Clark County School District
K–12 Mathematics
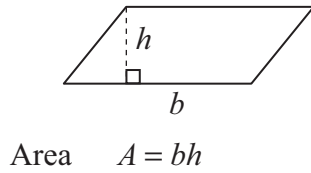

High School Practice Proficiency Examination Spring 2011
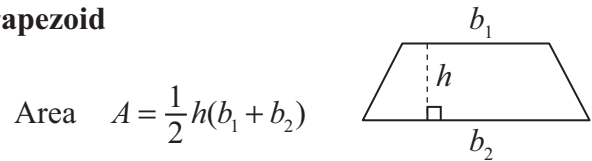
Formula Sheet

Note to Student: You may use these formulas throughout this entire test. Feel free to use this Formula Sheet as needed during your testing time.
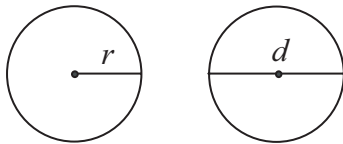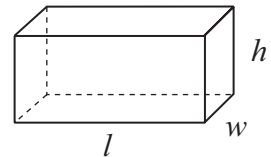
Parallelogram

Area $A = bh$

Trapezoid

Area $A = \dfrac{1}{2}h(b_1 + b_2)$

Circle

Circumference $C = 2\pi r$

$C = \pi d$

Area $A = \pi r^2$

Rectangular Solid

Volume $V = lwh$

Surface Area $SA = 2lw + 2lh + 2hw$

Cylinder

Volume $V = \pi r^2 h$

Cone

Volume $V = \dfrac{1}{3}\pi r^2 h$

Pythagorean Theorem

$a^2 + b^2 = c^2$
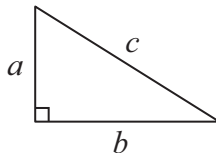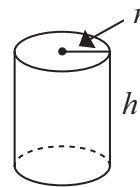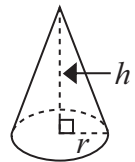
Trigonometric Ratios

$\sin x = \dfrac{a}{c}$

$\cos x = \dfrac{b}{c}$

$\tan x = \dfrac{a}{b}$

Permutations

$$_nP_k = \dfrac{n!}{(n-k)!}$$

Combinations

$$_nC_k = \dfrac{n!}{k!(n-k)!}$$

Special Right Triangles
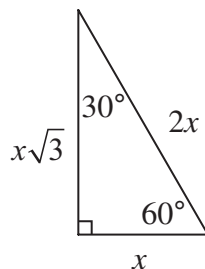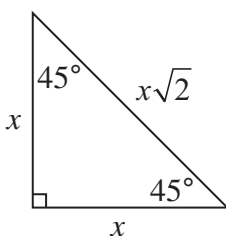
Temperature Formulas

$$°F = \dfrac{9}{5}C + 32$$

$$°C = \dfrac{5}{9}(F - 32)$$

1. Use the graph below.

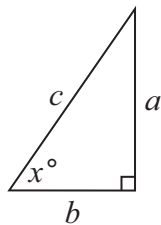Which table represents the information shown in the graph?

