2018 TAME High School Mathematics Test – Official Divisional

(1) If $b = 2a$ and $c = 5b$, what is the ratio of $8a + 2b$ to $2b + 2c$?

A) $\frac{1}{3}$ B) $\frac{1}{5}$ C) $\frac{2}{3}$ D) $\frac{1}{2}$

(2) Of the following sets of angles, which could be the angles of an isosceles triangle?

A) 60°, 45°, 45° B) 90°, 10°, 90° C) 70°, 70°, 70° D) 55°, 70°, 55°

(3) The average of a set of integers is 60. If the sum of the integers is 180, what is the number of integers in the set?

A) 3 B) 6 C) 12 D) 108

(4) How many positive factors of 36 are not multiples of 4?

A) 2 B) 4 C) 6 D) 8

(5) The side, front, and bottom face of a rectangular box have areas of 10-cm^2, 10-cm^2, and 25-cm^3, respectively. What is the volume of the box?

A) 25 cm^3 B) 50 cm^3 C) 625 cm^3 D) 2500 cm^3

(6) There are 6 marbles in a bag: 2 red, 3 blue, and 1 green. Liz takes one marble out of the bag and then she takes another single marble out of the bag for a total of two marbles. What is the probability that the two marbles she takes out are both red?

A) $\frac{1}{3}$ B) $\frac{1}{15}$ C) $\frac{2}{3}$ D) $\frac{1}{9}$

(7) If $x = \frac{1}{2}$ and $y = \frac{5}{2}$, then $x^2 + 2xy + y^2$ equals what number?

A) 3 B) 4 C) 8 D) None of these

(8) Wes makes a triangle with side lengths 5-cm, 12-cm, and 13-cm. Noah wants to make a triangle with integer side lengths that is similar to a right triangle with side lengths 3-cm, 4-cm, and 5-cm and has a greater area than Wes' triangle. What is the area of Noah's triangle?

A) 54 cm^2 B) 30 cm^2 C) 24 cm^2 D) 6 cm^2

(9) The difficulty of this test frustrates Dan and Mike. They only attempt to answer certain questions on this test numbered {1, 2, 3, ..., 60}. Dan only answers questions that are a multiple of 2 while Mike only answers questions that are multiple of 3. Both do not answer any questions that are a multiple of 6. How many more questions does Dan attempt to answer than Mike?

A) 3 B) 4 C) 5 D) 6

(10) Is the equation $3(2x - 4) = -18$ equivalent to $6x - 12 = -18$?

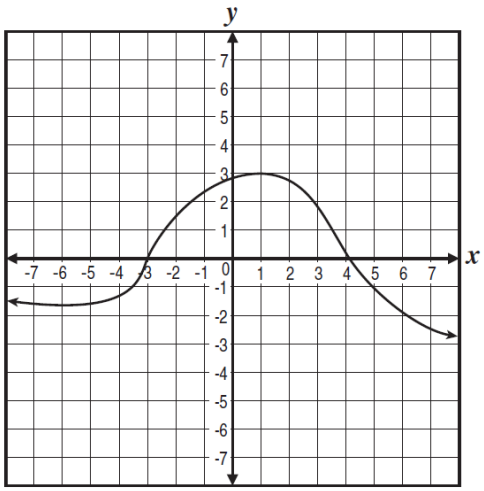
A) Yes, the equations are equivalent by the Associative Property of Multiplication.
B) Yes, the equations are equivalent by the Distributive Property of Multiplication over Addition.
C) Yes, the equations are equivalent by the Commutative Property of Multiplication.
D) No, the equations are not equivalent.

(11) Which statement is false?

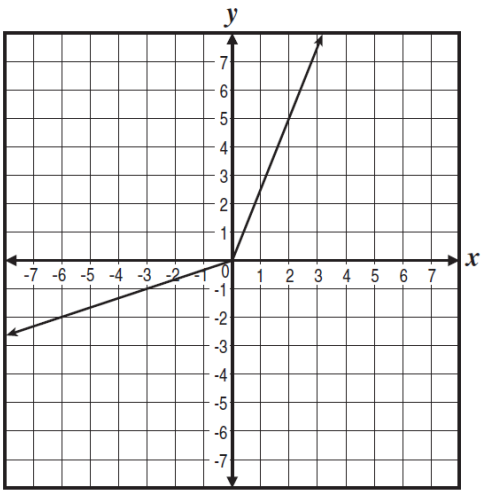
A) The order in which two whole numbers are subtracted does not affect the difference.
B) The order in which two whole numbers are added does not affect the sum.
C) The order in which two rational numbers are added does not affect the sum.
D) The order in which two rational numbers are multiplied does not affect the product.

