Mathematics All Around 7th edition Pirnot Test Bank

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INSTRUCTOR'S TESTING MANUAL

MATHEMATICS ALL AROUND

SEVENTH EDITION

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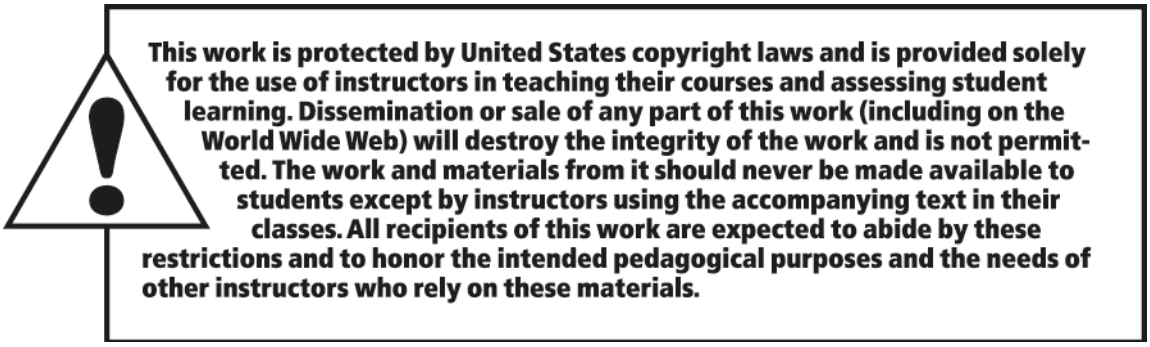

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Chapter 1 Exam A

Name_____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Determine whether the statement is true or false. If it is true, give two examples to illustrate it. If it is false, give a single counterexample.

1) If the price of an air conditioner is raised by 17% and then lowered by 17%, the price will be the same as the original price. 1) _____

2) If A is the father of B, and B is the father of C, then C is the grandson of A. 2) _____

Draw a picture to illustrate the situation.

3) At Moira's birthday party, each guest has a choice of chocolate, strawberry, or banana topping on vanilla ice cream. 3) _____

Explain the difference between the symbols.

4) $|-2|$ and $[-2]$ 4) _____

5) $\supseteq$ and $\supset$ 5) _____

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

Decide which set of names would be most meaningful for the indicated items.

6) On a bookshelf there are 4 math books, 5 science books, and 5 history books. 6) _____

A) b_1, b_2, and b_3 B) 4, 5, and 5 C) x, y, and z D) m, s, and h

7) Raoul and Carlotta are sharing servings of root beer and cake. 7) _____

A) R, C, b, and k B) p_1, p_2, f_1, and f_2

C) x, w, z, and w D) r, c, r, and c

Decide whether the two sequences of operations give the same result.

8) Subtracting y from x and adding the difference to z; adding x to z and then subtracting y 8) _____

A) No B) Yes

9) Dividing r by 5, then dividing s by 5, then multiplying the quotients; multiplying r and s, then dividing by 5. 9) _____

A) No B) Yes

Continue the pattern for five more items in the list.

10) 180, 169, 158, 147, ... 10) _____

A) 136, 125, 114, 103, 92 B) 139, 131, 123, 115, 107

C) 305, 452, 757, 1209, 2076 D) 136, 132, 128, 124, 120

11) 6, 12, 18, 24, ... 11) _____

A) 30, 37, 44, 51, 58 B) 11, 17, 24, 32, 41

C) 30, 36, 42, 48, 54 D) 31, 38, 45, 52, 59

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List the items mentioned. Try to organize your list in a systematic way.

12) A frozen yogurt stand has chocolate and vanilla yogurt. For toppings it has nuts, coconut syrup, or candy pieces. List all combinations that use one flavor and one topping. 12) _____

A) (chocolate, nuts), (nuts, chocolate), (vanilla, coconut syrup), (coconut syrup, chocolate), (nuts, vanilla), (candy, vanilla), (chocolate, candy)

B) (chocolate, nuts), (chocolate, coconut syrup), (chocolate, candy), (vanilla, nuts), (vanilla, coconut syrup), (vanilla, candy)

C) (chocolate, nuts), (chocolate, coconut syrup), (chocolate, candy), (vanilla, nuts), (vanilla, coconut syrup), (vanilla, candy), (candy, chocolate), (candy, vanilla), (coconut syrup, chocolate), (coconut syrup, vanilla)

D) (chocolate, nuts), (vanilla, coconut syrup), (coconut syrup, chocolate), (nuts, vanilla), (candy, vanilla), (chocolate, candy), (chocolate, vanilla)

13) A coin is flipped and a 6–sided number cube is rolled. Use H for heads and T for tails, and list all possible outcomes. 13) _____

A) (1, H), (H, 1), (1, T), (T, 1), (2, H), (H, 2), (2, T), (3, H), (H, 3), (3, T), (T, 3), (4, H), (H, 4). (4, T), (T, 4). (5, H), (H, 5), (5, T), (T, 5), (6, H), (H, T), (6, T), (T, 6)

B) (H, 1), (H, 2), (H, 3), (H,4), (H, 5), (H, 6)

C) (H, 1), (T, 2), (H, 3), (T, 4), (H, 5), (T, 6)

D) (1, H), (1, T), (2, H), (2, T), (3, H), (3, T), (4, H), (4, T), (5, H), (5, T), (6, H), (6, T)

Solve the problem by guessing and adjusting.

14) Mitra created a mosaic design using square 4–by–4 cm white tiles and rectangular 4–by–5 centimeter black tiles. She used twice as many white tiles as black tiles. The finished pattern was 2704 square centimeters in area. How many rectangular tiles did she use? 14) _____

A) 104 B) 212 C) 52 D) 20

15) Corinne is making a beaded necklace. She has 3 times as many green beads as red beads, and twice as many blue beads as green beads. If she has 150 beads all together, how many of the beads are blue? 15) _____

A) 45 B) 90 C) 75 D) 30

Decide whether the argument is an example of inductive or deductive reasoning.

16) The last four answers were false, therefore the next will be false. 16) _____

A) Inductive B) Deductive

17) $|-p| = p$, therefore $|-97| = 97$ 17) _____

A) Inductive B) Deductive

18) Practice makes perfect. Therefore, if I practice, I'll be perfect. 18) _____

A) Inductive B) Deductive

19) If $(-p)^2 = p^2$, then $(-6)^2 = 36$ 19) _____

A) Inductive B) Deductive

Illustrate Goldback's conjecture for the following number.

20) 60 20) _____

A) 30 + 30 B) $2^2 \cdot 3 \cdot 5$ C) 3 + 57 D) 19 + 41

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21) 40 21) _____

A) $2^3 \cdot 5$ B) 17 + 23 C) 20 + 20 D) 13 + 27

22) 50 22) _____

A) $2 \cdot 5^2$ B) 25 + 25 C) 13 + 37 D) 17 + 33

23) 30 23) _____

A) 15 + 15 B) 5 + 25 C) 7 + 23 D) $2 \cdot 3 \cdot 5$

24) 24 24) _____

A) 12 + 12 B) $2^3 \cdot 3$ C) 3 + 21 D) 11 + 13

Use inductive reasoning.

25) How many different squares are there in a 4 by 4 square? Use inductive reasoning to answer. 25) _____

A) 21 B) 16 C) 14 D) 30

26) How many different squares are there in an 8 by 8 square? Use inductive reasoning to answer. 26) _____

A) 64 B) 204 C) 285 D) 65

27) Use inductive reasoning to predict the next term in the sequence of numbers. 27) _____

37, 31, 25, 19, 13, ?

A) 2 B) 7 C) 6 D) 0

28) Use inductive reasoning to predict the next term in the sequence of numbers. 28) _____

2, 5, 4, 10, 8, 20, ?

A) 16 B) 40 C) 30 D) 12

29) How many different squares are there in a 6 by 6 square? Use inductive reasoning to answer. 29) _____

A) 50 B) 91 C) 36 D) 37

Estimate the answer using compatible numbers.

30) 8.9% × 196 30) _____

A) 8 B) 80 C) 18 D) 180

Estimate the answer by rounding as indicated.

31) Estimate by rounding to the nearest ten. 31) _____

$$\begin{array}{r} 83 \\ -\ 46 \\ \hline \end{array}$$

A) 130 B) 30 C) 40 D) 37

32) Estimate by rounding to the nearest hundred. 32) _____

$$\begin{array}{r} 461 \\ -\ 242 \\ \hline \end{array}$$

A) 200 B) 219 C) 700 D) 300

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33) Estimate by rounding to the nearest hundred. 33) _____

766
× 668

A) 560,000 B) 1500 C) 511,700 D) 511,688

Round the number to the place value indicated.

34) 4295 34) _____

A) 3900 B) 4100 C) 4000 D) 5000

35) 98,213 35) _____

A) 99,000 B) 98,100 C) 98,000 D) 108,000

36) 63,037 36) _____

A) 63,010 B) 63,100 C) 62,900 D) 63,000

37) 6619 37) _____

A) 7100 B) 8000 C) 7000 D) 6890

38) 829 38) _____

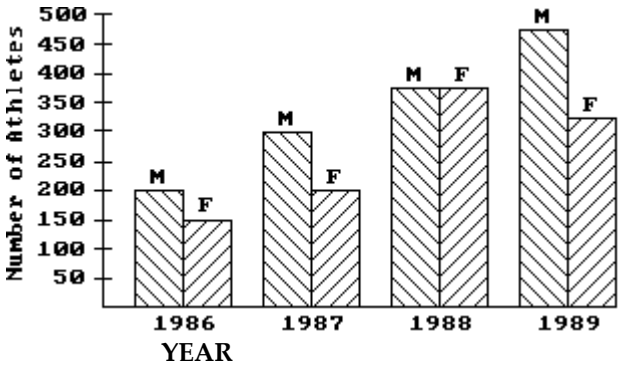
A) 810 B) 800 C) 900 D) 700

Estimate the answer. State whether the estimate is larger or smaller than the exact answer.

39) Each gallon of porch and deck paint covers 200 square feet. How many gallons are needed to cover 1980 square feet? 39) _____

A) 11; larger B) 9; smaller C) 8; smaller D) 10; larger

Refer to the double–bar graph below which shows the number of male (M) and female (F) athletes at a university over a four–year period. Solve the problem.



40) How many more male athletes than female athletes were there in 1987? 40) _____

A) 50 B) 100 C) 0 D) 150

41) How many female athletes were there in 1987? 41) _____

A) 150 B) 500 C) 200 D) 300

42) In which year was the number of male athletes equal to 375? 42) _____

A) 1989 B) 1987 C) 1986 D) 1988

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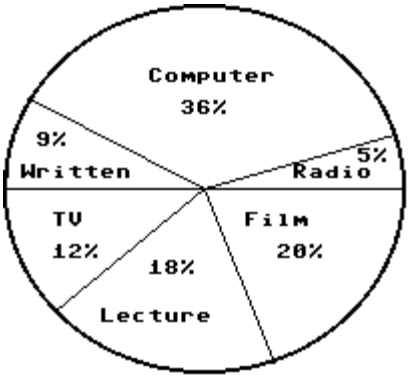
43) Find the increase in the number of female athletes from 1986 to 1987. 43) _____

A) 100 B) 75 C) 50 D) 200

In a school survey, students showed these preferences for instructional materials. Answer the question.



44) About how many students would you expect to prefer lectures in a school of 950 students? 44) _____

A) About 342 students B) About 190 students

C) About 18 students D) About 171 students

45) About how many students would you expect to prefer films in a school of 900 students? 45) _____

A) About 20 students B) About 162 students

C) About 108 students D) About 180 students

46) About how many students would you expect to prefer TV in a school of 700 students? 46) _____

A) About 140 students B) About 126 students

C) About 12 students D) About 84 students

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1) False. Possible counterexample: Let the original price be $1000. After the price is raised, it will be $1000 + 170 = \$1170$. After this is reduced by 17% it will be $1170 - 0.17 \cdot 1170 = \$971.10$.
2) False. Possible counterexample is that C is the granddaughter of A.
3) Answers will vary. Possible answer is a circle labeled "ice cream" connected by lines to three other circles labeled "chocolate," strawberry," and "banana."
4) Answers will vary. One possibility is: the first -2 is enclosed in absolute value bars and the second is in brackets.
5) Answers will vary. One possibility: the first symbol has a line beneath it, and the second does not.
6) D
7) A
8) B
9) A
10) A
11) C
12) B
13) D
14) C
15) B
16) A
17) B
18) B
19) B
20) D
21) B
22) C
23) C
24) D
25) D
26) B
27) B
28) A
29) B
30) C
31) B
32) D
33) A
34) C
35) C
36) D
37) C
38) B
39) D
40) B
41) C
42) D
43) C
44) D
45) D
46) D

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Chapter 1 Exam B

Name_____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Determine whether the statement is true or false. If it is true, give two examples to illustrate it. If it is false, give a single counterexample.

1) If A is the father of B, and B is the father of C, then C is the grandson of A. 1) _____

2) If the price of an air conditioner is raised by 15% and then lowered by 15%, the price will be the same as the original price. 2) _____

Draw a picture to illustrate the situation.

3) At Moira's birthday party, each guest has a choice of chocolate, strawberry, or banana topping on vanilla ice cream. 3) _____

4) A school has a Spanish Club, a French Club, and a Drama Club, which have 20 members each. The Spanish and Drama Club have 4 members in common. The Drama and French Club have 4 members in common. The Spanish and French club have no members in common. 4) _____

Explain the difference between the symbols.

5) $\uparrow$ and $\Uparrow$ 5) _____

6) $|-11|$ and $[-11]$ 6) _____

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

Decide which set of names would be most meaningful for the indicated items.

7) Karina is buying fabric to make a cloth for a table that is 3 times as long as it is wide. 7) _____

A) f, c B) L, W C) a, b D) K, c

8) On a bookshelf there are 5 math books, 3 science books, and 5 history books. 8) _____

A) x, y, and z B) b_1, b_2, and b_3 C) m, s, and h D) 5, 3, and 5

Decide whether the two sequences of operations give the same result.

9) Adding m and n and then multiplying the sum by 7; multiplying m by 7, multiplying n by 7, and then adding the two products 9) _____

A) No B) Yes

10) Subtracting y from x and adding the difference to z; adding x to z and then subtracting y 10) _____

A) Yes B) No

Continue the pattern for five more items in the list.

