. Find the perimeter of WXYZ.
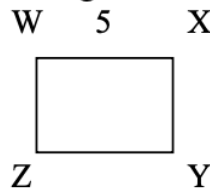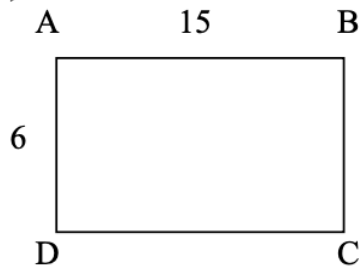
(A) 42   (B) 14   (C) 21   (D) 30   (E) not enough information

45) Find the area of triangle ABC.

(A) 180 (B) 225

(C) 144 (D) 90

(E) not enough information

A

12
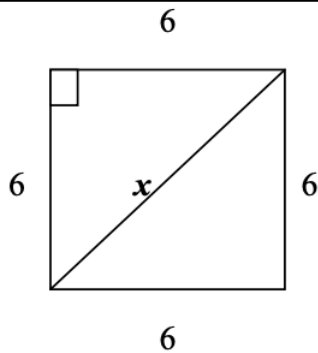
B   15   C

---

46) Find the geometric mean between 6 and 18.

(A) 108 (B) $6\sqrt{3}$ (C) $9\sqrt{3}$ (D) $6\sqrt{2}$ (E) $36\sqrt{3}$

---

47) Find x, AB is the diameter.
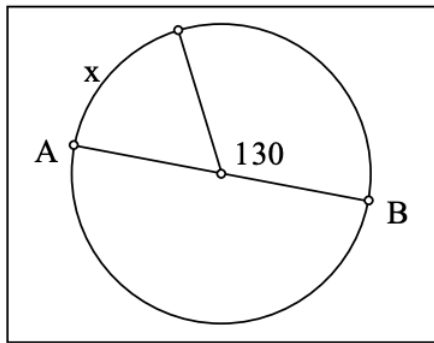
(A) 130° (B) 180°

(C) 50° (D) 360°

(E) not enough information
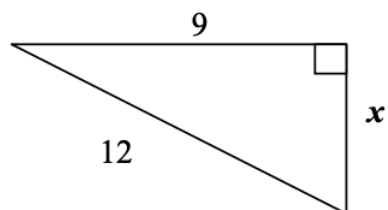
x

A   130   B

6

48) Find x

(A) 24 (B) $6\sqrt{2}$

6   x   6

(C) 36 (D) 72

(E) not enough information

6

---

49) Find x

(A) $3\sqrt{7}$ (B) 63

(C) $9\sqrt{7}$ (D) $3\sqrt{6}$
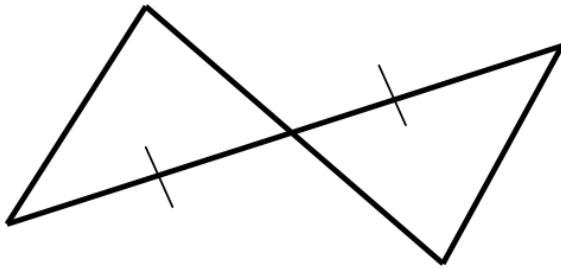
9

12   x

55) Find angle **x**.

