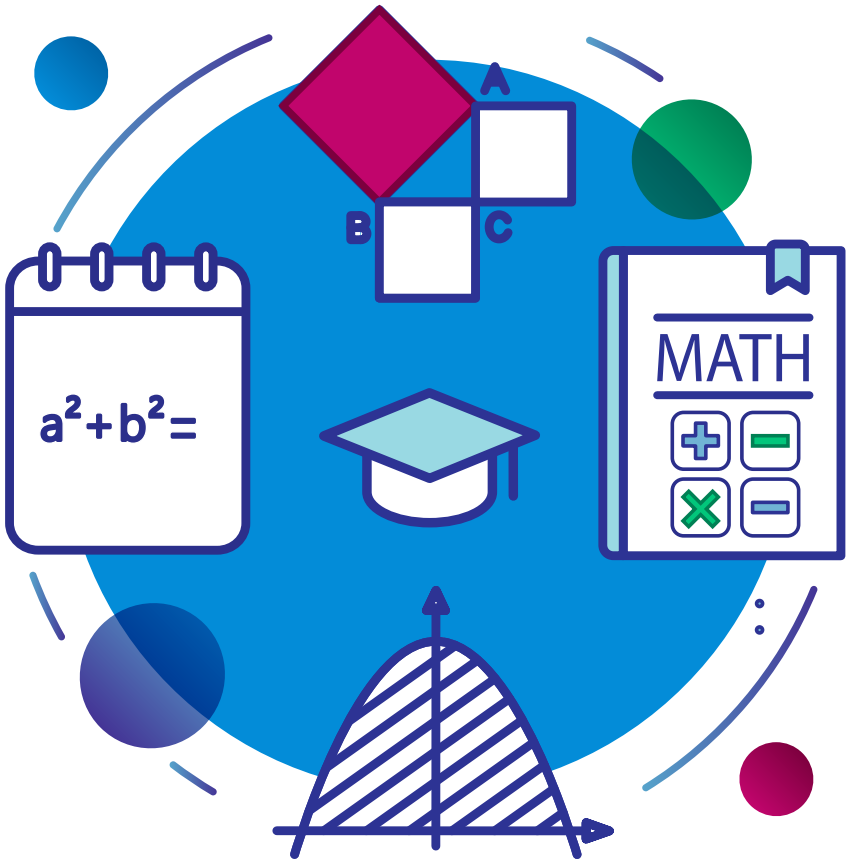


ACADEMIC MATHEMATICS

PLACEMENT STUDY GUIDE

Overview and Topics applies to new version of AMP to begin in January 2021
Revision Date: October 2020

COLLEGE OF THE NORTH ATLANTIC QATAR

Overview

- The Academic Mathematics Placement (AMP) is a diagnostic of basic skills in mathematics, administered by the CNAQ Testing Centre and designed by the math department in the School of General Educaiton.
- The AMP measures key areas of competence in specific core areas of mathematics covered in grade school.
- The AMP consists of 80 multiple-choice questions in 20 topic areas.
- Students have 2.5 hours to complete the AMP.
- The AMP score determines the math course for which a student has the prerequisite knowledge to succeed.
- A calculator is approved for all questions on the AMP.
    - ✓ CNAQ will provide you with a Casio fx-85Es
    - ✓ Students must know how to use the calculator
    - ✓ Students will not receive help on how to use the calculator

Topics

This study guide contains sample questions from the topics listed below, representing the average level of difficulty for each topic area.

- Real Number System
- Whole Numbers and Integers
- Fractions
- Decimals
- Percent
- Solving Equations
- Formula Rearrangement
- Laws of Exponents
- Negative Exponents
- Polynomials
- Factoring
- Rational Expressions
- Geometry
- Equation of the Line
- Systems of Equations and Inequalities
- Trigonometry
- Data Management
- Functions
- Logarithms
- Word Problems

Synopsis

Topic 1: Real Number System

- Practice Questions 1—10
- Define the various sets of the real number system
- Give examples that require the use of different number systems
- Identify the characteristics of various number sets
- Show the relations between the natural, whole, rational, irrational, and real numbers
- Use radical notation to express roots
- Evaluate roots of perfect squares and cubes
- Approximate square roots and cube roots using a calculator
- Place real numbers on the real number line

Topic 2: Whole Numbers and Integers

- Practice Questions 11—20
- Perform operations with whole numbers
- Find the factors of a whole number
- Determine whether a whole number is prime, composite, or neither
- Find the prime factorization of a number
- Use exponents on whole numbers
- Find the greatest common factor (GCF) for two or more numbers
- Find the lowest common multiple (LCM) for two or more numbers
- Use order of operations to perform calculations on integers
- Evaluate numerical expressions using absolute value

Topic 3: Fractions

- Practice questions 21—30
- Perform operations on fractions and mixed numbers
- Define proper fractions, improper fractions, and mixed numbers
- Convert mixed numbers to improper fractions and vice versa
- Simplify a fraction
- Define reciprocal
- Add and subtract proper fractions, improper fractions, and mixed numbers
- Multiply and divide proper fractions, improper fractions, and mixed numbers
- Perform operations on complex fractions

Topic 4: Decimals

- Practice questions 31—40
- Change a decimal to a fraction
- Change a decimal to a percent
- Identify the base units of measure for mass, volume, and length
- Convert from one unit of metric measure to another (kilo- to milli-range)
- Evaluate algebraic expressions
- Write a decimal number in scientific notation, and vice versa
- Round numbers to one or two decimal places

Topic 5: Percent

- Practice questions 41—50
- Define percent
- Change a percent to a fraction or decimal
- Change a fraction or decimal to a percent
- Perform calculations using the three types of percent problems
- Calculate percent increase and percent decrease.
- Calculate unweighted and weighted Averages

Topic 6: Solving Equations

- Practice questions 51—60
- Determine whether a given number is a solution for an equation
- Use the addition property to solve an equation
- Use the division property to solve an equation
- Combine the addition and division properties to solve an equation
- Solve equations that contain brackets
- Solve equations that contain fractions
- Solve a proportion for an unknown value

Topic 7: Formula Rearrangement

- Practice questions 61—70
- Solve an equation or formula for a given variable

Topic 8: Laws of Exponents

- Practice questions 71—80
- Perform calculations with exponents
- Simplify expressions involving zero and positive exponents

Topic 9: Negative Exponents

- Practice questions 81—90
- Perform calculations with negative exponents
- Simplify expressions involving negative exponents

Topic 10: Polynomials

- Practice questions 91—100
- Define polynomials
- Identify: monomials, binomials, and trinomials
- Find the degree of a polynomial that has one variable
- Write a polynomial in descending-exponent form
- Add, subtract, multiply and divide polynomials
- Square a binomial

Topic 11: Factoring

- Practice questions 101-—110
- Find the greatest common factor from a polynomial
- Factor trinomials of the form $x^2 + bx + c$
- Factor trinomials of the form $ax^2 + bx + c$
- Factor a difference of squares
- Factor by grouping
- Factor a sum and a difference of cubes

Topic 12: Rational Expressions

- Practice questions 111—120
- Determine the values for which a rational algebraic expression is defined
- Simplify rational algebraic expressions
- Add, subtract, multiply and divide rational algebraic expressions
- Find lowest common denominator of rational algebraic expressions

Topic 13: Geometry

- Practice questions 121—130
- Determine the number of significant digits of an approximate number
- Identify pairs of complementary angles and pairs of supplementary angles
- Classify angles as right, acute, obtuse, or straight
- Classify triangles as scalene, equilateral, right, or isosceles
- Use the angle-sum principle to calculate unknown angles in triangles
- Use the Pythagorean Theorem to calculate the unknown side lengths
- Find the area and perimeter of a square, rectangle, triangle, and circle
- Find the volume and surface area of a sphere, cone, cylinder, and prisms
- Recognize similar triangles and identify the corresponding parts
- Find the missing measures in similar triangles.

Topic 14: Equation of the Line

- Practice questions 131 — 140
- Determine distance between two points
- Determine midpoint of a line segment
- Determine slope of a line including parallel and perpendicular lines
- Given a line, find steepness and direction of slope.
- Graph a line given: its slope and y – intercept, its slope and any point, any two points on the line.
- Write equation of a line from standard form to slope-intercept form and vice versa
- Graph a linear equation using: its slope and y – intercept, its two intercepts, a point on the line and the equation of a parallel or perpendicular line.
- Graph horizontal and vertical lines from their equations.
- Find the equation of a line given: slope and y – intercept, slope and a point on the line, two points on the line, a point and either the equation of perpendicular line or a parallel line, or the graph of a line.

Topic 15: Systems of Equations and Inequalities

- Practice questions 141 —150
- Determine the number of solutions for a systems of equations
- Solve a system of linear equations in two variables by: graphing, elimination method, or substitution method
- Solve a system of linear inequalities in two variables by graphing
- Graph linear inequalities on a number line or x-y plane

Topic 16: Trigonometry

- Practice questions 151 -—160
- Primary trigonometric ratios:
  - Define the primary trigonometric ratios - sine, cosine, and tangent.
  - Use a calculator to determine the numerical values of the sine, cosine and tangent of angles between 0 and 90 degrees
  - Use a primary trigonometric ratio to calculate the unknown length of one side of a right triangle
  - Use the calculator to determine the size of an angle when the numerical value of its sine, cosine, or tangent is given
  - Use a trigonometric ratio to calculate an unknown acute angle of a right triangle
- Secondary trigonometric ratios
  - Define the secondary trigonometric ratios - cosecant, secant and cotangent
  - Use the calculator to determine the numerical values of the cosecant, secant, and cotangent of angles between 0 and 90 degrees
  - Use the calculator to determine the size of an angle when the numerical value of its cosecant, secant, or cotangent is given
- Define minutes and seconds as subdivisions of a degree
- Convert minutes and second to degrees and degrees to minutes and seconds

Topic 17: Data Measurement

- Practice questions 161 — 170
- Interpret data from circle graphs, histograms, bar charts, tables, scatterplots, line graphs

Topic 18: Functions

- Practice questions 171—180
- Define relations
- Represent relations as a set of ordered pairs, as a table of values, as a graph, or as an equation
- Determine the domain and range of a relation
- Determine if a particular relation is a function.
- Evaluate a function at a value in its domain
- Describe and sketch graphs of the functions given horizontal translations, vertical translations, and vertical stretch
- Given equation $y = a(x - h)^2 + k$ determine: the coordinates of its vertex, the equation of the axis of symmetry, direction of opening, maximum or minimum point, its domain and range
- Change $y = ax^2 + bx + c$ to the $y = a(x - h)^2 + k$ form

Topic 19: Logarithms

- Practice questions 181—190
- Change expressions from exponential to logarithmic form and vice versa
- Use the laws of logarithms to rewrite expressions
- Use the calculator to find common logarithms
- Use the laws of logarithms to solve literal equations
- Change the form of logarithmic and exponential equations
- Use the calculator to find antilogarithms

Topic 20: Word Problems

- Practice questions 191 — 200
- Using the skills from topics 1—19, answer questions based on English simple-sentence descriptions with or without a diagram.

Examples (with calculator)

1. Find the GCF and LCM of 32 and 48.

2. Evaluate: $250\left(1+0.15\times\frac{7}{12}\right)$

3. Change 120 kilograms (kg) to milligrams (mg).

4. What is 12% of 25?

5. 31% of what number is 15.5?

6. 16 is what percent of 25?