11) 7, 10, 13, 16, ... 11) _____

A) 19, 21, 23, 25, 27 B) 20, 24, 28, 31, 35

C) 19, 22, 25, 28, 31 D) 20, 25, 31, 38, 46

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12) aaa, aab, aba, ... 12) _____

A) abc, acb, cab, caa, cba
B) baa, aba, abb, bbb, baa
C) bab, baa, aba, bbb, bba
D) baa, abb, bab, bba, bbb

List the items mentioned. Try to organize your list in a systematic way.

13) A coin is flipped and a 6–sided number cube is rolled. Use H for heads and T for tails, and list all possible outcomes. 13) _____

A) (1, H), (H, 1), (1, T), (T, 1), (2, H), (H, 2), (2, T), (3, H), (H, 3), (3, T), (T, 3), (4, H), (H, 4). (4, T), (T, 4). (5, H), (H, 5), (5, T), (T, 5), (6, H), (H, T), (6, T), (T, 6)
B) (1, H), (1, T), (2, H), (2, T), (3, H), (3, T), (4, H), (4, T), (5, H), (5, T), (6, H), (6, T)
C) (H, 1), (T, 2), (H, 3), (T, 4), (H, 5), (T, 6)
D) (H, 1), (H, 2), (H, 3), (H,4), (H, 5), (H, 6)

14) A frozen yogurt stand has chocolate and vanilla yogurt. For toppings it has nuts, coconut syrup, or candy pieces. List all combinations that use one flavor and one topping. 14) _____

A) (chocolate, nuts), (chocolate, coconut syrup), (chocolate, candy), (vanilla, nuts), (vanilla, coconut syrup), (vanilla, candy)
B) (chocolate, nuts), (nuts, chocolate), (vanilla, coconut syrup), (coconut syrup, chocolate), (nuts, vanilla), (candy, vanilla), (chocolate, candy)
C) (chocolate, nuts), (vanilla, coconut syrup), (coconut syrup, chocolate), (nuts, vanilla), (candy, vanilla), (chocolate, candy), (chocolate, vanilla)
D) (chocolate, nuts), (chocolate, coconut syrup), (chocolate, candy), (vanilla, nuts), (vanilla, coconut syrup), (vanilla, candy), (candy, chocolate), (candy, vanilla), (coconut syrup, chocolate), (coconut syrup, vanilla)

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Solve the problem by guessing and adjusting.

15) After he had worked at the video store for 6 months, Hilton got a 10% raise and a $60 bonus. If he earned $368 with the raise and bonus, how much was he earning before? 15) _____

16) Corinne is making a beaded necklace. She has 3 times as many green beads as red beads, and twice as many blue beads as green beads. If she has 150 beads all together, how many of the beads are blue? 16) _____

Decide whether the argument is an example of inductive or deductive reasoning.

17) All U.S. Presidents have come from the original 48 states. No person from Alaska can be President. 17) _____

18) Practice makes perfect. Therefore, if I practice, I'll be perfect. 18) _____

19) If $(-p)^2 = p^2$, then $(-6)^2 = 36$ 19) _____

Illustrate Goldback's conjecture for the following number.

20) 32 20) _____

21) 30 21) _____

22) 48 22) _____

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23) 40 23) _____

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

Use inductive reasoning.

24) Use inductive reasoning to predict the next term in the sequence of numbers. 24) _____
0, 3, 3, 0, –3, ?
A) 3 B) 0 C) –3 D) 6

25) Use inductive reasoning to predict the next term in the sequence of numbers. 25) _____
37, 31, 25, 19, 13, ?
A) 7 B) 2 C) 6 D) 0

26) Use inductive reasoning to predict the next term in the sequence of numbers. 26) _____
$1, -\frac{1}{2}, \frac{1}{4}, -\frac{1}{8}, \frac{1}{16}, ?$
A) $\frac{1}{64}$ B) $-\frac{1}{32}$ C) $\frac{1}{32}$ D) $-\frac{1}{64}$

27) Use inductive reasoning to predict the next term in the sequence of numbers. 27) _____
2, 5, 4, 10, 8, 20, ?
A) 16 B) 12 C) 30 D) 40

Estimate the answer using compatible numbers.

28) 518 ÷ 52 28) _____
A) 11 B) 12 C) 10 D) 9

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Estimate the answer by rounding as indicated.

29) Estimate by rounding to the nearest hundred. 29) _____
461
– 242

30) Estimate by rounding to the nearest ten. 30) _____
83
– 46

31) Estimate by rounding to the nearest hundred. 31) _____
766
× 668

Round the number to the place value indicated.

32) 98,213 32) _____

33) 63,037 33) _____

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34) 21,629,336 34) _____

35) 61,005 35) _____

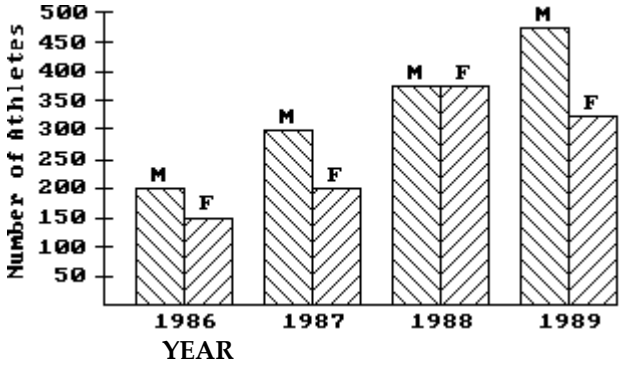
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Estimate the answer. State whether the estimate is larger or smaller than the exact answer.

36) Each gallon of porch and deck paint covers 200 square feet. How many gallons are needed to cover 1980 square feet? 36) _____

A) 10; larger B) 11; larger C) 8; smaller D) 9; smaller

Refer to the double–bar graph below which shows the number of male (M) and female (F) athletes at a university over a four–year period. Solve the problem.



37) In which year was the number of male athletes equal to 375? 37) _____

A) 1987 B) 1989 C) 1986 D) 1988

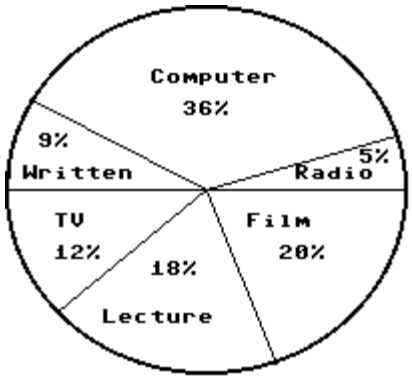
38) How many more male athletes than female athletes were there in 1987? 38) _____

A) 50 B) 150 C) 100 D) 0

39) What was the amount of the decrease in the number of female athletes from 1988 to 1989? 39) _____

A) 50 B) 100 C) 75 D) 200

In a school survey, students showed these preferences for instructional materials. Answer the question.



40) About how many students would you expect to prefer written materials in a school of 300 students? 40) _____

A) About 9 students B) About 54 students

C) About 108 students D) About 27 students

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41) About how many students would you expect to prefer lectures in a school of 950 students? 41) _____

A) About 342 students
B) About 190 students
C) About 18 students
D) About 171 students

42) About how many students would you expect to prefer films in a school of 900 students? 42) _____

A) About 162 students
B) About 108 students
C) About 20 students
D) About 180 students

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Answer Key
Testname: CHAPTER 1 EXAM B

1) False. Possible counterexample is that C is the granddaughter of A.
2) False. Possible counterexample: Let the original price be $1000. After the price is raised, it will be $1000 + 150 = \$1150$. After this is reduced by 15% it will be $1150 - 0.15 \cdot 1150 = \$977.50$.
3) Answers will vary. Possible answer is a circle labeled "ice cream" connected by lines to three other circles labeled "chocolate," strawberry," and "banana."
4) Answers will vary. Possible answer is 3 circles linked like a chain.
5) Answers will vary. One possibility: the first arrow is single-lined, and the second is double-lined.
6) Answers will vary. One possibility is: the first -11 is enclosed in absolute value bars and the second is in brackets.
7) B
8) C
9) B
10) A
11) C
12) D
13) B
14) A
15) $280
16) 90
17) Inductive
18) Deductive
19) Deductive
20) 13 + 19
21) 7 + 23
22) 17 + 31
23) 17 + 23
24) C
25) A
26) B
27) A
28) C
29) 300
30) 30
31) 560,000
32) 98,000
33) 63,000
34) 22,000,000
35) 61,000
36) A
37) D
38) C
39) A
40) D
41) D
42) D

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Chapter 2 Exam A

Name_____

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

Use the following definitions to determine if the statement is true or false.
N = {x : x is a natural number}
I = {x : x is an integer}
R = {x : x is a real number}
W = {x : x is a whole number}
Q = {x : x is a rational number}

1) W is a proper subset of I, Q, and R. 1) _____
A) True B) False

2) Q is a proper subset of R. 2) _____
A) True B) False

3) I is a proper subset of Q and R. 3) _____
A) True B) False

4) W is a proper subset of I, Q, N, and R. 4) _____
A) True B) False

Let U = {all soda pops}; A = {all diet soda pops}; B = {all cola soda pops}; C = {all soda pops in cans}; and D = {all caffeine–free soda pops}. Describe the given set in words.

5) $A' \cap C$ 5) _____
A) All non–diet soda pops in cans
B) All diet soda pops and all soda pops in cans
C) All non–diet soda pops and all soda pops in cans
D) All diet soda pops in cans

6) $A \cap B$ 6) _____
A) All soda pops B) All diet and all cola soda pops
C) All diet or all cola soda pops D) All diet–cola soda pops

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Determine whether the set is well defined or not.

7) {x : x is an expensive boat on the Great Lakes} 7) _____

8) {x : x is stock on the AmEx today} 8) _____

9) {x : x is a low–fat ice cream} 9) _____

Identify the set as finite or infinite.

10) {2, 4, 6, 8, ...} 10) _____

11) The set of multiples of 3 between 0 and 100 11) _____

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12) The set of stars in the Milky Way Galaxy at 12:00 A.M. on January 1, 2000 12) _____

13) {1, 1/3, 1/9, 1/27, . . .} 13) _____

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

Decide whether the sets are equivalent.

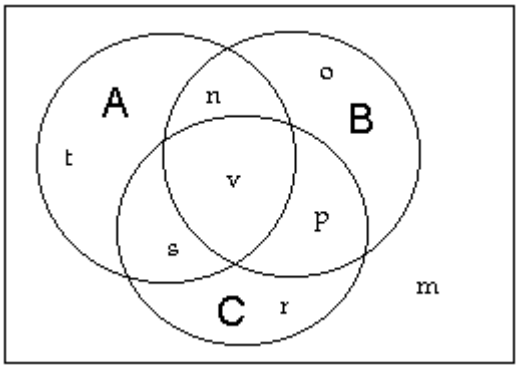
14) {d: d is a month of the year} and {g : g is a state in the United States} 14) _____

A) No B) Yes

15) {64, 26, 87, 9, 68} and {z, m, c, u, y} 15) _____

A) Yes B) No

Determine which labeled sections make up the indicated set.



16) B ∩ C 16) _____

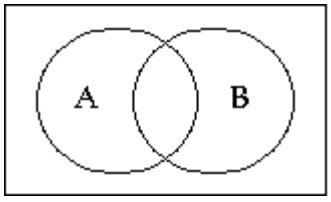
A) v, p B) s, v, p C) n, o, p, r, v, s D) p

17) C ∩ A ∩ B 17) _____

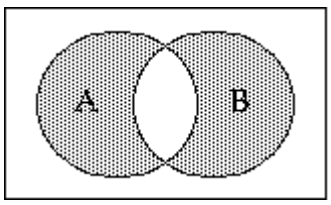
A) n, v, s, p B) v C) o D) t, s, v, n, o, p, r

Shade the Venn diagram to represent the set.

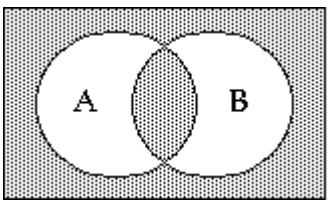
18) (A ∩ B) ∪ (A ∪ B)' 18) _____



A)



B)



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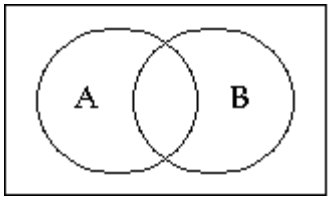
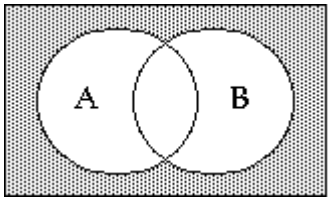
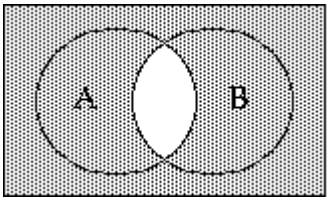
19) $A' \cup B'$ 19) _____



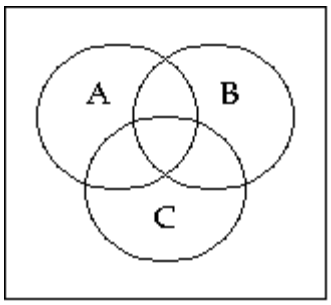
A)



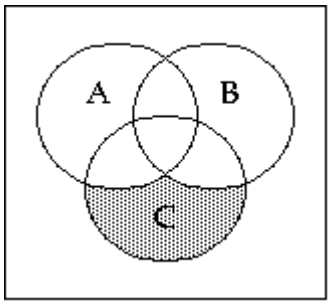
B)



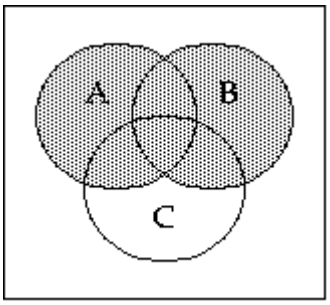
20) $(A \cup B \cup C')'$ 20) _____



A)



B)



Decide whether the sets are equal.

21) {b: b is a positive integer} and {k : k is a counting number} 21) _____

A) Yes B) No

22) {parsley, thyme, saffron, oregano} and {y : y is an herb} 22) _____

A) No B) Yes

Use an alternative method to express the set.

23) {t, a, b, l, e} 23) _____

A) {z : z is a letter in the word table} B) {table}

C) {z : z is a table} D) (z is a letter in table)

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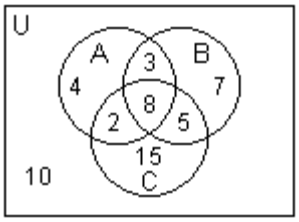
24) {d : d is a letter in the word cat and also in the word in} 24) _____

A) {∅} B) (c, a, t, i, n) C) {c, a, t, i, n} D) { }

Use the Venn diagram below to find the number of elements in the region.