A.
Height (in.)	59	60	62	65	66	70
Weight (lb)	115	110	130	120	160	170

B.
Height (in.)	59	60	62	65	66	70
Weight (lb)	100	110	130	120	160	190

C.
Height (in.)	59	61	62	65	66	70
Weight (lb)	100	110	130	120	160	190

D.
Height (in.)	59	61	62	65	66	70
Weight (lb)	115	110	130	120	160	170

2. The graph of a function is shown below.
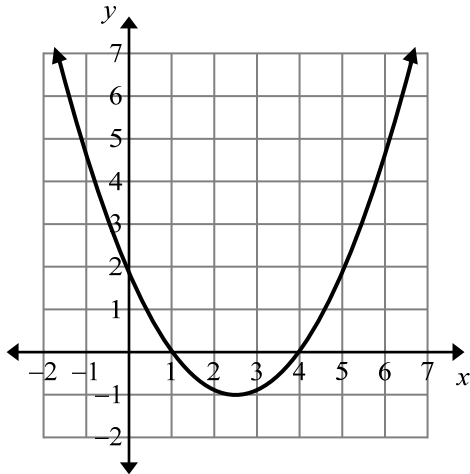
What is the domain of this function?

A. $x = 1$ or $x = 4$

B. x can be any real number

C. $y \geq -1$

D. $y = 2$

3. Use the diagram below.
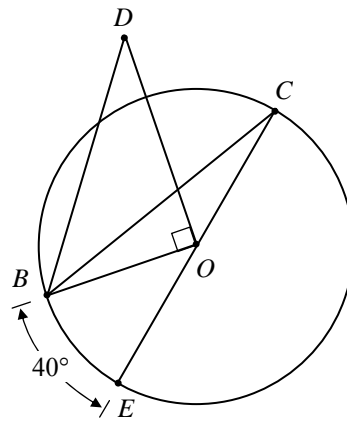
What is the measure of $\angle BCE$?

A. 20°

B. 25°

C. 40°

D. 50°

4. A group of 30 people was asked, "What is your favorite type of pet?" The results of the survey are shown below.

Favorite Type of Pet	Number of People
Dog	12
Cat	9
Fish	5
Bird	2
Iguana	2

   Which of these is a true statement about the data?

   A. The mean is 6.

   B. The mode is 2

   C. The mode is dog.

   D. The median is fish.

5. Use the table.

1	2	3	4
5	7	9	11

   The pattern in the table continues. What is the next column in the table?

   A.
5
10

   B.
5
13

   C.
10
5

   D.
13
5

6. Use the matrices below.

$$K = \begin{bmatrix} 4 & 0 \\ -1 & 3 \end{bmatrix} \quad L = \begin{bmatrix} 3 & -1 \\ 0 & 4 \end{bmatrix} \quad M = \begin{bmatrix} -3 & 1 \\ 0 & -4 \end{bmatrix}$$

   Which sum is equal to $\begin{bmatrix} 6 & -2 \\ 0 & 8 \end{bmatrix}$?

   A. $K + M$

   B. $L + L$

   C. $L + M$

   D. $M + M$

7. A game uses the two spinners shown below.
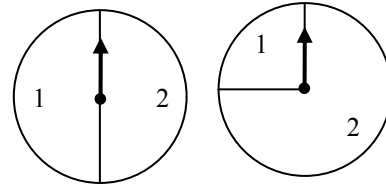
   Each spinner is spun once and the two results are added to determine a player's move. Which circle graph shows the distribution of possible moves?

   A.

   B.

   C.

   D.

8. A carpenter measures a board to be 37.9 inches in length. The board is actually 38 inches in length. Which expression shows the **percent error** of the carpenter's measurement?

   A. $\dfrac{(38-37.9)}{100}$

   B. $(38-37.9) \times 100$

   C. $\left(\dfrac{38-37.9}{37.9}\right) \times 100$

   D. $\left(\dfrac{38-37.9}{38}\right) \times 100$

9. A triangle has sides with lengths of 11 meters, 9 meters, and 7 meters. What type of triangle is it?

   A. acute

   B. equiangular

   C. obtuse

   D. right

10. The figure below shows a smaller rectangle inside a larger rectangle.

What is the area of the shaded region?

   A. $2x^2 + 2x + 2$

   B. $2x^2 + 3x + 2$

   C. $2x^2 + 5x + 2$

   D. $2x^2 + 8x + 2$

11. A definition of biased sampling is

   A. a method of selection that includes the whole population.

   B. a method of selection that excludes certain parts of the population.

   C. a method of selection that ensures the sample represents the population.

   D. a method of selection that results in a sample smaller than the population.

12. Use the statement below.

   If a number is divisible by 2, then it is also divisible by 4.

   Which is a **counterexample** to the statement?

