Summer Packet for students entering Advanced Topics in Mathematics

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Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Identify a pattern in the list of numbers. Then use this pattern to find the next number.

1) 7, 11, 15, 19, 23, ___ 1) _____

A) 31 B) 27 C) 26 D) 30

2) $1, -\frac{1}{3}, \frac{1}{9}, -\frac{1}{27}, \frac{1}{81}$ 2) _____

A) 1/729 B) –1/729 C) –1/243 D) 1/243

Round the number to the given place value.

3) In 2005 a company spent $593,749,564 on advertising. Round the advertising figure to the nearest hundred–thousand. 3) _____

A) $600,000,000 B) $500,000,000 C) $593,800,000 D) $593,700,000

4) In a town in Nebraska, the average consumption of soft drinks per day per elementary school student is 15.568 ounces. Round this value to the nearest tenth. 4) _____

A) 17 ounces B) 15.6 ounces C) 15.5 ounces D) 15.7 ounces

5) According to his ultra–precise scale, Paul gained 3.346 pounds in a three–month period. Round this amount to the nearest hundredth. 5) _____

A) 3.36 pounds B) 3.35 pounds C) 0.35 pounds D) 4 pounds

6) In a laboratory course in veterinary biology, fleas gathered from Muttsky, a volunteered pet dog, averaged 0.161610 inch in length. Round this amount to the nearest thousandth. 6) _____

A) 1 inch B) 0.163 inch C) 0.162 inch D) 0.161 inch

Solve the problem with estimation, but do not use a calculator. Use rounding to make the resulting calculations simple.

7) Estimate the cost of 103 shirts at $19.95 each. 7) _____

A) $1995 B) $200 C) $2054.85 D) $2000

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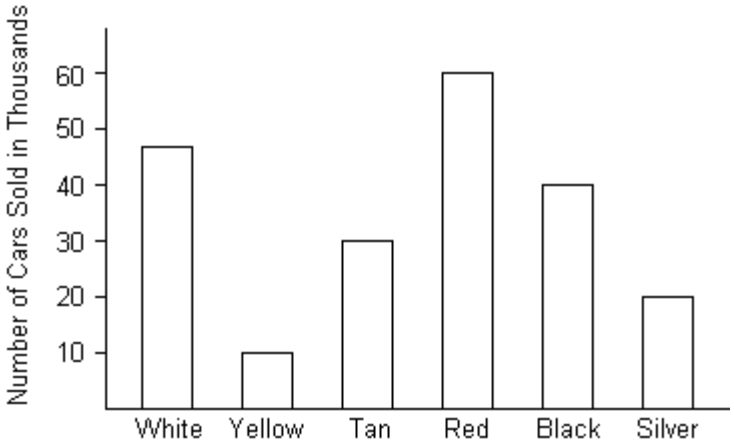
The bar graph below represents various colors of cars sold. Use the graph to answer the question(s).



8) Estimate the number of tan cars sold. 8) _____

A) 35,000 B) 40,000 C) 30,000 D) 25,000

9) Estimate how many more black cars were sold than silver cars. 9) _____

A) 14,000 B) 11,000 C) 21,000 D) 31,000

Determine if the number is divisible by 2, 3, 4, 5, 6, 8, 9, 10, and/or 12.

10) 3082 10) _____

A) 2, 3, 4 B) 4 C) 3, 4 D) 2

Find the prime factorization of the composite number.