25) n(A ∩ B ∩ C) 25) _____

A) 8 B) 18 C) 44 D) 16

26) n((C ∪ B) – (A ∪ B)) 26) _____

A) 5 B) 2 C) 15 D) 11

27) n(A) 27) _____

A) 9 B) 17 C) 4 D) 12

Use set notation to list all the elements of the set.

28) The letters needed to spell these words: 28) _____

tear, rate, rat, tea

A) {t,t,t,t,r,r,r,a,a,a,a,e,e,e} B) {t,t,a,a,r,r,e}

C) {a,e,r,t} D) {r,a,t}

29) {x : x is an integer between 15 and 18 not inclusive} 29) _____

A) {16, 17} B) {16} or {17}

C) {14, 15, 16, 17, 18, 19} D) {15, 16, 17, 18}

30) {x : x is an even natural number less than 10} 30) _____

A) {0, 1, 2, 3, 4, 5, 6, 7, 8, 9} B) {0, 2, 4, 6, 8}

C) {1, 2, 3, 4, 5, 6, 7, 8, 9} D) {2, 4, 6, 8}

31) The whole numbers between –3 and 0, not inclusive 31) _____

A) {0} B) ∅ C) {–3, –2, –1, 0} D) {–2, –1}

Let A and B be sets with cardinal numbers, n(A) = a and n(B) = b, respectively. Decide whether the statement is true or false.

32) (B ∪ A) ⊂ B 32) _____

A) True B) False

33) If B ⊆ A, n(B) = n(A – B). 33) _____

A) True B) False

34) n(A – B) = n(B – A) 34) _____

A) True B) False

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35) $n(A \cup B) = n(A) - n(B)$ 35) _____

A) True B) False

Find the cardinal number of the indicated set by referring to the given table.

36) $A - (F \cup S)$, 36) _____

given the following table:

U.S. Production (in Thousands of Tons) of Certain Nuts				
Year	Pecans (P)	Almonds (A)	Walnuts (W)	Hazelnuts (H)
1993 (T)	184	584	232	41
1994 (F)	99	587	232	21
1995 (V)	134	304	230	39
1996 (S)	111	412	205	22

A) 888 B) 175 C) 999 D) 759

37) $V \cap (P \cup W)$, 37) _____

given the following table:

U.S. Production (in Thousands of Tons) of Certain Nuts				
Year	Pecans (P)	Almonds (A)	Walnuts (W)	Hazelnuts (H)
1993 (T)	183	584	232	41
1994 (F)	99	586	232	21
1995 (V)	134	304	235	39
1996 (S)	111	412	205	22

A) 158 B) 0 C) 369 D) 343

Replace the # with either $\in$ or $\notin$ to express a true statement.

38) -4.5 # {n : n is a whole number} 38) _____

A) $\notin$ B) $\in$

39) Iowa # {r : r is a state in the United States} 39) _____

A) $\notin$ B) $\in$

Find n(A) for the set.

40) $A = \{\emptyset, 0\}$ 40) _____

A) $n(A) = 0$ B) $n(A) = 2$ C) $n(A) = \emptyset$ D) $n(A) = 1$

41) $A = \{-9, -8, -7, \ldots, 0\}$ 41) _____

A) $n(A) = 1$ B) $n(A) = 10$ C) $n(A) = 9$ D) $n(A) = 4$

42) $A = \{0, 2, 4, 6, 8\}$ 42) _____

A) $n(A) = 4$ B) $n(A) = 8$ C) $n(A) = 5$ D) $n(A) = 2$

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Find, if possible, the number of elements in sets A, B, and C using the given information.

43) $n(A - C) = 10$ 43) _____
$n(C - A) = 3$
$n(A \cap B) = 8$
$n(C \cap A) = 8$
$n(C \cap B) = 6$
$n(B - A) = 8$
$n(A \cap B \cap C) = 4$
A) $n(A) = 22, n(B) = 20, n(C) = 15$
B) $n(A) = 18, n(B) = 16, n(C) = 11$
C) $n(A) = 11, n(B) = 27, n(C) = 18$
D) The information is inconsistent or incomplete.

44) $n(A - C) = 10$ 44) _____
$n(C - A) = 2$
$n(A \cup C) = 22$
$n(A \cap B) = 10$
$n((C \cap A) - B) = 4$
$n((A \cap B) - C) = 4$
$n(B - (A \cup C)) = 3$
$n(B \cap C) = 7$
A) $n(A) = 12, n(B) = 25, n(C) = 20$
B) $n(A) = 20, n(B) = 14, n(C) = 12$
C) $n(A) = 16, n(B) = 18, n(C) = 12$
D) The information is inconsistent or incomplete.

Show that the set has cardinal number $\aleph_0$ by establishing a one–to–one correspondence between the natural numbers and the given set. Be sure to indicate the general correspondence.

45) {5, 25, 125, 625, ...} 45) _____

A) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ 5, & 25, & 125, & 625, & \ldots, & 5^{2n}, & \ldots \end{array}$

B) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ 5, & 25, & 125, & 625, & \ldots, & n^5, & \ldots \end{array}$

C) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ 5, & 25, & 125, & 625, & \ldots, & 5^n, & \ldots \end{array}$

D) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ 5, & 25, & 125, & 625, & \ldots, & 5n, & \ldots \end{array}$

46) $\left\{\frac{1}{3}, \frac{3}{5}, \frac{5}{7}, \frac{7}{9}, \frac{9}{11}, \ldots\right\}$ 46) _____

A) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ \frac{1}{3}, & \frac{3}{5}, & \frac{5}{7}, & \frac{7}{9}, & \frac{9}{11}, & \ldots, & \frac{3n-1}{n+1}, & \ldots \end{array}$

B) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ \frac{1}{3}, & \frac{3}{5}, & \frac{5}{7}, & \frac{7}{9}, & \frac{9}{11}, & \ldots, & \frac{2n+1}{2n-1}, & \ldots \end{array}$

C) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ \frac{1}{3}, & \frac{3}{5}, & \frac{5}{7}, & \frac{7}{9}, & \frac{9}{11}, & \ldots, & \frac{2n-1}{2n+1}, & \ldots \end{array}$

D) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ \frac{1}{3}, & \frac{3}{5}, & \frac{5}{7}, & \frac{7}{9}, & \frac{9}{11}, & \ldots, & \frac{n+1}{3n-1}, & \ldots \end{array}$

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47) {0, 3, 6, 9, 12, ...} 47) _____

A) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
0, 3, 6, 9, ..., 3n, ...

B) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
0, 3, 6, 9, ..., 3n + 3, ...

C) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
0, 3, 6, 9, ..., 3n – 3, ...

D) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
0, 3, 6, 9, ..., 3n – 1, ...

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

List the subsets.

48) List all of the three element subsets of the set {a, b, c, d}. 48) _____

49) List all of the two element subsets of the set {a, b, c, d, e}. 49) _____

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

Find the number of subsets of the set.

50) {math, English, history, science, art} 50) _____

A) 24 B) 16 C) 32 D) 28

51) {14, 15, 16} 51) _____

A) 3 B) 7 C) 6 D) 8

52) {0} 52) _____

A) 4 B) 0 C) 2 D) 1

Decide whether the statement is true or false.

53) {12, 84, 145, 264} ⊆ {12, 24, 36, ..., 1080} 53) _____

A) True B) False

54) {12, 20, 32, 52} ⊆ {2, 4, 6, 8, ..., 98} 54) _____

A) True B) False

Describe a one–to–one correspondence between the given set and one of its proper subsets. For example, if we gave you the set {3, 5, 7, 9, 11, ...}, the nth term is 2n +1. You could then write the correspondence by matching the elements of {3, 5, 7, 9, 11, ...} with the elements of the subset {5, 7, 9, 11, 13, ...}. The general correspondence would match 2n + 1 with 2n + 3.

55) {5, 6, 7, 8, ...} 55) _____

A) 5, 6, 7, 8, ..., n + 4, ...
↕ ↕ ↕ ↕ ↕
4, 5, 6, 7, ..., n + 3, ...

B) 5, 6, 7, 8, ..., n + 4, ...
↕ ↕ ↕ ↕ ↕
6, 7, 8, 9, ..., n + 5, ...

C) 5, 6, 7, 8, ..., n + 5, ...
↕ ↕ ↕ ↕ ↕
4, 5, 6, 7, ..., n + 3, ...

D) 5, 6, 7, 8, ..., n + 4, ...
↕ ↕ ↕ ↕ ↕
6, 7, 8, 9, ..., n + 6, ...

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Let U = {q, r, s, t, u, v, w, x, y, z}
A = {q, s, u, w, y}
B = {q, s, y, z}
C = {v, w, x, y, z}. List the elements in the set.

56) $A \cap (B \cup C)$ 56) _____

A) {q, y, z} B) {q, s, u, w, y, z} C) {q, s, w, y} D) {q, r, w, y, z}

57) $C' \cup A'$ 57) _____

A) {w, y} B) {q, s, u, v, w, x, y, z}
C) {s, t} D) {q, r, s, t, u, v, x, z}

58) $(A \cap B)'$ 58) _____

A) {q, s, t, u, v, w, x, y} B) {r, t, u, v, w, x, z}
C) {s, u, w} D) {t, v, x}

Describe the indicated set in words and find the set.

59) $P - (E \cup C)'$, given the following information: 59) _____

The table gives features of different dishwashers

model	price (dollars)	clean china	clean glassware	energy efficiency	water usage
a	712	excellent	good	good	low
b	455	excellent	good	fair	moderate
c	554	excellent	good	good	high
d	606	excellent	good	good	high
e	556	good	fair	good	low
f	385	excellent	fair	good	moderate
g	480	good	fair	fair	moderate
h	361	good	fair	fair	moderate
i	263	fair	poor	good	moderate

In the universal set U = {a, b, c, ..., i}, let the following characteristics be defined:
P = price is at or below $455
C = does an excellent job of cleaning china
G = does an excellent job of cleaning glassware
E = has a good energy efficiency rating
F = has low water usage

A) Dishwashers that cost $455 or less and either have a good energy efficiency rating or do an excellent job of cleaning china; {h}
B) Dishwashers that cost $455 or less and have both a low energy efficiency rating and do an excellent job of cleaning china; {f}
C) Dishwashers that cost $455 or less and have either a low energy efficiency rating or do an excellent job of cleaning china; {a, b, c, d, e, f, h, i}
D) Dishwashers that cost $455 or less and either have a good energy efficiency rating or do an excellent job of cleaning china; {b, f, i}

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60) $(P \cup L) - (S \cap C)$, given the following information: 60) _____

The table gives the approximate nutritional value per serving of foods at a certain restaurant.

food	calories	protein (grams)	fat (grams)	calcium (mg)	sodium (mg)	vitamin A (A.U.)
Chow Mein	240	23	16	75	1250	1100
Pizza (cheese)	120	15	9	220	705	2720
Bean Burrito	340	20	4	185	1230	80
Linguini & Meatballs	330	19	13	124	1009	1590
Pea Soup	250	7	7	158	900	850
Chicken Salad	210	33	8	28	360	100
Ice Cream	270	3	13	145	98	420

Let:
C = {m : m provides 251 or more calories}
P = {m : m provides 20 or more grams of protein}
F = {m : m provides 10 or more grams of fat}
L = {m : m provides 150 or more mg of calcium}
S = {m : m provides 1000 or more mg of sodium}
A = {m : m provides 1000 or more A.U. of Vitamin A}

A) Foods that have either 20 or more grams of protein or 150 or more mg of calcium, but do not have both 1000 or more mg of sodium and 251 or more calories; {Chow Mein, Pizza, Pea Soup, Chicken Salad}

B) Foods that have either 20 or more grams of protein or 150 or more mg of calcium, but do not have either 1000 or more mg of sodium or 251 or more calories; {Chow Mein, Pizza, Pea Soup, Chicken Salad}

C) Foods that have both 20 or more grams of protein and 150 or more mg of calcium, but do not have both 1000 or more mg of sodium and 251 or more calories; ∅

D) Foods that have either 20 or more grams of protein or 150 or more mg of calcium, and also have either 1000 or more mg of sodium or 251 or more calories; {Chow Mein, Pizza, Bean Burrito, Pea Soup, Chicken Salad}

Solve the problem.

61) A local television station sends out questionnaires to determine if viewers would rather see a documentary, an interview show, or reruns of a game show. There were 450 responses with the following results: 61) _____

135 were interested in an interview show and a documentary, but not reruns.
18 were interested in an interview show and reruns but not a documentary.
63 were interested in reruns but not an interview show.
108 were interested in an interview show but not a documentary.
45 were interested in a documentary and reruns.
27 were interested in an interview show and reruns.
36 were interested in none of the three.

How many are interested in exactly one kind of show?

A) 216 B) 226 C) 196 D) 206

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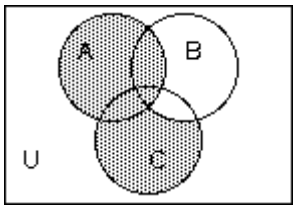
62) A survey of 240 families showed that 62) _____
91 had a dog;
70 had a cat;
31 had a dog and a cat;
91 had neither a cat nor a dog nor a parakeet;
7 had a cat, a dog, and a parakeet.

How many had a parakeet only?

A) 24 B) 29 C) 19 D) 34

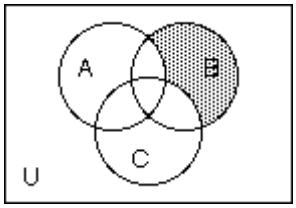
Write a description of the shaded region using the symbols A, B, C, ∪, ∩, –, and ′ as needed.

63) 63) _____



A) B′ ∩ A ∪ C B) C ∩ B′ ∪ A C) A ∪ C – B D) A ∪ C

64) 64) _____



A) B ∩ (A ∩ C)′ B) B′ – (A ∪ B) C) B – (A ∩ C) D) A′ ∩ C′ ∩ B

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1) A
2) A
3) A
4) B
5) A
6) D
7) Not well defined
8) Well defined
9) Not well defined
10) Infinite
11) Finite
12) Finite
13) Infinite
14) A
15) A
16) A
17) B
18) B
19) B
20) A
21) A
22) A
23) A
24) D
25) A
26) C
27) B
28) C
29) A
30) D
31) B
32) B
33) B
34) B
35) B
36) A
37) C
38) A
39) B
40) B
41) B
42) C
43) B
44) B
45) C
46) C
47) C
48) {a, b, c}, {a, b, d}, {a, c, d}, {b, c, d}
49) {a, b}, {a, c}, {a, d}, {a, e}, {b, c}, {b, d}, {b, e}, {c, d}, {c, e}, {d, e}
50) C

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51) D
52) C
53) B
54) A
55) B
56) C
57) D
58) B
59) D
60) A
61) A
62) C
63) B
64) D

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SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Draw a picture to illustrate the situation.