(12) Which of the following graphs represents a relation that is not a function of x?

A)



C)



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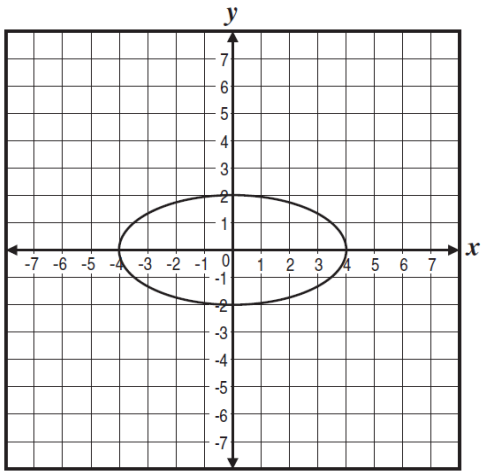
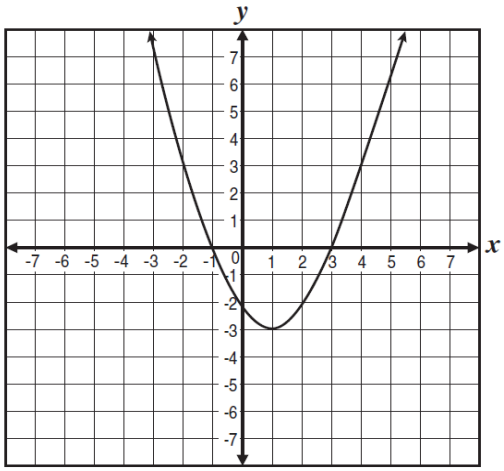


D)



(13) If $a \neq 0$, $b \neq 0$, and $3b \neq a$, find the product of x and y satisfying: $\begin{cases} 3ax - ay = 4a \\ ax - by = 4b \end{cases}$.

A) 0 B) –4 C) 12 D) 12a

(14) If a line segment has an endpoint (2, 3), midpoint $(2 + \sqrt{5}, 7)$ and endpoint (x, y), what is $(x - 2)^2 - y$?

A) –1 B) 9 C) 49 D) 89

(15) Which of the following points determines a right triangle with the points (0, 5) and (2, 4)?

A) (2, 9)
B) (7, 4)
C) (6, 2)
D) (–3, 4)

(16) Matt and Mike working together can wash all the windows at home in 4 hours. Working alone it takes Mike twice as long as Matt to do the same job. How long does it take Matt to wash all the windows by himself at this home?

A) 12 hours B) 10 hours C) 8 hours D) 6 hours

(17) What are the possible values of x in $|12 - 4x| = 2$?

A) $2.50 < x < 3.50$
B) $x = -2.50$ or $x = -3.50$
C) $x = 2.50$ or $x = 3.50$
D) $-3.50 < x < -2.50$

(18) For a wedding, Genevieve bought several dozen roses and several dozen carnations. The roses cost $15 per dozen, and the carnations cost $8 per dozen. Genevieve bought a total of 17 dozen flowers and paid a total of $192. How many roses did she buy?

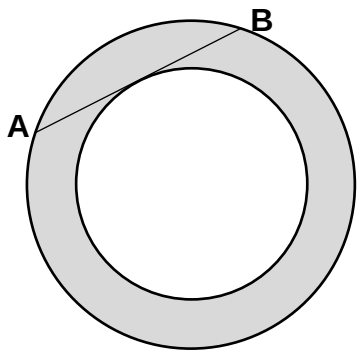
A) 6 dozen B) 7 dozen C) 8 dozen D) 9 dozen

(19) If triangle PQR is inscribed in Circle O and $PQ : RP : QR = 4 : 5 : 3$, then what is the measure of angle R?