7. Simplify: a) $-x^2y+4xy^3-(xy^3-9x^2y)$

   b) $ab(b^2-4ac)$

   c) $(4-7x)^2$

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

   e) $\left(\frac{x^{-1}y^4z}{x^2yz^0}\right)^{-2}$

8. Solve for x: $4(x+2)-(x-1)=9-3x$

9. Five more than twice a number is 19. What is the number?

10. A price for a pair of shoes is 400 QR. The price is decreased by 30%. What is the new price?

11. Factor: a) $3x^2 - 5x - 2$

b) $12x^3y^3 + 6x^4y^2 + 3x^2y$

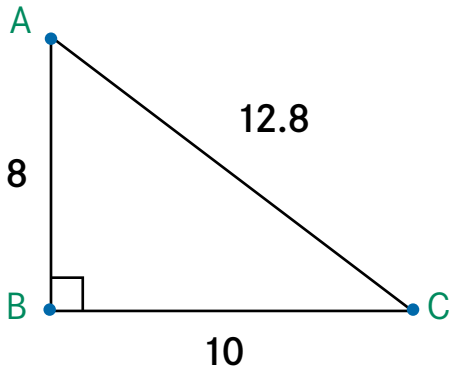
c) $4x^2 - 9y^2$

12. Simplify: a) $\dfrac{x^2 + 4x + 4}{x^2 - x - 6}$

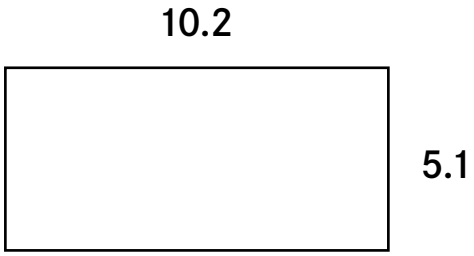
b) $\dfrac{m}{3n} - \dfrac{2m}{15n}$

c) $\dfrac{y^2 - 9}{2y^2 + 10y} \times \dfrac{y^2 + 5y}{y^2 + y - 6}$

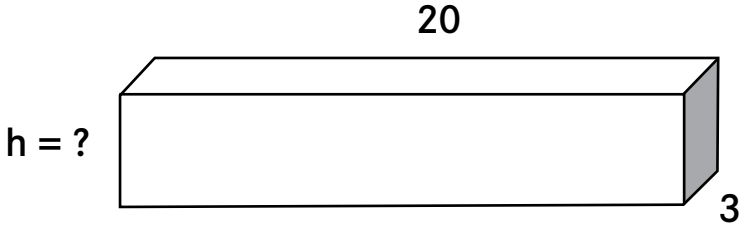
13. Find the perimeter:



14. Find the area:



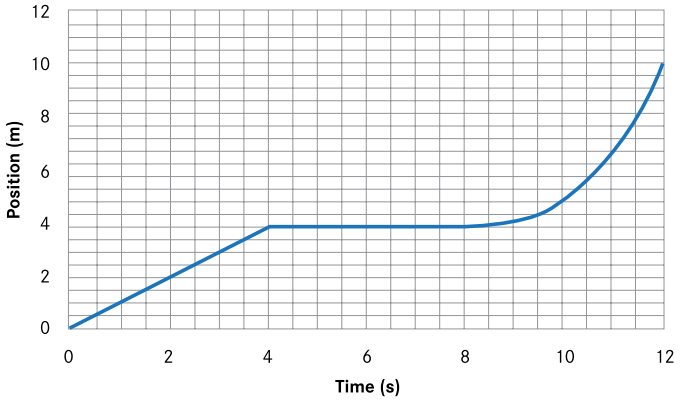
15. What is the height of the box if the volume is 150?



16. What is the slope of the line given by the equation $3x - 9y = -18$?

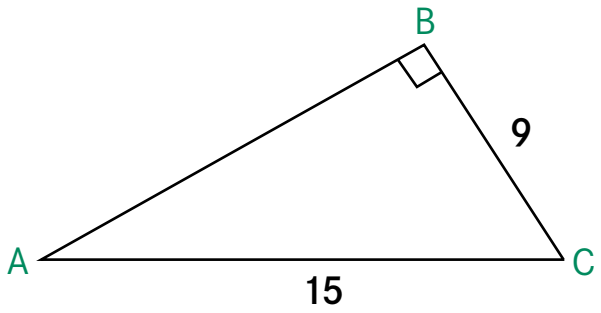
17. What is the x-intercept of the line given by the equation $3x - 9y = -18$?

18. What is the position at t = 10 seconds?



19. Using the graph in Question 18, at what time is the position 3 m?

20. Find the measure of $\angle C$



21. In $\Delta SRT, \angle R = 90^0, r = 17.5, t = 4.90$. Calculate the length of the missing side.

22. What is the circumference of a circle that has a diameter of 4 units?

Examples (without calculator)

1. Round to ONE decimal place: 5.6498

2. Which digit is in the *tens* place? 10.63

3. Evaluate (a) $3 \times 2 - 2^5 \div 8 + 1$ (b) $\frac{7}{9} \div \frac{35}{18}$ (c) $\frac{4}{5} - \frac{3}{10}$

(d) $2\frac{3}{8} - 1\frac{2}{3}$ (e) $\dfrac{\frac{7}{9}}{\frac{2}{3} - \frac{1}{12}}$

4. Complete the table:

	Fraction	Decimal	Percent
a	$\frac{5}{9}$		
b			$11\frac{2}{3}\%$
c	$\frac{9}{8}$		
d			0.06%
e		1.26	

5. Write an equation to represent the statement: "9 less than twice a number is 17"

6. Simplify $\dfrac{x^4 \cdot x^9}{x^2}$

7. Solve the formula for w: $P = 2(L + w)$

Solutions (with calculator)

1. To find the GCF: $32 = 2\times2\times2\times2\times2$

$48 = 2\times2\times2\times2\times3$

Common factors…so the GCF is $2\times2\times2\times2 = 16$

To find the LCM: multiples of 32: $32, 64, 96, 128\ldots$

multiples of 48: $48, 96, 144, 192\ldots$

96 is the smallest common multiple, so the LCM is 96

2. $$250\left(1+0.15\times\frac{7}{12}\right) = 250\left(1+0.15\times0.58333\ldots\right)$$
$$= 250(1+0.0875)$$
$$= 250(1.0875)$$
$$= 271.875$$

3. $$120\text{ kg} = 120\text{ kg}\times\frac{1000\text{ g}}{1\text{ kg}} = 120\,000\text{ g}\times\frac{1000\text{ mg}}{1\text{ g}} = 120\,000\,000\text{ mg}$$

4. $$12\%\times25 = x$$
$$0.12\times25 = x$$
$$3 = x$$

5. $$31\%\times x = 15.5$$
$$0.31x = 15.5$$
$$\frac{0.31x}{0.31} = \frac{15.5}{0.31}$$
$$x = 50$$

6. $16 = x \times 25$

$$\frac{16}{25} = \frac{25x}{25}$$

$$0.64 = x$$

$$64\% = x$$

7. (a) $-x^2y + 4xy^3 - (xy^3 - 9x^2y)$

Combine like terms

$$= -x^2y + 4xy^3 - xy^3 + 9x^2y$$

$$= 8x^2y + 3xy^3$$

(b) $ab(b^2 - 4ac) = ab^3 - 4a^2bc$

(c) $(4-7x)^2 = (4-7x)(4-7x)$

$$= 16 - 28x - 28x + 49x^2$$

$$= 16 - 56x + 49x^2$$

(d) $\left(5a^5b^3\right)^2 = \left(5\right)^2\left(a^5\right)^2\left(b^3\right)^2$

$$= 25a^{10}b^6$$

(e) $\left(\frac{x^{-1}y^4z}{x^2yz^0}\right)^{-2} = \left(\frac{x^{-1-2}y^{4-1}z}{(1)}\right) = \left(\frac{x^{-3}y^3z}{1}\right) = \left(\frac{y^3z}{x^3}\right)^{-2} = \left(\frac{x^3}{y^3z}\right)^2 = \frac{x^6}{y^6z^2}$

8. $4(x+2) - (x-1) = 9 - 3x$

$$4x + 8 - x + 1 = 9 - 3x$$

$$4x - x + 3x = 9 - 8 - 1$$

$$6x = 0$$

$$\frac{6x}{6} = \frac{0}{6}$$

$$x = 0$$

9. Let x = the number. Then: $2x+5=19$

$$2x=19-5$$
$$2x=14$$
$$\frac{2x}{2}=\frac{14}{2}$$
$$x=7$$

10. Let x = new price. Then: $x=400-30\%\times 400$

$$x=400-0.30\times 400$$
$$x=400-120$$
$$x=280$$

The new price of the shoes is 280 QR.

11. (a) $3x^2-5x-2$

$$3x^2-6x+x-2$$
$$\left(3x^2-6x\right)+\left(x-2\right)$$
$$3x\left(x-2\right)+1\left(x-2\right)$$
$$\left(3x+1\right)\left(x-2\right)$$

(b) $12x^3y^3+6x^4y^2+3x^2y$

$$=3x^2y\left(4xy^2+2x^2y+1\right)$$

(c) $4x^2-9y^2$

$$=\left(2x+3y\right)\left(2x-3y\right)$$

12. (a) $\dfrac{x^2+4x+4}{x^2-x-6} = \dfrac{(x+2)(x+2)}{(x-3)(x+2)}$

Cancel Combine factors $(x+2)$

$= \dfrac{(x+2)}{(x-3)}$

(b) $\dfrac{m}{3n} - \dfrac{2m}{15n} = \dfrac{5m}{15n} - \dfrac{2m}{15n}$

$= \dfrac{3m}{15n}$

$= \dfrac{m}{5n}$

(c) $\dfrac{y^2-9}{2y^2+10y} \times \dfrac{y^2+5y}{y^2+y-6} = \dfrac{(y+3)(y-3)}{2y(y+5)} \times \dfrac{y(y+5)}{(y+3)(y-2)}$

$= \dfrac{y-3}{2(y-2)}$

13. $P = 8\text{ cm} + 10\text{ cm} + 12.8\text{ cm} = 30.8\text{ cm}$

14. $A = l \times w$

$= (10.2\text{ cm})(5.1\text{ cm})$

$= 52.02\text{ cm}^2$

15. $V = l \times w \times h$

$150\text{ m}^3 = (20\text{ m})(3\text{ m})(h)$

$150\text{ m}^3 = (60\text{ m}^2)(h)$

$\dfrac{150\text{ m}^3}{60\text{ m}^2} = \dfrac{(60\text{ m}^2)(h)}{60\text{ m}^2}$

$2.5\text{ m} = h$

16. $3x - 9y = -18$

$-9y = -3x - 18$

$\frac{-9y}{-9} = \frac{-3x - 18}{-9}$

$y = \frac{1}{3}x + 2$

Slope-intercept form

So the slope of the line is $\frac{1}{3}$.

17. $3x - 9y = -18$

$3x - 9(0) = -18$

$3x = -18$

$\frac{3x}{3} = \frac{-18}{3}$

$x = -6$

The x-intercept happens when y=0

18. 5 m

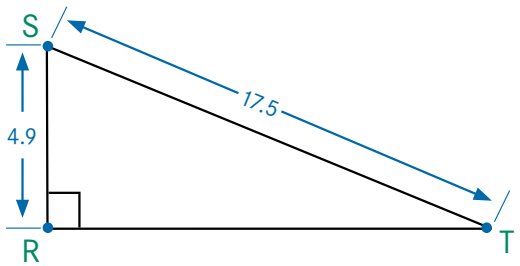
19. 3 seconds

20. $\cos \angle C = \frac{9}{15}$

$\angle C = \cos^{-1}\left(\frac{9}{15}\right)$

$\angle C = 53^\circ$

21.



$17.5^2 = 4.9^2 + s^2$

$306.25 = 24.01 + s^2$

$306.25 - 24.01 = s^2$

$282.24 = s^2$

$\sqrt{282.24} = s$

$16.8 \text{ m} = s$

22. If the diameter is 4 units, then the radius is $4 \div 2 = 2$ units. The circumference is then $C = 2\pi r = 2\pi(2) = 12.57$ units.

Solutions (without calculator)

1. 5.6

2. 1

3. (a) $3\times 2-2^5\div 8+1=6-32\div 8+1$
$=6-4+1$
$=3$

(b) $\frac{7}{9}\div\frac{35}{18}=\frac{7}{9}\times\frac{18}{35}=\frac{\cancel{7}}{\cancel{9}}\times\frac{\cancel{9}\times 2}{\cancel{7}\times 5}=\frac{2}{5}$

(c) $\frac{4}{5}-\frac{3}{10}=\frac{4\times 2}{5\times 2}-\frac{3}{10}$
$=\frac{8}{10}-\frac{3}{10}$
$=\frac{5}{10}=\frac{1}{2}$

(d) $2\frac{3}{8}-1\frac{2}{3}=(2-1)+\left(\frac{3}{8}-\frac{2}{3}\right)$

Cannot subtract 16 from 9...
We need to borrow from the 1

The 1 becomes $\frac{24}{24}$

$=1+\left(\frac{9}{24}-\frac{16}{24}\right)$
$=\left(\frac{24}{24}+\frac{9}{24}-\frac{16}{24}\right)=\frac{17}{24}$

(e) $\dfrac{\frac{7}{9}}{\frac{2}{3}-\frac{1}{12}}=\dfrac{\frac{7}{9}}{\frac{2\times 4}{3\times 4}-\frac{1}{12}}$
$=\dfrac{\frac{7}{9}}{\frac{8}{12}-\frac{1}{12}}$
$=\dfrac{\frac{7}{9}}{\frac{7}{12}}=\frac{7}{9}\times\frac{12}{7}=\frac{4}{3}$

COLLEGE OF THE NORTH ATLANTIC QATAR

4.