(A) 10°   (B) 25°

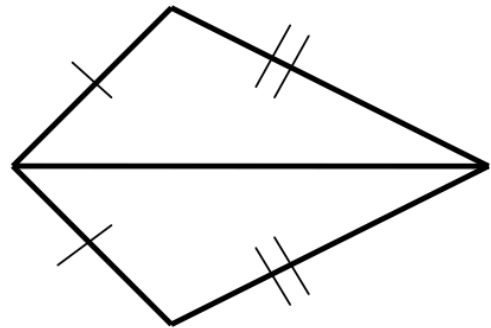(C) 40°   (D) 80°
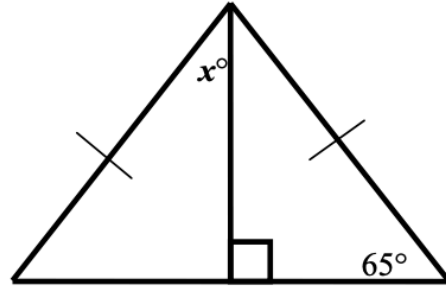
For problems **#56 – 59**, state how the triangles can be proven congruent. If none, state so.
Mark (A) SAS for $\cong \Delta$s   **(B)** SSS for $\cong \Delta$s   **(C)** ASA for $\cong \Delta$s
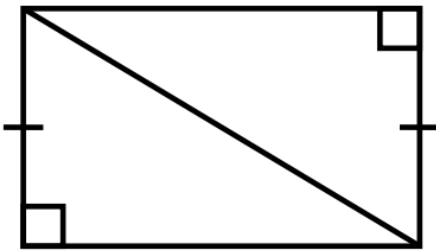
(D) HL for $\cong \Delta$s   **(E)** none
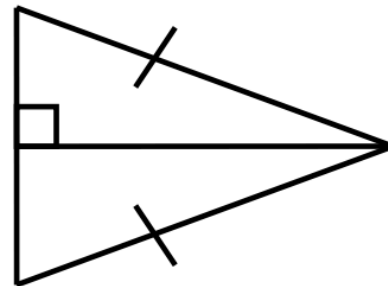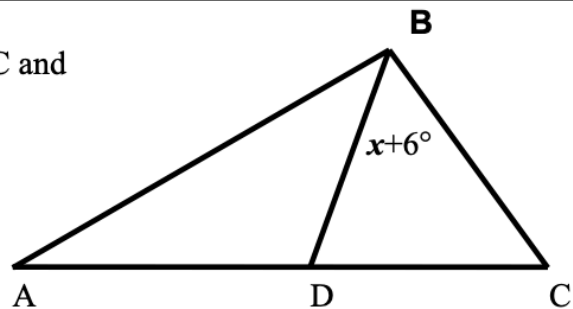
56)

57)

58)

59)

60) Find **x** if BD is an angle bisector of $\angle$ABC and
m$\angle$ABC = 4**x** − 6

(A) 9   (B) 3

(C) 15   (D) 6

$x+6°$

A   D   C

B

50) Find **x**.

(A) 34   (B) 17

(C) 21   (D) 16

15

x

27

---
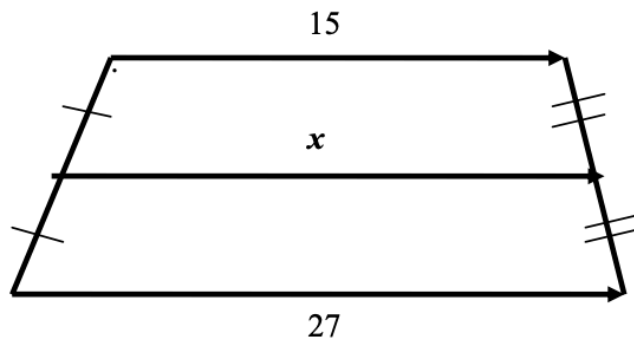
51) Find the degree measure of angle **b**.

(A) 50°   (B) 130°

(C) 135°   (D) 140°

$b°$

60°

70°

---
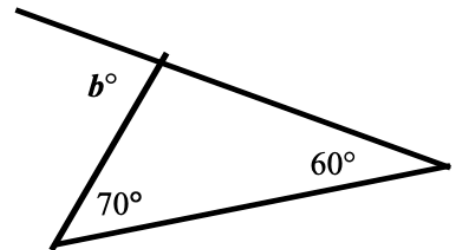
52) In parallelogram ACDB, angle ABD = 112° and angle ABC = 47°. What is the measure angle ACB?

C   D

(A) 68°   (B) 45°

(C) 47°   (D) 65°

A   B

---
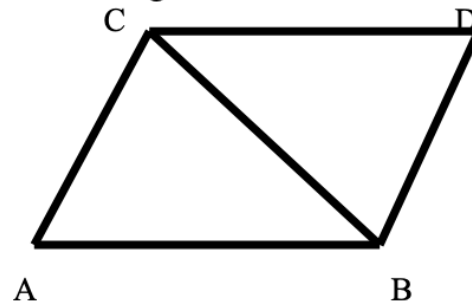
53) In this triangle, the length of **x** must be ___ < **x** < ___.