11) 45 11) _____

A) $3^2 \times 5$ B) 5^2 C) 9×5 D) 9×3

12) 470 12) _____

A) $2 \times 5 \times 47$ B) 10×47 C) $5^2 \times 47$ D) $2^2 \times 47$

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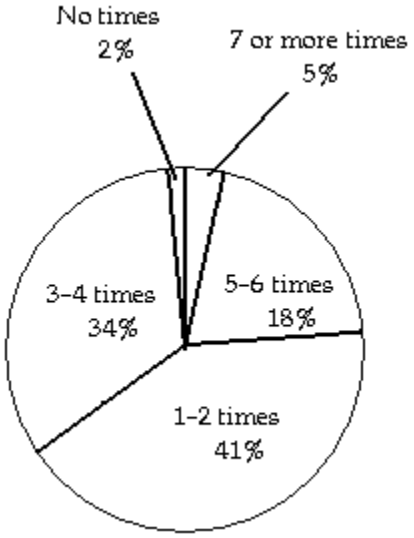
The circle graph shows the number of times a group of survey respondents watched the news in the past week. Use the chart to answer the question.

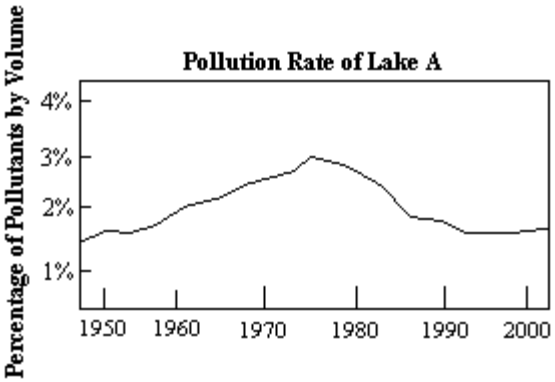


13) If the number of respondents in the study was approximately 44,757, estimate how many stated that they watched the news 5–6 times in the last week. 13) _____

A) 8000 respondents B) 6000 respondents

C) 10,000 respondents D) 12,000 respondents

The line graph shows the pollution rate for a certain lake from 1950 to 2000. Use the graph to answer the question.



14) Find an estimate for the pollution rate of the lake in 2000. 14) _____

A) 3% B) 1.5% C) 2.5% D) 1%

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Find the greatest common factor of the numbers.

15) 52, 135 15) _____

A) 65 B) 1 C) 26 D) 6

16) 36 and 54 16) _____

A) 36 B) 18 C) 108 D) 54

Solve the problem.

17) A store owner wishes to stack books into equal piles, each pile containing only one title. There are 18 books of one title and 42 books of another title in a shipment. What is the largest number of books that can be stacked in each pile? 17) _____

A) 18 B) 42 C) 6 D) 126

Find the least common multiple of the numbers.

18) 30 and 45 18) _____

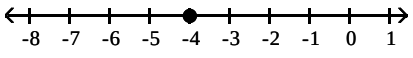
A) 1350 B) 90 C) 450 D) 675

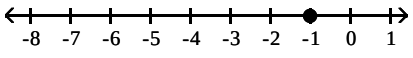
19) 70 and 84 19) _____

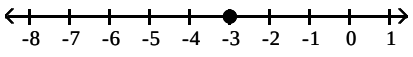
A) 5880 B) 980 C) 420 D) 1176

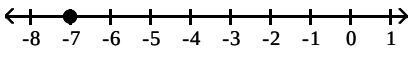
Graph the integer on the number line.

20) –7 20) _____

A) 

B) 

C) 

D) 

Insert < or > in the area between the integers to make the statement true.

21) –1 __ 6 21) _____

A) –1 < 6 B) –1 > 6

22) $-59 \_\_ -30$ 22) _____

A) $-59 > -30$ B) $-59 < -30$

23) $-400 \_\_ 0$ 23) _____

A) $-400 < 0$ B) $-400 > 0$

Find the absolute value.

24) $|6|$ 24) _____

A) 6 B) 12 C) 0 D) −6

25) $|-10|$ 25) _____

A) 0 B) 20 C) −10 D) 10

For problems 26–29, perform the indicated operation. You may not use a calculator. Show all work next to the problem. No credit will be given if not work is shown.

