**LJHSCE Mathematics Review**

**Grade 9**

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Reference Information**

The following information is for your reference in answering some of the questions in this study guide.

**Numbers and Operations**

***The Order of Operations***

* ***Parentheses***
* ***Exponents***
* ***Multiplication and Division (left to right)***
* ***Addition and Subtraction (left to right)***

***This order of operations is sometimes remembered by the***

***word PEMDAS, in which each letter represents one operation.***

**Activity 1**

Evaluate the following expressions. SOLUTIONS

1. 6(-2)+3 (1) 6(-2)+3 =

2. 10(5-3) (2) 10 (5-3) = 10(2) =20

3. (3) =16

=16

4. (4) = 24/2 = =144

5. 5 – 2 + 3 (5) 5 – 2 + 3 = 3 + 3 = 6

**Virtually all of the numbers in everyday algebra are**

**real numbers.**

**{Counting Numbers} = {1, 2, 3, 4, …} (positive numbers)**

**{Whole Numbers} = {0, 1, 2, 3, 4, …} (non-negative integers)**

**{Integers} = {…, -3, -2, -1, 0, 1, 2, 3,…}**

**{Rational Numbers} = {Numbers that can be expressed as the**

**quotient of two integers, in the form a/b where b }**

**{Irrational Numbers} = {Numbers that cannot be expressed as**

**the quotient of two integers}**

**{Real Numbers} = {All rational numbers and all irrational numbers}**

**Activity 2**

Identify each of the following as a rational number or an irrational number.

1. 9 SOLUTIONS

2. 0 (1) rational

3. (2) rational

4. (3) rational

5. (4) irrational

(5) irrational (pi = 3.14… or 22/7)

|  |
| --- |
| **SYMBOL**   **MEANING** |
| is less than |
| is greater than |
| is less than or equal to |
| is greater than or equal to |
| is not equal to |

**ARITHMETIC & ALGEBRA**

**DEGREE OF A MONOMIAL**

The degree of a monomial is the sum of the exponents in that monomial. Remember when calculating degree that a variable with no written exponent has an implied exponent of 1.

|  |
| --- |
| **MONOMIAL**   **COEFFICIENT** **VARIABLES**   **EXPONENTS** **DEGREE** |
| 8 8 none 0 0 |
| X 1 x 1 1 |
| a, b 1,1 1+1 = 2 |
| 7 7 g 3 3 |

**Activity 3**

Practice working with monomials in the following exercises. State the degree of each of the following monomials.

1. SOLUTIONS

2. n (1) 0

3. 5ab (2) 1

4. (3) 2

5. 7b (4) 7

(5) 1

**Mathematics Formula Sheet**

**Algebra**

**Activity 4:** slope of a line m =

Example 1



Solution

Find the slope of the line graphed above. Choose two points on the line, such as A (1, 4) and B (2, 1). Find the number of units of change in moving from point A to point B.

slope = rise/run = 3 units down/ 1 unit right = -3/1 = -3

If you are given the coordinates of two points on a line, you can find the slope of the line by using this formula.

slope =

Find the slope of the line that passes through the points M (0, 2) and N (-2, -1).

m =

ATTENTION!

Be sure to subtract the y – coordinates and the x – coordinates in the same order: = or

.

slope-intercept form of the

equation of a line y = mx + b

The **y-intercept of a line** is the y-coordinate of the point where it intersects the y-axis. Since you can use y = mx + b to find the slope and the y – intercept of a line, it is called the **slope-intercept form** of an equation. The slope of the line is m. The y-intercept is b.

**More examples. Check-out this table**

|  |  |  |  |
| --- | --- | --- | --- |
| Equation | Two Solutions | Slope | y-intercept |
| y = 2x + 1 | (0, 1) , (1/2, 0) | 2 | 1 |
| y = x + 4 | (0, 4) , (-4, 0) | 1 | 4 |
| y = 0.5x -2.5 | (0, -2.5) , (5, 0) | 0.5 | -2.5 |

Try these! Identify the slope and y-intercept of each equation.

i. y = -6x (-6; 0)

ii. y = 3x -7 (3; -7)

iii. 4x -y = 5 (4; -5)

**Activity 5:** point-slope form of the

of a line

The point-slope form of the equation of the nonvertical line that passes through a given point

with the slope of m is shown above.

Example 2

First find the slope. Use the points = (-3, 6) and = (1, -2).

m = = =

Then use the slope to write the point-slope form. Choose either point as .

