

## Mathematics 1 – Grade 9

Welcome to your Conquesta Olympiad. When you have decided which of the answers is correct, scratch out the letter in the matching square on your answer sheet. Example:- If the answer to question 4 is c, then scratch out the letter c in the square containing c next to the number 4 (see example 1 below). If you've made a mistake and b should have been the answer, neatly cross out the mistake and then scratch out b (see example 2 below).

Example 1:- 4. a b ~~c~~ d

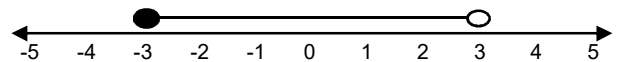
Example 2:- 4. a ~~b~~ ~~c~~ d

**Useful tip:-** When you have number sentences using different operations, apply the rule of **BODMAS**, which is the order of operations:- Firstly, calculate whatever is in **B**rackets, then **O**ther (of, square roots, power of, etc), then **D**ivision and **M**ultiplication (from left to right as they rank equally), and lastly, **A**ddition and **S**ubtraction (also from left to right).

**Did you know?**

- Factors** are the numbers we can multiply together to get another number.
- A **multiple** is the result of multiplying a number by an integer (not a fraction).  $6 \times 2 = 12$ , so 12 is a multiple of 6 and a multiple of 2.
- Squared numbers** are numbers multiplied by themselves, e.g.,  $4 \times 4 = 16$ , also be written as '4 to the power of 2', '4 to the second power' or simply '4 squared'. E.g.,  $4^2 = 16$ , so 4 squared is 16; and the square root of  $16 = 4$ . The little 2 is called an exponent. The square root symbol is  $\sqrt{\quad}$ .
- The **exponent** (also called **powers** or **indices**) of a number says how many times to use the number in a multiplication. If the exponent is 1, then the number remains the same, e.g.,  $9^1 = 9$ . If the exponent is 3, then the number is written as, e.g.,  $9^3 = 9 \times 9 \times 9 = 729$ . If the exponent is 0, then you get 1, e.g.,  $9^0 = 1$ . Remember fractions are negative powers. E.g.,  $(\frac{1}{2})^x = 2^{-x}$ .
- Negative Exponent** means how many times to divide the number, e.g.,  $8^{-1} = 1 \div 8 = \frac{1}{8} = 0,125$ . Or many divides, e.g.,  $5^{-3} = 1 \div 5 \div 5 \div 5 = 0,008$ .
- Scientific Notation** is a special way of writing numbers. The number is written in two parts, the **digits** (with the decimal point placed after the first digit), followed by  $\times 10$  to a power that puts the decimal point where it should be. E.g., 700 written as  $7 \times 10^2$ , because  $700 = 7 \times 100$  and  $100 = 10 \times 10 = 10^2$ . When the number is 10 or greater, the decimal point has to move to the left, and the power of 10 is positive. When the number is smaller than 1, the decimal point has to move to the right, so the power of 10 is negative. E.g., 0,0055 is written  $5,5 \times 10^{-3}$ .
- To convert a **recurring decimal** (E.g.,  $0,48$ ) to a fraction, first set up an equation:  $x = 0,484848$ . The recurring pattern has 2 repeats, so multiply by 100:  $100x = 48,484848$ . Subtracting the 2 equations gives  $99x = 48$ . Divide both sides of the equation by 99 to solve for x:  $x = \frac{48}{99}$ . This simplifies to  $\frac{16}{33}$ .

Look at the number line below.



The closed end of the top line, means the answer can be equal to the number where the closed end is. The open end means the answer must be less than the number it represents, and it cannot equal that number.

3. The interval (inequality) described on the number line above is:

- (a)  $-3 \geq x > 3$       (b)  $-3 \leq x < 3$   
(c)  $-3 \leq x \leq 3$       (d)  $-3 > x < 3$

Anathi wants to have her garden landscaped. The landscapers charge R200 per hour on weekdays, and their rate is increased by 30% on weekends. The new plants will cost R3 840. They will take 4 hours on Friday and 5 hours on Saturday.