26) $23 + (-78)$ 26) _____

A) 101 B) −101 C) −55 D) 55

27) $-37 + (-21)$ 27) _____

A) −16 B) −58 C) 58 D) 16

28) $61 - (-15)$ 28) _____

A) −46 B) −76 C) 46 D) 76

29) $-16 - (-29)$ 29) _____

A) 13 B) −13 C) −45 D) 45

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For problems 30–32, find the product. You may not use a calculator.

30) (–5)(9) 30) _____

A) –40 B) 40 C) –45 D) –54

31) –15(0) 31) _____

A) 15 B) –30 C) –15 D) 0

32) (–20)(–6) 32) _____

A) –140 B) 120 C) 126 D) 140

Evaluate the exponential expression.

33) -2^2 33) _____

A) –4 B) 4

34) $(-11)^2$ 34) _____

A) 22 B) –22 C) 121 D) –121

35) $(-1)^6$ 35) _____

A) $\frac{1}{6}$ B) 6 C) 7 D) 1

36) 6^3 36) _____

A) 9 B) –216 C) 216 D) 18

For problems 37–41, **find the quotient, or, if applicable, state that the expression is undefined. You may not use a calculator.**

37) $\frac{48}{-8}$ 37) _____

A) 8 B) 6

C) –6 D) The expression is undefined.

38) $\frac{0}{-7}$ 38) _____

A) 7 B) 0

C) –7 D) The expression is undefined.

39) $\frac{30}{0}$ 39) _____

A) 30 B) 1

C) 0 D) The expression is undefined.

40) (–18) ÷ (3) 40) _____

A) –6 B) 3

C) 6 D) The expression is undefined.

41) (–54) ÷ (–9) 41) _____

A) –6 B) 6

C) 9 D) The expression is undefined.

For problems 42–47, use the order of operations to find the value of the expression. You may not use a calculator. All work must be shown next to the problem or no credit will be given.

42) $-7 + 3 \cdot 7$ 42) _____

A) 14 B) –46 C) –70 D) –28

43) $6 \cdot 3 + (-9) \cdot 3$ 43) _____

A) –21 B) –36 C) 9 D) –9

44) 3 – 4(–8) – 5 44) _____

A) 3 B) 30 C) 33 D) 13

45) $4 - 2(-6 + 5)$ 45) _____

A) 26 B) –2 C) 6 D) 21

46) $3(-5)^2 - 4(-3)^2$ 46) _____

A) 639 B) –5 C) –6 D) 39

47) $5^2 - 25 \div 5 \cdot 2 + 1$ 47) _____

A) 16 B) 1 C) 0 D) 14

Solve the problem.

48) An experiment calls for cooling a mixture to –20°F, then increasing the temperature 80 degrees. What is the final temperature the experiment is to obtain? 48) _____

A) –60°F B) 60°F C) –100°F D) 100°F

Express the sentence as a single numerical expression. Then use the order of operations to simplify the expression.

49) Subtract 11 from 8. Multiply this difference by 2. Raise this product to the third power. 49) _____

A) –216 B) 216 C) –64 D) 36

Reduce the rational number to its lowest terms.

50) $\frac{15}{24}$ 50) _____

A) $\frac{3}{8}$ B) $\frac{5}{8}$ C) $\frac{15}{24}$ D) $\frac{5}{3}$

51) $\frac{39}{65}$ 51) _____

A) $\frac{3}{5}$ B) $\frac{13}{5}$ C) $\frac{39}{65}$ D) $\frac{3}{13}$

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Convert the mixed number to an improper fraction.

52) $6\frac{7}{8}$ 52) _____

A) $\frac{48}{7}$ B) $\frac{55}{7}$ C) $\frac{55}{8}$ D) $\frac{48}{8}$

53) $-3\frac{5}{7}$ 53) _____

A) $-\frac{21}{7}$ B) $-\frac{21}{5}$ C) $-\frac{26}{5}$ D) $-\frac{26}{7}$

Convert the improper fraction to a mixed number.