Write point-slope form

y – 6 = - 2 [x – ( -3) ] Substitute for m, and

y – 6 = - 2 (x + 3) Simplify

y – 6 = - 2x – 6 Use distributive property

y = - 2x Add 6 to each side

**Activity 6**: standard form of a

quadratic equation

Example 1

A **quadratic equation** is an equation that can be written in the following **standard form.**

, where

In standard form, a is the **leading coefficient.**  When b = 0, this equation becomes

. To solve quadratic equations of this form, isolate on one side. Then find the square root(s) of each side.

**Solution**

Solve each equation.

a. b. c. d.

a. has two solutions: x = +2 and x = - 2.

b. has two solutions: and

c. has one solution: x = 0.

d. has no real solution.

Example 2

Solve

Solution

Write original equation.

Add 48 to each side.

Divide each side by 3.

Find the square roots.

16 is a perfect square: .

The solutions are 4 and . Check both solutions in the original equation. Both 4 and make the equation true, so has two solutions.

**Activity 7:** quadratic formula

The quadratic formula is very important in algebra and is worth memorizing. Before the formula can be used, the quadratic equation must be in the form . Once a, b, and c are identified, applying the quadratic formula is simply a matter of performing arithmetic.

|  |  |
| --- | --- |
|  |  |
| is equivalent to |  |
| is equivalent to |  |
| is equivalent to |  |
| is equivalent to |  |
| is equivalent to |  |

Example 1

Identify a, b, and c for .

a. a = 2, b = 9, c = 3

b. a = 1, b = , c =

c. a = 1, b = 0, c =

Now that we can identify a, b, and c in the quadratic formula, we are ready to solve quadratic equations using the formula.

Example 2

d. a = 2 b = 3 c = 1

e. Rewrite as

a = 2 b = 6 c =

f. a = 1 b = c =

**Solution**

=

=

**e. =**  =

= = = =

=

**f.**  = =

**=**  =

**Activity 8:** Pythagorean Theorem

A

c

b

B

C

a

In a right triangle, the side opposite the right angle is called the **hypotenuse.** The other sides are called the **legs.** There is a special relationship between the legs of a right triangle and the hypotenuse.

*In any right triangle, the square of the length of the hypotenuse is equal to the sum of the*

*squares of the lengths of the legs.*

In the right triangle ABC, where c is the length of the hypotenuse, and a and b are the lengths of the legs, you can state the relationship as follows.

This property is called the **Pythagorean Theorem,** after the Greek mathematician Pythagoras. The Pythagorean Theorem can be used to find the measure of one side of a right triangle if the measures of the other two sides are known.

Example 1

A

12 cm

c

5 cm

C

B

Find the length of the hypotenuse of triangle ABC.

**Solution**

Use the Pythagorean Theorem.

The length of the hypotenuse is 13 cm.

**Activity 9:** simple interest I = prt

(I = interest, p = principal, r = rate, t = time)

**Interest** is money that is paid for the use of money over a period of time. For example, if you put money into a savings account, a bank will pay you interest for the use of that money over a given period of time. If you borrow money from a bank, the bank will charge you interest for the use of their money for a given period of time.

The amount of money that is earning interest or that you are borrowing at interest is called the **principal.** **Simple interest** is paid only on the principal.

The **rate** is the percent of the principal charged for the use of the money over a given period of time, usually a year.

The **time** is the number of time periods during which the principal remains in the bank account or has not been paid back. Time is usually expressed in years or parts of a year.

To sum-up, the interest (I) earned or paid on a given principal (p) at a given rate ( r ) over time period ( r ) is given by the formula

**I = prt**

Example 1

Find the interest on LD$3,000 for two years at the rate of 8% per year.

**Solution**

Use the formula I = prt to solve.

Substitute the values into the formula.

I = LD$3,000 x 8% x 2

I = LD$3,000 x 0.08 x 2

I = LD$480 The interest is LD$480

Example 2

Find the interest and the total amount in the account for a LD$6,300 deposit for 4 years at the rate of 5.4% per year.

**Solution**

Find the interest.

I = prt

I = LD$6,300 x 5.4% x 4

I = LD$6,300 x 0.054 x 4

I = LD$1,360.80  **interest**

Find the total amount by adding the interest to the principal.

LD$6,300 + LD$1,360.80 = LD$7,660.80

So the total amount in the account after 4 years is LD$7,660.80.

When you repay money borrowed, the **amount due** is equal to the principal plus the interest accrued.

Example 3

Martha borrowed LD$4,125 from a ban at an annual interest rate of 18.5%. The term of the loan was 36 months. Find the simple interest and the total amount due on the loan.

**Solution**

Find the interest

I = prt

I = LD$4,125 x 0.185 x 3 **Change 36 months to 3 years**

I = LD$2,289.375 LD$2,289.38

Find the total amount due.