   A. 6
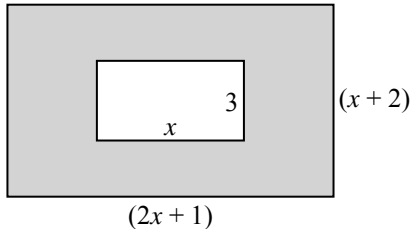
   B. 16

   C. 36

   D. 56

13. Which one of the following statements is NOT always true for positive numbers a, b, and c?

   A. $a(b \cdot c) = (a \cdot b)c$

   B. $a(b + c) = a \cdot b + a \cdot c$

   C. $a \div (b \cdot c) = (b \cdot c) \div a$

   D. $a + (b + c) = a + (c + b)$

14. Two dice are rolled. The **number** of dice showing "6" is counted. Which is the correct sample space?

   A. {6}

   B. {0, 1, 2}

   C. {0, 6, 12}

   D. {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}

15. An equation is shown below.

$$R = \frac{pL}{A}$$

   Which is an equivalent equation solved for L?

   A. $L = \dfrac{A}{pR}$

   B. $L = \dfrac{p}{AR}$

   C. $L = \dfrac{pR}{A}$

   D. $L = \dfrac{AR}{p}$

16. Use the information below.

$$☆ = ◯ ◯$$
$$□ = ◯ △$$
$$△ = ◯ ◯ ◯$$

   Which figure is equivalent to ☆ □ □ ?

   A.

   B.

   C.

   D.

17. Which equation has roots of –3 and 5?

   A. $x^2 - 2x - 15 = 0$

   B. $x^2 - 2x + 15 = 0$

   C. $x^2 + 2x - 15 = 0$

   D. $x^2 + 2x + 15 = 0$

18. The key is missing from the graph below.

Apple Harvest in Area Towns

Alvin

Morris

Steeple
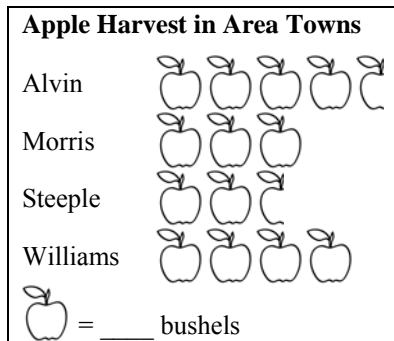
Williams

◯ = ____ bushels

   Morris and Williams harvested 560 bushels of apples. How many bushels does each apple in the graph represent?

   A. 7

   B. 14

   C. 40

   D. 80

19. The formula for the surface area S of a sphere is shown below, where r is the length of the radius.

$$S = 4\pi r^2$$

   When the surface area of a sphere is $64\pi \text{ cm}^3$, what is the length of the radius?

   A. 4 cm

   B. 8 cm

   C. 16 cm

   D. 64 cm

20. Which statement is true if $x = 10^0 + \sqrt[3]{30}$?

   A. $0 < x \le 4$

   B. $4 < x \le 6$

   C. $6 < x \le 12$

   D. $12 < x \le 20$

21. A system of linear equations is shown below.

$$\begin{cases} y = 2x + 1 \\ 2x - 3y = 5 \end{cases}$$

   What is the y-coordinate of the point of intersection?

   A. –5

   B. –3

   C. –2

   D. 9

22. Dave's windshield has a crack. He must decide who will fix it. Relevant information is listed below.

   • Replacing the windshield costs $200.

   • Repairing the crack costs $70.

   • If he has the windshield repaired, the insurance company will pay half of the cost.

   • If he has the windshield replaced by Glass Plus, he pays $25 plus 20% of the cost. His insurance pays the rest.

   • If he has the windshield replaced by Mobile Glass, he must pay the full cost; insurance pays nothing.

   What is the least amount of money Dave must pay to get the windshield repaired or replaced?

   A. $35

   B. $65

   C. $100

   D. $200

23. An equation is shown below.

$$x^2 + 2x - 24 = 0$$

   What is the solution set of the equation?

   A. $\{-4, 6\}$

   B. $\{-6, 4\}$

   C. $\{-12, 2\}$

   D. $\{-2, 12\}$

24. A survey about space program funding asked the question,

"Should the space program receive increased funding?"

A graph of the results is shown below.
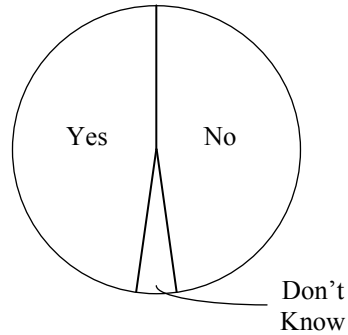
If the survey had instead asked,

"*Given the great benefits provided by the space program*, should the space program receive increased funding?"

which of these graphs shows likely results of that question?