(A) 4m, 36m   (B) 36m, 4m

(C) 5m, 35m   (D) 35m, 5m

x   16m

20m

---
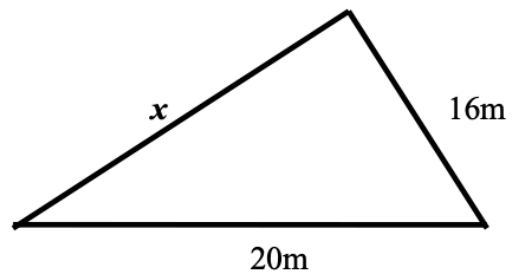
54) Find angle **x**.

(A) 30°   (B) 60°

(C) 90°   (D) 120°

$x°$
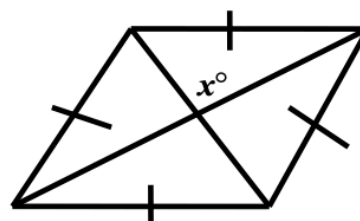
61) Find MT if MX = $4x + 5$ and XT = $2x + 11$ MATH is a rectangle.

(A)   3   (B)   17

(C)   34   (D)   8

---
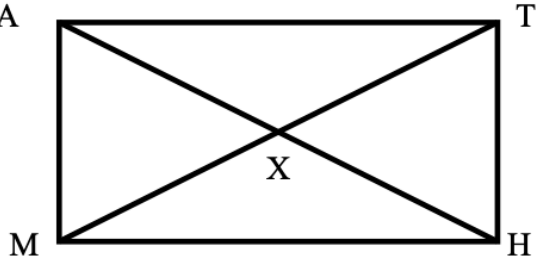
62)   Suppose polygon **P** is similar to polygon **Q**, and that the ratio of similarity of **Q** to **P** is 3. If **P** has a perimeter of 15 m, what is the perimeter of **Q**?

(A)   45 m   (B)   5 m   (C)   9 m   (D)   27 m

---

63)   Find x.

(A)   3 uts   (B) $3\sqrt{2}$ uts

(C)   6 uts   (D) $\dfrac{3\sqrt{2}}{2}$ uts

---
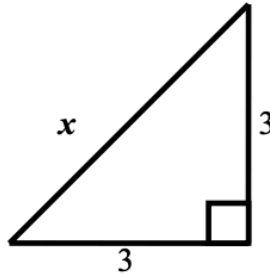
64)   Find x.

(A)   9 ft   (B) $6\sqrt{3}$ ft

(C)   12 ft   (D) $12\sqrt{3}$ ft

---
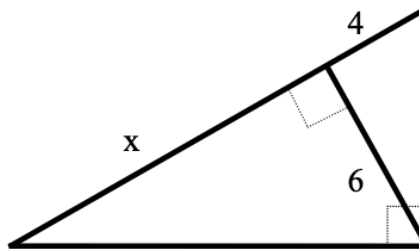
65)   Find the ratio of similarity of ΔABC to ΔDEF.

(A)   3

(B)   1:3

(C)   4:9

(D)   1:5
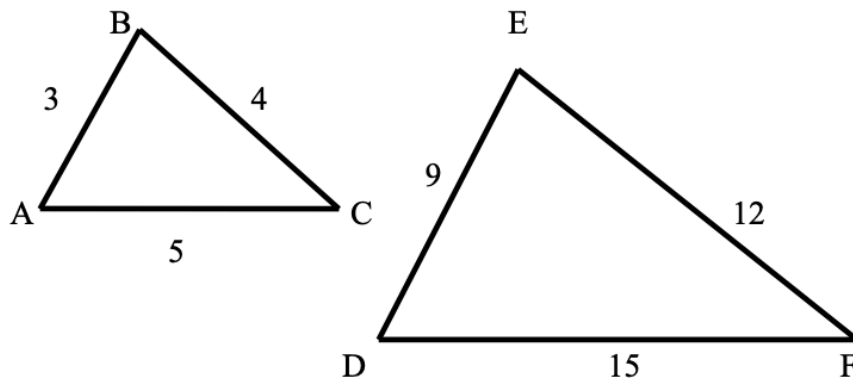
66) Find x.