1) A school has a Spanish Club, a French Club, and a Drama Club, which have 21 members each. The Spanish and Drama Club have 5 members in common. The Drama and French Club have 5 members in common. The Spanish and French club have no members in common.

   Answer: Answers will vary. Possible answer is 3 circles linked like a chain.

2) At Moira's birthday party, each guest has a choice of chocolate, strawberry, or banana topping on vanilla ice cream.

   Answer: Answers will vary. Possible answer is a circle labeled "ice cream" connected by lines to three other circles labeled "chocolate," strawberry," and "banana."

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

Decide which set of names would be most meaningful for the indicated items.

3) On a bookshelf there are 3 math books, 4 science books, and 3 history books.

   A) m, s, and h B) 3, 4, and 3 C) x, y, and z D) b_1, b_2, and b_3

   Answer: A

4) Randy and Christy are sharing servings of root beer and cake.

   A) R, C, b, and k B) p_1, p_2, f_1, and f_2 C) x, w, z, and w D) r, c, r, and c

   Answer: A

5) Karina is buying fabric to make a cloth for a table that is 4 times as long as it is wide.

   A) L, W B) K, c C) a, b D) f, c

   Answer: A

6) A fish tank is 4 times as long as it is wide, and has a volume of 23 gallons.

   A) l, $4 \cdot$ l, g B) L, V, W C) x, y D) t, g

   Answer: B

List the items mentioned. Try to organize your list in a systematic way.

7) Slips of paper numbered 1 through 5 are put in a hat. One slip is drawn and called and then a second slip is drawn without replacing the first. List all possible ways the two numbers could be called.

   A) (1, 2), (1, 3), (1, 4), (1, 5), (2, 1), (2, 3), (2, 4), (2, 5), (3, 1), (3, 2), (3, 4), (3, 5), (4, 1), (4, 2), (4, 3), (4, 5), (5, 1), (5, 2), (5, 3), (5, 4)

   B) (1, 2), (2, 1), (3, 2), (2, 3), (3, 1), (4, 2), (2, 4), (4, 1), (4, 3), (3, 4), (5, 1), (1, 5), (4, 5), (5, 4), (1, 4), (1, 3), (3, 5)

   C) (1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (2, 1), (2,2), (2, 3), (2, 4), (2, 5), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5)

   D) (1, 2), (1, 3), (1, 4), (1, 5), (2, 3), (2, 4), (2, 5), (3, 4), (3, 5), (4, 1), (4, 2), (4, 3), (4, 5)

   Answer: A

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8) A two–person team is being chosen from Amber, Barb, Carlo, and Donna. Use a letter to represent each person and list all possible teams.

A) (A, B), (B, A), (A, C), (C, A), (A, D), (D, A), (B, B), (B, C), (C, B), (C, D), (D, C), (B, D), (D, B)

B) (A, A), (A, B), (A, C), (A, D), (B, A), (B, B), (B, C), (B, D), (C, A), (C, B), (C, C), (C, D), (D, A), (D, B), (D, C), (D, D)

C) (A, B), (A, C), (A, D), (B, A), (B, C), (B, D), (C, A), (C, B), (C, D), (D, A), (D, B), (D, C)

D) (A, B), (A, C), (A, D), (B, C), (B, D), (C, D)

Answer: D

9) A frozen yogurt stand has chocolate and vanilla yogurt. For toppings it has nuts, sprinkles, or candy pieces. List all combinations that use one flavor and one topping.

A) (chocolate, nuts), (vanilla, sprinkles), (sprinkles, chocolate), (nuts, vanilla), (candy, vanilla), (chocolate, candy), (chocolate, vanilla)

B) (chocolate, nuts), (nuts, chocolate), (vanilla, sprinkles), (sprinkles, chocolate), (nuts, vanilla), (candy, vanilla), (chocolate, candy)

C) (chocolate, nuts), (chocolate, sprinkles), (chocolate, candy), (vanilla, nuts), (vanilla, sprinkles), (vanilla, candy)

D) (chocolate, nuts), (chocolate, sprinkles), (chocolate, candy), (vanilla, nuts), (vanilla, sprinkles), (vanilla, candy), (candy, chocolate), (candy, vanilla), (sprinkles, chocolate), (sprinkles, vanilla)

Answer: C

10) A coin is flipped and a 6–sided number cube is rolled. Use H for heads and T for tails, and list all possible outcomes.

A) (1, H), (1, T), (2, H), (2, T), (3, H), (3, T), (4, H), (4, T), (5, H), (5, T), (6, H), (6, T)

B) (1, H), (H, 1), (1, T), (T, 1), (2, H), (H, 2), (2, T), (3, H), (H, 3), (3, T), (T, 3), (4, H), (H, 4). (4, T), (T, 4). (5, H), (H, 5), (5, T), (T, 5), (6, H), (H, T), (6, T), (T, 6)

C) (H, 1), (H, 2), (H, 3), (H,4), (H, 5), (H, 6)

D) (H, 1), (T, 2), (H, 3), (T, 4), (H, 5), (T, 6)

Answer: A

Continue the pattern for five more items in the list.

11) 5, 8, 11, 14, ...

A) 17, 19, 21, 23, 25 B) 18, 22, 26, 29, 33 C) 17, 20, 23, 26, 29 D) 18, 23, 29, 36, 44

Answer: C

12) 5, 10, 15, 20, ...

A) 25, 31, 37, 43, 49 B) 26, 32, 38, 44, 50 C) 10, 16, 23, 31, 40 D) 25, 30, 35, 40, 45

Answer: D

13) aaa, aab, aba, ...

A) baa, abb, bab, bba, bbb B) abc, acb, cab, caa, cba

C) baa, aba, abb, bbb, baa D) bab, baa, aba, bbb, bba

Answer: A

14) 180, 173, 166, 159, ...

A) 325, 484, 809, 1,293, 2,172 B) 152, 148, 144, 140, 136

C) 155, 151, 147, 143, 139 D) 152, 145, 138, 131, 124

Answer: D

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Solve the problem by guessing and adjusting.

15) Ramon spent twice as long on his English homework as he did on his History homework. If he spent 120 minutes on the two combined, then how long did he spend on his History homework?

A) 40 minutes B) 20 minutes C) 24 minutes D) 80 minutes

Answer: A

16) Corinne is making a beaded necklace. She has 3 times as many green beads as red beads, and twice as many blue beads as green beads. If she has 90 beads all together, how many of the beads are blue?

A) 27 B) 18 C) 45 D) 54

Answer: D

17) After he had worked at the video store for 6 months, Hilton got a 10% raise and a $75 bonus. If he earned $427 with the raise and bonus, how much was he earning before?

A) $433.28 B) $320 C) $388.10 D) $352

Answer: B

18) Mitra created a mosaic design using square 2–by–2 cm white tiles and rectangular 2–by–3 centimeter black tiles. She used twice as many white tiles as black tiles. The finished pattern was 616 square centimeters in area. How many rectangular tiles did she use?

A) 6 B) 90 C) 88 D) 44

Answer: D

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Determine whether the statement is true or false. If it is true, give two examples to illustrate it. If it is false, give a single counterexample.

19) If A is the father of B, and B is the father of C, then C is the grandson of A.

Answer: False. Possible counterexample is that C is the granddaughter of A.

20) If you make the sides of a square 5 times longer, the area of the square is 25 times larger.

Answer: True. Possible illustration: A square with sides of 2 cm has an area of 4 square centimeters. If the sides are increased to 10 centimeters, the area becomes 100 square centimeters.

21) If the price of an air conditioner is raised by 14% and then lowered by 14%, the price will be the same as the original price.

Answer: False. Possible counterexample: Let the original price be $1000. After the price is raised, it will be $1000 + 140 = \$1{,}140$. After this is reduced by 14% it will be $1{,}140 - 0.14 \cdot 1{,}140 = \$980.40$.

22) If Janice got a higher grade than Rachel, and Steve got a lower grade than Rachel, then Steve got a lower grade than Janice.

Answer: True. Possible illustration. Suppose Janice scored 90, Rachel scored 80, and Steve scored 70. Then Steve's score is lower than Janice's score.

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

Decide whether the two sequences of operations give the same result.

23) Squaring a number, then multiplying it by 7; multiplying a number by 7 and then squaring the product

A) Yes B) No

Answer: B

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24) Adding m and n and then multiplying the sum by 6; multiplying m by 6, multiplying n by 6, and then adding the two products

A) No B) Yes

Answer: B

25) Subtracting y from x and adding the difference to z; adding x to z and then subtracting y

A) Yes B) No

Answer: A

26) Dividing r by 3, then dividing s by 3, then multiplying the quotients; multiplying r and s, then dividing by 3.

A) Yes B) No

Answer: B

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Explain the difference between the symbols.

27) $|-10|$ and $[-10]$

Answer: Answers will vary. One possibility is: the first –10 is enclosed in absolute value bars and the second is in brackets.

28) $\subseteq$ and $\subset$

Answer: Answers will vary. One possibility: the first symbol has a line beneath it, and the second does not.

29) $(-3)^9$ and $-(3)^9$

Answer: Answers will vary. One possibility: in the first expression, the minus sign is inside the parentheses and in the second expression it is outside the parentheses.

30) $\leftrightarrow$ and $\Leftrightarrow$

Answer: Answers will vary. One possibility: the first arrow is single–lined, and the second is double–lined.

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

Decide whether the argument is an example of inductive or deductive reasoning.

31) The last four mayors were Democrats, therefore the next will be a Democrat.

A) Inductive B) Deductive

Answer: A

32) Fresh fruit costs more in winter. This is January. These fresh strawberries cost more.

A) Inductive B) Deductive

Answer: B

33) Every coach must know his sport well. John Madden was a football coach. John Madden knows football well.

A) Deductive B) Inductive

Answer: A

34) $29 + 7 = 36$, $47 + 47 = 94$, $23 + 41 = 64$. The sum of two prime numbers is even.

A) Deductive B) Inductive

Answer: B

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35) Practice makes perfect. Therefore, if I practice, I'll be perfect.
A) Deductive B) Inductive
Answer: A

36) All U.S. Presidents have come from the original 48 states. No person from Alaska can be President.
A) Deductive B) Inductive
Answer: B

37) $|-p| = p$, therefore $|-82| = 82$
A) Inductive B) Deductive
Answer: B

38) If $(-p)^2 = p^2$, then $(-4)^2 = 16$
A) Inductive B) Deductive
Answer: B

Use inductive reasoning.

39) Use inductive reasoning to predict the next term in the sequence of numbers.
4, 11, 18, 25, 32, ?
A) 38 B) 36 C) 46 D) 39
Answer: D

40) Use inductive reasoning to predict the next term in the sequence of numbers.
41, 34, 27, 20, 13, ?
A) 2 B) 6 C) 0 D) 7
Answer: B

41) Use inductive reasoning to predict the next term in the sequence of numbers.
6, –18, 54, –162, 486, ?
A) –810 B) 810 C) –1,458 D) 1,458
Answer: C

42) Use inductive reasoning to predict the next term in the sequence of numbers.
0, 2, 2, 0, –2, ?
A) 4 B) 0 C) –2 D) 2
Answer: C

43) Use inductive reasoning to predict the next term in the sequence of numbers.
$1, -\frac{1}{4}, \frac{1}{16}, -\frac{1}{64}, \frac{1}{256}, ?$
A) $\frac{1}{4096}$ B) $-\frac{1}{4096}$ C) $\frac{1}{1024}$ D) $-\frac{1}{1024}$
Answer: D

44) Use inductive reasoning to predict the next term in the sequence of numbers.
3, 5, 6, 10, 12, 20, ?
A) 18 B) 40 C) 30 D) 24
Answer: D

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45) How many different squares are there in a 4 by 4 square? Use inductive reasoning to answer.

A) 21 B) 30 C) 16 D) 14

Answer: B

46) How many different squares are there in a 6 by 6 square? Use inductive reasoning to answer.

A) 36 B) 91 C) 50 D) 37

Answer: B

47) How many different squares are there in an 8 by 8 square? Use inductive reasoning to answer.

A) 204 B) 285 C) 65 D) 64

Answer: A

48) How many different squares are there in a 9 by 9 square? Use inductive reasoning to answer.

A) 81 B) 285 C) 82 D) 204

Answer: B

Illustrate Goldback's conjecture for the following number.

49) 12

A) 3 + 9 B) 6 + 6 C) 5 + 7 D) $2^2 \cdot 3$

Answer: C

50) 24

A) 12 + 12 B) 11 + 13 C) $2^3 \cdot 3$ D) 3 + 21

Answer: B

51) 30

A) $2 \cdot 3 \cdot 5$ B) 5 + 25 C) 15 + 15 D) 7 + 23

Answer: D

52) 32

A) 13 + 19 B) 16 + 16 C) 2^5 D) 7 + 25

Answer: A

53) 36

A) $2^2 \cdot 3^2$ B) 18 + 18 C) 7 + 29 D) 3 + 33

Answer: C

54) 40

A) $2^3 \cdot 5$ B) 13 + 27 C) 17 + 23 D) 20 + 20

Answer: C

55) 48

A) 24 + 24 B) 13 + 35 C) $2^4 \cdot 3$ D) 17 + 31

Answer: D

56) 60

A) 30 + 30 B) 3 + 57 C) 19 + 41 D) $2^2 \cdot 3 \cdot 5$

Answer: C

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57) 50

A) 25 + 25 B) 13 + 37 C) 17 + 33 D) $2 \cdot 5^2$

Answer: B

58) 100

A) 49 + 51 B) $2^2 \cdot 5^2$ C) 50 + 50 D) 47 + 53

Answer: D

Round the number to the place value indicated.