A.

C.

B.

D.

---
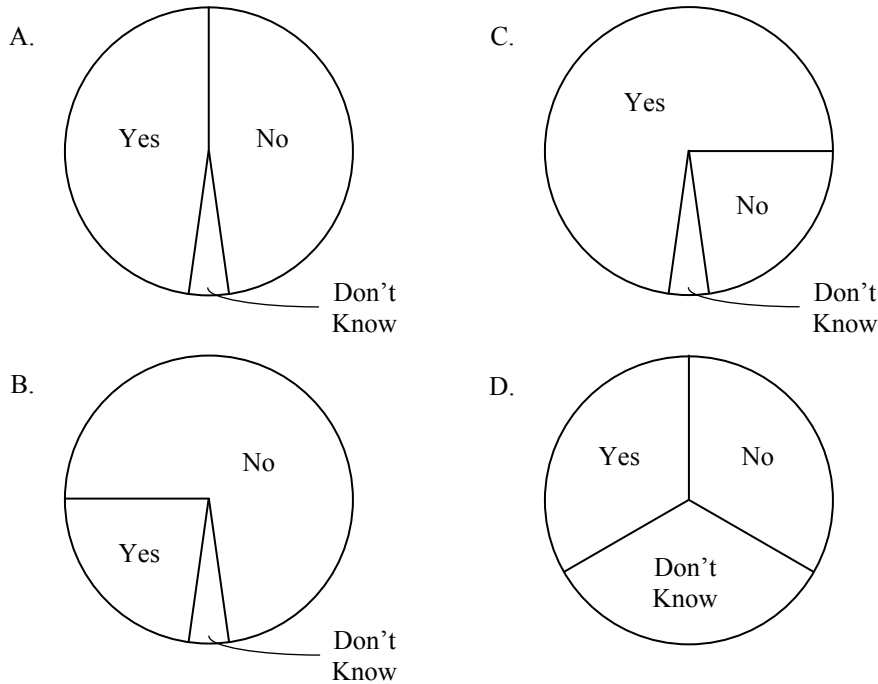
25. Which set of numbers could be the lengths of the sides of a right triangle?

A. 2, 3, 4

B. 3, 4, 7

C. 5, 10, 15

D. 9, 12, 15

26. What is the number of combinations of 7 things taken 3 at a time?

A. 21

B. 35

C. 210

D. 343

27. Fred and Ethel are solving the system of linear equations shown below:

$$\begin{cases} 2x - 3y = 12 \\ -4x + 6y = -24 \end{cases}$$

Fred found the solution to be the point (6, 0). Ethel found the solution to be the point (0, –4). Which person has the correct solution to the system and why?

A. Fred, because the point (6, 0) lies on both lines.

B. Ethel, because the point (0, –4) lies on both lines.

C. Neither, because any two lines may only have one point in common.

D. Neither, because they have found only two of the infinitely many points that lie on both lines.

28. A secretary types 56 words in a minute. Which proportion shows the approximate number of words that she can type in $\frac{1}{2}$ hour?

A. $\dfrac{56}{1} = \dfrac{x}{30}$

B. $\dfrac{56}{30} = \dfrac{x}{1}$

C. $\dfrac{56}{60} = \dfrac{x}{30}$

D. $\dfrac{56}{60} = \dfrac{x}{1}$

29. The cylinder and cone shown in the diagram below have equal volumes and equal heights.
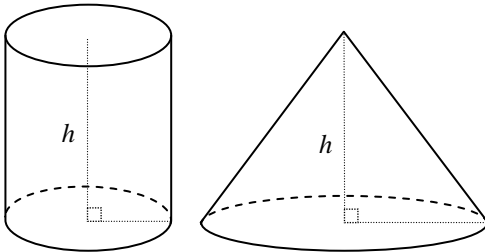
What is the ratio of the radius of the cylinder to the radius of the cone?