(A)   5   (B)   10

(C)   15   (D)   20

---
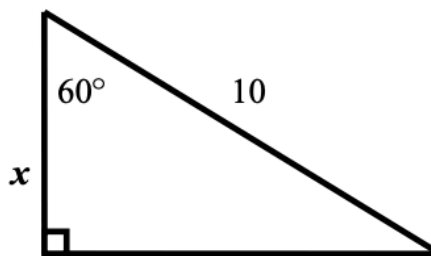
67) Find x.

(A)   14   (B)   7

(C)   3.5   (D)   60

---
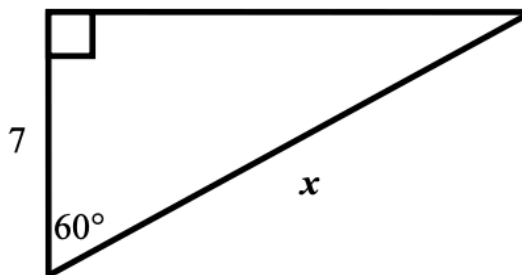
68) Find x.

(A)   12.8   (B)   4.8

(C)   16   (D)   6.8

---
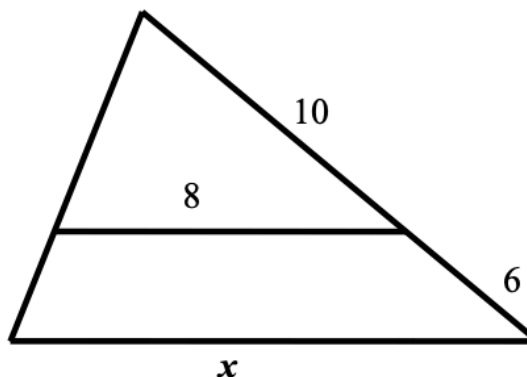
69) Find the geometric mean between 8 and 18.

(A)   8   (B)   18   (C)   13   (D)   12

---

70) Find the perimeter of the rectangle.

(A) $5 + 5\sqrt{3}$ (B) $10\sqrt{3}$

(C) $10 + 10\sqrt{3}$ (D) $20\sqrt{3}$
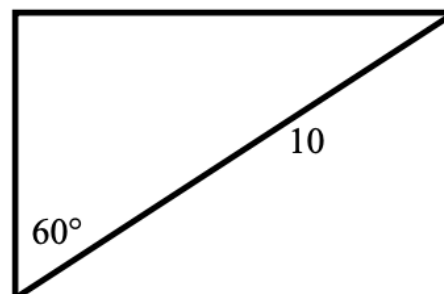
Answers:

1E	15B	29B	43D	57B
2E	16A	30C	44B	58D
3D	17C	31A	45D	59D
4D	18D	32D	46B	60A
5E	19A	33B	47C	61C
6A	20A	34E	48B	62A
7B	21A	35C	49A	63B
8E	22A	36D	50C	64A
9B	23B	37B	51B	65B
10C	24A	38D	52D	66A
11E	25D	39B	53A	67A
12A	26A	40D	54C	68A
13D	27C	41A	55B	69D
14D	28D	42C	56E	70C

Percent

Percent Word Problems
Ratio and proportion method

Here are several aids that will help you solve word problems:

1. Make sure you understand the question that is asked
2. Sort out the information to make a basic percent problem, such as "30% of what is 17?"
3. Sometimes, you will have to subtract or add some of the numbers.
4. The <u>base</u> will always be the original number, price, or total.

Some examples of percent word problems.

A baseball pitcher won 80% of the games he pitched. If he pitched 35 ballgames, how many games did he win?