4. What will the total bill be?

- (a) R1 100      (b) R5 160  
(c) R1 300      (d) R5 040

5. Simplify using the laws of exponents:

$$\frac{(3m^2n^3)^4(-2mn^3)^3}{(9m^5n^7)^2}$$

- (a)  $-\frac{1}{8mn^7}$       (b)  $-\frac{8m}{n^7}$       (c)  $-\frac{2}{3m^4n^7}$       (d)  $-8mn^7$

The diameter of an atom is 0,000005 cm.

6. What is the diameter of the atom, written in scientific notation?

- (a)  $5 \times 10^{-6}$  cm      (b)  $5 \times 10^{-5}$  cm  
(c)  $5 \times 10$  cm      (d)  $5 \times 10^{-8}$  cm

7. Multiply the binomials below:

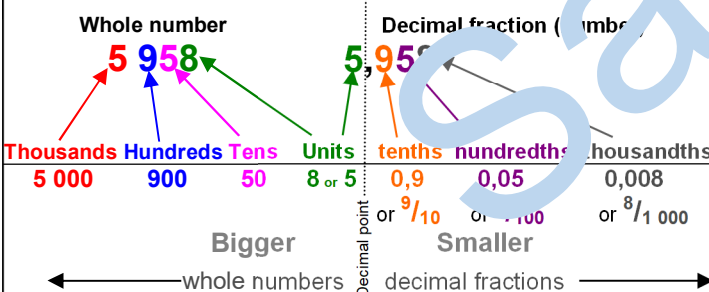
(See 'Did you know?' box on page 2.)

$$\left(\frac{1}{2}x^3 - 4xy^3\right)(x^3 + 2xy^3)$$

- (a)  $\frac{1}{2}x^6 - 8x^2y^6$       (b)  $\frac{1}{2}x^6 - 3x^4y^3 - 8x^2y^6$   
(c)  $\frac{1}{2}x^6 - 3xy^3 - 8x^2y^6$       (d)  $\frac{1}{2}x^6 + 3x^4y^3$



**Scale of Place Values**



1.  $0,7\bar{5}$  is a recurring decimal. Change it to a common fraction in its simplest form

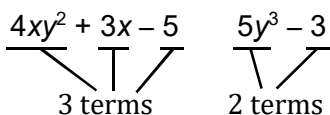
- (a)  $\frac{3}{4}$       (b)  $\frac{75}{100}$       (c)  $\frac{75}{99}$       (d)  $\frac{25}{33}$

2. Which set listed below does  $\sqrt{\frac{1}{5}}$  belong to?

- (a) Natural numbers.      (b) Rational numbers.  
(c) Integers.      (d) Real numbers.

**Did you know?**

- An **equation** says that two things are equal. It will have an equal sign "=", so an equation is like a **statement**, "this equals that". E.g.,  $x + 2 = 6$ . This example says: **what is on the left ( $x + 2$ ) is equal to what is on the right (6).**
- A **formula** is a fact or rule that uses mathematical symbols. It will usually have an equal sign (=), and two or more **variables** ( $x, y,$  etc) that stand in for values we don't know yet. It shows us how things are related to each other. E.g.,  $x = 2y - 7$  (relating  $x$  and  $y$ ), and  $a^2 + b^2 = c^2$  (relating  $a, b$  and  $c$ ).
- **Directly Proportional:** as one amount **increases**, another amount **increases at the same rate**.  $\propto$  is the symbol for **directly proportional**. (Don't confuse it with the symbol for infinity  $\infty$ ).
- **Inversely Proportional:** when one value **decreases at the same rate that the other increases**.
- **Polynomial** comes from poly- (meaning 'many') and -nomial (in this case meaning 'term') ... so it says many terms.
- A **binomial** is a polynomial with **two terms**.



Michael earns R7 500 per month. Jabu earns 6% more than Michael. Jabu spends  $\frac{1}{5}$  of her salary on gym fees.

- 14. How much is gym costing Jabu per month?**  
 (a) R1 590 (b) R1 500 (c) R2 400 (d) R1 750

- 15. Give the following with positive exponents:**

$$\frac{\sqrt{0,09x^{-2}}}{(xy)^0}$$

- (a) 1 (b)  $\frac{0,3x}{1}$  (c)  $\frac{0,3}{x}$  (d) 0,03x

A sport supply store is offering a 5% discount to people who represent a certain school. Simone plays on the school's netball team, and she buys a new netball for R330,00. The shop deducts the discount first, and then adds 15% Vat.