A. 1:3

B. 3:1

C. $1 : \sqrt{3}$

D. $\sqrt{3} : 1$

30. The tables below show favorite foods of three classes from two teachers.

Favorite Foods – Teacher A

	Burritos	Hamburgers	Pizza
Period 1	10	11	12
Period 2	9	13	10
Period 3	7	8	9

Favorite Foods – Teacher B

	Burritos	Hamburgers	Pizza
Period 1	10	15	8
Period 2	7	14	9
Period 3	8	12	7

Which matrix shows that Period 2 likes hamburgers the most?

A. $\begin{bmatrix} 7 & 14 & 9 \end{bmatrix}$

B. $\begin{bmatrix} 9 & 13 & 10 \end{bmatrix}$

C. $\begin{bmatrix} 16 & 27 & 19 \end{bmatrix}$

D. $\begin{bmatrix} 25 & 41 & 24 \end{bmatrix}$

31. Given $x = 2^3$, $y = \sqrt[3]{27}$, and $z = 4\sqrt{3}$, which number line shows the correct placement of x, y and z?

A.

B.

C.

D.
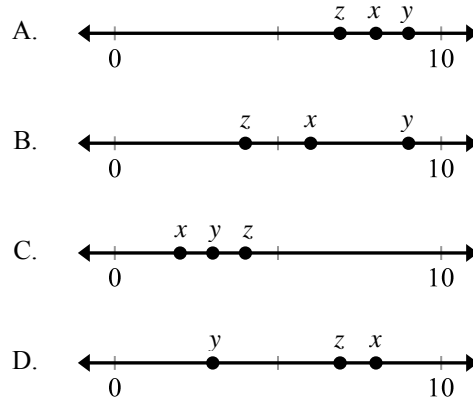
32. An ice cream shop advertises that they can make sundaes 36 different ways. A sundae consists of one sauce (chocolate, caramel, butterscotch), one nut (peanuts, walnuts, pecans), and one fruit. What is the fewest number of fruits the shop can offer to make 36 different sundaes?

A. 4

B. 9

C. 12

D. 30

33. Look at the quadrilateral below.

What is the value of x?

A. 32

B. 34

C. 68

D. 70

34. Use the figure below.

What word best describes $\overleftrightarrow{DB}$?

A. chord

B. diameter

C. secant

D. tangent

35. Which inequality is equivalent to $|p+5| \leq 8$?

A. $-13 \leq p \leq 3$

B. $-3 \leq p \leq 13$

C. $p \leq -13$ or $p \geq 3$

D. $p \leq -3$ or $p \geq 13$

36. Brand X locks use a 2-character code made up of the digits 0 through 9 which MAY NOT repeat. Brand Y locks use a 3-character code also made up from the digits 0 through 9 which MAY repeat. How many more different codes can Brand Y locks use than Brand X locks?

A. 620

B. 630

C. 900

D. 910

37. Use the sequence below.

$$5 \quad 1 \quad \frac{1}{5} \quad \frac{1}{25} \quad \frac{1}{125}$$

What is the nth term in the sequence?

A. 5^n

B. 5^{2n-1}

C. $\left(\dfrac{1}{5}\right)^{n-2}$

D. $\left(\dfrac{1}{5}\right)^{n}$

38. The table below shows points on a line.

x	-2	-1	0	1	2
y	-2	1	4	7	10

What is the slope of the line?

A. $-\dfrac{1}{3}$

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

C. -3

D. 3

39. The Venn Diagram below shows the numbers of students who are in Science Club, Math Club, and Honor Society.
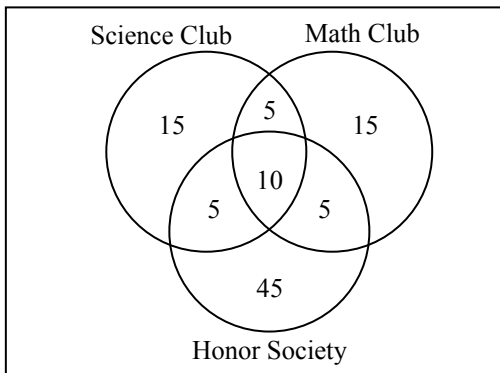
If a student is chosen at random, what is the probability that the student is in math club and in science club?