59) 9$\underline{2}$5

A) 920 B) 930 C) 940 D) 1,030

Answer: B

60) 80,2$\underline{5}$7

A) 80,270 B) 80,360 C) 80,260 D) 80,250

Answer: C

61) $\underline{6}$37

A) 610 B) 500 C) 700 D) 600

Answer: D

62) 41,$\underline{3}$29

A) 41,200 B) 41,310 C) 41,300 D) 41,400

Answer: C

63) $\underline{6}$120

A) 7,000 B) 5,900 C) 6,100 D) 6,000

Answer: D

64) $\underline{8}$712

A) 9,100 B) 10,000 C) 8,890 D) 9,000

Answer: D

65) 2$\underline{9}$,305

A) 30,000 B) 29,100 C) 39,000 D) 29,000

Answer: D

66) 5$\underline{9}$,006

A) 60,000 B) 59,100 C) 59,010 D) 59,000

Answer: D

67) 3$\underline{1}$5,956

A) 320,000 B) 315,000 C) 310,000 D) 400,000

Answer: A

68) 3$\underline{1}$,912,463

A) 32,000,000 B) 31,1,000,000 C) 31,000,000 D) 31,912,000

Answer: A

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Estimate the answer by rounding as indicated.

69) Estimate by rounding to the nearest ten.

$$\begin{array}{r} 24 \\ 51 \\ 84 \\ 81 \\ +\ 18 \\ \hline \end{array}$$

A) 258 B) 260 C) 250 D) 300

Answer: C

70) Estimate by rounding to the nearest ten.

$$\begin{array}{r} 46 \\ -\ 24 \\ \hline \end{array}$$

A) 70 B) 30 C) 20 D) 22

Answer: B

71) Estimate by rounding to the nearest ten.

$$\begin{array}{r} 76 \\ \times\ 66 \\ \hline \end{array}$$

A) 5,600 B) 5,016 C) 150 D) 5,020

Answer: A

72) Estimate by rounding to the nearest hundred.

$$\begin{array}{r} 999 \\ 993 \\ 185 \\ 859 \\ +\ 586 \\ \hline \end{array}$$

A) 3,620 B) 3,622 C) 3,600 D) 3,700

Answer: D

73) Estimate by rounding to the nearest hundred.

$$\begin{array}{r} 853 \\ -\ 737 \\ \hline \end{array}$$

A) 100 B) 200 C) 116 D) 1,600

Answer: B

74) Estimate by rounding to the nearest hundred.

$$\begin{array}{r} 607 \\ \times\ 522 \\ \hline \end{array}$$

A) 300,000 B) 316,854 C) 1,100 D) 316,900

Answer: A

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Estimate the answer using compatible numbers.

75) 6.9% × 291

A) 210 B) 21 C) 12 D) 120

Answer: B

76) 422 ÷ 50

A) 10 B) 8 C) 9 D) 7

Answer: B

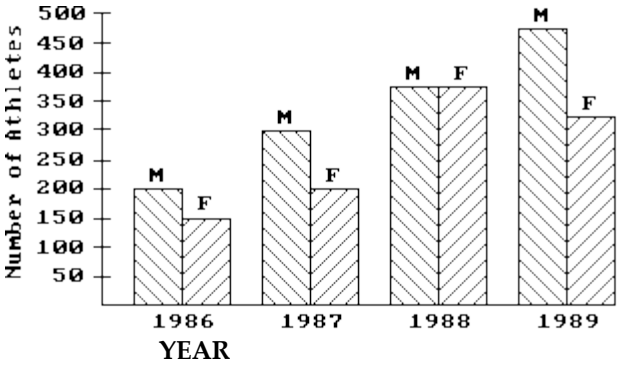
Estimate the answer. State whether the estimate is larger or smaller than the exact answer.

77) Each gallon of porch and deck paint covers 200 square feet. How many gallons are needed to cover 1,365 square feet?

A) 7; larger B) 5; smaller C) 6; smaller D) 8; larger

Answer: A

Refer to the double–bar graph below which shows the number of male (M) and female (F) athletes at a university over a four–year period. Solve the problem.



78) How many female athletes were there in 1987?

A) 150 B) 200 C) 500 D) 300

Answer: B

79) In which year was the number of male athletes equal to 375?

A) 1988 B) 1987 C) 1986 D) 1989

Answer: A

80) Find the increase in the number of female athletes from 1986 to 1987.

A) 75 B) 100 C) 50 D) 200

Answer: C

81) What was the amount of the decrease in the number of female athletes from 1988 to 1989?

A) 100 B) 50 C) 75 D) 200

Answer: B

82) How many students were involved in athletics in 1989?

A) 825 B) 775 C) 800 D) 750

Answer: C

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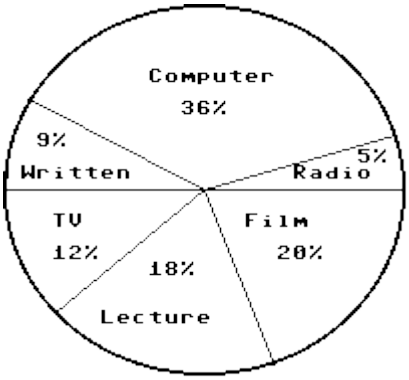
83) How many more male athletes than female athletes were there in 1986?
A) 50 B) 150 C) 100 D) 0
Answer: A

84) How many more male athletes than female athletes were there in 1987?
A) 100 B) 50 C) 150 D) 0
Answer: A

85) How many more male athletes than female athletes were there in 1989?
A) 0 B) 150 C) 50 D) 100
Answer: B

In a school survey, students showed these preferences for instructional materials. Answer the question.



86) About how many students would you expect to prefer computers in a school of 850 students?
A) About 153 students B) About 170 students C) About 36 students D) About 306 students
Answer: D

87) About how many students would you expect to prefer lectures in a school of 550 students?
A) About 198 students B) About 18 students C) About 110 students D) About 99 students
Answer: D

88) About how many students would you expect to prefer written materials in a school of 850 students?
A) About 77 students B) About 306 students C) About 9 students D) About 153 students
Answer: A

89) About how many students would you expect to prefer radio in a school of 650 students?
A) About 5 students B) About 33 students C) About 234 students D) About 117 students
Answer: B

90) About how many students would you expect to prefer TV in a school of 550 students?
A) About 110 students B) About 12 students C) About 99 students D) About 66 students
Answer: D

91) About how many students would you expect to prefer films in a school of 400 students?
A) About 72 students B) About 80 students C) About 48 students D) About 20 students
Answer: B

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1) Answers will vary. Possible answer is 3 circles linked like a chain.
2) Answers will vary. Possible answer is a circle labeled "ice cream" connected by lines to three other circles labeled "chocolate," strawberry," and "banana."
3) A
4) A
5) A
6) B
7) A
8) D
9) C
10) A
11) C
12) D
13) A
14) D
15) A
16) D
17) B
18) D
19) False. Possible counterexample is that C is the granddaughter of A.
20) True. Possible illustration: A square with sides of 2 cm has an area of 4 square centimeters. If the sides are increased to 10 centimeters, the area becomes 100 square centimeters.
21) False. Possible counterexample: Let the original price be \$1000. After the price is raised, it will be $1000 + 140 = \$1{,}140$. After this is reduced by 14% it will be $1{,}140 - 0.14 \cdot 1{,}140 = \$980.40$.
22) True. Possible illustration. Suppose Janice scored 90, Rachel scored 80, and Steve scored 70. Then Steve's score is lower than Janice's score.
23) B
24) B
25) A
26) B
27) Answers will vary. One possibility is: the first –10 is enclosed in absolute value bars and the second is in brackets.
28) Answers will vary. One possibility: the first symbol has a line beneath it, and the second does not.
29) Answers will vary. One possibility: in the first expression, the minus sign is inside the parentheses and in the second expression it is outside the parentheses.
30) Answers will vary. One possibility: the first arrow is single–lined, and the second is double–lined.
31) A
32) B
33) A
34) B
35) A
36) B
37) B
38) B
39) D
40) B
41) C
42) C
43) D
44) D
45) B

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46) B
47) A
48) B
49) C
50) B
51) D
52) A
53) C
54) C
55) D
56) C
57) B
58) D
59) B
60) C
61) D
62) C
63) D
64) D
65) D
66) D
67) A
68) A
69) C
70) B
71) A
72) D
73) B
74) A
75) B
76) B
77) A
78) B
79) A
80) C
81) B
82) C
83) A
84) A
85) B
86) D
87) D
88) A
89) B
90) D
91) B

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

Use set notation to list all the elements of the set.

1) The integers between 1 and 5, not inclusive
A) {1, 2, 3, 4, 5} B) {1, 2, 3, 4} C) {2, 3, 4, 5} D) {2, 3, 4}
Answer: D

2) The integers from 4 to 8 inclusive
A) {5, 6, 7, 8} B) {5, 6, 7} C) {4, 5, 6, 7} D) {4, 5, 6, 7, 8}
Answer: D

3) The whole numbers greater than 1 and less than 5
A) {2, 3, 4, 5} B) {1, 2, 3, 4, 5} C) {1, 2, 3, 4} D) {2, 3, 4}
Answer: D

4) The letters needed to spell these words:
toot, tot, too, to
A) {t,t,o,o} B) {t,t,o} C) {t,o} D) {t,o,o}
Answer: C

5) {x : x is an integer between 13 and 16 inclusive}
A) {12, 13, 14, 15, 16, 17} B) {14, 15}
C) {14} or {15} D) {13, 14, 15, 16}
Answer: D

6) {x : x is an integer between 17 and 20 not inclusive}
A) {16, 17, 18, 19, 20, 21} B) {18} or {19}
C) {17, 18, 19, 20} D) {18, 19}
Answer: D

7) {x : x is an even natural number less than 10}
A) {0, 2, 4, 6, 8} B) {1, 2, 3, 4, 5, 6, 7, 8, 9}
C) {2, 4, 6, 8} D) {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}
Answer: C

8) The natural numbers between –3 and 1, not inclusive
A) {–2, –1, 0} B) {0} C) {0, 1} D) ∅
Answer: D

9) The whole numbers between –3 and 0, not inclusive
A) {0} B) {–2, –1} C) {–3, –2, –1, 0} D) ∅
Answer: D

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Use an alternative method to express the set.

10) {x: x has winter sports}

The table shows some of the facilities available at selected State Parks in New Jersey.

	camping	fishing	boat rental	swimming	winter sports	food service
Allaire	yes	yes	no	yes	no	yes
Parvin	yes	yes	yes	yes	no	yes
Delaware and Raritan Canal	no	yes	yes	yes	yes	no
Corson's Inlet	no	yes	yes	no	no	no
Wharton Forest	yes	yes	yes	yes	no	yes

A) ∅ B) {Allaire, Parvin, Corson's Inlet, Wharton Forest}

C) {Delaware and Raritan Canal} D) (Delaware and Raritan Canal)

Answer: C

11) {h, o, r, s, e}

A) {z : z is a letter in the word horse} B) (z is a letter in horse)

C) {z : z is a horse} D) {horse}

Answer: A

12) {d : d is a letter in the word hat and also in the word in}

A) { } B) {∅} C) (h, a, t, i, n) D) {h, a, t, i, n}

Answer: A

13) {9, 12, 15, ..., 45}

A) {x : x is a multiple of 3 greater than 9 and less than 45}

B) {t : t is a multiple of 3 greater than 8 and less than 46}

C) {w : w is a multiple of 3}

D) {b : b is a multiple of 3 greater than or equal to 9}

Answer: B

Determine whether the set is well defined or not.

14) {x : x is a tennis player who has won at Wimbledon}

A) Well defined B) Not well defined

Answer: A

15) {x : x is a low–fat ice cream}

A) Not well defined B) Well defined

Answer: A

16) {x :x is a football team that has won the Super Bowl}

A) Well defined B) Not well defined

Answer: A

17) {x : x is spy books in the library}

A) Well defined B) Not well defined

Answer: B

18) {x : x is stock on the AmEx today}

A) Not well defined B) Well defined

Answer: B

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19) {x : x is an expensive boat on the Great Lakes}
A) Well defined B) Not well defined
Answer: B

20) {x : x is a four–year college in Illinois}
A) Not well defined B) Well defined
Answer: B

Replace the # with either ∈ or ∉ to express a true statement.

21) 40 # {5, 10, 15, 20, ... }
A) ∈ B) ∉
Answer: A

22) –3.7 # {n : n is a negative integer}
A) ∈ B) ∉
Answer: B

23) Missouri # {r : r is a state in the United States}
A) ∉ B) ∈
Answer: B

24) Texas # {California, Vermont, Maryland, New Jersey, Maine, Kentucky}
A) ∈ B) ∉
Answer: B

Find n(A) for the set.

25) A = {7, 9, 11, 13, 15}
A) n(A) = 5 B) n(A) = 15 C) n(A) = 2 D) n(A) = 4
Answer: A

26) A = {x : x is a month in the year}
A) n(A) = 24 B) n(A) = 12 C) n(A) = 1 D) n(A) = 52
Answer: B

27) A = {x : x is a second in a minute}
A) n(A) = 120 B) n(A) = 60 C) n(A) = Infinite D) n(A) = 12
Answer: B

28) A = {–8, –7, –6, . . ., 0}
A) n(A) = 8 B) n(A) = 4 C) n(A) = 9 D) n(A) = 1
Answer: C

29) A = {{a, b}, {c, d}, {e, b}}
A) n(A) = 3 B) n(A) = 2 C) n(A) = 6 D) n(A) = 5
Answer: A

30) A = {∅, 0}
A) n(A) = ∅ B) n(A) = 2 C) n(A) = 0 D) n(A) = 1
Answer: B

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31) A = {{∅}, {0}, {∅, 0}}
A) n(A) = 4 B) n(A) = 3 C) n(A) = 0 D) n(A) = 2
Answer: B

32) A = {x : x is a vowel in the word infinite}
A) n(A) = 3 B) n(A) = 2 C) n(A) = 4 D) n(A) = 5
Answer: B

Identify the set as finite or infinite.

33) {2, 3, 4, . . ., 8}
A) Infinite B) Finite
Answer: B

34) {1, 1/2, 1/4, 1/8, . . .}
A) Infinite B) Finite
Answer: A

35) {x : x is a fraction between 94 and 95}
A) Infinite B) Finite
Answer: A

36) {2, 4, 6, 8, ...}
A) Finite B) Infinite
Answer: B

37) The set of even whole numbers less than 100
A) Infinite B) Finite
Answer: B

38) The set of natural numbers greater than 1,000
A) Infinite B) Finite
Answer: A

39) The set of multiples of 3 between 0 and 50
A) Infinite B) Finite
Answer: B

40) The set of fractions that are less than 1 but greater than 0
A) Infinite B) Finite
Answer: A

41) The set of people watching fireworks at Miller Park on July 4, 2000 at 9:45 P.M.
A) Finite B) Infinite
Answer: A

42) The set of stars in the Milky Way Galaxy at 12:00 A.M. on January 1, 2000
A) Infinite B) Finite
Answer: B

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Decide whether the sets are equal.