54) $\frac{41}{3}$ 54) _____

A) $12\frac{2}{7}$ B) $14\frac{2}{3}$ C) $\frac{2}{3}$ D) $13\frac{2}{3}$

55) $-\frac{27}{5}$ 55) _____

A) $-5\frac{2}{5}$ B) $-4\frac{2}{5}$ C) $-5\frac{2}{7}$ D) $-6\frac{2}{5}$

Express the rational number as a decimal.

56) $\frac{7}{8}$ 56) _____

A) 7.125 B) 0.1875 C) 0.125 D) 0.875

Express the terminating decimal as a quotient of integers. If possible, reduce to lowest terms.

57) 0.74 57) _____

A) $\frac{37}{5}$ B) $\frac{74}{9}$ C) $\frac{37}{50}$ D) $\frac{74}{99}$

Express the repeating decimal as a quotient of integers. If possible, reduce to lowest terms.

58) $0.\overline{6}$ 58) _____

A) $\frac{2}{33}$ B) $\frac{3}{5}$ C) $\frac{3}{50}$ D) $\frac{2}{3}$

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Perform the indicated operation(s). Where possible, reduce the answer to lowest terms. DO NOT USE A CALCULATOR ON PROBLEMS 59–67!!

59) $\frac{4}{7} \cdot \frac{2}{9}$ 59) _____

A) $\frac{7}{18}$ B) $\frac{3}{8}$ C) $\frac{8}{63}$ D) $\frac{63}{8}$

60) $\left(-\frac{1}{6}\right)\left(\frac{5}{7}\right)$ 60) _____

A) $\frac{5}{42}$ B) $-\frac{5}{42}$ C) $\frac{2}{21}$ D) $-\frac{7}{30}$

61) $\left(2\frac{1}{4}\right)\left(3\frac{5}{9}\right)$ 61) _____

A) 7 B) 8 C) 4 D) 6

62) $\frac{6}{8} \div \frac{1}{2}$ 62) _____

A) $\frac{3}{16}$ B) $\frac{3}{2}$ C) $\frac{7}{10}$ D) $\frac{16}{3}$

63) $-\frac{5}{6} \div \frac{2}{3}$ 63) _____

A) $\frac{5}{9}$ B) $\frac{5}{4}$ C) $-\frac{5}{9}$ D) $-\frac{5}{4}$

64) $\frac{1}{5} + \frac{3}{5}$ 64) _____

A) $\frac{4}{25}$ B) $\frac{4}{5}$ C) $\frac{2}{5}$ D) 0

65) $\frac{8}{9} + \frac{7}{12}$ 65) _____

A) $\frac{53}{36}$ B) $\frac{5}{36}$ C) $\frac{5}{7}$ D) $\frac{1}{6}$

66) $\frac{9}{11} - \frac{1}{11}$ 66) _____

A) $-\frac{9}{11}$ B) 0 C) $\frac{8}{11}$ D) $\frac{10}{11}$

67) $\frac{3}{13} - \left(-\frac{1}{13}\right)$ 67) _____

A) $\frac{4}{13}$ B) $\frac{1}{13}$ C) $-\frac{4}{13}$ D) $\frac{2}{13}$

Use a calculator with a square root key to find a decimal approximation for the square root. Round the number diplayed as indicated.

68) $\sqrt{828}$ to the nearest thousandth 68) _____

A) 28.772 B) 28.780 C) 828.000 D) 28.775

For problems 69–70, simplify the square root. DO NOT USE A CALCULATOR!!

69) $\sqrt{63}$ 69) _____

A) 7.937 B) $3\sqrt{7}$

C) $9\sqrt{7}$ D) This expression is already simplified.

70) $\sqrt{128}$ 70) _____

A) $2\sqrt{24}$ B) $8\sqrt{2}$

C) $4\sqrt{8}$ D) This expression is already simplified.