	Fraction	Decimal	Percent
(a)	$\frac{5}{9}$	$5 \div 9 = 0.555\ldots$	$0.5555\ldots \times 100 = 55.56\%$
(b)	$\frac{11\times 3+2}{3} \div 100 = \frac{35}{3} \times \frac{1}{100} = \frac{35}{300} = \frac{35 \div 5}{300 \div 5} = \frac{7}{60}$	$7 \div 60 = 0.11666\ldots$	$11\frac{2}{3}\%$
(c)	$\frac{9}{8}$	$9 \div 8 = 1.125$	$1.125 \times 100 = 112.5\%$
(d)	$0.06 \div 100 = \frac{0.06 \times 100}{100 \times 100} = \frac{6}{10000} = \frac{6 \div 2}{10000 \div 2} = \frac{3}{5000}$	$0.06 \div 100 = 0.0006$	0.06%
(e)	$\frac{126}{100} = \frac{126 \div 2}{100 \div 2} = \frac{63}{50}$	1.26	$1.26 \times 100 = 126\%$

5. Let x = the number, then the equation is $2x - 9 = 17$

6. $\frac{x^4 \cdot x^9}{x^2} = x^{4+9-2} = x^{11}$

7. $P = 2l + 2w$

$P - 2l = 2w$

$\frac{P - 2l}{2} = \frac{2w}{2}$

$\frac{P - 2l}{2} = w$

$\frac{P - 2l}{2} = w$

Do not cancel the 2

Practice Questions

Instructions: Circle the correct answer: A, B, C, D, or E

Topic 1: Real Number System

1. $-2\frac{3}{5}$ is a member of which two number sets?

A) Irrational, Integer

B) Rational, Integer

C) Irrational, Real

D) Rational, Real

E) none of the above

2. Which statement is true?

A) If a number is an integer, then it is also rational.

B) All integers are whole numbers.

C) The number 2π is rational.

D) Some numbers are both rational and irrational.

E) none of the above

3. Which real number is between 4 and 4.5?

A) $-\sqrt{20}$

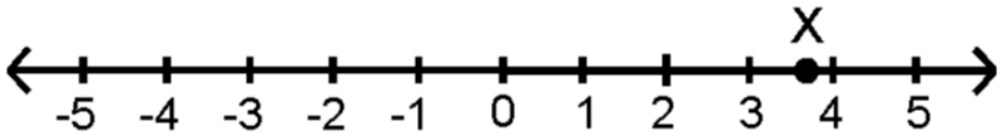
B) $\sqrt{15}$

C) $\frac{17}{4}$

D) $4\frac{2}{3}$

E) none of the above

4. Which radical could be represented by point X on the number line?



A) $\sqrt{10}$

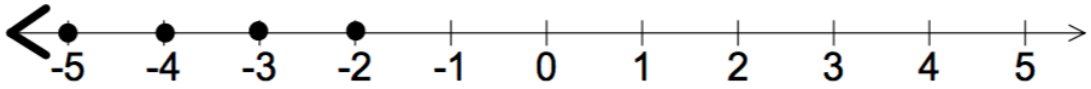
B) $\sqrt{15}$

C) $\sqrt{17}$

D) $\sqrt{22}$

E) none of the above

5. Which set notation represents the graph?



A) $\{x \mid x < -1, x \in R\}$

B) $\{x \mid x < -1, x \in I\}$

C) $\{x \mid x > -1, x \in R\}$

D) $\{x \mid x > -1, x \in I\}$

E) none of the above

6. Which number is irrational?

A) $3+\sqrt{9}$

B) $-\frac{1}{4}$

C) 3.5

D) $\sqrt{4+16}$

E) none of the above

7. Which represents $\sqrt{360}$ in simplest radical form?

A) $2\sqrt{90}$

B) 18.97

C) $6\sqrt{10}$

D) $12\sqrt{5}$

E) none of the above

8. To which subset of the Real Numbers does 0 **NOT** belong?

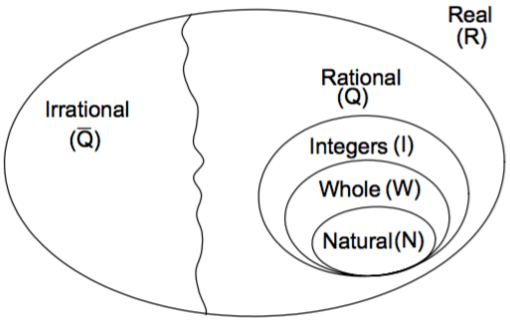
A) I

B) N

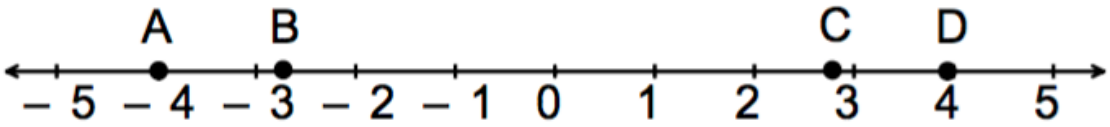
C) Q

D) W

E) none of the above



9. Which letter best locates $-\sqrt{8}$ on the number line shown?



A) A

B) B

C) C

D) D

E) none of the above

10. What real number property is shown by the equation?

$$-2(x+11) = -2x - 22$$

A) Associative

B) Communicative

C) Distributive

D) Inverse

E) none of the above

Topic 2: Whole Numbers and Integers

11. Which number is prime?

A) 26

B) 39

C) 47

D) 50

E) none of the above

12. What are all the factor of 21?

A) 3, 7, 21

B) 1, 3, 21

C) 1, 3, 7, 21

D) 1, 2, 3, 7, 21

E) none of the above

13. What is the greatest common factor of 18, 27, and 36?

A) 3

B) 9

C) 72

D) 108

E) none of the above

14. What is the prime factorization of 60?

A) 3 x 20
B) 1 x 3 x 20
C) 2 x 2 x 3 x 5
D) 1 x 2 x 2 x 3 x 5
E) none of the above

15. What is the lowest common denominator of 8, 15, and 20?

A) 12
B) 40
C) 60
D) 120
E) none of the above

16. Evaluate: $|-6+4|-|7-5|$

A) -4
B) 0
C) 4
D) 8
E) none of the above

17. Evaluate: $7+(3+2)^2 \div 2.5$

A) 6.8
B) 7.2
C) 12.8
D) 17.0
E) none of the above

18. Evaluate: $\left[(-2-4)^2+(-2)^3-7\right]\div\left[-11+(8-4)\right]$

A) -6

B) -3

C) 3

D) 6

E) none of the above

19. Which number is composite?

A) 2

B) 23

C) 37

D) 91

E) none of the above

20. Evaluate: $\left[5+(-2)^3-(3^2-2\bullet 4)\right]\div 4$

A) -1

B) 0

C) 1

D) 3

E) none of the above

Topic 3: Fractions

21. What is $7\frac{1}{3}$ written as an improper fraction in lowest terms?

A) $\frac{22}{3}$

B) $\frac{11}{3}$

C) $\frac{22}{7}$

D) $\frac{10}{7}$

E) none of the above

22. What is $\frac{105}{135}$ reduced to lowest terms?

A) $\frac{15}{9}$

B) $\frac{7}{9}$

C) $\frac{10}{13}$

D) $\frac{10}{7}$

E) none of the above

23. What is the reciprocal of $\frac{-7}{6}$?

A) $\frac{-6}{7}$

B) $\frac{6}{7}$

C) $\frac{7}{6}$

D) $1\frac{1}{6}$

E) none of the above

24. Calculate: $\frac{-2}{3}+\frac{3}{4}\times 3$

A) $\frac{1}{12}$

B) $\frac{3}{7}$

C) 1

D) $\frac{19}{12}$

E) none of the above

25. What is the product of the largest and smallest numbers in this set?

$$\left\{-\frac{2}{5},\ -\frac{3}{4},\ 1\frac{3}{5},\ \frac{7}{4}\right\}$$

A) $-\frac{21}{16}$

B) $-\frac{24}{20}$

C) $-\frac{16}{25}$

D) $-\frac{14}{20}$

E) none of the above

26. Calculate: $\frac{2}{2^{-2}} \times \frac{3^2}{3^4}$

A) $\frac{8}{9}$

B) 1

C) 72

D) $\frac{729}{2}$

E) none of the above

27. Calculate: $\left(1\frac{2}{3} \div \frac{5}{6}\right) - \frac{3}{4}$

A) $\frac{-1}{4}$

B) $\frac{-7}{36}$

C) $\frac{23}{36}$

D) $\frac{5}{4}$

E) none of the above

28. Simplify: $\frac{3\frac{1}{2} - 1\frac{7}{8}}{1\frac{2}{3} \div 2\frac{2}{9}}$

A) $\frac{6}{13}$

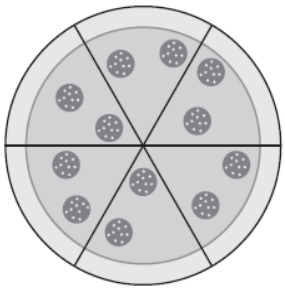
B) $\frac{9}{11}$

C) $\frac{13}{6}$

D) $\frac{11}{9}$

E) none of the above

29. Jassim ate $\frac{2}{3}$ of this pizza. What part of the pizza is left?



A) $\frac{1}{6}$

B) $\frac{1}{5}$

C) $\frac{1}{3}$

D) $\frac{1}{2}$

E) none of the above

30. Simplify: $\dfrac{\left(4\frac{1}{3}\right)^2 - 8\frac{7}{8} \div 3}{7\frac{1}{2} + 5\frac{2}{3} \times \left(1\frac{1}{2}\right)^3}$

A) $\frac{1}{400}$

B) $\frac{69}{200}$

C) $\frac{501}{903}$

D) $\frac{1139}{1917}$

E) none of the above

Topic 4: Decimals

31. Round 6.8732 to the nearest tenths.

A) 6.8

B) 6.9

C) 6.87

D) 6.88

E) none of the above

32. What is 0.051 as a percent?

A) 0.0051%

B) 5.1%

C) 51%

D) 510%

E) none of the above

33. What is 0.005 as a fraction in lowest terms?

A) $\frac{1}{2}$

B) $\frac{5}{10}$

C) $\frac{1}{200}$

D) $\frac{5}{1000}$

E) none of the above

34. Evaluate: $4b^2 - 3a$ for $a = -1.5$ and $b = 0.5$

A) -3.5
B) -0.5
C) 0.5
D) 3.5
E) none of the above

35. What is the base unit for length?

A) grams
B) litres
C) metres
D) kilometres per hour
E) none of the above

36. Convert 32 500 000 milligrams to grams.

A) 32.5
B) 325
C) 3 250
D) 32 500
E) none of the above

37. Convert 4 litres to centilitres

A) 40
B) 400
C) 4000
D) 40 000
E) none of the above

38. Convert 7.84 metres to kilometres

A) 0.000784

B) 0.0784

C) 0.784

D) 7840

E) none of the above

39. Express 390 000 in scientific notation

A) 3.9×10^{-5}

B) 3.9×10^{5}

C) 39×10^{4}

D) 0.39×10^{6}

E) none of the above

40. Express 2.67×10^{-4} in standard notation.

A) -267000

B) 0.0000267

C) 0.000267

D) 267000

E) none of the above

Topic 5: Percent

41. A school has 880 students. If 352 are female, what percent are male?

A) 25%
B) 40%
C) 60%
D) 75%
E) none of the above

42. What is $83\frac{1}{3}\%$ of 12?

A) $\frac{5}{6}$
B) 9.996
C) 10
D) $14\frac{2}{5}$
E) none of the above

43. 36 is 12% of what number?

A) 3
B) 4.32
C) 300
D) 432
E) none of the above

44. What percent of 1500 is 675?

A) 0.45%
B) $\frac{9}{20}\%$
C) 45%
D) 222%
E) none of the above

45. What is 0.0041 as a percent?

A) 0.00041%
B) 0.41%
C) 4.1%
D) 41%
E) none of the above

46. What is $5\frac{1}{3}$ as a percent?

A) 5.3%
B) $5.\overline{3}\%$
C) 0.053%
D) $0.05\overline{3}\%$
E) none of the above

47. What is the percent increase from 60 to 75?

A) 15%
B) 20%
C) 25%
D) 40%
E) none of the above

48. What is the percent decrease from 50 to 42?

A) 8%
B) 15%
C) 30%
D) 77%
E) none of the above

49. The grades on a student's five tests are: 0%, 65%, 70%, 73%, and 82%. What is the student's average test grade?

A) 44.5%
B) 58%
C) 70%
D) 72.5%
E) none of the above

50. The table shows the grades a student received in a course, and the value for each category: What is the student's final grade, rounded to the nearest percent?