43) {b: b is a natural number} and {k : k is a counting number}

A) Yes B) No

Answer: A

44) {y : y was an American President in the year 1,516} and ∅

A) No B) Yes

Answer: B

45) {parsley, thyme, basil, oregano} and {y : y is an herb}

A) No B) Yes

Answer: A

46) {7, 14, 21, 28, 56} and {7, 14, 21, 28, ..., 56}

A) No B) Yes

Answer: A

Decide whether the statement is true or false.

47) {8, 20, 34, 58} ⊆ {2, 4, 6, 8, ..., 98}

A) False B) True

Answer: B

48) {2, 14, 25, 44} ⊆ {2, 4, 6, ..., 180}

A) False B) True

Answer: A

49) {a : a is an even integer} ⊂ {b : b is a positive integer}

A) False B) True

Answer: A

50) ∅ ⊆ {5, 10, 15, 20, 25}

A) True B) False

Answer: A

Decide whether the sets are equivalent.

51) {x : x is a multiple of 10 between 1 and 100, inclusive} and {7, 14, 21, ..., 70}

A) No B) Yes

Answer: B

52) {d: d is a day of the week} and {g : g is a planet in the solar system}

A) No B) Yes

Answer: A

53) {62, 21, 87, 6, 68} and {z, m, c, t, y}

A) Yes B) No

Answer: A

54) {∅} and {x : x is a state in the U.S. with a minimum voting age of 65}

A) No B) Yes

Answer: A

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SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

List the subsets.

55) List all of the two element subsets of the set {a, b, c, d}.

Answer: {a, b}, {a, c}, {a, d}, {b, c}, {b, d}, {c, d}

56) List all of the two element subsets of the set {a, b, c, d, e}.

Answer: {a, b}, {a, c}, {a, d}, {a, e}, {b, c}, {b, d}, {b, e}, {c, d}, {c, e}, {d, e}

57) List all of the three element subsets of the set {a, b, c, d}.

Answer: {a, b, c}, {a, b, d}, {a, c, d}, {b, c, d}

58) List all of the three element subsets of the set {a, b, c, d, e}.

Answer: {a, b, c}, {a, b, d}, {a, b, e}, {a, c, d}, {a, c, e}, {a, d, e}, {b, c, d}, {b, c, e}, {b, d, e}, {c, d, e}

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

Use the following definitions to determine if the statement is true or false.
N = {x : x is a natural number}
I = {x : x is an integer}
R = {x : x is a real number}
W = {x : x is a whole number}
Q = {x : x is a rational number}

59) W is a subset of W, I, Q, and R.

A) True B) False

Answer: A

60) W is a subset of N, W, I, Q, and R.

A) True B) False

Answer: B

61) I is a subset of Q.

A) True B) False

Answer: A

62) N is a subset of N.

A) True B) False

Answer: A

63) W is a proper subset of I, Q, and R.

A) True B) False

Answer: A

64) W is a proper subset of I, Q, N, and R.

A) True B) False

Answer: B

65) I is a proper subset of Q and R.

A) True B) False

Answer: A

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66) I is a proper subset of N, W, Q, and R.
A) True B) False
Answer: B

67) Q is a proper subset of R.
A) True B) False
Answer: A

68) Q is a proper subset of N, I, and W.
A) True B) False
Answer: B

Find the number of subsets of the set.

69) {13, 14, 15}
A) 3 B) 7 C) 8 D) 6
Answer: C

70) {0}
A) 1 B) 2 C) 4 D) 0
Answer: B

71) {mom, dad, son, daughter}
A) 16 B) 14 C) 12 D) 8
Answer: A

72) {math, English, history, science, art}
A) 28 B) 16 C) 32 D) 24
Answer: C

73) {x | x is a day of the week}
A) 128 B) 127 C) 124 D) 256
Answer: A

74) {x | x is an even number between 19 and 39}
A) 38 B) 1024 C) 7 D) 128
Answer: B

75) {1, 2, 3, . . . , 7}
A) 128 B) 124 C) 256 D) 16
Answer: A

Let U = {q, r, s, t, u, v, w, x, y, z}
A = {q, s, u, w, y}
B = {q, s, y, z}
C = {v, w, x, y, z}. List the elements in the set.

76) $A \cap B'$
A) {q, s, t, u, v, w, x, y} B) {r, s, t, u, v, w, x, z} C) {u, w} D) {t, v, x}
Answer: C

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77) $(A \cup B)'$

A) {s, u, w} B) {r, t, v, x} C) {r, s, t, u, v, w, x, z} D) {t, v, x}

Answer: B

78) $(A \cap B)'$

A) {s, u, w} B) {t, v, x} C) {q, s, t, u, v, w, x, y} D) {r, t, u, v, w, x, z}

Answer: D

79) $A' \cup B$

A) {r, s, t, u, v, w, x, z} B) {q, r, s, t, v, x, y, z} C) {s, u, w} D) {q, s, t, u, v, w, x, y}

Answer: B

80) $A \cup (B \cap C)$

A) {q, r, w, y, z} B) {q, w, y} C) {q, s, u, w, y, z} D) {q, y, z}

Answer: C

81) $A \cap (B \cup C)$

A) {q, s, u, w, y, z} B) {q, r, w, y, z} C) {q, s, w, y} D) {q, y, z}

Answer: C

82) $C' \cup A'$

A) {w, y} B) {q, r, s, t, u, v, x, z} C) {q, s, u, v, w, x, y, z} D) {s, t}

Answer: B

83) $C' \cap A'$

A) {q, r, s, t, u, v, x, z} B) {w, y} C) {q, s, u, v, w, x, y, z} D) {r, t}

Answer: D

84) $C - A$

A) {v, x, z} B) {q, s, u} C) {q, s, u, v, x, z} D) {w, y}

Answer: A

85) $A - C$

A) {v, x, z} B) {q, s, u, v, x, z} C) {w, y} D) {q, s, u}

Answer: D

Let U = {all soda pops}; A = {all diet soda pops}; B = {all cola soda pops}; C = {all soda pops in cans}; and D = {all caffeine–free soda pops}. Describe the given set in words.

86) $A \cap B$

A) All diet or all cola soda pops B) All soda pops

C) All diet–cola soda pops D) All diet and all cola soda pops

Answer: C

87) $A' \cap C$

A) All non–diet soda pops in cans B) All diet soda pops in cans

C) All diet soda pops and all soda pops in cans D) All non–diet soda pops and all soda pops in cans

Answer: A

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88) $A \cap B \cap D$

A) All diet, all cola, and all caffeine–free soda pops
B) All diet, caffeine–free, cola soda pops in cans
C) All soda pops not in cans
D) All diet, caffeine–free, cola soda pops

Answer: D

89) $(A \cup B) \cup D$

A) All diet, caffeine–free, cola soda pops
B) All soda pops not in cans
C) All soda pops
D) All diet, all cola, and all caffeine–free soda pops

Answer: D

90) $(A \cap B) \cap C'$

A) All diet and all cola soda pops not in cans
B) All non–diet, non–cola soda pops not in cans
C) All cola soda pops not in cans
D) All diet–cola soda pops not in cans

Answer: D

91) $(A \cup D) \cap C'$

A) All non–diet, non–caffeine–free soda pops not in cans
B) All diet, caffeine–free soda pops not in cans
C) All non–cola soda pops not in cans
D) All soda pops not in cans that are diet or caffeine–free

Answer: D

Describe the indicated set in words and find the set.

92) $(P \cap C)$, given the following information:

The table gives features of different dishwashers.

model	price (dollars)	clean china	clean glassware	energy efficiency	water usage
a	715	excellent	good	good	low
b	450	excellent	good	fair	moderate
c	549	excellent	good	good	high
d	601	excellent	good	good	high
e	551	good	fair	good	low
f	384	excellent	fair	good	moderate
g	475	good	fair	fair	moderate
h	360	good	fair	fair	moderate
i	262	fair	poor	good	moderate

In the universal set U = {a, b, c, ..., i}, let the following characteristics be defined:

P = price is at or below $450

C = does an excellent job of cleaning china

G = does an excellent job of cleaning glassware

E = has a good energy efficiency rating

F = has low water usage

A) Dishwashers costing $450 or less that do an excellent job of cleaning china; {b, f}
B) Dishwashers costing $450 or less that do an excellent job of cleaning china; {a, b, f}
C) Dishwashers that do an excellent job of cleaning china; {a, b, c, d, f}
D) Dishwashers costing $450 or less and dishwashers that do an excellent job of cleaning china; {a, b, c, d, f}

Answer: A

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93) P – (E ∪ C)′ , given the following information:

The table gives features of different dishwashers

model	price (dollars)	clean china	clean glassware	energy efficiency	noise level
a	743	excellent	good	good	low
b	447	excellent	good	fair	moderate
c	546	excellent	good	good	high
d	598	excellent	good	good	high
e	548	good	fair	good	low
f	373	excellent	fair	good	moderate
g	472	good	fair	fair	moderate
h	349	good	fair	fair	moderate
i	251	fair	poor	good	moderate

In the universal set U = {a, b, c, ..., i}, let the following characteristics be defined:

P = price is at or below $447

C = does an excellent job of cleaning china

G = does an excellent job of cleaning glassware

E = has a good energy efficiency rating

F = has low noise level

A) Dishwashers that cost $447 or less and have both a low energy efficiency rating and do an excellent job of cleaning china; {f}

B) Dishwashers that cost $447 or less and either have a good energy efficiency rating or do an excellent job of cleaning china; {h}

C) Dishwashers that cost $447 or less and have either a low energy efficiency rating or do an excellent job of cleaning china; {a, b, c, d, e, f, h, i}

D) Dishwashers that cost $447 or less and either have a good energy efficiency rating or do an excellent job of cleaning china; {b, f, i}

Answer: D

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94) $(P \cap L) - S'$, given the following information:

The table gives the approximate nutritional value per serving of foods at a certain restaurant.

food	calories	protein (grams)	fat (grams)	calcium (mg)	sodium (mg)	vitamin A (A.U.)
Chop Suey	240	23	16	75	1250	1100
Pizza (cheese)	120	15	9	220	683	2720
Bean Burrito	340	20	4	185	1230	80
Linguini & Meatballs	330	19	13	124	1009	1590
Tomato Soup	250	7	7	158	900	850
Chicken Salad	210	33	8	28	360	100
Milkshake	270	3	13	145	98	420

Let:

C = {m : m provides 251 or more calories}

P = {m : m provides 20 or more grams of protein}

F = {m : m provides 10 or more grams of fat}

L = {m : m provides 150 or more mg of calcium}

S = {m : m provides 1000 or more mg of sodium}

A = {m : m provides 1000 or more A.U. of vitamin A}

A) Foods that provide either 20 or more grams of protein or 150 or more mg of calcium, and have 1000 or more mg of sodium; {Chop Suey, Bean Burrito}

B) Foods that provide both 20 or more grams of protein and 150 or more mg of calcium, and have 1000 or more mg of sodium; {Chop Suey, Bean Burrito}

C) Foods that provide both 20 or more grams of protein and 150 or more mg of calcium, but have less than 1000 mg of sodium; ∅

D) Foods that provide either 20 or more grams of protein or 150 or more mg of calcium, but have less than 1000 mg of sodium; {Pizza, Tomato Soup, Chicken Salad}

Answer: C

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95) $(P \cup L) - (S \cap C)$, given the following information:

The table gives the approximate nutritional value per serving of foods at a certain restaurant.

food	calories	protein (grams)	fat (grams)	calcium (mg)	sodium (mg)	vitamin A (A.U.)
Chop Suey	240	23	16	75	1250	1100
Pizza (cheese)	120	15	9	220	690	2720
Bean Burrito	340	20	4	185	1230	80
Rigatoni & Meatballs	330	19	13	124	1009	1590
Pea Soup	250	7	7	158	900	850
Chicken Salad	210	33	8	28	360	100
Ice Cream	270	3	13	145	98	420

Let:

C = {m : m provides 251 or more calories}

P = {m : m provides 20 or more grams of protein}

F = {m : m provides 10 or more grams of fat}

L = {m : m provides 150 or more mg of calcium}

S = {m : m provides 1000 or more mg of sodium}

A = {m : m provides 1000 or more A.U. of Vitamin A}

A) Foods that have either 20 or more grams of protein or 150 or more mg of calcium, but do not have both 1000 or more mg of sodium and 251 or more calories; {Chop Suey, Pizza, Pea Soup, Chicken Salad}

B) Foods that have either 20 or more grams of protein or 150 or more mg of calcium, and also have either 1000 or more mg of sodium or 251 or more calories; {Chop Suey, Pizza, Bean Burrito, Pea Soup, Chicken Salad}

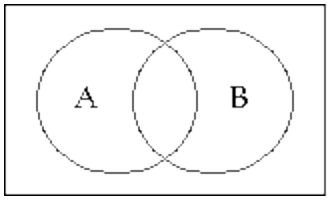
C) Foods that have either 20 or more grams of protein or 150 or more mg of calcium, but do not have either 1000 or more mg of sodium or 251 or more calories; {Chop Suey, Pizza, Pea Soup, Chicken Salad}

D) Foods that have both 20 or more grams of protein and 150 or more mg of calcium, but do not have both 1000 or more mg of sodium and 251 or more calories; ∅

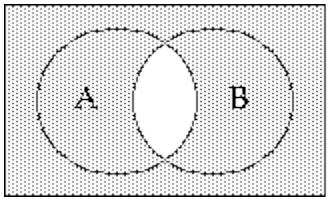
Answer: A

Shade the Venn diagram to represent the set.