- 16. What did Simone pay for the netball?**  
 (a) R398,48 (b) R360,53 (c) R363 (d) R294,53

Keith sells used motor spares. He purchased a second-hand gear box for R12 500 and sold it for R13 437,50.

- 17. What was the mark-up percentage Keith added to the gear box?**  
 (a) 7% (b) 7,5% (c) 10,75% (d) 0,75%

- 18. Simplify:**

$$\frac{2a^2b^3}{4} + \frac{5a^2b^3}{4}$$

(a)  $\frac{3}{10}ab^3$  (b)  $\frac{8a^2b^3}{6}$  (c)  $a^2b^3$  (d)  $\frac{11a^2b^3}{4}$

- 19. Which one of the following statements is false?**

- (a)  $\frac{x}{15} = \frac{x}{15} \therefore x = 45$  (b)  $\frac{x}{5} = \frac{12}{30} \therefore x = 2$   
 (c)  $\frac{6}{x} = \frac{2}{8} \therefore x = 24$  (d)  $\frac{8}{16} = \frac{4}{x} \therefore x = 8$

Sarah gets home at quarter past 2 in the afternoon, and she has until 5:30 pm to complete her chores and do her homework. She spends about 80% of her time on homework.



- 8. How long does she have to complete her chores?**  
 (a) 45 minutes. (b) 1 hour and 48 minutes.  
 (c) 39 minutes. (d) 1 hour and 5 minutes.

- 9. Simplify:**

$$\frac{8^{-1}}{2 \times 4^{-1}} \times 4 \frac{2}{4}$$

- (a)  $\frac{9}{8}$  (b)  $\frac{9}{2}$  (c) 2 (d)  $\frac{9}{128}$

Juno is fertilizing her roses. The ratio of fertilizer to water must be in a ratio of 3:2. The jar contains 3,5 litres of fertilizer.

- 10. How much water must be added?**  
 (a)  $5\frac{1}{4}$  litres. (b)  $1\frac{2}{5}$  litres. (c)  $2\frac{1}{10}$  litres. (d)  $2\frac{1}{5}$  litres.

Thabo built a rectangular sand pit for his children. It has a perimeter of 75 m and one side is 7,5 m.

- 11. Calculate the area of the sand pit.**  
 (a) 37,5 m<sup>2</sup> (b) 187,5 m<sup>2</sup> (c) 225 m<sup>2</sup> (d) 450 m<sup>2</sup>

$$\frac{y}{2} = 3x + 4$$

- 12. If  $x = -5$ , what is the value of  $y$ ?**  
 (a) 16 (b) 4 (c) -28 (d) 32

$$\sqrt[3]{-64}; -\frac{27}{6}; -3\frac{4}{3}; -(2,1)^2$$

- 13. Arrange the above numbers in ascending order.**

- (a)  $\sqrt[3]{-64}; -3\frac{4}{3}; -(2,1)^2; -\frac{27}{6}$   
 (b)  $-\frac{27}{6}; -(2,1)^2; -3\frac{4}{3}; \sqrt[3]{-64}$   
 (c)  $\sqrt[3]{-64}; -(2,1)^2; -3\frac{4}{3}; -\frac{27}{6}$   
 (d)  $-\frac{27}{6}; -3\frac{4}{3}; -(2,1)^2; \sqrt[3]{-64}$



Louise needs 2,5 cups of flour to bake a cake that serves 8 people. She is going to take her cake to school, so she uses  $13\frac{1}{8}$  cups of flour instead.



- 20. How many people is she planning to serve?**  
 (a) 41 (b) 43 (c) 44 (d) 42

Anton buys a digital camera online and it costs \$76,80. The exchange rate was R14,30 to the dollar. Anton was not happy with the camera and he returned it to the supplier, but the exchange rate had decreased to R13,80 to the dollar.

- 21. How much money did Anton lose on the deal?**  
 (a) R194,85 (b) R38,40 (c) R0,50 (d) R5,19

- 22. Solve for  $x$ :**

$$x^2 + x - 6 = (x + 4)(x - 5)$$

- (a)  $x = -7$  (b)  $x = -13$   
 (c)  $x = 0$  (d)  $x$  is undefined.