Quizzes (Value: 20%)	Tests (Value: 40%)	Final Exam (Value: 40%)
89%	95%	72%
92%	65%	
70%	92%	
95%		
80%		

A) 75%
B) 77%
C) 79%
D) 80%
E) none of the above

Topic 6: Solving Equations

51. Solve for x: $-2x+7=11$

A) -9

B) -2

C) 2

D) 9

E) none of the above

52. Solve for x: $-5x+6=4+3x$

A) -4

B) $-\frac{1}{4}$

C) $\frac{1}{4}$

D) 4

E) none of the above

53. Solve for x: $-(x-18)=14$

A) -32

B) -4

C) 4

D) 32

E) none of the above

54. Solve for x: $\frac{-2}{3}x+5=17$

A) -33
B) -18
C) -8
D) 18
E) none of the above

55. Solve for x: $-5x+5=-3(x-7)$

A) -8
B) -2
C) 2
D) 8
E) none of the above

56. Solve for x: $\frac{x}{3}=\frac{2x+3}{2}-5$

A) -5.25
B) -4.75
C) 4.75
D) 5.25
E) none of the above

57. Solve for x: $-8\left(2+3x\right)=5\left(-2-6x\right)$

A) -9
B) -1
C) 1
D) 9
E) none of the above

58. Solve for x: $\frac{4x-2}{4}+2=\frac{2x}{5}$

A) -6.5
B) -2.5
C) 2.5
D) 6.5
E) none of the above

59. Solve for x: $\frac{3x}{4}-\frac{2x-4}{2}=\frac{2x+2}{3}$

A) $\frac{-16}{11}$
B) $\frac{-9}{10}$
C) $\frac{9}{10}$
D) $\frac{16}{11}$
E) none of the above

60. Solve for x: $\frac{-2}{5}=\frac{2x}{x+12}$

A) -2
B) $\frac{-1}{2}$
C) $\frac{1}{2}$
D) 2
E) none of the above

Topic 7: Formula Rearrangement

61. Solve for x: $y = mx + b$

A) $y - b - m$

B) $\frac{y - b}{m}$

C) $\frac{y}{m} - b$

D) $\frac{y}{b} - m$

E) none of the above

62. Solve for h: $rs + h^2 = p$

A) $\sqrt{rs - p}$

B) $\sqrt{p + rs}$

C) $p - rs$

D) $\sqrt{p - rs}$

E) none of the above

63. Solve for g: $gh - gt + g = t$

A) $\frac{t}{h - t - 1}$

B) $\frac{t}{h + t + 1}$

C) $\frac{t}{h - t + 1}$

D) $\frac{t}{h + t - 1}$

E) none of the above

64. Solve for y: $\frac{x}{y} + 9 = n$

A) $y = xn - 9$

B) $y = x(n - 9)$

C) $y = \frac{x}{n - 9}$

D) $y = \frac{n - 9}{x}$

E) none of the above

65. Solve for b: $A = \frac{1}{2}bh$

A) $\frac{Ah}{2}$

B) $A - \frac{h}{2}$

C) $2Ah$

D) $2A - h$

E) none of the above

66. Solve for A: $-D = 2AB - C$

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

B) $\frac{D - C}{2B}$

C) $-D + C - 2B$

D) $\frac{2B}{C - D}$

E) none of the above

67. Solve for s: $D = \frac{c - s}{n}$

A) $\frac{Dn}{c}$

B) $\frac{c}{Dn}$

C) $c - Dn$

D) $Dn - c$

E) none of the above

68. Solve for v: $K = \frac{1}{2}mv^2$

A) $\frac{1}{2}Km$

B) $\sqrt{\frac{1}{2Km}}$

C) $\sqrt{2Km}$

D) $2Km$

E) none of the above

69. Solve for Z: $\frac{3}{4}S = R + XYZ$

A) $\frac{3}{4}S - R - XY$

B) $\frac{3S}{4XY} - R$

C) $\frac{3S - R}{4XY}$

D) $3S - 4R - 4XY$

E) none of the above

70. Solve for a: $P = \dfrac{n^2 + a}{n + a}$

A) $\dfrac{n(n - P)}{P - 1}$

B) $\dfrac{n(P - n)}{P - 1}$

C) $\dfrac{n(n - P)}{1 - P}$

D) $\dfrac{n(P - n)}{1 - P}$

E) none of the above

Topic 8: Laws of Exponents

71. Evaluate: $-\left(10^{0}\right)^{7}$

A) -7
B) -1
C) 1
D) 7
E) none of the above

72. What is $\left(\frac{x}{y}\right)^{3}$ as a quotient of powers?

A) $x^{3}-y^{3}$
B) $x^{3}+y^{3}$
C) $\frac{x^{3}}{y}$
D) $\frac{x^{3}}{y^{3}}$
E) none of the above

73. Simplify: $\frac{\left(-3x^{2}y\right)^{4}}{3\left(xy^{2}\right)^{3}}$

A) $\frac{x^{5}}{y^{2}}$
B) $-\frac{x^{5}}{y^{2}}$
C) $\frac{27x^{5}}{y^{2}}$
D) $\frac{x^{5}}{y}$
E) none of the above

74. Simplify: $\left(3ab^5\right)^3$

A) $9ab^{15}$
B) $9a^3b^{15}$
C) $27ab^{15}$
D) $27a^3b^{15}$
E) none of the above

75. Simplify: $\frac{8^{x+4}}{8^{x+1}}$

A) 4
B) 1^{2x+5}
C) 8^{2x+5}
D) 512
E) none of the above

76. Express 390 000 in scientific notation

A) 3.9×10^{-5}
B) 3.9×10^{5}
C) 39.0×10^{4}
D) 0.39×10^{6}
E) none of the above

77. Express 2.67×10^{-4} in standard notation.

A) -267000
B) 0.0000267
C) 0.000267
D) 267000
E) none of the above

78. Simplify: $\left(\frac{4x^7}{x^2y^4}\right)^2$

A) $\frac{16}{x^7y^8}$

B) $\frac{8x^{10}}{y^8}$

C) $\frac{8x^9}{y^6}$

D) $\frac{16x^{10}}{y^8}$

E) none of the above

79. Simplify: $\left(-3a^3\right)^2\left(2ab\right)^4$

A) $-48a^{10}b^4$

B) $-54a^{10}b^4$

C) $144a^{10}b^4$

D) $72a^9b^4$

E) none of the above

80. Simplify: $2x^8 \bullet 3x^3$

A) $5x^{11}$

B) $5x^{24}$

C) $6x^{11}$

D) $6x^{24}$

E) none of the above

Topic 9: Negative Exponents

81. Simplify: $\frac{x^{-5}}{x^{-5}}$

A) x^{10}
B) 0
C) 1
D) $\frac{1}{x^{10}}$
E) none of the above

82. Simplify: $-2^{-2}(-2x)^3 \cdot x$

A) $-32x^4$
B) $-32x^3$
C) $32x^4$
D) $16x^4$
E) none of the above

83. Simplify: $\left(\frac{2x^{-3}}{x^2}\right)^{-2}$

A) $\frac{x^{10}}{-4}$
B) $\frac{x^{10}}{4}$
C) $-\frac{x^9}{4}$
D) $-4x^9$
E) none of the above

84. Simplify: $-2\left(x^{-2}\right)^{0}$

A) -2
B) 2
C) $\dfrac{-2}{x^{2}}$
D) 1
E) none of the above

85. Simplify: $\left(-2p^{-1}q^{-4}r^{3}\right)^{2}$

A) $\dfrac{-4r^{6}}{p^{2}q^{8}}$
B) $-4r^{6}p^{2}q^{8}$
C) $\dfrac{4r^{6}}{p^{2}q^{8}}$
D) $\dfrac{-2r^{6}}{pq^{4}}$
E) none of the above

86. Simplify: $-\left(\dfrac{4}{x}\right)^{-2}$

A) $\dfrac{-x^{2}}{16}$
B) $\dfrac{x^{2}}{16}$
C) $\dfrac{-16}{x^{2}}$
D) $\dfrac{16}{x^{2}}$
E) none of the above

87. Simplify: $\left(\frac{-4x^2}{2x^{-1}}\right)^{-1}$

A) $-\frac{1}{2x^3}$

B) $-\frac{x^3}{2}$

C) $\frac{2}{x^3}$

D) $\frac{1}{2x^3}$

E) none of the above

88. Simplify: $\frac{(x^{-2})^{-3}(-2y^4)^2}{(-2x^{-5})^{-2}(3y)^0}$

A) $\frac{-16y^8}{x^4}$

B) $\frac{16y^8}{x^4}$

C) $\frac{-16x^4}{y^8}$

D) $\frac{16x^4}{y^8}$

E) none of the above

89. Simplify: $\left(\frac{x^{-4}}{-2y^{-1}}\right)^{-3}\left(\frac{xy^{-2}}{-3x^{5}}\right)^{2}$

A) $\frac{-72x^{4}}{y^{7}}$

B) $\frac{72x^{4}}{y^{7}}$

C) $\frac{-8x^{4}}{9y^{7}}$

D) $\frac{8x^{4}}{9y^{7}}$

E) none of the above

90. Simplify: $\frac{(2a^{-1}b^{0})^{2}(3a^{4}b^{-2})}{4ab^{-5}}$

A) $3ab^{3}$

B) $3ab^{5}$

C) $6a^{5}b^{3}$

D) $6a^{5}b^{5}$

E) none of the above

Topic 10: Polynomials

91. Which polynomial is a binomial with two variables?

A) $5xy$
B) $x^3 + 4x^2$
C) $5x^3 - 7$
D) $3x^3 - \sqrt{2}y$
E) none of the above

92. What is the degree of $4xyz + 2x^5yz^3 + 11$?

A) 3
B) 8
C) 9
D) 11
E) none of the above

93. Simplify: $(6y^2 + 7) - (-5y^4 - 3y^2 + 7)$

A) $14y^6$
B) $5y^4 + 9y^2$
C) $5y^4 + 9y^2 - 14$
D) $-5y^4 + 3y^2 + 14$
E) none of the above

94. Subtract $\left(-2x^2\right)$ from the sum of $\left(x^2-x\right)$ and $\left(x^2+x\right)$. What is the result?

A) 0
B) $-2x$
C) $2x$
D) $4x^2$
E) none of the above

95. Simplify: $\left(-5p+3q\right)^2$

A) $-25p^2+9q^2$
B) $25p^2+9q^2$
C) $25p^2+30pq+9q^2$
D) $25p^2-30pq+9q^2$
E) none of the above