LD$4,125 + LD$2,289.38 = LD$6,414.38

Martha paid LD$2,289.38 in simple interest and LD$6,414.38 over the life of the loan.

compound interest

A stands for the amount of money that the lender ends up with after being repaid the initial principal, P, plus interest earned. The “1” is simply the number one. The letter r is the interest rate (for the time period covered). And t stands for the number of time periods.

Example 1

1. Calculate LD$1000 invested at 3% per year, compounded monthly for 5 years.

2. If you invest LD$2000 at 12% per annual, compounded semi-annually for 2 years.

3. If you invest LD$10,000 at 12% per annual, compounded quarterly for a year. How much interest was received on this investment at the end of the term?

Solution

1. A = LD$1000

= $1000

= $4399.79

2. A = LD$ 2000

= $2000

= $2524.95

3. A = LD$10,000

=$10,000

= $11,255.09 $10,000 $1255.09 Interest

**Activity 10:** distance formula d = rt

One of the greatest formulas of all time is distance = rate x time, or, among the in-crowd, d = r x t.

Example 1

Finding Distance

A car averaging 55 m.p.h. reaches its destination in 3 ½ hours. How far did it travel?

Solution:

d = r x t

= 55 x 3.5

= 192.5 miles

Example 2

Finding Rate

d = r x t

or r = d/t

A group of cyclists left on a 100-miles trip at noon and arrived at their destination at 8 P. M. What was their average rate of speed (i.e., m.p.h.)?

r = d/t

r = 100/8

r = 12.5 m.p.h.

Example 3

Finding Time

d = r x t

or t = d/r

Hannah drove 300 miles at an average rate of speed of 40 m.p.h. How long did her trip take?

Solution:

t = d/r

t = 300/40 = 7.5

t = 7.5 hours.

**Area of a:**

**Activity 11:** square

Example 1

22.3 ft

22.3 ft

**Solution**

A =

A = 22.3 ft x 22.3 ft =

rectangle A = lw

Example 2

12cm

30 cm

**Solution**

A = l x w

A = 12 cm x 30 cm =

parallelogram A = bh

Example

16 cm

21 cm

**Solution**

A = b x h

A = 21 x 16 = 336

The area is

triangle

Example

5 m

10 m

**Solution**

A =

A = =

trapezoid

25 in.

Example 1

5 in.

15 in.

**Solution**

A = ½ (5 in.) (25 in. + 15 in.)

A = ½ (5) (40) = ½ (200)

A= 100

circle

Example

a. b.

5 in.

12.2 cm

**Solution**

A = 3.14 (6.1) (6.1) = 116.8 A = 3.14 x

**Perimeter of a:**

square P = 4s

3

Example

3 m

3 m

3 m mmmmm

m m mmm

3 m

**Solution**

Add the lengths of the four sides: 3 + 3 + 3 + 3

The perimeter is 12 m

rectangle P = 2l + 2w

Example

6 in.

2 in.

2 in.

6 in.

**Solution**

The perimeter is 2(6) + 2(2) = 16 in.

triangle

Example 1

6 1/3 ft

2 ft

5 ¾ ft

**Solution**

Add the lengths of the three sides.

= 2 + 6 = 13 = 14 ft.

Circumference of a circle OR C =

Example 2

a. Find the circumference. Use 3.14 for

5 in

**Solution**

C =

C = 3.14 x 5

C = 15.70

The circumference is approximately equal to 15.70 in.

Example 3

To find the circumference of a circle when you know the radius (r) , use the formula

C =  b. Find the circumference. Use 22/7 for .

7 mm mmmm

**Solution**

C = 2

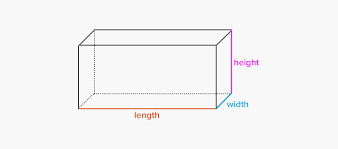
C = 2 x 22/7 x 7

C = 44

The circumference is approximately equal to 44 mm.