A. 25%

B. 20%

C. 15%

D. 10%

40. The diagram below shows six parking spaces. The marked angles are congruent.
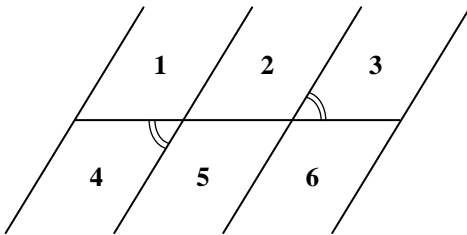
Is the width of parking space #2 the same as the width of parking space #5?

A. Yes. Alternate exterior angles are marked congruent, so the lines are parallel and equidistant.

B. Yes. Corresponding angles are marked congruent, so the lines are parallel and equidistant.

C. No. Alternate interior angles are not marked congruent, so the lines may not be parallel and equidistant.

D. No. Vertical angles are not marked congruent, so the lines may not be parallel and equidistant.

Spring 2011 Practice HSPE Solution Key and Answers

1. Use the graph to find ordered pairs;

    (59, 100), (61, 110), (62, 130), … Match the chart.

    ANSWER – C

2. (x, y), (domain, range), (abscissa, ordinate) → alphabetical order

    domain represents the x values, the range represents the y values.
    x can be any number

    ANSWER – B

3. ∠ whose vertex at center of circle equals intercepted arc
    ∠ whose vertex lies on the circle equals equal ½ intercepted arc
    ∠ whose vertex lies in the circle equals ½ sum of intercepted arcs
    ∠ whose vertex lies outside the circle equals ½ difference of intercepts arcs

    ∠BCE vertex lies on the circle, equals ½ intercepted arc, ½(40) = 20

    ANSWER – A

4. Mean – add, then divide
    Median – middle when in order
    Mode – most frequent

    The most frequent is 12 dogs, the mode.

    ANSWER – C

5. The pattern is +1 on top row and +2 on bottom row
    4 → 5
    11 → 13

    ANSWER – B

6. The sum is $\begin{pmatrix} 6 & -2 \\ 0 & 8 \end{pmatrix}$

   Quickly add numbers in row 1 column 1 to see which answers work

K + M,	4 + (–3) = 1	does not work
L + L,	3 + 3 = 6	works
L + M,	3 + (–3) = 0	does not work
M + M,	–3 + (–3) = – 6	does not work

   ANSWER – B

7. **Two spins have to add to 1 + 1 = 2, 1 + 2 = 3 or 2 + 2 = 4. So possible distribution has sums of 2, 3 and 4. That eliminates answer A.**

   $P(\text{sum=2}) = \dfrac{1}{2}\dfrac{1}{4} = \dfrac{1}{8}$

   $P(\text{sum=4}) = \dfrac{1}{2}\dfrac{3}{4} = \dfrac{3}{8}$

   $P(\text{sum=3}) = \dfrac{4}{8}$
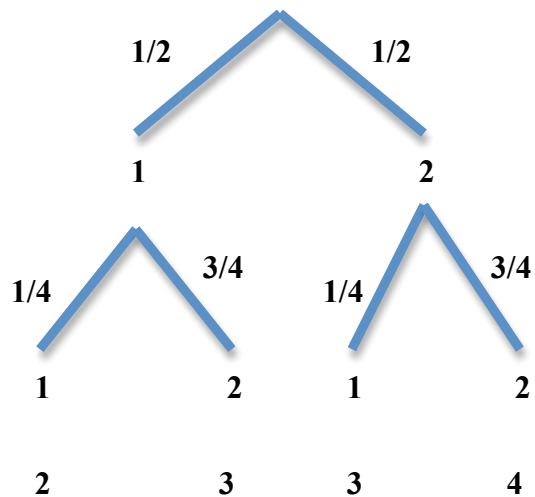
   ANSWER – C

8. $\dfrac{38 - 37.9}{38} = dec$, **multiply by 100 to get percent**

   ANSWER – D

9. $\triangle$ has sides of 11, 9 and 7. **If it is a right $\triangle$, then $c^2 = a^2 + b^2$. The larger side would have to be the hypotenuse.**

$11^2 \neq 9^2 + 7^2$ – can not be a right triangle
Sides are not equal, can not be equiangular
Since $11^2 < 9^2 + 7^2$, triangle must be acute.