80% of 35 is what?

$$\frac{80}{100} = \frac{\quad}{35}$$

1. Multiply the opposites
   $$80 \times 35 = 2800$$
2. Divide by the remaining number
   $$100 \overline{)2800}^{\;28}$$

<u>28 games</u>

Jerry, an electrician, worked 7 months out of the year. What percent of the year did he work? (round answer to the nearest hundredth)

What percent of 12 is 7?   12 months = 1 year

$$\frac{\quad}{100} = \frac{7}{12}$$

1. Multiply the opposites
   $$7 \times 100 = 700$$
2. Divide by the remaining number
   $$12 \overline{)700.00}^{\;58.33}$$

<u>58.33%</u> (rounded to hundredth)

Sometimes the information needed to solve a percent word problem is not stated directly. You will need to sort out the numbers given in the problem. Organizing all the information into a box format will help you see what numbers you have and what you need.

Some examples.

There are 28 students in a class. Sixteen of those students are men. What percent of the class are women? (Round to the nearest tenth)

Men	%	16
Women	%	12
Total	100%	28

28 total students
-16 men
12 women

12 is what % of 28?

$$\frac{}{100} = \frac{12}{28}$$

1. Multiple the opposites
   $100 \times 12 = 1200$
2. Divide by the remaining number

$$28\overline{)1200.00}$$ → 42.85

42.9%

`

Donovan took a math test and got 35 correct and 10 incorrect answers. What was the percentage of correct answers? (Round to the nearest hundredth)

Correct answers	%	35
Incorrect answers	%	10
Total answers	100%	45

35 correct answers
+10 incorrect answers
45 total answers

35 is what % of 45?

$$\frac{}{100} = \frac{35}{45}$$

1. Multiple the opposites
   $100 \times 35 = 3500$
2. Divide by the remaining number

$$45\overline{)3500.000}$$ → 77.777

77.78% (rounded to hundredth)

Percent Word Problems

Directions: Set up a basic percent problem. Sometimes you will have to do extra steps to solve the problem. Follow rounding directions. Answers and solutions start on page 6.

1) A student earned a grade of 80% on a math test that had 20 problems. How many problems on this test did the student answer correctly? (round to the nearest whole number)

2) There are 36 carpenters in a crew. On a certain day, 29 were present. What percent showed up for work? (round to the nearest tenth)

3) A metal bar weighs 8.15 ounces. 93% of the bar is silver. How many ounces of silver are in the bar? (round to the nearest thousandth)

4) A woman put $580 into a savings account for one year. The rate of interest on the account was $6\frac{1}{2}$%. How much was the interest for the year in dollars and cents? (Round to the nearest cent)

5) A student answered 86 problems on a test correctly and received a grade 98%. How many problems were on the test, if all the problems were worth the same number of points? (Round to the nearest whole number)

6) Manuel found a wrecked Trans-Am that he could fix. He bought the car for 65% of the original price of $7200. What did he pay for the car? (Round to nearest dollar)

7) Pamela bought an electric drill at 85% of the regular price. She paid $32.89 for the drill. What was the regular price? (Round to the nearest cent)

8) A crew is made up of 8 men; the rest are women. $66\frac{2}{3}$% of the crew are men. How many people are in the crew?

9) Ben earns $12,800 a year. About 15% is taken out for taxes. How much is taken out for taxes?

10) At a sale, shirts were sold for $15 each. This price was 80% of their original price. What was the original price?

11) There are 32 students in a class. Nine of those students are women. What percent are men? (round to the nearest tenth)

12) The Royals softball team played 75 games and won 55 of them. What percent of the games did they lose? (round to the nearest tenth)

1. $\dfrac{80}{100} = \dfrac{}{20}$

Multiply the opposites:

$$80 \times 20 = 1600$$

Divide by the remaining number:

$$100 \overline{)1600} \;\; 16$$

16 problems

2. $\dfrac{}{100} = \dfrac{29}{36}$

Multiply the opposites:

$$29 \times 100 = 2900$$

Divide by the remaining number:

$$36 \overline{)2900.00} \;\; 80.55$$

80.6%

3. $\dfrac{93}{100} = \dfrac{}{8.15}$

Multiply the opposites:

$$93 \times 8.15 = 757.95$$

Divide by the remaining number:

$$100 \overline{)757.9500} \;\; 7.5795$$

7.580 ounces

4. $\dfrac{6\frac{1}{2}}{100} = \dfrac{}{580}$

Multiply the opposites:

$$6\frac{1}{2} \times 580 = 3770$$

Divide by the remaining number:

$$100 \overline{)3770.00} \;\; 37.70$$

$37.70

5. $\dfrac{98}{100} = \dfrac{86}{}$

Multiply the opposites:

$$100 \times 86 = 8600$$

Divide by the remaining number:

$$98 \overline{)8600.0} \;\; 87.7$$

88 problems (rounded to nearest whole)