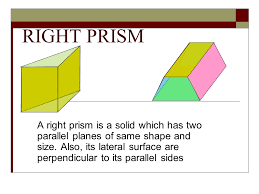
**Activity 12: Surface Area and Volume of a : (Three-Dimensional Figures)**

rectangular prism SA = 2lw + 2lh + 2wh V = lwh

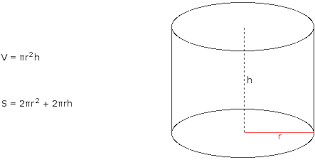


When the base of a right prism is a rectangle, the prism is called a rectangular prism or rectangular solid. A rectangular solid has six faces, each of which is a rectangle. The area of a rectangle is the product of its length and width; using this fact, a general formula for the volume of a rectangular solid can be written as shown above: V=lwh

right prism SA = ph + 2B V = Bh



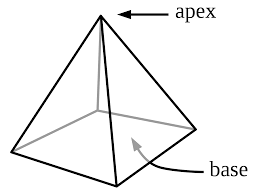
cylinder SA = V =



**TEACHING TIP**

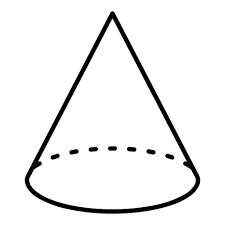
A **cylinder** has two identical, parallel, circular bases.

pyramid SA = 1/2ps + B V = 1/3Bh



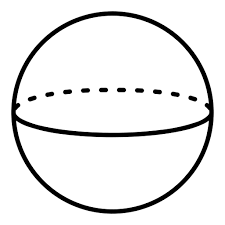
A **pyramid** is a polyhedron with only one base. A **polyhedron** (plural: polyhedra) is a three-dimensional figure in which each surface is a polygon.

cone SA = + V = 1/3



A **cone** has one circular base and one vertex.

sphere SA = 4 V = 4/3



A **sphere** is the set of all points in space that are the same distance from a given point, called the center of the sphere.

(p = perimeter of base B;

**Activity 13: Data**

mean mean is equal to the total of the values of a data set,

divided by the number of elements in the data set

median median is the middle value in an odd number of ordered

values of a data set, or the mean of the two middle values

in an even number of ordered values in a data set

mode mode is the number that occurs most frequently in the set

of data. Some sets of data have no mode; some have

more than one mode.

range range is the difference between the greatest and the

least values in a set of data.

Example

The seven students at one table in the cafeteria had these numbers of books with them:

4 3 6 5 5 7 5

a. Find the mean b. Find the median

c. Find the mode d. Find the range

**Solution**

**a.** The mean is 5 because the sum of the data is 35 and 35 divided by 7 is 5.

**b.** The median is 5 because when the data are arranged in order--- 3, 4, 5, 5, 5, 6, 7 ---the

middle number is 5.

**c.** The mode is 5 because it is the number that occurs most frequently.

**d.** The range is 4 because the difference between 7 and 3 is 4.

**Helpful Links:**

1. [**https://mathantics.com/**](https://mathantics.com/)Basic math videos and worksheets.

2. <https://www.mathhelp.com/> Covers math and hundreds of subjects all grade levels.

3. <https://www.khanacademy.org/> Free math lessons at all grade levels.

4. <https://www.mashupmath.com/> Get free math puzzles for all grades.

5. <https://www.mathplanet.com/> An online resource where one can study math for free.

6. <https://www.insidemathematics.org/> It about improving students’ mathematics learning and performance.

**LJHSCE Mathematics Review**

**Grade 9**

**50 Questions Test (Check Your Knowledge)**

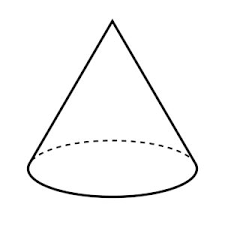
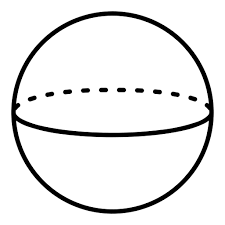
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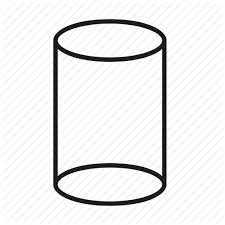
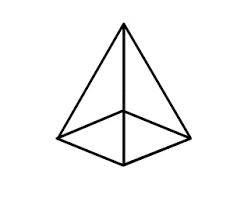
Part I

Answer 25 questions from this part. Write your answers in the spaces provided below each problem.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Identify the following figures below:

a. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ b.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_

c.  \_\_\_\_\_\_\_\_\_\_\_\_ d.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. What is in simplified radical form?

3. Solve for x: 1.4x – 0.9 = 3.3

4. Factor

5. Simplify and

6. The area of a circle is . What is the length of a radius of the circle?

7. Anita is finding the measures of the angles in a triangle that have the ratio 2:4:4. What are the measures of the angles?