ANSWER – A

10. Area of shaded region = area of larger region – area of smaller region

A = length x width

$A_{small\ region} = 3x$ $\qquad\qquad$ $A_{large\ region} = (2x + 1)(x + 2)$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad = 2x^2 + 5x + 2$

$A\ (shaded) = (2x^2 + 5x + 2) - 3x = 2x^2 + 2x + 2$

ANSWER – A

11. Selecting only certain population or excluding others results in bias.

ANSWER – B

12. Counter examples contradict the statement.

Answer B, C, and D support the statement, they are all even numbers divisible by 4. Answer A is 6 which is even and NOT divisible by 4.

ANSWER – A

13. Properties of real Numbers

Commutative and Associative Properties only work for addition and multiplication. The division in answer C should raise a red flag.

ANSWER – C

14. The "number" of dice showing a "6" could be 0, 1 or 2.

ANSWER – B

15. $R = \dfrac{pl}{A}$ → $AR = pl$ multiplying both sides by A

$\dfrac{AR}{p} = l$

ANSWER – D

16. KEY-   * = 00

$\square = 0\triangle$

$\triangle = 000$

Find *$\square\square$.   Substitute for *, $\square$, then $\triangle$

*$(0\triangle)$ $(0\triangle)$
00$(0\ 000)$ $(0\ 000)$
0000000000 → 10 circles

ANSWER – D

17. Roots are solutions (answers). $x = -3$ or $x = 5$

$x + 3$ is a factor $x - 5$ is a factor

$(x - 3)(x - 5) = 0$
$x^2 - 2x - 15 = 0$

ANSWER – A

18.

ALVIN –	4 ½ APPLES	Morris + Williams = 560 bush
MORRIS –	3 APPLES	3 ap + 4 ap = 560 bush
STEEPLE –	2 ½ APPLES	7 ap = 560 bush
WILLIAMS –	4 APPLES	ap = 80 bush

ANSWER – D

19. $S = 4\pi r^2$ $\qquad\qquad$ $S = 64\pi$

$64\pi = 4\pi r^2$

$16 = r^2$

$4 = r$

ANSWER – A

20. $x = 10^0 + \sqrt[3]{30}$ $\qquad\qquad\qquad$ $\rightarrow \sqrt[3]{27} = 3$

$x = 1 + 3^+$ **(# little greater than 3)**

$x = 4^+$

ANSWER – B

21. $y = 2x + 1$ $\qquad$ **Systems can be solved by substitution or linear combination**

$2x - 3y = 5$

The system is set up to be solved by substitution;

$2x - 3y = 5$

$2x - 3(2x + 1) = 5$

$2x - 6x - 3 = 5$

$-4x - 3 = 5$

$-4x = 8$

$x = -2.$ **If** $x = -2,$ **then** $y = 2x + 1 \rightarrow 2(-2) + 1 = -3$

ANSWER – B

If I used linear combination, the problem could have been solved quicker.

$y = 2x + 1 \rightarrow$ $\qquad$ $-2x + y = 1$

$2x - 3y = 5 \rightarrow$ $\qquad$ $\underline{2x - 3y = 5}$

$\qquad\qquad\qquad\qquad$ $-2y = 6$

$\qquad\qquad\qquad\qquad$ $y = -3$

22. Options   Repair with insurance $\frac{1}{2}(70) = 35$

                                Replace with Glass + $25 + .20(220) = 65$

                                Replace with Mobile   200

ANSWER – A

23. $x^2 + 2x - 24 = 0;$ $- 24$

                                            $24, - 1$

$(x + 6)(x - 4) = 0$ $12, - 2$

$x = -6$ or $x = 4$ $8, - 3$

                                            $\underline{6, - 4}$

ANSWER – B

24. Setting a positive tone results in greater acceptance.

ANSWER – C

25. In a right triangle, the hypotenuse is the longest side, check the sides using
$c^2 = a^2 + b^2$

$4^2 \ ?= 2^2 + 3^2;$ NO

$7^2 \ ?= 3^2 + 4^2;$ NO

$15^2 \ ?= 10^2 + 5^2;$ NO

$15^2 \ ?= 9^2 + 12^2;$ YES

ANSWER – D

26. $_nC_r = \dfrac{n!}{r!(n-r)!};$ $_7C_3 = \dfrac{7!}{(7-3)!3!} = \dfrac{7!}{4!3!}$

$$= \dfrac{7 \cdot 6 \cdot 5}{3 \cdot 2 \cdot 1} = 35$$

ANSWER – B

27.