A) 30° B) 40° C) 60° D) 80°

(20) In the concentric circles shown to the right, chord AB is tangent to the smaller circle. If AB = 12, then what is the shaded area (the annulus)?

A) 6π
B) 12π
C) 36π
D) 144π



(21) The numbers 1, 2, 3, ..., ***n*** are evenly spaced on the rim of a circle. If 15 is directly opposite 49, then what is ***n***?

A) 49 B) 50 C) 57 D) 68

(22) Mackenzie is planning her summer vacation. She can choose to go to one of 7 different countries, using 4 different airlines, and 3 different departure dates. How many different vacation combinations consisting of one airline, one country and one departure date are possible?

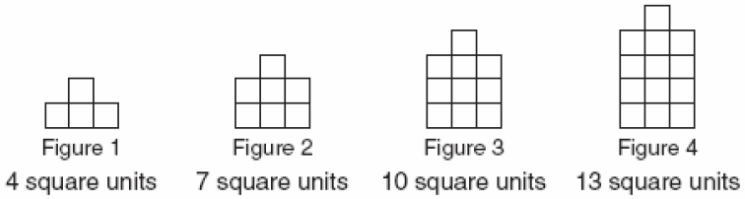
A) 24 B) 28 D) 31 D) 84

(23) Which of the linear equations below is derived from the following table of values?

x	–3	–1	1	3
y	1	3	5	7

A) $y = x + 4$ B) $y = 2x + 7$ C) $y = -x + 4$ D) $y = 3x + 2$

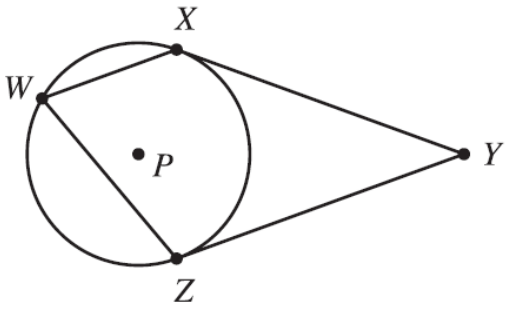
(24) If the number of square units in the pattern of figures to the right continues to increase arithmetically as shown, how many square figures will be in the 9^{th} figure?



A) 9
B) 39 + 1
C) 9(3 + 1)
D) 1 + (3 · 9)

(25) Which transformation of ΔABC does not result in a congruent triangle?
A) a dilation by a factor of 2, followed by a dilation by a factor of 0.5
B) a reflection across the x-axis, followed by a rotation of 180° about the origin
C) a translation of 1 unit right and 2 units up, followed by a dilation by a factor of 3
D) a rotation by 180° about the origin, followed by a translation of 2 units left and 3 units down

(26) In the figure to the right circle P has tangents $\overline{ZY}$ and $\overline{XY}$ as well as chords $\overline{WX}$ and $\overline{WZ}$. If the measure of $\angle$ZWX is 70°, what is the measure of $\angle$XYZ?



A) 20°
B) 35°
C) 40°
D) 55°

(27) Which statement is true for any two circles?
A) The ratio of the areas of the circles is the same as the ratio of their radii.
B) The ratio of the areas of the circles is the same as the ratio of their diameters.
C) The ratio of the circumferences of the circles is the same as the ratio of their radii.
D) The ratio of the areas of the circles is the same as the ratio of their circumferences.

(28) The graph of a circle has its center at (2, 3) with a radius of 10 units. Which point does not lie on the circle?
A) (-4, -5) B) (8, 11) C) (-2, 6) D) (-4, 11)

(29) What is the mean absolute deviation of the set {12, 10, 14, 4, 5}?
A) 18.0 B) 9.0 C) 3.6 D) 1.8

(30) A spinner has three sections, each with different point values and areas.

- The 1-point section is $\frac{2}{3}$ the area of the spinner.
- The 2-point section is $\frac{1}{4}$ the area of the spinner.
- The 3-point section is $\frac{1}{12}$ the area of the spinner.

To the nearest tenth of a point, what is the expected value on any one spin?
A) 0.7 B) 1.4 C) 2.0 D) 6.0

(31) A certain car depreciates at a rate of 15% per year. If the purchase price of the car is \$26,000, what will the value of the car be in 6 years?