8. Find the value of if and

9. Solve for x:

10. If 25 % of a number is 12, find the number.

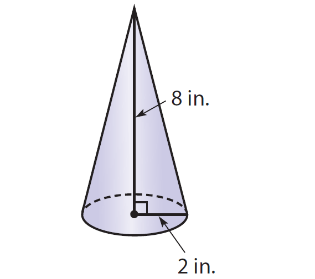
11. Solve: Find the sum of and

12. Solve the following system of equations for y:

2x + y = 12

-2x + 3y = -4

13. Find the volume of the cone below:



14. Anna deposited $LD 2500 in a saving account earning 3.5% interest. What was the interest earned after 6 years?

15. Lee had a total of 40 likes on Facebook. Eight of the likes were from Cestos Junior High School. What percent of the likes were from Cestos?

16. Evaluate the expression if a = 3 and b = - 2

17. Factor completely

18. What is 30,000, written in scientific notation?

19. What is x ?

20.

21.

22.

23. Solving these equations and then check your answers:

8 + 7y = 15 – 8

24. Write this ratio in lowest terms

42 to 72

25. 4(x + 3) = 2 ( x + 6) – 8

Part II

Directions (26 – 50): For each question chosen, select the letter preceding the word or expression that best completes the statement or answers the question.

26.

Find the value of x.

A) x = 43

B) x = 45

C) x = 50

D) x = 55

27. Factor

A) 15(x-2) (x+2)

B) 15(x-2) (x+3)

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

D) 5(x+3) (x-2)

28. Which ratio is equivalent to 3: 11?

A) 9 : 22

B) 12 : 45

C) 15 : 55

D) 18 : 77

29. A survey showed that 62% of the students surveyed prefer a certain brand of toothpaste. What fraction of these students prefer the brand of toothpaste?

A) 1/62

B) 31/50

C) 16/25

D) 2/3

30. Samuel invested $LD 1550 at 6.5% interest. He earned $LD 302.25 interest after t years. What is the value of t?

A) 1

B) 3

C) 6

D) 9

7 m

31. What is the perimeter of the figure?

3 m m

6m

4 m

A) 20 m

B) 21 m

C) 26 m

D) 27 m

32. The area of a rectangle is 37.5 square inches. The length of the rectangle is 15 inches. What is the width of the rectangle?

A) 2 in

B) 2.5 in

C) 22.5 in

D) 562.5 in

33. What is the exact circumference of a circle with a radius of 17 millimeters?

A)

B)

C)

D)

34. What expression is irrational?

A)

B)

C)

D)

35. Between what two consecutive integers does lie?

A) 4 and 5

B) 5 and 6

C) 6 and 7

D) 7 and 8

36. What is in simplified radical form?

A)

B)

C)

D)

37. What is the distance between the points and ?

A) 5.6 units

B) 7.2 units

C) 9 units

D) 10 units

38. What is the value of x? 4x – 1 2x + 5

2x + 5

4x - 1

A) 1

B) 2

C) 3

D) 4

39. Sarah is choosing a drink from a cooler containing 3 bottles of water, 2 bottles of tea, and 7 bottles of juice. How many ways can Sara choose a drink?

A) 12

B) 13

C) 42

D) 44

40. The expression 7! Is equal to which of the following?

A) 7

B) 720

C) 5040

D) 40, 320

41. Use the stem-and-leaf plot to answer the question.

**Ages of College Professors**

3 0, 2

4 1, 4, 4, 5

5 3, 5, 8, 9

6 2, 2, 2, 5, 6, 8

7 5, 5, 6

Key: 5 3 means 53

What is the range of the ages shown in the stem-and-leaf plot?

A) 4

B) 6

C) 35

D) 46

42. How many people drink 7 or more glasses of palm wine each day?

|  |  |
| --- | --- |
| Number of Glasses of water | Frequency |
| 5 | 3 |
| 6 | 8 |
| 7 | 3 |
| 8 | 5 |
| 9 | 3 |

A) 3

B) 8

C) 11

D) 13

43. Which is a rational number?

A)

B)

C)

D)

44. What is 82.4%, written as a decimal?

A) 0.824

B) 8.24

C) 82.4

D) 824

45. The angles shown are supplementary. Find the value of x.

(3x)

A) x = 15

B) x = 17

C) x = 19

D) x = 21

46. Translate the phrase “a number decreased by the quotient of three and four.”

A)

B)

C)

D)

47. Find the mean, the median, and the mode of the collection of numbers.

123, 151, 121, 112, 146, 112, 138

a) mean =

b) median =

c) mode =

48. Find the first, second, and third quartiles of the data

16, 20, 76, 31, 14, 88, 54

a) first quartile =

b) second quartile =

c) third quartile =

49. Solve the inequality

A)

B)

C)

D)

50. Which of the following sets of integers is a Pythagorean triple?

A) 3, 5, 6

B) 5, 12, 13

C) 15, 9, 17

D) 6, 8, 12

\*\*\*\*\*\*\*\*\*\*