96. Simplify: $\left(m-5\right)\left(m+5\right)$

A) m^2-25
B) m^2+25
C) m^2-10
D) $m^2-10m-25$
E) none of the above

97. Simplify: $\dfrac{32x^3+8x^2}{4x}$

A) $8x^2+2x$
B) $10x^3$
C) $28x^2-4x$
D) $10x^4$
E) none of the above

98. Which is a like term for $-3x^5y$?

A) $\sqrt{3}x^5y$

B) $-3xy^5$

C) $\dfrac{1}{-3x^5y}$

D) $-3x^5+y$

E) none of the above

99. What is the polynomial $-5x^3+6-2x^7+4x^5$ in descending exponent form?

A) $4x^5+5x^3+2x^7+6$

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

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

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

E) none of the above

100. Divide: $\dfrac{22a^5b^2c-20a^2b^3c^3+16a^2bc}{2a^2bc}$

A) $20a^3b-18b^2c^2+14$

B) $11a^3b-10b^2c^2+8$

C) $9a^3bc$

D) $16a^3b^2c$

E) none of the above

Topic 11: Factoring

101. Factor completely: $8x + 20x$

A) $4\left(2x + 5x\right)$

B) $x\left(8x + 20\right)$

C) $8x\left(x + 5\right)$

D) $4x\left(2x + 5\right)$

E) none of the above

102. Factor completely: $-x^8y^9 + 6x^3y^7 - 18x^6y^4$

A) $-x^3y^4\left(x^5y^5 + 6y^3 - 18x^3\right)$

B) $-x^3y^4\left(x^5y^5 - 6y^3 + 18x^3\right)$

C) $-6x^3y^4\left(6x^5y^5 - y^3 + 3x^3\right)$

D) $-xy\left(x^7y^8 - 6x^2y^6 + 18x^5y^3\right)$

E) none of the above

103. Factor completely: $x^2 + 13x + 42$

A) $\left(x + 2\right)\left(x + 21\right)$

B) $\left(x - 7\right)\left(x - 6\right)$

C) $\left(x + 6\right)\left(x + 7\right)$

D) $\left(x + 7\right)\left(x - 6\right)$

E) none of the above

104. Factor completely: $6x^4 - 9x^3 - 36x^2 + 54x$

A) $3x\left(x^2 - 6\right)\left(2x - 3\right)$

B) $3x\left(x^2 + 6\right)\left(2x + 3\right)$

C) $6x\left(x^2 - 6\right)\left(2x - 3\right)$

D) $6x\left(x^2 + 6\right)\left(2x + 3\right)$

E) none of the above

105. Factor completely: $5x^2 - 11x - 36$

A) $\left(5x + 6\right)\left(x - 6\right)$

B) $\left(5x + 9\right)\left(x + 4\right)$

C) $\left(5x + 9\right)\left(x - 4\right)$

D) $\left(5x - 4\right)\left(x - 9\right)$

E) none of the above

106. Factor completely: $25x^2 + 20x + 4$

A) $\left(5x + 2\right)^2$

B) $\left(5x - 2\right)^2$

C) $\left(5x + 2\right)\left(5x + 10\right)$

D) $\left(5x + 4\right)\left(5x + 1\right)$

E) none of the above

107. Factor completely: $4x^2 - 9$

A) $(4x-9)(x+1)$

B) $(4x+9)(x-1)$

C) $(2x-3)(2x+3)$

D) $(2x-3)^2$

E) none of the above

108. Factor completely: $4x^2 - 9y^4$

A) $(2x-3y^2)^2$

B) $(2x+3y^2)^2$

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

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

E) none of the above

109. Factor completely: $4y^2 + 20xy + 25x^2$

A) $(2y+5x)^2$

B) $(2y-5x)^2$

C) $(2y+5x)(2y-5x)$

D) $(5x+2y)(5x-2y)$

E) none of the above

110. Factor completely: $64y^3 - 27$

A) $(4y+3)(16y^2-12y+9)$

B) $(4y-3)(16y^2-12y+9)$

C) $(4y+3)(16y^2+12y-9)$

D) $(4y-3)(16y^2+12y-9)$

E) none of the above

Topic 12: Rational Expressions

111. For what values is the rational expression $\frac{4x^2+1}{(x-4)(x-5)}$ undefined ?

A) -2 and -5

B) -2 and 5

C) 2 and -5

D) 4 and 5

E) none of the above

112. What is the lowest common denominator of $\frac{5}{3(x+1)}$ and $\frac{7}{3(x-1)}$?

A) $9(x+1)$

B) $9(x-1)$

C) $3(x+1)(x-1)$

D) $9(x+1)(x-1)$

E) none of the above

113. Simplify: $\frac{4x+8}{14}\cdot\frac{7}{x^2-4}$

A) $\frac{2}{x-2}$

B) $\frac{4}{x-2}$

C) $\frac{4}{x+2}$

D) $\frac{4x+8}{2(x^2-4)}$

E) none of the above

114. Simplify: $\frac{2}{3x}+\frac{3}{4x}$

A) $\frac{5}{12x}$

B) $\frac{5}{7x}$

C) $\frac{17}{12x}$

D) $\frac{17}{7x}$

E) none of the above

115. Simplify: $\frac{4s}{3s+2}\div\frac{2s^3}{6s^2+4s}$

A) $\frac{s}{4}$

B) $\frac{4}{s}$

C) $4s$

D) $4+s$

E) none of the above

116. Simplify: $\frac{3x}{x^2+5x-14}-\frac{4}{x-2}$

A) $\frac{-x}{(x+7)(x-2)}$

B) $\frac{3x-4}{(x+7)(x-2)}$

C) $\frac{-x-28}{(x+7)(x-2)}$

D) $\frac{x-28}{(x+7)(x-2)}$

E) none of the above

117. Simplify: $\frac{9-y^2}{y^2+y-12}$

A) $\frac{y+3}{y+4}$

B) $\frac{-y-3}{y+4}$

C) $\frac{3}{4}$

D) $\frac{y-3}{y+4}$

E) none of the above

118. Simplify: $\frac{\frac{1}{x^2}+\frac{1}{y^2}}{\frac{1}{x^2}-\frac{1}{y^2}}$

A) 1

B) $\frac{x^2+y^2}{y^2-x^2}$

C) $\frac{x^2-y^2}{(y-x)(y+x)}$

D) $\frac{x^2+y^2}{(y-x)(y+x)}$

E) none of the above

119. Simplify: $\dfrac{\frac{3}{2}-\frac{2}{3x}}{\frac{3}{4x}-\frac{1}{3x^2}}$

A) $\dfrac{2x}{9x-4}$

B) $\dfrac{12x}{3x-2}$

C) $2x$

D) $4x$

E) none of the above

120. Simplify: $\dfrac{5x+25}{2x^2+13x+15}-\dfrac{10x-20}{x^2-4}$

A) $\dfrac{-5}{(2x+3)(x+2)}$

B) $\dfrac{-5(3x+4)}{(2x+3)^2}$

C) $\dfrac{-15x+20}{(2x+3)(x+2)}$

D) $\dfrac{-5(3x+4)}{(2x+3)(x+2)}$

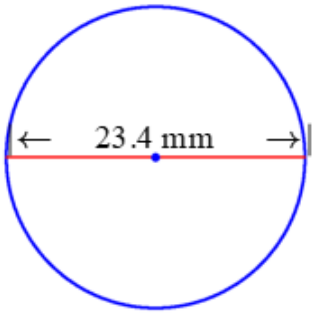
E) none of the above

Topic 13: Geometry

121. If $\angle P$ and $\angle Q$ are supplementary angles and $\angle P = 12^0$, what is the measure of $\angle Q$?

A) 12^0
B) 78^0
C) 168^0
D) 180^0
E) none of the above

122. What is the circumference, in mm, of the circle below?

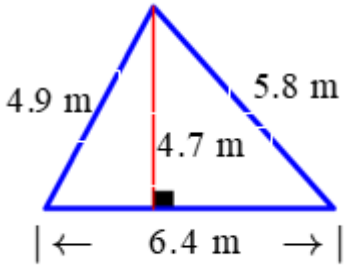


A) 73.5
B) 147
C) 430.1
D) 1720.2
E) none of the above

123. How many significant digits does the number 0.002570 have?

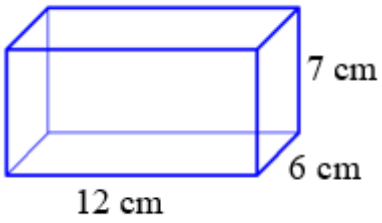
A) 3
B) 4
C) 5
D) 6
E) none of the above

124. What is the area, in m^2, of the triangle below?



A) 15.0
B) 17.1
C) 21.8
D) 30.1
E) none of the above

125. What is the surface area of the figure shown below?

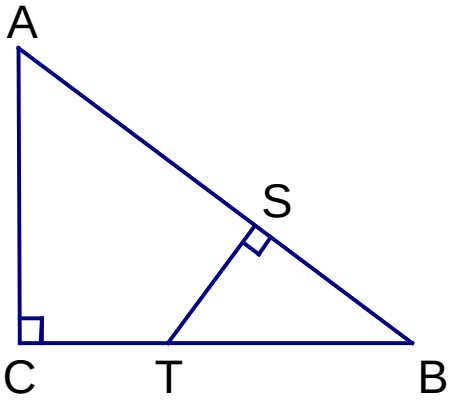


A) 25
B) 400
C) 500
D) 750
E) none of the above

126. What term describes an angle of 141^0 ?

A) acute
B) obtuse
C) right
D) straight
E) none of the above

127. What is the correct similarity relation for the similar triangles in the diagram below?



A) $\Delta ACB \sim \Delta TBS$

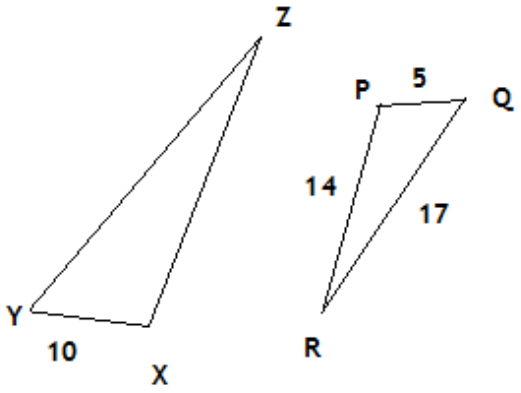
B) $\Delta ABC \sim \Delta TBS$

C) $\Delta CAB \sim \Delta TSB$

D) $\Delta BCA \sim \Delta TSB$

E) none of the above

128. If $\Delta PQR \sim \Delta XYZ$, what is the measurement of $\overline{YZ}$?



A) 7

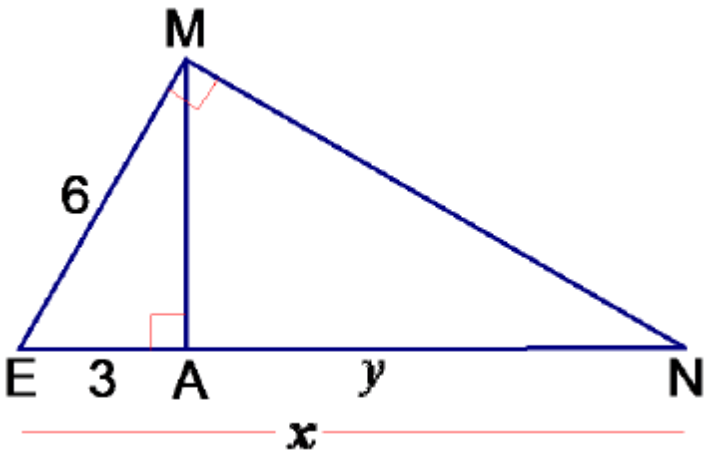
B) 8.5

C) 28

D) 34

E) none of the above

129. What is the value of y shown in the diagram below ?



A) 8
B) 9
C) 12
D) 15
E) none of the above

130. What is the volume, in m^3, of the spherical gas tank that has a radius of 8 m?

A) 268
B) 2144
C) 6434
D) 11259
E) none of the above

Topic 14: Equation of the Line

131. What is the distance between the points (-4, 1) and (-1, -3)?

A) $\sqrt{5}$

B) $\sqrt{7}$

C) $\sqrt{13}$

D) 5

E) none of the above

132. What is the slope of the line parallel to the line $3x + 4y = 20$?

A) $-\frac{4}{3}$

B) $-\frac{3}{4}$

C) $\frac{3}{4}$

D) $\frac{4}{3}$

E) none of the above

133. What are the x and y intercepts of the line $3x + 2y = 12$?

A) x-intercept (-6, 0); y-intercept (0, -4)

B) x-intercept (-4, 0); y-intercept (0, -6)

C) x-intercept (6, 0); y-intercept (0, 4)

D) x-intercept (4, 0); y-intercept (0, 6)

E) none of the above

134. What is the slope of the line that is perpendicular to the line $3y = -5x + 21$?

A) $\frac{-5}{3}$

B) $\frac{-3}{5}$

C) $\frac{3}{5}$

D) $\frac{5}{3}$

E) none of the above

135. One end of the line segment CD is C(-3, 4). If the coordinates of the midpoint are (-5, 7), find the coordinates of D.

A) (-4, 5.5)

B) (-7, 10)

C) (-7, -10)

D) (7, 10)

E) none of the above

136. How is the equation $x = 4$ best described?

A) Upwards and to the left

B) Upwards and to the right

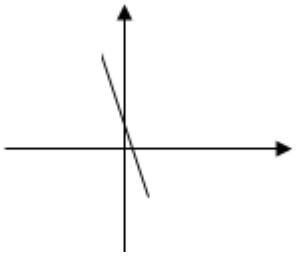
C) horizontal line

D) vertical line

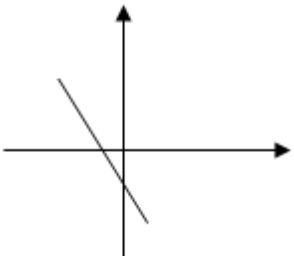
E) none of the above

137. Which graph represents the equation $y = -3x - 1$?

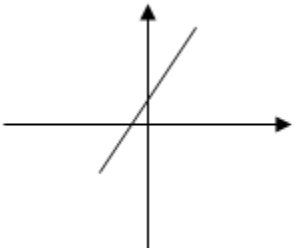
A)



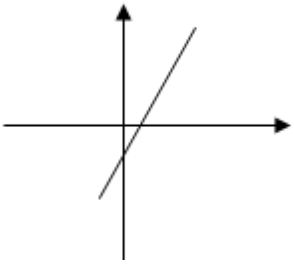
B)



C)

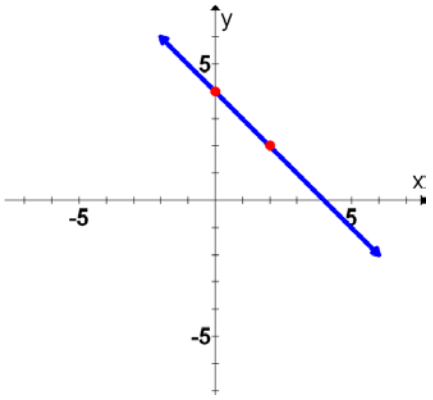


D)