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6. $\dfrac{65}{100} = \dfrac{}{7200}$

Multiply the opposites:

$$65 \times 7200 = 468{,}000$$

Divide by the remaining number:

$$100 \overline{)468000} \quad \dfrac{4680}{}$$

$4680

7. $\dfrac{85}{100} = \dfrac{32.89}{}$

Multiply the opposites:

$$100 \times 32.89 = 3289$$

Divide by the remaining number:

$$85 \overline{)3289.000} \quad \dfrac{38.694}{}$$

$38.69

8. $\dfrac{66\frac{2}{3}}{100} = \dfrac{8}{}$

Multiply the opposites:

$$100 \times 8 = 800$$

Divide by the remaining number:

$$800 \div 66\,\frac{2}{3} = \frac{800}{1} \div \frac{200}{3} = \frac{\overset{4}{\cancel{800}}}{1} \times \frac{3}{\cancel{200}} = \frac{12}{1}$$

12

9. $\dfrac{15}{100} = \dfrac{}{12{,}800}$

Multiply the opposites:

$$15 \times 12{,}800 = 192{,}000$$

Divide by the remaining number:

$$100 \overline{)192000} \quad \dfrac{1920}{}$$

$1920

10. $\dfrac{80}{100} = \dfrac{15}{}$

Multiply the opposites:

$$100 \times 15 = 1500$$

Divide by the remaining number:

$$80 \overline{)1500.00} \quad \dfrac{18.75}{}$$

<u>$18.75</u>

11.

Total	100%	32
Men		23
Women		9

```
  32
 − 9
  23
```

$$\frac{}{100} = \frac{23}{32}$$

Multiply the opposites:
  100 x 23 = 2300
Divide by the remaining number:

```
       71.87
  32)2300.00
```

<u>71.9%</u>(rounded to nearest tenth)

12.

Total	100%	75
Won		55
Lost		20

```
  75
 − 55
  20
```

$$\frac{}{100} = \frac{20}{75}$$

Multiply the opposites:
  100 x 20 = 2000
Divide by the remaining number:

```
       26.667
  75)2000.000
```

<u>26.7%</u> games lost (rounded to tenth)

1. If you purchase an iPod that costs $339, how much sales tax will you pay if the rate is 8.375%?

   $28.39

2. A shirt that regularly sells for $38.50 is on sale for 25% off. By how much money is the shirt being discounted?

   $9.63

3. If 13 out of 27 students in a computer class are seniors, then what percent of the class is composed of seniors?

   48%

4. A meteorologist was accurate 90% of the time, reporting accurately on 45 days. How many days of weather did he report?

   50

5. Jimmy owes $29,500 for a car loan to be repaid in 36 months. If the interest rate is 7.375%, then how much interest will he pay?

   $6,526.88

6. At Kennedy High School, 119 students walk to school. If this number is 35% of school enrollment, then how many students are enrolled at the school?

   340

7. Jerry deposited $550.00 into a saving account at his bank. If the interest rate is 2.75%, then how much will he have after 24 months?

   $580.25

8. Last year a school had 249 honor students as compared with only 243 this year. What is the percent decrease in honor students?

   2.4%

9. At the Hip-Hop Shop each salesperson receives an 8.5% commission on sales. What would a salesperson earn if she sold $250 in goods?

   $21.25

10. At a supermarket the hourly pay increased from $14.00 to $15.50. What is the percent increase in pay?

    11%

SAT Real Test Practice Homework

1

A musician has a new song available for downloading or streaming. The musician earns $0.09 each time the song is downloaded and $0.002 each time the song is streamed. Which of the following expressions represents the amount, in dollars, that the musician earns if the song is downloaded d times and streamed s times?