A) \$3,900 B) \$9,806 C) \$22,100 D) \$22,609

(32) Which function represents the graph having x-intercepts at -3 and 2 and passing through (3, 12)?

A) $y = \frac{1}{2}(x-2)(x+3)$

B) $y = \frac{1}{2}(x-3)(x+2)$

C) $y = 2(x + 3)(x – 2)$

D) $y = 2(x + 2)(x – 3)$

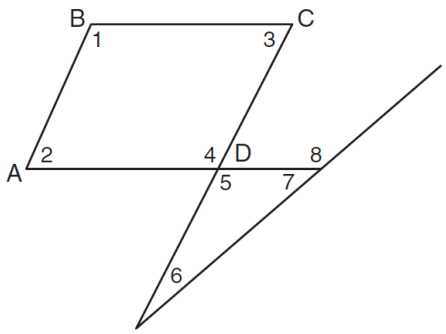
(33) Which of these functions has the greatest y-intercept?

A) $f(x) = 4 \cos x + 2$ B) $f(x) = 5x^2 + 3x + 4$ C) $f(x) = 5x + 2$ D) $f(x) = 3(2^x)$

(34) Judy has a container of dimes and quarters. In her container, she has 12 more dimes than quarters. If the total amount of money in Judy's container is \$11.35, how many quarters does she have?

A) 24 B) 29 C) 36 D) 41

(35) Figure ABCD to the right is a rhombus. If m∠1 = 115° and m∠6 = 40°, what is the m∠8 ?



A) 75°

B) 105°

C) 115°

D) 155°

(36) At a grocery store, Jane makes a window display using cans of dog food. Her display is in the shape of a trapezoid that will be 8 rows high. The top row of Jane's display has 6 cans, and each row below has one more can than the row above. How many total cans are in the display?

A) 48 B) 51 C) 63 D) 76

(37) How long does it take to triple your money if you invest in an account that draws 5% annual interest compounded continuously?

A) 4.09 years B) 13.86 years C) 20.10 years D) 21.97 years

(38) A parabola has vertex (2,0) and passes through the point (3,5). Which of the following points is on the parabola?

A) (4, 20) B) (0, 18) C) (1, 6) D) (-1, 32)

(39) If θ is an angle in standard position whose terminal side passes through the point (-3, 4), what is the value of $\cos\theta + \tan\theta$?

A) $-\frac{8}{15}$ B) $-\frac{29}{15}$ C) $\frac{1}{5}$ D) 1

(40) In a triangle with sides of lengths 3-ft, 4-ft, and 6-ft, what is the measure of the angle between the sides of lengths 4-ft and 6-ft?
A) 26.4° B) 48.2° C) 114.2° D) 122.8°

(41) Which of the following statements is true about the graph of a polynomial function of degree three.
A) It is monotonic.
B) It intersects the *y*-axis at exactly one point.
C) It intersects the *x*-axis at three distinct points.
D) It has a maximum value and a minimum value.

(42) What is the center of the circle $x^2 + y^2 + 4x - 2y - 11 = 0$?
A) (-2, 1) B) (1, -2) C) (1, 1) D) (4, -2)

(43) Given $f(x) = x^2$ and $g(x) = 2x - 3$, what is the value of $f \circ g(4)$?
A) 16 B) 5 C) 29 D) 25

(44) Find a third degree polynomial function $f(x)$ with zeros $1 + i$ and 2 for which $f(0) = -8$.
A) $f(x) = x^3 - 3x^2 + 12x - 8$
B) $f(x) = 2x^3 - 8x^2 + 12x - 8$
C) $f(x) = 3x^3 - 12x^2 + 2x - 8$
D) $f(x) = x^3 + 3x^2 - 12x + 8$

(45) An octahedron has how many edges?
A) 6 B) 8 C) 12 D) 20

(46) The minute hand of Weatherford's town clock measures 12 feet. How far, in feet, does the tip of the minute hand travel in 35 minutes?
A) 14π feet B) 13π feet C) 12π feet D) 10π feet