E) none of the above

138. What equation is represented by the line graphed below?



A) $y = -2x + 4$

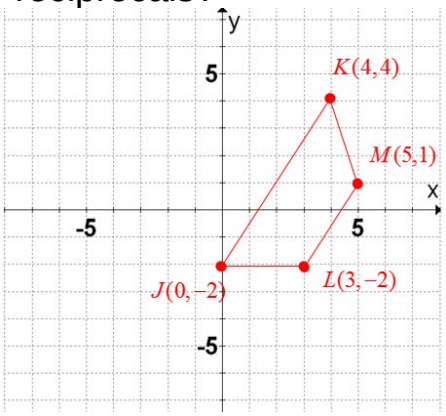
B) $y = -4x + 2$

C) $y = -x + 4$

D) $y = -x - 4$

E) none of the above

139. Based on the diagram below, which two line segments have slopes that are negative reciprocals?



A) JK and LM

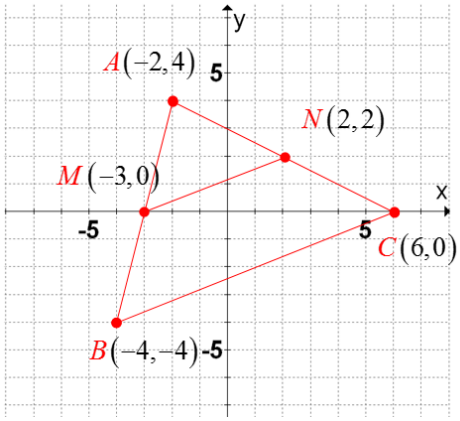
B) JL and KM

C) LM and MK

D) JK and MK

E) none of the above

140. Based on the diagram below, which statement is true?



A) $\overline{AM} \parallel \overline{AN}$

B) $\overline{AM} \perp \overline{AN}$

C) $\overline{BC} = 2\overline{MN}$

D) $\overline{MN} = 2\overline{BC}$

E) none of the above

Topic 15: Systems of Equations and Inequalities

141. How many solutions are there to the system $\begin{cases} y = \frac{1}{2}x + 5 \\ x + 3y = 6 \end{cases}$?

A) 0
B) 1
C) 2
D) 3
E) none of the above

142. If a system of linear equations has no solution, what is the conclusion about their slopes?

A) equal
B) unequal
C) undefined
D) zero
E) none of the above

143. Solve for y: $3x - 2y + 12 > 0$

A) $y < \frac{3}{2}x - 6$

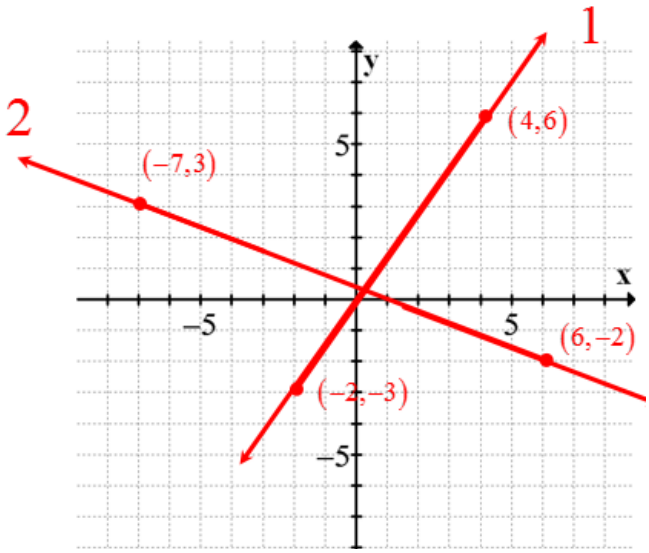
B) $y > -\frac{3}{2}x - 6$

C) $y > \frac{3}{2}x + 6$

D) $y < \frac{3}{2}x + 6$

E) none of the above

144. What is the solution to the system of equations graphed below?



A) $(-7,3)$

B) $(-2,-3)$

C) $(4,6)$

D) $(6,-2)$

E) none of the above

145. Solve the system: $\begin{cases} 4x-3y=9 \\ -2x+y=-5 \end{cases}$

A) $(-3,-1)$

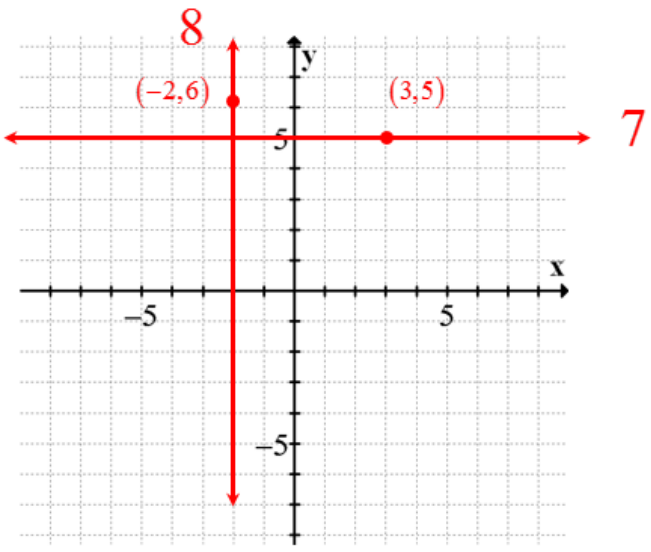
B) $(-1,-3)$

C) $(1,3)$

D) $(3,1)$

E) none of the above

146. What is the solution to the system of equations graphed below?



A) $(2,5)$

B) $(5,2)$

C) $(7,8)$

D) $(8,7)$

E) none of the above

147. Solve the system: $\left\{\begin{matrix} x+2y=-10 \\ y=2x+5 \end{matrix}\right\}$

A) $(-3,-4)$

B) $(4,-3)$

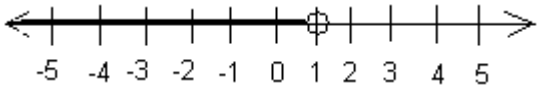
C) $(-4,-3)$

D) $(4,3)$

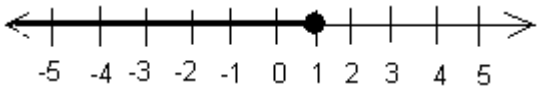
E) none of the above

148. Which number line represents the solution to $x < 1$?

A)

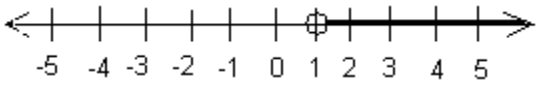


B)



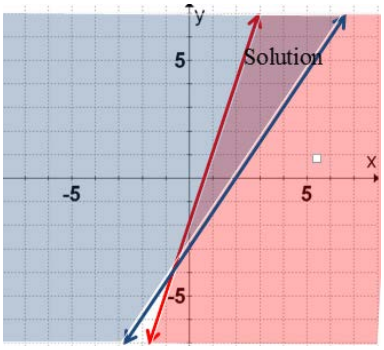
C)

D)



E) none of the above

149. Which system of inequalities represents the graph below?



A) $\begin{cases} y < 3x - 2 \\ 3x - 2y < 6 \end{cases}$

B) $\begin{cases} y > 3x - 2 \\ 3x - 2y > 6 \end{cases}$

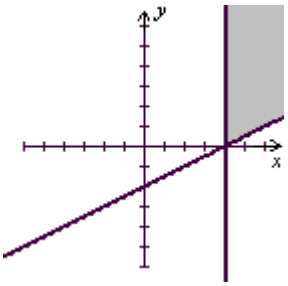
C) $\begin{cases} y \geq 3x - 2 \\ 3x - 2y \geq 6 \end{cases}$

D) $\begin{cases} y \leq 3x - 2 \\ 3x - 2y \leq 6 \end{cases}$

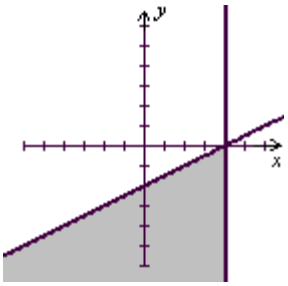
E) none of the above

150. Which graph is a solution for $\begin{cases} x - 2y \geq 4 \\ x \geq 4 \end{cases}$?

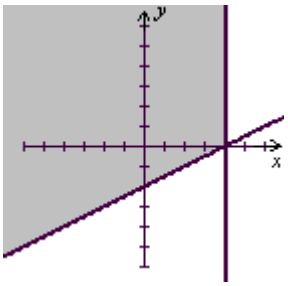
A)



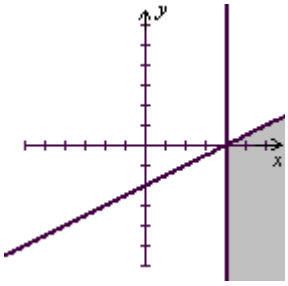
B)



C)



D)



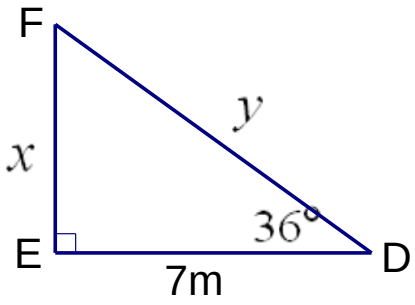
E) none of the above

Topic 16: Trigonometry

151. $\tan B = 0.6345$. What is the measure of $\angle B$ to the nearest degree?

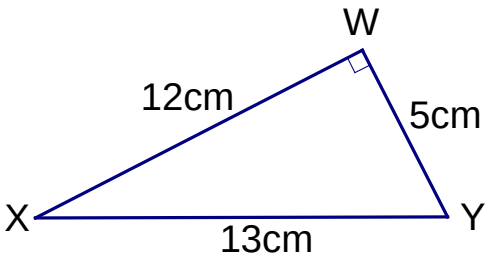
A) $25°$
B) $32°$
C) $39°$
D) $51°$
E) none of the above

152. Find the value of y to 1 decimal place?



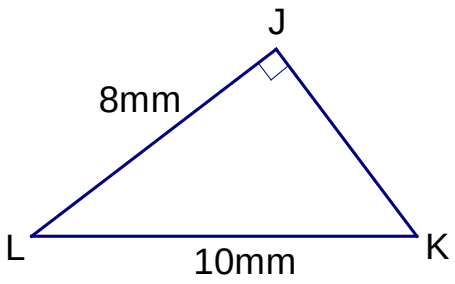
A) $4.1\,m$
B) $5.1\,m$
C) $5.7\,m$
D) $8.7\,m$
E) none of the above

153. What is the ratio for $\sin Y$?



A) $\frac{5}{13}$
B) $\frac{12}{13}$
C) $\frac{5}{12}$
D) $\frac{12}{5}$
E) none of the above

154. Use ΔWXY to find the measure of $\angle K$ to the nearest degree.



A) $37°$

B) $39°$

C) $53°$

D) $90°$

E) none of the above

155. Convert $29^{\circ}15'12"$ to degrees?

A) 29.15°

B) 29.25°

C) 29.1512°

D) 44.12°

E) none of the above

156. What is the value of $\frac{1}{\sin 22^{0}}$?

A) 0.375

B) 0.927

C) 1.079

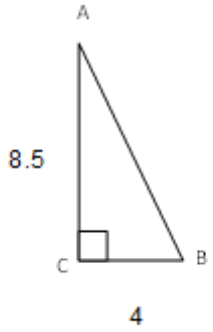
D) 2.669

E) none of the above

157. $\sec A = 1.523$ What is the measure of $\angle A$ to the nearest degree?

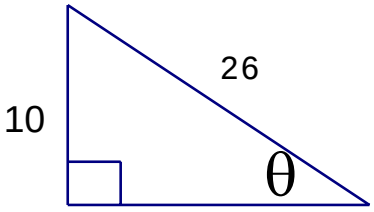
A) 32^0
B) 41^0
C) 49^0
D) 58^0
E) none of the above

158. What is the measure of $\angle A$ to the nearest degree?



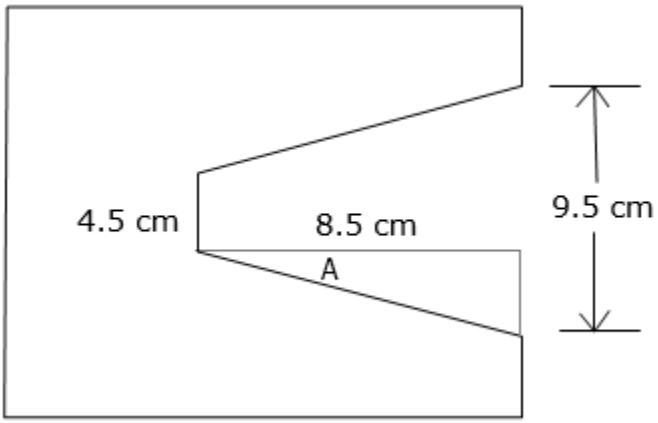
A) 25°
B) 28°
C) 62°
D) 65°
E) none of the above

159. What is the ratio for $\csc\theta$?



A) $\frac{5}{13}$
B) $\frac{5}{12}$
C) $\frac{12}{13}$
D) $\frac{13}{5}$
E) none of the above

160. What is the value of $\angle A$?



A) 16.4^0

B) 19.1^0

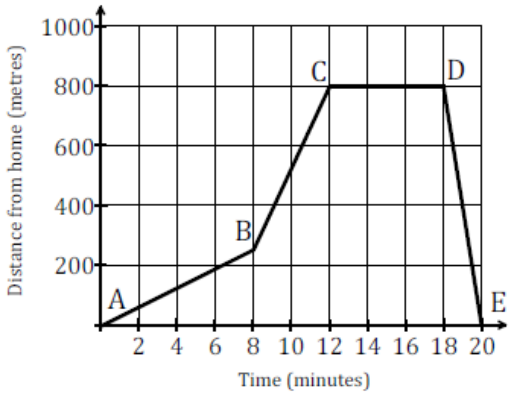
C) 32.8^0

D) 38.2^0

E) none of the above

Topic 17: Data Measurement

161. Ali is walking to the store. The graph represents his distance from home over time. During what time interval is Ali walking the fastest?