A) $0.002d + 0.09s$

B) $0.002d - 0.09s$

C) $0.09d + 0.002s$

D) $0.09d - 0.002s$

2

A quality control manager at a factory selects 7 lightbulbs at random for inspection out of every 400 lightbulbs produced. At this rate, how many lightbulbs will be inspected if the factory produces 20,000 lightbulbs?

A) 300

B) 350

C) 400

D) 450

3

$$\ell = 24 + 3.5m$$

One end of a spring is attached to a ceiling. When an object of mass m kilograms is attached to the other end of the spring, the spring stretches to a length of ℓ centimeters as shown in the equation above. What is m when ℓ is 73 ?

A) 14

B) 27.7

C) 73

D) 279.5

Questions 4 and 5 refer to the following information.

The amount of money a performer earns is directly proportional to the number of people attending the performance. The performer earns $120 at a performance where 8 people attend.

4

How much money will the performer earn when 20 people attend a performance?

A) $960

B) $480

C) $300

D) $240

5

The performer uses 43% of the money earned to pay the costs involved in putting on each performance. The rest of the money earned is the performer's profit. What is the profit the performer makes at a performance where 8 people attend?

A) $51.60

B) $57.00

C) $68.40

D) $77.00

6

When 4 times the number x is added to 12, the result is 8. What number results when 2 times x is added to 7 ?

A) -1

B) 5

C) 8

D) 9

7

$$y = x^2 - 6x + 8$$

The equation above represents a parabola in the xy-plane. Which of the following equivalent forms of the equation displays the x-intercepts of the parabola as constants or coefficients?

A) $y - 8 = x^2 - 6x$

B) $y + 1 = (x - 3)^2$

C) $y = x(x - 6) + 8$

D) $y = (x - 2)(x - 4)$

8

In a video game, each player starts the game with k points and loses 2 points each time a task is not completed. If a player who gains no additional points and fails to complete 100 tasks has a score of 200 points, what is the value of k ?

A)   0

B)   150

C)   250

D)   400

9

A worker uses a forklift to move boxes that weigh either 40 pounds or 65 pounds each. Let x be the number of 40-pound boxes and y be the number of 65-pound boxes. The forklift can carry up to either 45 boxes or a weight of 2,400 pounds. Which of the following systems of inequalities represents this relationship?

A) $\begin{cases} 40x + 65y \le 2{,}400 \\ x + y \le 45 \end{cases}$

B) $\begin{cases} \dfrac{x}{40} + \dfrac{y}{65} \le 2{,}400 \\ x + y \le 45 \end{cases}$

C) $\begin{cases} 40x + 65y \le 45 \\ x + y \le 2{,}400 \end{cases}$

D) $\begin{cases} x + y \le 2{,}400 \\ 40x + 65y \le 2{,}400 \end{cases}$

10

A function f satisfies $f(2) = 3$ and $f(3) = 5$. A function g satisfies $g(3) = 2$ and $g(5) = 6$. What is the value of $f(g(3))$?

A) 2

B) 3

C) 5

D) 6

11

Number of hours Tony plans to read the novel per day	3
Number of parts in the novel	8
Number of chapters in the novel	239
Number of words Tony reads per minute	250
Number of pages in the novel	1,078
Number of words in the novel	349,168

Tony is planning to read a novel. The table above shows information about the novel, Tony's reading speed, and the amount of time he plans to spend reading the novel each day. If Tony reads at the rates given in the table, which of the following is closest to the number of days it would take Tony to read the entire novel?

A)   6

B)   8

C)   23

D) 324

On January 1, 2000, there were 175,000 tons of trash in a landfill that had a capacity of 325,000 tons. Each year since then, the amount of trash in the landfill increased by 7,500 tons. If y represents the time, in years, after January 1, 2000, which of the following inequalities describes the set of years where the landfill is at or above capacity?