(47) An 18-inch diameter pizza is cut into 12 slices. What is the distance around one slice?
A) $18+\frac{3\pi}{2}$ B) $18+\frac{\pi}{2}$ C) $18+\frac{9\pi}{2}$ D) $18 + 9\pi$

(48) A circular pool with a radius of 10 has a circular walkway constructed around it with a width of 1. What is the area of the walkway?
A) 21π B) 32π C) 36π D) 44π

(49) The ratio of children to adults at a party is 2:3. A busload of 30 more children arrives at the party, and now the ratio of children to adults is 3:2. How many people were at the party before the bus arrived?
A) 24 B) 30 C) 36 D) 60

(50) Genny and Andy are walking in opposite directions along the same route between A and B. Genny is going from A to B, and Andy from B to A. They start at the same time and they pass each other 3 hours later. Genny arrives at B 2.5 hours before Andy arrives at A. How many hours are required for Andy's trip from B to A?
A) 5 hours B) $7\frac{1}{2}$ hours C) 8 hours D) $8\frac{3}{4}$ hours

(51) Two fair six-sided dice are rolled. What is the probability that the results sum to 5 or 7?

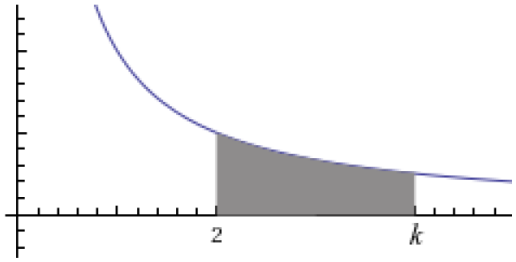
A) $\frac{2}{9}$ B) $\frac{5}{18}$ C) $\frac{7}{18}$ D) $\frac{5}{9}$

(52) Let $f(x) = \tan x$, and $g(x) = x^2$. At what value of x in the interval $0 \le x \le \pi$ do the graphs of f and g have parallel tangent lines?

A) 0 B) 0.660 C) 2.083 D) 2.194

(53) A portion of the function $f(x) = 1/x$ is plotted at right. For what value of k will the area of the shaded region be ln(4)?

A) 4
B) 8
C) e
D) e^2



(54) Given a triangle, where a and b are sides of the triangle and θ is the angle between those sides, what angle θ will maximize the area of the triangle?

A) $\frac{\pi}{2}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{6}$ D) $\frac{3\pi}{4}$

(55) The radius of a circle is increasing. At a certain instant the rate of increase of the area is numerically equal to twice the rate of increase of the circumference. What is the radius of the circle at that instant?

A) $\frac{1}{2}$ B) 1 C) $\sqrt{2}$ D) 2

(56) The position of a particle on the x-axis at time t, $t > 0$, is $\ln t$. What is the average velocity of the particle for $1 \le t \le e$?

A) 1 B) e C) $\frac{1}{e} - 1$ D) $\frac{1}{e-1}$

(57) The velocity of a bicycle, in feet per second, is given by the function $f(t) = 4t$. How far does the bicycle travel in 5 seconds?

A) 50 feet B) 75 feet C) 100 feet D) 175 feet

(58) Evaluate: $\lim_{x \to -2} \frac{x^3 - 7x - 6}{x^2 - x - 6}$.

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

(59) Evaluate: $\int (1 - \cos x)\, dx$.

A) $1 + \sin x$ B) $\sin x$ C) $x + \sin x$ D) $x - \sin x$

(60) If $y = \frac{x-3}{x^2}$ then $y'(-2) = ?$

A) $-\frac{1}{4}$ B) $\frac{1}{2}$ C) -1 D) $-\frac{5}{4}$

2017 – 2018 TAME High School Division Mathematics Test
Answer Key

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

(21) D
(22) D
(23) A
(24) D
(25) C
(26) C
(27) C
(28) C
(29) C
(30) B
(31) B
(32) C
(33) A
(34) B
(35) D
(36) D
(37) D
(38) A
(39) B
(40) A

(41) B
(42) A
(43) D
(44) B
(45) C
(46) A
(47) A
(48) A
(49) D
(50) B
(51) B
(52) C
(53) B
(54) A
(55) D
(56) D
(57) A
(58) A
(59) D
(60) C