A) A to B

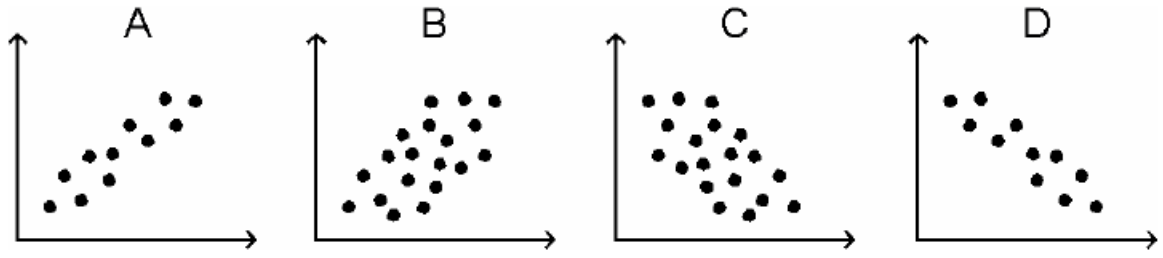
B) B to C

C) C to D

D) D to E

E) none of the above

162. Which scatterplot has the weakest negative relationship?



A) A

B) B

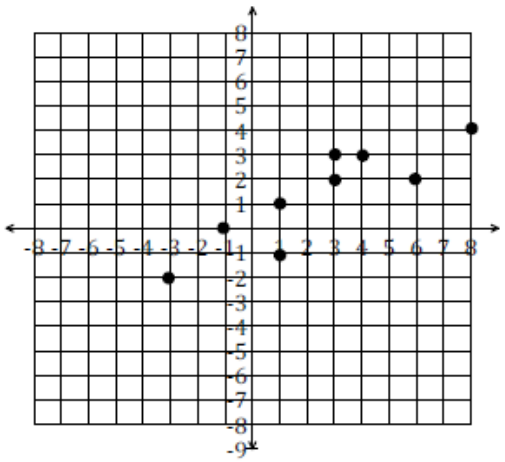
C) C

D) D

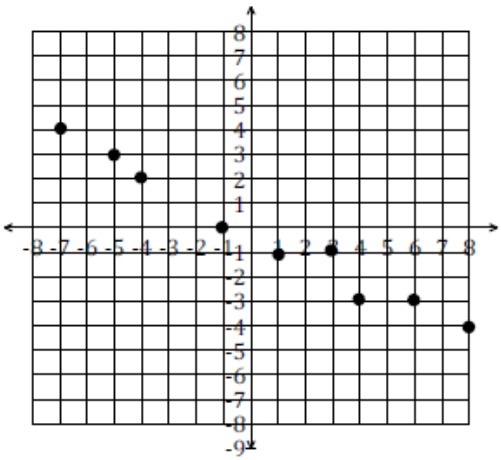
E) none of the above

163. Which scatter plot has an approximate line of best fit of $y = -2x$

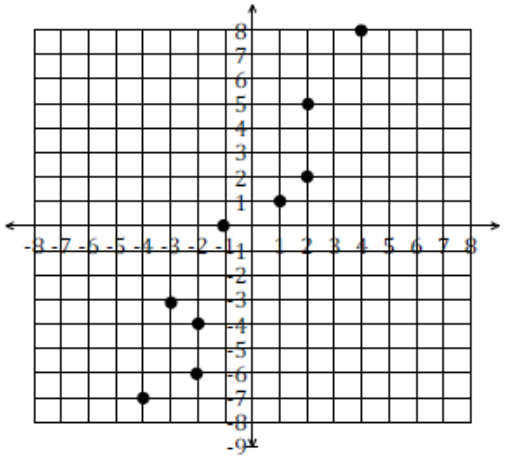
(A)



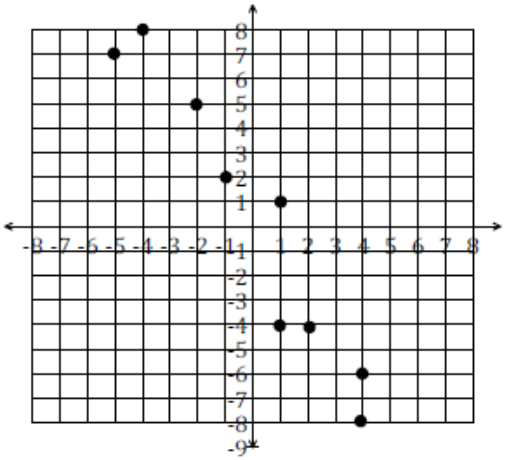
(B)



(C)

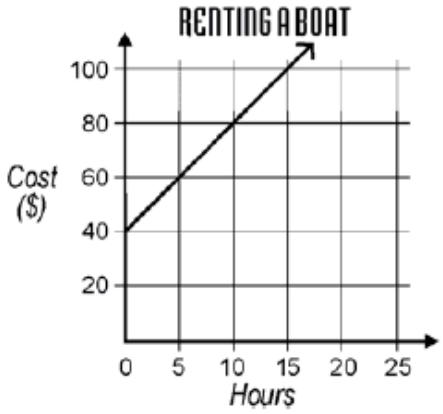


(D)



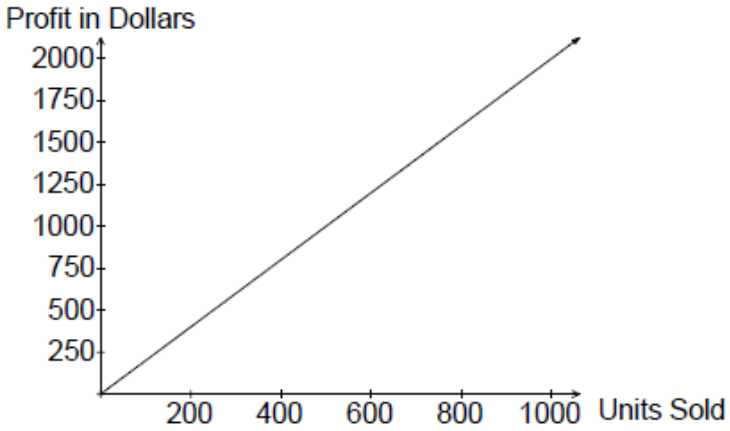
(E) none of the above

164. The graph shown represents the cost of renting a boat over time. What is the hourly rate to rent the boat?



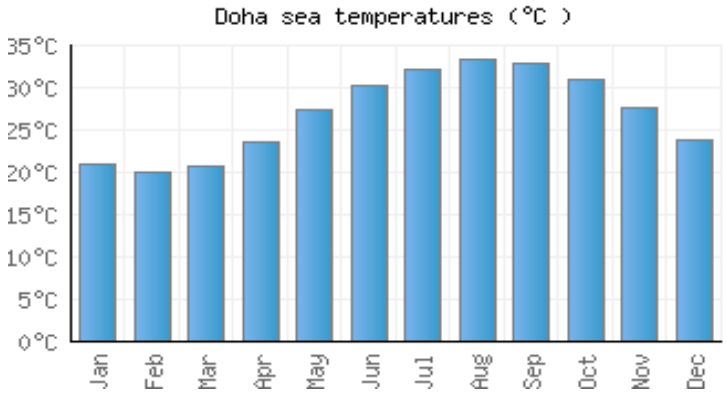
A) $1.00
B) $4.00
C) $20.00
D) $40.00
E) none of the above

165. This graph represents profit per unit sold. What is the profit, in dollars, for sales of 500 units?



A) 200
B) 275
C) 750
D) 1000
E) none of the above

166. What is the difference in Doha's sea temperature between September and February?



A) 9

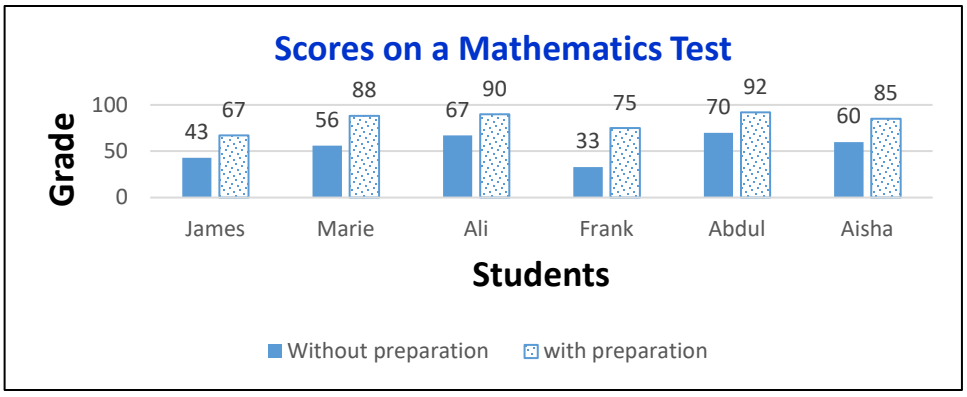
B) 13

C) 15

D) 53

E) none of the above

167. The graph below gives two scores for six students on a mathematics test. Who had the highest improvement in their grade?



A) Abdul

B) Ali

C) Frank

D) Marie

E) none of the above

168. Which station has the lowest humidity recorded?

STATION	TEMP. (° C)	HUMIDITY (%)	WIND DIRECTION & SPEED (kt)
Al Wakrah	27.7	76.7	E - 14
Mesaieed	30	68	E - 10
Abu Samra	34.9	16.4	SSE - 08
Dukhan	32.6	33.8	SE - 07
Al Ruwais	29.2	58.5	SSE - 12
Alkhor	28.4	72.3	SE - 12
DOHA	28.9	63.3	E - 11

A) Abu Samra

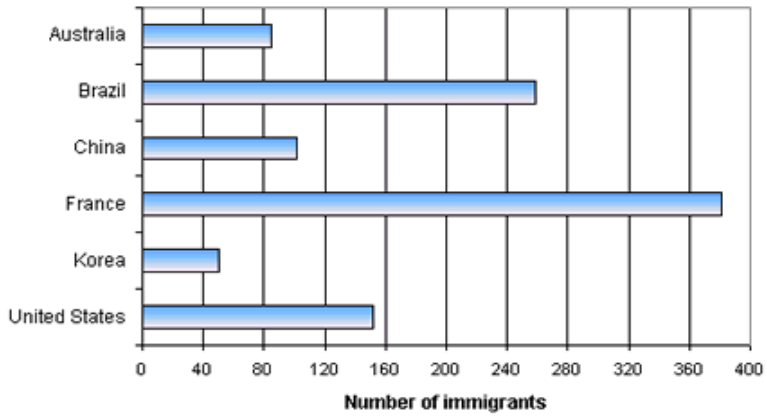
B) Dukhan

C) Al Wakrah

D) Doha

E) none of the above

169. Which country had the smallest number of immigrants?



A) Australia

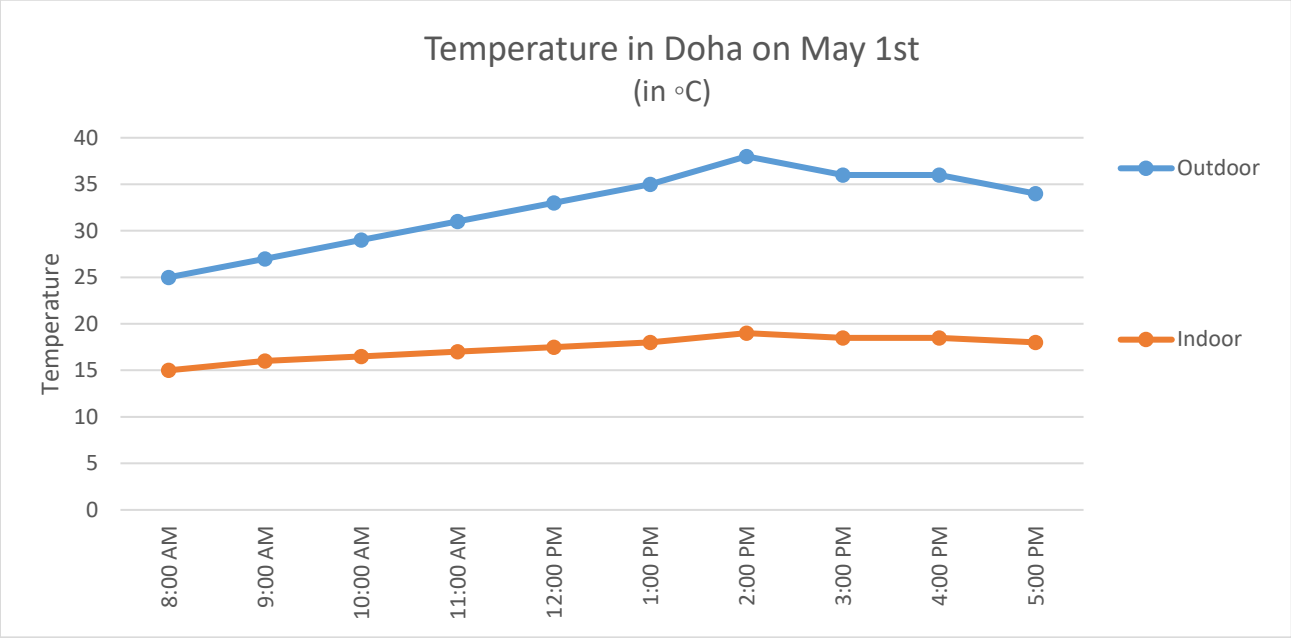
B) Brazil

C) France

D) Korea

E) none of the above

170. The graph shows the indoor and outdoor temperatures during the day in Doha on May 1. What is the highest indoor temperature?