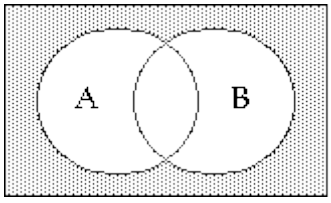
96) $A' \cap B'$



A)



B)



Answer: B

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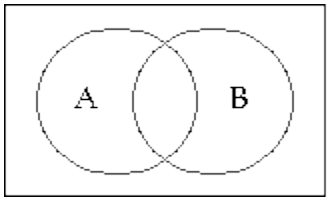
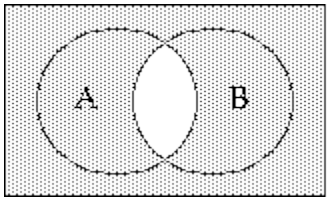
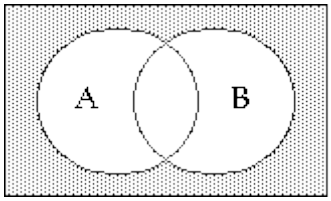
97) A' ∪ B'



A)

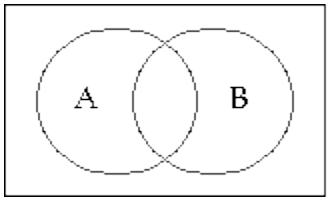


B)

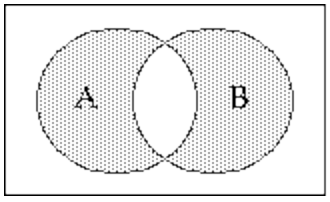


Answer: A

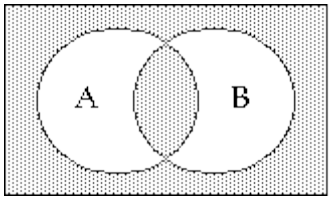
98) (A ∪ B) ∩ (A ∩ B)'



A)

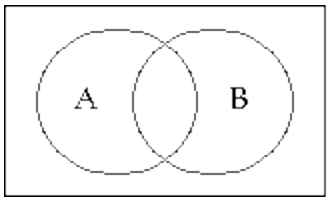


B)

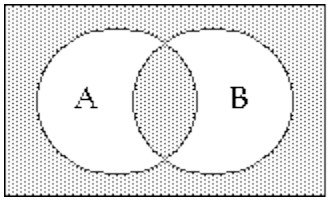


Answer: A

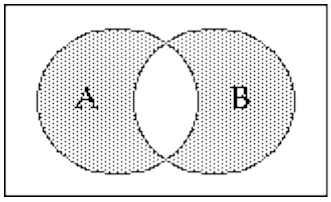
99) (A ∩ B) ∪ (A ∪ B)'



A)



B)



Answer: A

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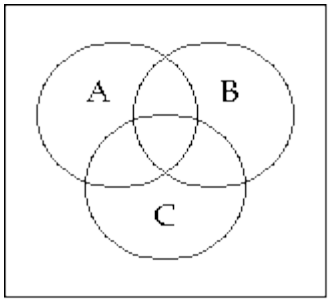
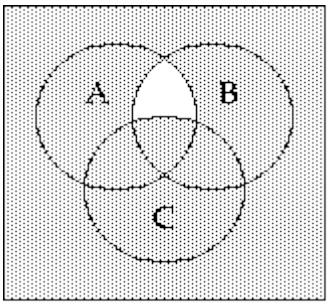
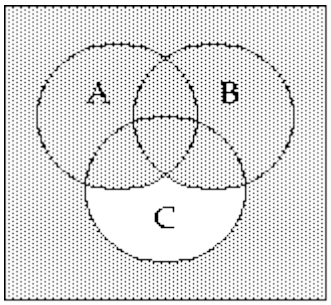
100) $(A \cap B \cap C')'$



A)

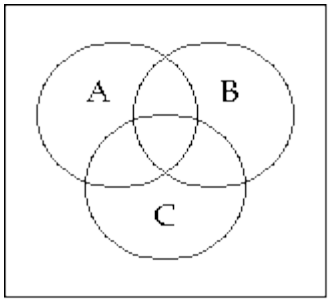


B)

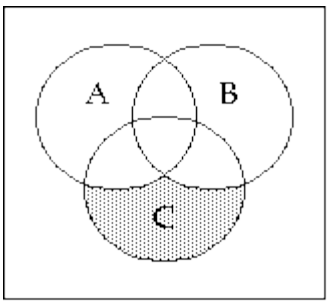


Answer: A

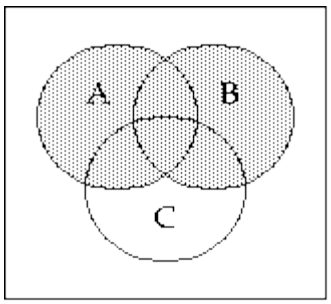
101) $(A \cup B \cup C')'$



A)



B)



Answer: A

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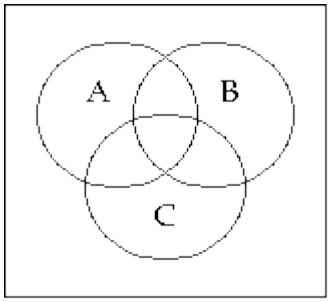
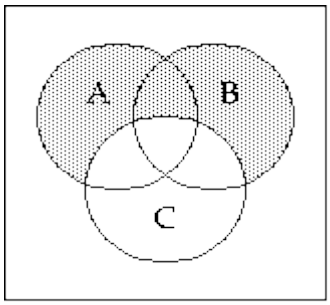
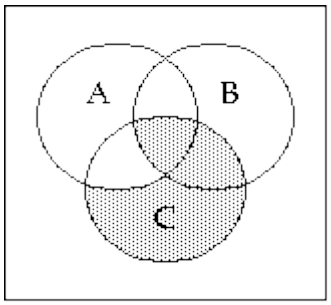
102) C' ∩ (A ∪ B)



A)

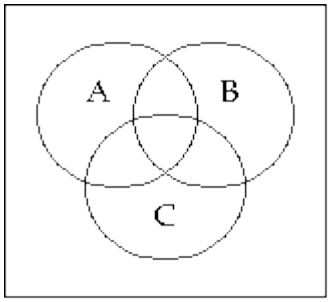


B)

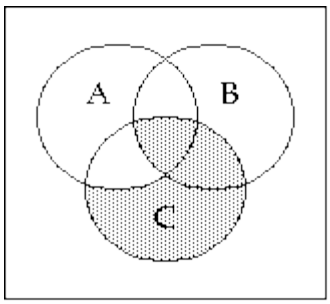


Answer: A

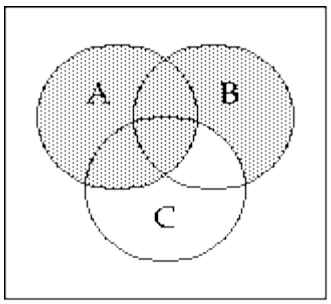
103) (A' ∪ B) ∩ C



A)



B)



Answer: A

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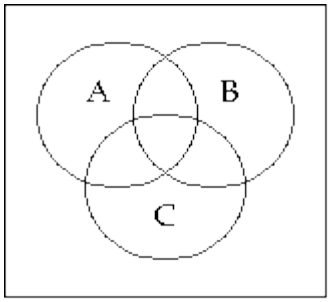
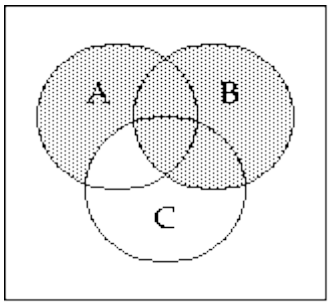
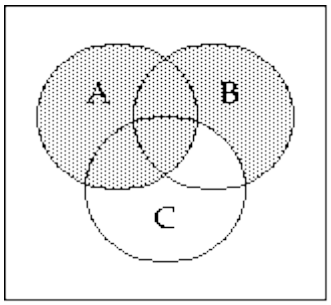
104) A ∪ (B ∩ C')



A)

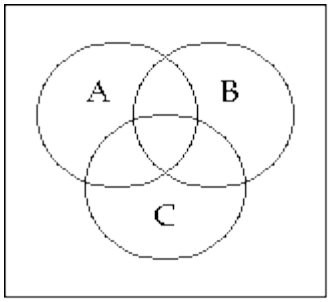


B)

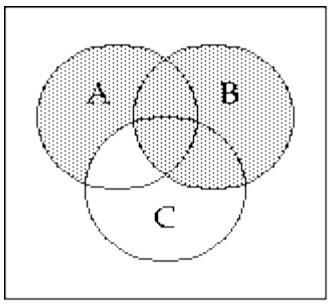


Answer: B

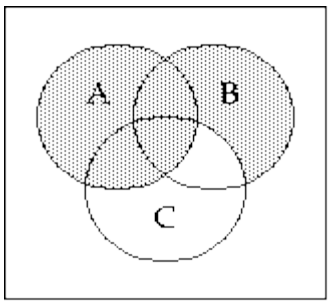
105) B ∪ (A ∩ C')



A)



B)



Answer: A

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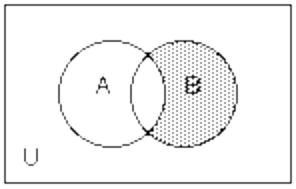
Write a description of the shaded region using the symbols A, B, C, ∪, ∩, –, and ′ as needed.

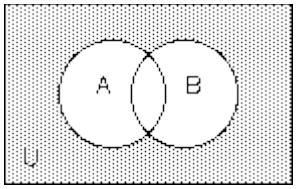
106)



A) A – B B) B ∩ A′ C) A ∩ B′ D) B – A′

Answer: B

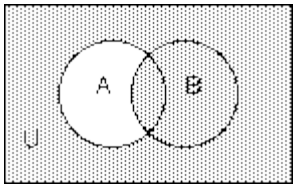
107)



A) A′ ∩ B′ B) A ∪ B C) A – B D) (A ∩ B)′

Answer: A

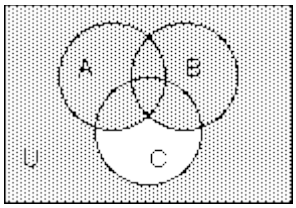
108)



A) B – A B) A′ ∩ B C) A′ ∪ B D) (A ∩ B)′

Answer: C

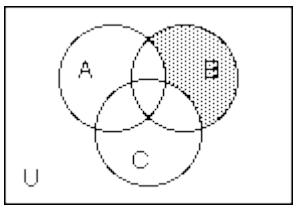
109)



A) (A ∪ B) ∪ C′ B) A ∪ B ∩ C′ C) (A ∪ B ∪ C)′ D) (A ∩ B) ∪ C′

Answer: A

110)



A) B – (A ∩ C) B) A′ ∩ C′ ∩ B C) B ∩ (A ∩ C)′ D) B′ – (A ∪ B)

Answer: B

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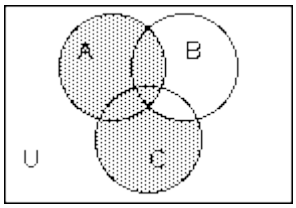
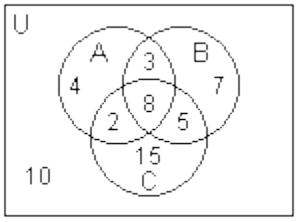
111)



A) $C \cap B' \cup A$ B) $A \cup C - B$ C) $A \cup C$ D) $B' \cap A \cup C$

Answer: A

Use the Venn diagram below to find the number of elements in the region.



112) n(A)

A) 17 B) 9 C) 12 D) 4

Answer: A

113) $n(A \cup B)$

A) 11 B) 21 C) 14 D) 29

Answer: D

114) n(C′)

A) 14 B) 29 C) 39 D) 24

Answer: D

115) n(C – A)

A) 13 B) 15 C) 11 D) 20

Answer: D

116) $n(A \cap C)$

A) 37 B) 10 C) 2 D) 18

Answer: B

117) $n(A \cap B \cap C)$

A) 8 B) 16 C) 44 D) 18

Answer: A

118) $n((A \cup B) \cap C)$

A) 14 B) 33 C) 11 D) 15

Answer: D

119) $n((C \cup B) - (A \cup B))$

A) 5 B) 2 C) 15 D) 11

Answer: C

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Let A and B be sets with cardinal numbers, n(A) = a and n(B) = b, respectively. Decide whether the statement is true or false.

120) $B \subset (B \cap A)$

A) True B) False

Answer: B

121) $(B \cup A) \subset B$

A) True B) False

Answer: B

122) $n(A \cup B) = n(A) - n(B)$

A) True B) False

Answer: B

123) $n(A - B) = n(B - A)$

A) True B) False

Answer: B

124) If $B \subseteq A$, $n(B) = n(A - B)$.

A) True B) False

Answer: B

125) If $B \subseteq A$, $n(B) = n(A) - n(A - B)$.

A) True B) False

Answer: A

126) $n(A \cap B) = n(B \cap A)$

A) True B) False

Answer: A

127) $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

A) True B) False

Answer: A

128) $n(A \cap B) = n(A) - n(B)$

A) True B) False

Answer: B

129) $n(A \cup B) + n(A \cap B) = n(A) + n(B)$

A) True B) False

Answer: A

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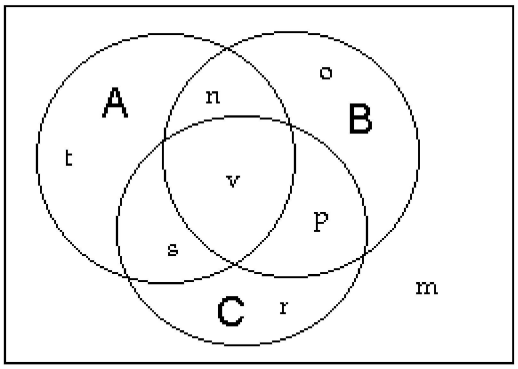
Determine which labeled sections make up the indicated set.



130) $A \cap B$

A) n, v B) n, v, s C) n D) t, n, o, p, v, s

Answer: A

131) $A - C$

A) s, v B) t, n C) s, t, n D) t

Answer: B

132) $B - (C \cap A)$

A) n, o, p B) n, v, p C) o D) n, o

Answer: A

133) $C \cap B \cap A$

A) t B) n, v, s, p C) v D) t, s, v, n, o, p, r

Answer: C

Find, if possible, the number of elements in sets A, B, and C using the given information.

134) $n(A \cup B \cup C) = 28$
$n(A \cap B) = 8$
$n(A \cap C) = 8$
$n(A - B) = 6$
$n(C \cap B) = 10$
$n(A \cap B \cap C) = 5$
$n(C - (A \cup B)) = 5$

A) $n(A) = 9, n(B) = 14, n(C) = 21$ B) $n(A) = 14, n(B) = 17, n(C) = 18$
C) $n(A) = 11, n(B) = 20, n(C) = 18$ D) The information is inconsistent or incomplete.

Answer: B

135) $n(A - C) = 10$
$n(C - A) = 6$
$n(A \cup C) = 25$
$n(A \cap B) = 10$
$n((C \cap A) - B) = 3$
$n((A \cap B) - C) = 4$
$n(B - (A \cup C)) = 5$
$n(B \cap C) = 9$

A) $n(A) = 15, n(B) = 22, n(C) = 15$ B) $n(A) = 19, n(B) = 18, n(C) = 15$
C) $n(A) = 15, n(B) = 30, n(C) = 19$ D) The information is inconsistent or incomplete.