$$2x - 3y = 12 \qquad (x2)\rightarrow \qquad 4x - 6y = 24$$
$$-4x + 6y = -24 \qquad \rightarrow \qquad \underline{-4x + 6y = -24}$$
$$0 = 0$$

0 = 0 is a true. That means that that the two equations are equivalent, have the same solution set, the graphs are the same lines. There is an infinite number of solutions.

ANSWER – D

28. **Secretary 56 words/minute; ½ hour = 30 minutes**

$$\frac{56}{1} = \frac{x}{30}$$

ANSWER – A

29. $V_{cyl} = \pi r_1^2 h$ $\qquad V_{con} = 1/3\ \pi r_2^2 h,$ **the volumes are the same and** $\dfrac{V_{cyl}}{V_{con}} = 1$

$$1 = \frac{Vcylinder}{Vcone} = \frac{\pi r_1^2 h}{(1/3)\pi r_2^2 h} = \frac{r_1^2}{(1/3)r_2^2} \rightarrow \frac{3r_1^2}{r_2^2} = \frac{\sqrt{3}r_1}{r_2}$$

$$\frac{\sqrt{3}r_1}{r_2} = 1 \rightarrow \frac{r_1}{r_2} = \frac{1}{\sqrt{3}}$$

ANSWER – C

30. **PERIOD 2 Hamburgers; 13 + 14 = 27**

ANSWER – C

31. $x = 2^3$ $y = \sqrt[3]{27}$ $z = 4\sqrt{3}$

     $x = 8$ $y = 3$ $z = 4$ (# less than 2)

                                                         $z < 8$

y is the smallest, z is in the middle, and x is the largest

ANSWER – D

32. Sauces   3 choices
       Nuts   3 choices
       Fruits   ? choices

       Use Fundamental Counting Principle;   Sauces x Nuts x Fruits = 36
                                                              3 x 3 x Fruits = 36
                                                                  Fruits = 4

       ANSWER – A

33. Sum of interior angles of a polygon given by (n – 2)360

       Quadrilateral – 360°
       x + (2x + 5) + (x + 10) + (x – 5) = 360
                               5x + 10 = 360
                                  5x = 350
                                    x = 70

       ANSWER – D

34. Chord – endpoints on the circle, it's a line segment
       Secant – line that intersects the circle in two points

       ANSWER – C

35. $|p + 5| \le 8$. by definition $p + 5 \le 8$ AND $-(p + 5) \le 8$
                                                     $p \le 3$ $-p - 5 \le 8$
                                                                        $-p \le 13$
                                                                        $p \ge -13$

       *When you mult/div an inequality by a negative number, change the order of
       the inequality. $-13 \le p \le 3$

       ANSWER – A

36. **Brand X; 1st - 10 ways, 2nd - 9 ways**   **Brand X; 10 x 9 = 90 ways**

Brand Y; 1st 10 ways, 2nd 10, 3rd 10 ways   Brand Y; 10 x 10 x 10 =1000 ways

1000 – 90 = 910

ANSWER – D

37.   5   1   1/5   1/25   1/125, …

Use substitution, let n= 1, n = 2, n = 3, etc to see which works

5^n;   **n = 1 works, n = 2 does NOT work**
5^{2n-1};   **n = 1 works, n = 2 does NOT work**
$(1/5)^{n-2}$;   **n = 1 works, n = 2 works, n = 3 works**

ANSWER – C

38. $m = \dfrac{\Delta y}{\Delta x}$;   **Pick any two points. Using an ordered pair with a coordinate 0 makes computation easier – (0, 4) and (1, 7).**

$$m = \frac{7-4}{1-0} = \frac{3}{1}$$

ANSWER – D

39.   TOTAL # OF SUDENTS – 100; math + science = 5 + 10; 15/100 = 15 %

ANSWER – C

40.   Using ABBA

ANSWER – A