A) $325,000 - 7,500 \leq y$

B) $325,000 \leq 7,500y$

C) $150,000 \geq 7,500y$

D) $175,000 + 7,500y \geq 325,000$

A researcher conducted a survey to determine whether people in a certain large town prefer watching sports on television to attending the sporting event. The researcher asked 117 people who visited a local restaurant on a Saturday, and 7 people refused to respond. Which of the following factors makes it least likely that a reliable conclusion can be drawn about the sports-watching preferences of all people in the town?

A) Sample size

B) Population size

C) The number of people who refused to respond

D) Where the survey was given

Miles Traveled by Air Passengers in Country X, 1960 to 2005
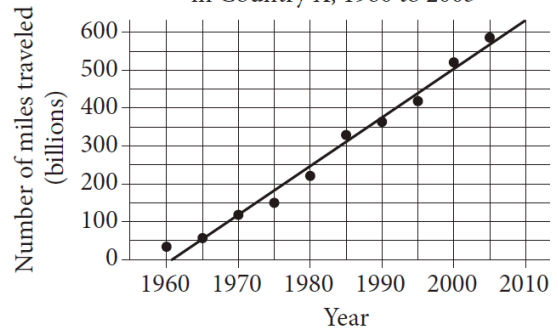
According to the line of best fit in the scatterplot above, which of the following best approximates the year in which the number of miles traveled by air passengers in Country X was estimated to be 550 billion?

A) 1997

B) 2000

C) 2003

D) 2008

15

The distance traveled by Earth in one orbit around the Sun is about 580,000,000 miles. Earth makes one complete orbit around the Sun in one year. Of the following, which is closest to the average speed of Earth, in miles per hour, as it orbits the Sun?

A)   66,000
B)   93,000
C)   210,000
D)   420,000

16

Results on the Bar Exam of Law School Graduates

	Passed bar exam	Did not pass bar exam
Took review course	18	82
Did not take review course	7	93

The table above summarizes the results of 200 law school graduates who took the bar exam. If one of the surveyed graduates who passed the bar exam is chosen at random for an interview, what is the probability that the person chosen did <u>not</u> take the review course?

A) $\dfrac{18}{25}$

B) $\dfrac{7}{25}$

C) $\dfrac{25}{200}$

D) $\dfrac{7}{200}$

17

The atomic weight of an unknown element, in atomic mass units (amu), is approximately 20% less than that of calcium. The atomic weight of calcium is 40 amu. Which of the following best approximates the atomic weight, in amu, of the unknown element?

A)   8
B)   20
C)   32
D)   48

18

A survey was taken of the value of homes in a county, and it was found that the mean home value was $165,000 and the median home value was $125,000. Which of the following situations could explain the difference between the mean and median home values in the county?

A)   The homes have values that are close to each other.

B)   There are a few homes that are valued much less than the rest.

C)   There are a few homes that are valued much more than the rest.

D)   Many of the homes have values between $125,000 and $165,000.

A sociologist chose 300 students at random from each of two schools and asked each student how many siblings he or she has. The results are shown in the table below.

Students' Sibling Survey

Number of siblings	Lincoln School	Washington School
0	120	140
1	80	110
2	60	30
3	30	10
4	10	10

There are a total of 2,400 students at Lincoln School and 3,300 students at Washington School.

19

What is the median number of siblings for all the students surveyed?

A) 0

B) 1

C) 2

D) 3

20

Based on the survey data, which of the following most accurately compares the expected total number of students with 4 siblings at the two schools?

A) The total number of students with 4 siblings is expected to be equal at the two schools.

B) The total number of students with 4 siblings at Lincoln School is expected to be 30 more than at Washington School.

C) The total number of students with 4 siblings at Washington School is expected to be 30 more than at Lincoln School.

D) The total number of students with 4 siblings at Washington School is expected to be 900 more than at Lincoln School.

21

A project manager estimates that a project will take x hours to complete, where $x > 100$. The goal is for the estimate to be within 10 hours of the time it will actually take to complete the project. If the manager meets the goal and it takes y hours to complete the project, which of the following inequalities represents the relationship between the estimated time and the actual completion time?

A) $x + y < 10$

B) $y > x + 10$

C) $y < x - 10$

D) $-10 < y - x < 10$

Math Test Calculator Answers

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