Answer: B

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136) $n(A - C) = 9$
$n(C - A) = 3$
$n(A \cap B) = 7$
$n(C \cap A) = 9$
$n(C \cap B) = 4$
$n(B - A) = 7$
$n(A \cap B \cap C) = 3$

A) $n(A) = 18, n(B) = 14, n(C) = 12$
B) $n(A) = 21, n(B) = 17, n(C) = 15$
C) $n(A) = 12, n(B) = 27, n(C) = 18$
D) The information is inconsistent or incomplete.

Answer: A

137) $(A \cap B) = \varnothing$
$n(A \cap C) = 6$
$n(C - B) = 9$
$n(B - C) = 8$
$n(A - C) = 3$
$n(B \cup C) = 23$

A) $n(A) = 3, n(B) = 20, n(C) = 21$
B) $n(A) = 9, n(B) = 14, n(C) = 15$
C) $n(A) = 9, n(B) = 14, n(C) = 23$
D) The information is inconsistent or incomplete.

Answer: B

Solve the problem.

138) A local television station sends out questionnaires to determine if viewers would rather see a documentary, an interview show, or reruns of a game show. There were 450 responses with the following results:

135 were interested in an interview show and a documentary, but not reruns.
18 were interested in an interview show and reruns but not a documentary.
63 were interested in reruns but not an interview show.
108 were interested in an interview show but not a documentary.
45 were interested in a documentary and reruns.
27 were interested in an interview show and reruns.
36 were interested in none of the three.

How many are interested in exactly one kind of show?

A) 196
B) 206
C) 216
D) 226

Answer: C

139) A survey of 260 families showed that
99 had a dog;
76 had a cat;
34 had a dog and a cat;
98 had neither a cat nor a dog nor a parakeet;
8 had a cat, a dog, and a parakeet.

How many had a parakeet only?

A) 31
B) 36
C) 21
D) 26

Answer: C

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140) A survey of a group of 117 tourists was taken in St. Louis. The survey showed the following:
65 of the tourists plan to visit Gateway Arch;
49 plan to visit the zoo;
10 plan to visit the Art Museum and the zoo, but not the Gateway Arch;
12 plan to visit the Art Museum and the Gateway Arch, but not the zoo;
19 plan to visit the Gateway Arch and the zoo, but not the Art Museum;
8 plan to visit the Art Museum, the zoo, and the Gateway Arch;
16 plan to visit none of the three places.

How many plan to visit the Art Museum only?

A) 101 B) 14 C) 37 D) 49

Answer: B

141) A survey of 124 college students was done to find out what elective courses they were taking. Let A = the set of those taking art, B = the set of those taking basketweaving, and C = the set of those taking canoeing. The study revealed the following information.
$n(A) = 45$ $n(A \cap B) = 12$
$n(B) = 55$ $n(A \cap C) = 15$
$n(C) = 40$ $n(B \cap C) = 23$
$n(A \cap B \cap C) = 2$

How many students were not taking any of these electives?

A) 42 B) 34 C) 10 D) 32

Answer: D

Find the cardinal number of the indicated set by referring to the given table.

142) $H \cup A$,
given the following table:

U.S. Production (in Thousands of Tons) of Certain Nuts				
Year	Pecans (P)	Almonds (A)	Walnuts (W)	Hazelnuts (H)
1993 (T)	182	584	232	41
1994 (F)	99	583	232	21
1995 (V)	134	304	231	39
1996 (S)	111	412	205	20

A) 543 B) 625 C) 1,039 D) 2,004

Answer: D

143) $V \cap W$,
given the following table:

U.S. Production (in Thousands of Tons) of Certain Nuts				
Year	Pecans (P)	Almonds (A)	Walnuts (W)	Hazelnuts (H)
1993 (T)	180	584	232	41
1994 (F)	99	585	232	21
1995 (V)	134	304	232	39
1996 (S)	111	412	205	20

A) 0 B) 366 C) 709 D) 232

Answer: D

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144) A – (F ∪ S),
given the following table:

U.S. Production (in Thousands of Tons) of Certain Nuts				
Year	Pecans (P)	Almonds (A)	Walnuts (W)	Hazelnuts (H)
1993 (T)	183	584	232	41
1994 (F)	99	587	232	21
1995 (V)	134	304	229	39
1996 (S)	111	412	205	22

A) 888 B) 175 C) 999 D) 759

Answer: A

145) V ∩ (P ∪ W),
given the following table:

U.S. Production (in Thousands of Tons) of Certain Nuts				
Year	Pecans (P)	Almonds (A)	Walnuts (W)	Hazelnuts (H)
1993 (T)	185	584	232	41
1994 (F)	99	587	232	21
1995 (V)	134	304	231	39
1996 (S)	111	412	205	22

A) 365 B) 0 C) 164 D) 343

Answer: A

Show that the set has cardinal number $\aleph_0$ by establishing a one–to–one correspondence between the natural numbers and the given set. Be sure to indicate the general correspondence.

146) {5, 10, 15, 20, ...}

A) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
5, 10, 15, 20, ..., n, ...

B) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
5, 10, 15, 20, ..., 5n, ...

C) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
5, 10, 15, 20, ..., 6n, ...

D) 0, 1, 2, 3, ..., n, ...
↕ ↕ ↕ ↕ ↕
5, 10, 15, 20, ..., 5n, ...

Answer: B

147) {0, 4, 8, 12, 16, ...}

A) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
0, 4, 8, 12, ..., 4n – 4, ...

B) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
0, 4, 8, 12, ..., 4n, ...

C) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
0, 4, 8, 12, ..., 4n + 4, ...

D) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
0, 4, 8, 12, ..., 4n – 1, ...

Answer: A

148) {2, 6, 10, 14, 18, ...}

A) 1, 2, 3, 4, 5, ..., n, ...
↕ ↕ ↕ ↕ ↕ ↕
2, 6, 10, 14, 18, ..., 3n – 3, ...

B) 1, 2, 3, 4, 5, ..., n, ...
↕ ↕ ↕ ↕ ↕ ↕
2, 6, 10, 14, 18, ..., 4n + 2, ...

C) 1, 2, 3, 4, 5, ..., n, ...
↕ ↕ ↕ ↕ ↕ ↕
2, 6, 10, 14, 18, ..., 3n + 3, ...

D) 1, 2, 3, 4, 5, ..., n, ...
↕ ↕ ↕ ↕ ↕ ↕
2, 6, 10, 14, 18, ..., 4n – 2, ...

Answer: D

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149) {9, 14, 19, 24, 29, ...}

A) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ 9, & 14, & 19, & 24, & 29, & \ldots, & 5n+3, & \ldots \end{array}$

B) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ 9, & 14, & 19, & 24, & 29, & \ldots, & 5n+4, & \ldots \end{array}$

C) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ 9, & 14, & 19, & 24, & 29, & \ldots, & 4n+4, & \ldots \end{array}$

D) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ 9, & 14, & 19, & 24, & 29, & \ldots, & 4n-3, & \ldots \end{array}$

Answer: B

150) $\left\{\frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8}, \ldots\right\}$

A) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ \frac{1}{4}, & \frac{1}{5}, & \frac{1}{6}, & \frac{1}{7}, & \frac{1}{8}, & \ldots, & \frac{1}{n+2}, & \ldots \end{array}$

B) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ \frac{1}{4}, & \frac{1}{5}, & \frac{1}{6}, & \frac{1}{7}, & \frac{1}{8}, & \ldots, & \frac{1}{n-3}, & \ldots \end{array}$

C) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ \frac{1}{4}, & \frac{1}{5}, & \frac{1}{6}, & \frac{1}{7}, & \frac{1}{8}, & \ldots, & \frac{1}{n+3}, & \ldots \end{array}$

D) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ \frac{1}{4}, & \frac{1}{5}, & \frac{1}{6}, & \frac{1}{7}, & \frac{1}{8}, & \ldots, & \frac{1}{n}, & \ldots \end{array}$

Answer: C

151) $\left\{\frac{1}{3}, \frac{3}{5}, \frac{5}{7}, \frac{7}{9}, \frac{9}{11} \ldots\right\}$

A) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ \frac{1}{3}, & \frac{3}{5}, & \frac{5}{7}, & \frac{7}{9}, & \frac{9}{11}, & \ldots, & \frac{n+1}{3n-1}, & \ldots \end{array}$

B) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ \frac{1}{3}, & \frac{3}{5}, & \frac{5}{7}, & \frac{7}{9}, & \frac{9}{11}, & \ldots, & \frac{2n+1}{2n-1}, & \ldots \end{array}$

C) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ \frac{1}{3}, & \frac{3}{5}, & \frac{5}{7}, & \frac{7}{9}, & \frac{9}{11}, & \ldots, & \frac{3n-1}{n+1}, & \ldots \end{array}$

D) $\begin{array}{ccccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ \frac{1}{3}, & \frac{3}{5}, & \frac{5}{7}, & \frac{7}{9}, & \frac{9}{11}, & \ldots, & \frac{2n-1}{2n+1}, & \ldots \end{array}$

Answer: D

152) {1, 8, 27, 64, 125 ...}

A) $\begin{array}{cccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ 1, & 8, & 27, & 64, & 125, & \ldots, & 2n^3, & \ldots \end{array}$

B) $\begin{array}{cccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ 1, & 8, & 27, & 64, & 125, & \ldots, & n^2, & \ldots \end{array}$

C) $\begin{array}{cccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ 1, & 8, & 27, & 64, & 125, & \ldots, & n^4, & \ldots \end{array}$

D) $\begin{array}{cccccccc} 1, & 2, & 3, & 4, & 5, & \ldots, & n, & \ldots \\ \updownarrow & \updownarrow & \updownarrow & \updownarrow & \updownarrow & & \updownarrow & \\ 1, & 8, & 27, & 64, & 125, & \ldots, & n^3, & \ldots \end{array}$

Answer: D

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153) {4, 16, 64, 256, ...}

A) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
4, 16, 64, 256, ..., 4^n, ...

B) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
4, 16, 64, 256, ..., 4^{2n}, ...

C) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
4, 16, 64, 256, ..., n^4, ...

D) 1, 2, 3, 4, ..., n, ...
↕ ↕ ↕ ↕ ↕
4, 16, 64, 256, ..., 4n, ...

Answer: A

We give an expression describing the number that corresponds to the natural number n. Use this expression to describe a one–to–one correspondence between the natural numbers and one of its subsets.

154) 4n – 2

A) 1, 2, 3, 4, 5, ..., n, ...
↕ ↕ ↕ ↕ ↕ ↕
3, 7, 11, 15, 19 ..., 4n – 2 , ...

B) 1, 2, 3, 4, 5, ..., n, ...
↕ ↕ ↕ ↕ ↕ ↕
1, 5, 9, 13, 17 ..., 4n – 2, ...

C) 1, 2, 3, 4, 5, ..., n, ...
↕ ↕ ↕ ↕ ↕ ↕
2, 6, 10, 14, 18 ..., 4n, ...

D) 1, 2, 3, 4, 5, ..., n, ...
↕ ↕ ↕ ↕ ↕ ↕
2, 6, 10, 14, 18 ..., 4n – 2, ...

Answer: D

Describe a one–to–one correspondence between the given set and one of its proper subsets. For example, if we gave you the set {3, 5, 7, 9, 11, ...}, the nth term is 2n +1. You could then write the correspondence by matching the elements of {3, 5, 7, 9, 11, ...} with the elements of the subset {5, 7, 9, 11, 13, ...}. The general correspondence would match 2n + 1 with 2n + 3.

155) {4, 5, 6, 7, ...}

A) 4, 5, 6, 7, ..., n + 4, ...
↕ ↕ ↕ ↕ ↕
3, 4, 5, 6, ..., n + 2, ...

B) 4, 5, 6, 7, ..., n + 3, ...
↕ ↕ ↕ ↕ ↕
5, 6, 7, 8, ..., n + 5, ...

C) 4, 5, 6, 7, ..., n + 3, ...
↕ ↕ ↕ ↕ ↕
5, 6, 7, 8, ..., n + 4, ...

D) 4, 5, 6, 7, ..., n + 3, ...
↕ ↕ ↕ ↕ ↕
3, 4, 5, 6, ..., n + 2, ...

Answer: C

156) {4, 6, 8, 10, ...}

A) 4, 6, 8, 10, ..., 2n + 2, ...
↕ ↕ ↕ ↕ ↕
6, 8, 10, 12, ..., 2n + 4, ...

B) 4, 6, 8, 10, ..., 2n + 2, ...
↕ ↕ ↕ ↕ ↕
5, 7, 9, 11, ..., 2n + 4, ...

C) 4, 6, 8, 10, ..., 2n + 3, ...
↕ ↕ ↕ ↕ ↕
6, 8, 10, 12, ..., 2n + 5, ...

D) 4, 6, 8, 10, ..., 2n + 6, ...
↕ ↕ ↕ ↕ ↕
6, 8, 10, 12, ..., 2n + 4, ...

Answer: A

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

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51) B
52) A
53) A
54) A
55) {a, b}, {a, c}, {a, d}, {b, c}, {b, d}, {c, d}
56) {a, b}, {a, c}, {a, d}, {a, e}, {b, c}, {b, d}, {b, e}, {c, d}, {c, e}, {d, e}
57) {a, b, c}, {a, b, d}, {a, c, d}, {b, c, d}
58) {a, b, c}, {a, b, d}, {a, b, e}, {a, c, d}, {a, c, e}, {a, d, e}, {b, c, d}, {b, c, e}, {b, d, e}, {c, d, e}
59) A
60) B
61) A
62) A
63) A
64) B
65) A
66) B
67) A
68) B
69) C
70) B
71) A
72) C
73) A
74) B
75) A
76) C
77) B
78) D
79) B
80) C
81) C
82) B
83) D
84) A
85) D
86) C
87) A
88) D
89) D
90) D
91) D
92) A
93) D
94) C
95) A
96) B
97) A
98) A
99) A
100) A

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101) A
102) A
103) A
104) B
105) A
106) B
107) A
108) C
109) A
110) B
111) A
112) A
113) D
114) D
115) D
116) B
117) A
118) D
119) C
120) B
121) B
122) B
123) B
124) B
125) A
126) A
127) A
128) B
129) A
130) A
131) B
132) A
133) C
134) B
135) B
136) A
137) B
138) C
139) C
140) B
141) D
142) D
143) D
144) A
145) A
146) B
147) A
148) D
149) B
150) C

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151) D
152) D
153) A
154) D
155) C
156) A

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