For problems 71–74, perform the indicated operation. Simplify the answer when possible. DO NOT USE A CALCULATOR!!

71) $\sqrt{3} \cdot \sqrt{7}$ 71) _____

A) $\sqrt{21}$ B) $\sqrt{3+7}$ C) 21 D) $\sqrt{10}$

72) $\frac{\sqrt{10}}{\sqrt{5}}$ 72) _____

A) $\sqrt{2}$ B) $\sqrt{\frac{10}{5}}$ C) 10 D) $\sqrt{5}$

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73) $\sqrt{10} + \sqrt{40}$ 73) _____

A) $\sqrt{50}$ B) $3\sqrt{10}$ C) 40 D) $5\sqrt{10}$

74) $9\sqrt{12} + 12\sqrt{12}$ 74) _____

A) $42\sqrt{3}$ B) 234 C) 1008 D) $21\sqrt{24}$

Rationalize the denominator. DO NOT USE A CALCULATOR!!

75) $\frac{5}{\sqrt{6}}$ 75) _____

A) $\frac{5\sqrt{6}}{6}$ B) $5\sqrt{6}$ C) 41 D) $\frac{25\sqrt{6}}{6}$

Use properties of exponents to simplify the expression. First, express the answer in exponential form. Then, evaluate the expression.

76) $2^3 \cdot 2^5$ 76) _____

A) 2^{15}; 32,768 B) 2^8; 256 C) $8 \cdot 2$; 16 D) 2^8; 40

77) $(8^2)^3$ 77) _____

A) 8^5; 32,768 B) 8^6; 262,144 C) 16^3; 1024 D) 24^2; 192

78) $(1^6)^7$ 78) _____

A) 1^{42}; 1 B) 1^{42}; 42 C) 1^{13}; 1 D) 1^{42}; 0

Use the zero and negative exponent rules to simplify the expression.

79) $(3)^0$ 79) _____

A) –1 B) 1 C) 0 D) 3

For problems 80 and 81, use properties of exponents to simplify the expression. Do not use a calculator. Express answer in exponential form.

80) $5^3 \cdot 5^{-5}$ 80) _____

A) -5^8 B) 5^{-15} C) -5^{-2} D) 5^{-2}

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81) $\frac{3^6}{3^4}$ 81) _____

A) 3^{10} B) 3^{-2} C) 3^{24} D) 3^2

Express the number in decimal notation.

82) 9.18×10^{-4} 82) _____

A) 0.0000918 B) 0.000918 C) 0.00918 D) –918,000

Express the number in scientific notation.

83) 26,000 83) _____

A) 2.6×10^4 B) 2.6×10^5 C) 2.6×10^{-4} D) 2.6×10^{-5}

Evaluate the algebraic expression for the given value or values of the variable.

84) $2x^2 + 4xy + 3y^2$; x = –2, y = –5 84) _____

A) 75 B) 102 C) 281 D) 123

Simplify the algebraic expression.

85) 7a + 2 – 5a 85) _____

A) 4a B) 2a + 2 C) –2a + 2 D) 12a + 2

86) (11y + 6) – (3y – 2) 86) _____

A) 14y + 8 B) 8y – 8 C) 8y + 8 D) 8y + 4

87) –7(9x + 4) + 9(9x + 8) 87) _____

A) –91x B) 18x + 4 C) 18x + 44 D) 2x – 3

Write the English phrase as an algebraic expression. Let x represent the number. Simplify the expression, if possible.

88) The sum of a number and 100 88) _____

A) 100 – x B) 100 C) 100 + x D) 100x

89) 9 less than 6 times a number 89) _____

A) $9 - 6x$ B) $6x - 9$ C) $6 - 9x$ D) $9x - 6$

90) The quotient of 63 and a number 90) _____

A) $\frac{x}{63}$ B) $63 - x$ C) $\frac{63}{x}$ D) $63x$

Solve the equation. Be sure to check your proposed solution by substituting it for the variable in the given equation.