A) 15

B) 19

C) 34

D) 38

E) none of the above

Topic 18: Functions

171. Which set of ordered pairs represents a function?

A) $\{(2,3),\ (-4,5),\ (2,7),\ (7,-2)\}$

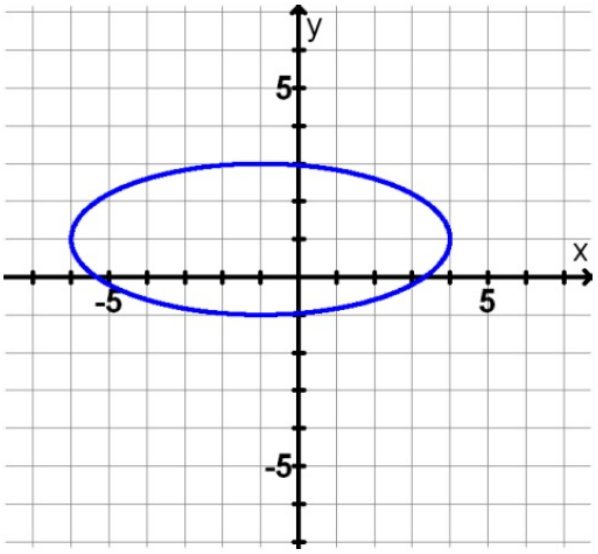
B) $\{(2,3),\ (-4,5),\ (-2,7),\ (-4,-2)\}$

C) $\{(2,3),\ (-4,5),\ (-2,7),\ (7,7)\}$

D) $\{(2,3),\ (-4,5),\ (2,-7),\ (7,-2)\}$

E) none of the above

172. What is the range of the graph?



A) $\{x|-6 \le x \le 4,\ x \epsilon \mathrm{R}\}$

B) $\{x|-1 \le x \le 3,\ x \epsilon \mathrm{R}\}$

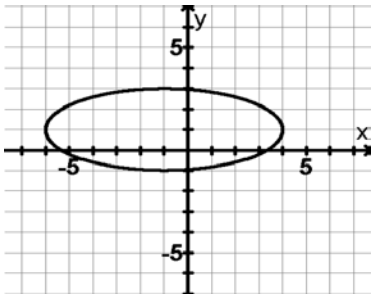
C) $\{y|-6 \le y \le 4,\ y \epsilon \mathrm{R}\}$

D) $\{y|-1 \le y \le 3,\ y \epsilon \mathrm{R}\}$

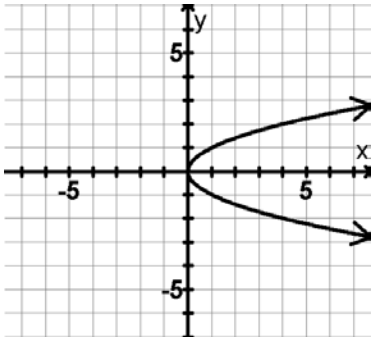
E) none of the above

173. Which graph represents a function?

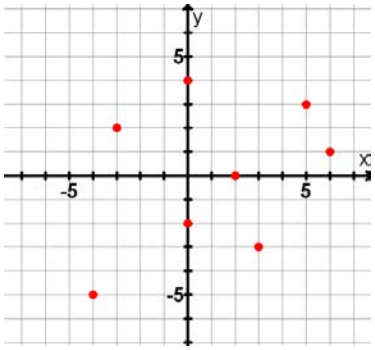
A)



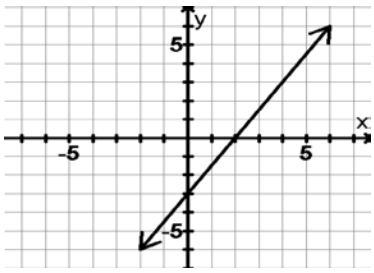
B)



C)

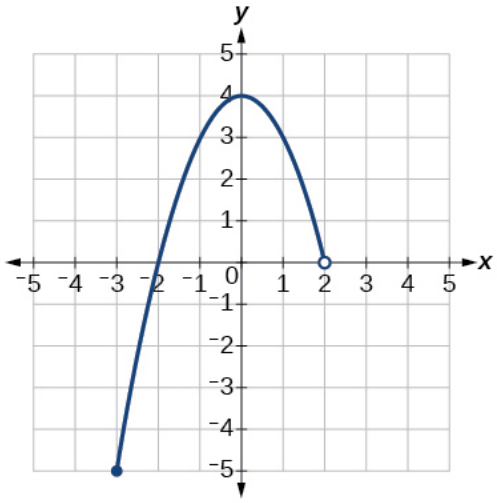


D)



E) none of the above

174. What is the domain of the graph below?



A) $\{x| -3 \leq x \leq 2,\ x \epsilon \mathrm{R}\}$

B) $\{x| -3 < x \leq 2,\ x \epsilon \mathrm{R}\}$

C) $\{x| -3 \leq x < 2,\ x \epsilon \mathrm{R}\}$

D) $\{x| -3 \leq x \leq 2,\ x \epsilon \mathrm{I}\}$

E) none of the above

175. What is the domain of the function $y = -3(x+5)^2 - 8$?

A) $\{x \mid x \geq -8, y \in R\}$

B) $\{x \mid x \in R\}$

C) $\{x \mid x \leq -5, x \in R\}$

D) $\{x \mid x \leq 5, x \in R\}$

E) none of the above

176. What is the axis of symmetry of the function $y = 4(x-2)^2 + 7$?

A) $x = 7$

B) $x = -2$

C) $x = -7$

D) $x = 2$

E) none of the above

177. Which function below will have a vertex at (-3,4)?

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

B) $y = \frac{1}{3}(x+3)^2 - 4$

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

D) $y = 3x^2 + 4$

E) none of the above

178. What is the value of $f(-3)$ if $f(x) = 2x^2 + 3x - 5$?

A) -27

B) -8

C) 4

D) 22

E) none of the above

179. What is the y-intercept of the function $y = 5x^2 - 12x + 9$?

A) (0,2)

B) (0,9)

C) (0,0)

D) (0,-9)

E) none of the above

180. What is $y = 2x^2 + 4x + 8$ in the form $y = a(x-h)^2 + k$?

A) $y = 2(x-1)^2 - 2$

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

C) $y = 2(x+1)^2 - 2$

D) $y = 2(x-1)^2 + 2$

E) none of the above

Topic 19: Logarithms

181. What is $81 = 3^4$ in logarithmic form?

A) $\log_4 3 = 81$

B) $3 = \log_4 81$

C) $\log_{81} 4 = 3$

D) $4 = \log_3 81$

E) none of the above

182. What is $-z = 7\log_x y$ in exponential form?

A) $x^{-z} = y$

B) $x^{-z} = 7y$

C) $x^{-z} = \frac{7}{y}$

D) $x^{-z} = y^7$

E) none of the above

183. Which expression is equal to $3\log_6\left(3x^2\right)$?

A) $\log_6\left(9x^2\right)$

B) $\log_6\left(9x^6\right)$

C) $\log_6\left(27x^8\right)$

D) $\log_6\left(27x^6\right)$

E) none of the above

184. Solve for x: $\log_x 256 = 8$

A) $\frac{1}{32}$

B) 2

C) 32

D) 2048

E) none of the above

185. Write as a single logarithm: $2\log A - \log B$

A) $\log\left(A^2 - B\right)$

B) $\log\frac{A^2}{B}$

C) $\log\left(A^2 B\right)$

D) $\log\frac{2A}{B}$

E) none of the above

186. Solve for x: $\log_3 27 + \log_3 9 - \log_3 81 = \log_3 x$

A) $\frac{1}{9}$

B) $\frac{1}{3}$

C) 1

D) 3

E) none of the above

187. Solve for x: $\log_3(x+6) - \log_3(x-6) = \log_3 4$

A) -10
B) -4
C) 4
D) 10
E) none of the above

188. Solve for x: $\frac{1}{2}\log 16 + \log(x+1) = \log(3x+48)$

A) 8
B) 10
C) 44
D) 52
E) none of the above

189. Solve for x: $2 = \log(x-10) + \log(x+10)$

A) 0
B) $\pm$ 100
C) $\pm 10\sqrt{2}$
D) $\pm 20\sqrt{2}$
E) none of the above

190. Write $\log_3\left(\frac{xy}{p^2}\right)$ as a sum and/or difference of logarithms, without exponents.

A) $\log_3 x + \log_3 y - \log_3 p^2$
B) $\log_3 x + \log_3 y - \log_3 2p$
C) $\log_3 x + \log_3 y - 2\log_3 p$
D) $\log_3 x - \log_3 y - 2\log_3 p$
E) none of the above

Topic 20: Word Problems

191. A football is kicked up into the air, so that the height (*h)* above the ground after *t* seconds given by the equation $h = -8t^2 + 32t + 20$. What is the maximum height reached by the football?

A) 2
B) 4
C) 20
D) 52
E) none of the above

192. Eight apples and two oranges cost 32 QR. Five apples and four oranges cost 31QR. What is the cost for one apple?

A) 2
B) 3
C) 4
D) 5
E) none of the above

193. The perimeter of a rectangle is 72m. The length is 4 m more than three times the width. What is the length of the rectangle?

A) 8
B) 17
C) 28
D) 55
E) none of the above

194. One number is 4 less than 3 times another. If the sum of the numbers is 36, what are the two numbers?

A) 8 and 28

B) 10 and 26

C) 12 and 24

D) 13 and 23

E) none of the above

195. A water balloon of a spherical shape has a diameter of 25 cm when filled. How much water can the balloon hold when filled completely, to the nearest cm^3?

A) 1963

B) 7850

C) 8177

D) 65 417

E) none of the above

196. A 6am, the temperature was -11^0C. The temperature increased at a constant rate of 3.2^0C per hour. What expression represents the temperature at 12 noon?

A) $-11+9.2$

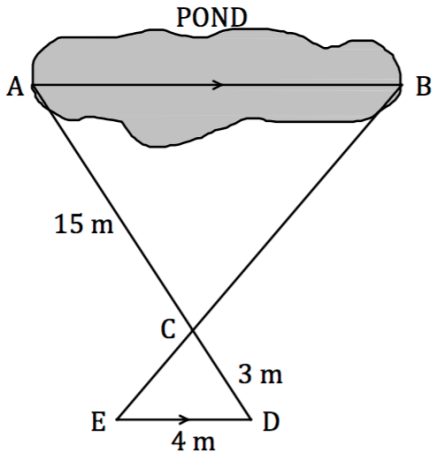
B) $-11+7(3.2)$

C) $-11-19.2$

D) $-11+3.2\times 6$

E) none of the above

197. A walker drew the triangles below to help determine the length of the pond, $\overline{AB}$. What is the length of the pond?



A) 11.25

B) 15.75

C) 20

D) 60

E) none of the above

198. In ΔABC, $AB = x$, BC is three more than AB, and AC is twice BC. If the perimeter of ΔABC is 93 cm, what is the length of AB in cm?

A) 21

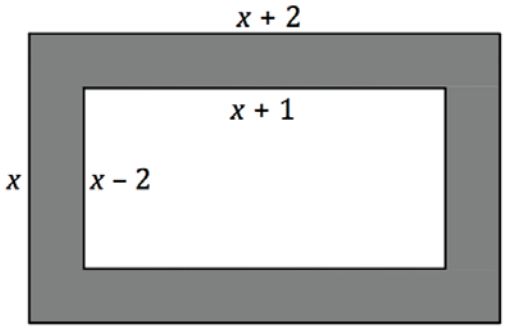
B) 21.75

C) 22.5

D) 28

E) none of the above

199. What is the area of the shaded region for the figure below in simplest form?



A) $-3x-2$

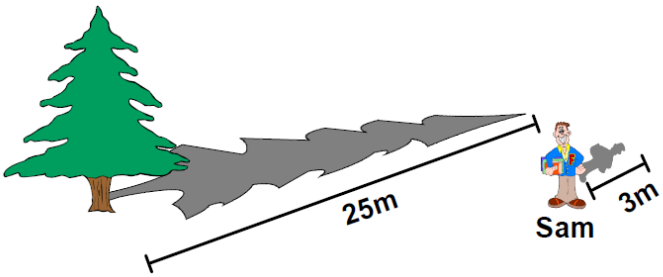
B) $-x+2$

C) $x-2$

D) $3x+2$

E) none of the above

200. Sam, who is 1.7 m tall, casts a shadow of 3 m. What is the height of a tree, in metres, if the tree casts a shadow of 25 m at the same time of day?



A) 0.2

B) 4.9

C) 14.2

D) 15.9

E) none of the above