91) $8y + 2 = 8 - 4y$ 91) _____

A) $\left\{\frac{2}{5}\right\}$ B) $\{2\}$ C) $\left\{\frac{1}{2}\right\}$ D) $\{-2\}$

92) $3x - (2x - 1) = 2$ 92) _____

A) $\{1\}$ B) $\left\{-\frac{1}{5}\right\}$ C) $\}\{-1\}$ D) $\left\{\frac{1}{5}\right\}$

93) $10(2x - 9) - 5 = 10(x - 8) + (5)$ 93) _____

A) {2} B) {–3} C) {–1} D) {4}

94) $0.60x - 0.20(20 + x) = 1.40(20)$ 94) _____

A) {40} B) {70} C) {80} D) {90}

Solve the equation for y.

95) $7x + 3y = 19$ 95) _____

A) $y = 7x - 19$ B) $y = \frac{7}{3}x - \frac{19}{3}$ C) $y = \frac{7}{3}x + \frac{19}{3}$ D) $y = -\frac{7}{3}x + \frac{19}{3}$

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Indicate whether the equation has no solution or is true for all real numbers. If neither is the case, solve for the variable.

96) $15x - 3(3 + 5x) = -9$ 96) _____

A) $\emptyset$ B) $\left\{\frac{3}{5}\right\}$

C) {x | x is a real number} D) $\left\{\frac{5}{3}\right\}$

Factor the trinomial, or state that the trinomial is prime. Check your factorization using FOIL multiplication.

97) $x^2 + 3x - 70$ 97) _____

A) $(x + 10)(x - 7)$ B) $(x - 10)(x + 1)$ C) $(x - 10)(x + 7)$ D) prime

Solve the quadratic equation by factoring.

98) $x^2 - x = 42$ 98) _____

A) {–6, 7} B) {6, 7} C) {–6, –7} D) {1, 42}

Calculate the slope of the line passing through the given points. If the slope is undefined, so state. Then indicate whether the line rises, falls, is horizontal, or is vertical.

99) (–3, –4), (4, –1) 99) _____

A) – 5, falls B) $-\frac{3}{7}$, falls C) $\frac{7}{3}$, rises D) $\frac{3}{7}$, rises

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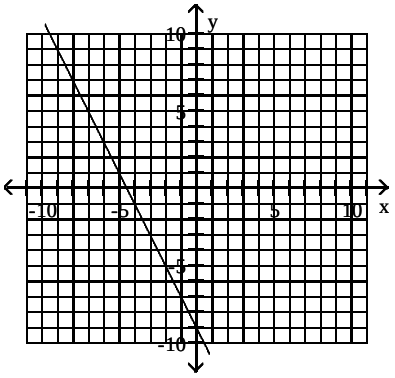
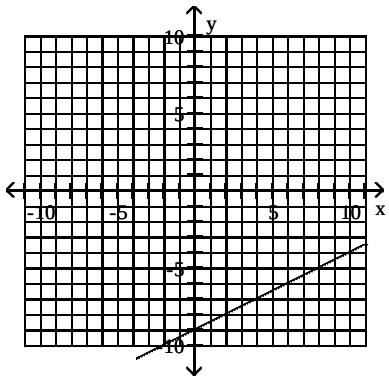
Graph the linear function using the slope and y–intercept.

100) $y = -2x + 9$ 100) _____

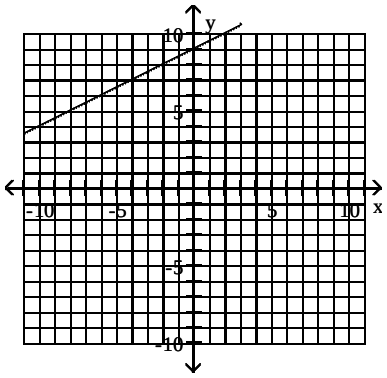
A)



B)



C)



D)