



education

Department of
Education
FREE STATE PROVINCE

GRADE 9

MATHEMATICS ITEMS BANK FOR WHOLE NUMBERS EXAMINATION

PURPOSE OF THE DOCUMENT

- TO GUIDE TEACHERS ON THE DEPTH OF THEIR PLANNING AND PREPARATION.
- TO HELP BOTH DHs AND TEACHERS TO DETERMINING CURRICULUM COVERAGE.
- TO HELP TEACHERS TO SET THEIR OWN STANDARDISED PAPERS AND TO HELP DHs TO MODERATE THE PAPERS WITH EASY.
- TO HELP IN CONTINUOUSLY PREPARING LEARNERS FOR TIMSS AND GEC PAPERS SINCE SOME QUESTIONS ARE TAKEN FROM TIMSS AND GEC PREVIOUS PAPERS.
- TO HELP TEACHERS TO SET THEIR OWN WEEKLY, BIWEEKLY AND OR MONTHLY TESTS.

NB: THE DOCUMENT IS MEANT FOR TEACHERS NOT LEARNERS. LEARNERS WILL INTERACT WITH THE DOCUMENT VIA FORMATIVE OR SUMMATIVE ASSESSMENT.

WHOLE NUMBERS

PROPERTIES OF NUMBERS

Grades 8:

- **Revise:**

- recognizing and using the commutative; associative; distributive properties of whole numbers.
- 0 in terms of its additive property (identity element for addition).
- 1 in terms of its multiplicative property (identity element for multiplication).
- **Recognize the division property of 0, whereby any number divided by 0 is undefined.**

Knowledge

Recognizing

1. Which expression represents the associative property in $(a \times b)(e \times g)$? (1)
A $(a + e)(b + g)$ B $(a + g) \times (b \times e)$
C $(a \times e)(b \times g)$ D $(a + b)(e + g)$
2. Which expression represents the distributive property in $(4 + 7) \times 11$? (1)
A $(4 \times 11) + (4 \times 7)$ B $4 \times (7 \times 11)$
C $4 + (7 \times 11)$ D $(4 \times 11) + (7 \times 11)$

Routine procedure

Using

1. By using the commutative, associative and/or associative properties, calculate:
 - 1.1 $16 - 83 + 82 - 6$ (4)
 - 1.2 8×77 (4)

Recognizing

1. Calculate the following without using a calculator:
 - 1.1 $\frac{1000}{-7+7}$ (2)
 - 1.2 $(25 - 15) \div (125 - 125)$ (3)

Grades 9:



- Describe the real number system by recognising, defining and distinguishing properties of:

- Natural numbers
- Whole numbers.
- Integers
- Rational numbers
- Irrational numbers

Knowledge

Recognising

1. Complete the table below by ticking the correct column. All the numbers are real. (10)

	Real	Natural number	Whole number	Integers	Rational number	Irrational number
1.1	$\sqrt{49}$					
1.2	$-1,372 \dots$					
1.3	$\sqrt[3]{-64}$					
1.4	$\frac{22}{7}$					
1.5	$3,142 \dots$					
1.6	$\sqrt{8}$					
1.7	$-2, \dot{4}$					
1.8	$3,142$					
1.9	$0 \times \pi$					
1.10	$\frac{2}{\pi}$					

Defining

2. Define the following:
- 2.1 Natural numbers (2)
- 2.2 Rational numbers (2)

10. Indicate whether the following statements are true or false:

10.1 Rational numbers and irrational numbers are real numbers. (1)

10.2 Natural numbers are whole numbers. (1)

10.3 Whole numbers are natural numbers (1)

10.4 Irrational numbers can be expressed as fractions. (1)

Classifying

11. Use any method to determine between which two integers is the $\sqrt{87}$ lie. (2)



CALCULATIONS WITH NUMBERS

- **Revise:**

- calculations using all four operations on whole numbers, estimating and using calculators where appropriate.

Routine Procedure

Calculate without the use of a calculator:

1. $(8 + 4) \times 3 - 18 \div 2$ (4)
2. $2 + 3 \times 7 - 12 \div (4 + 2)$ (5)
3. $20 + 3(2 + 8 \times 3) - 4$ (5)
4. $18 - 18 \div 3 \times 2 + 7 - (3 \times 0 + 4 \times 1)$ (6)

CALCULATION TECHNIQUES

- **Use a range of techniques to perform and check written and mental calculations of whole numbers including:**
 - long division
 - adding and subtracting and multiplying in columns
 - estimation
 - rounding off and compensating
 - using a calculator

Routine Procedure

1. Calculate each of the following without using a calculator:
 - 1.1 $9\ 500 \div 364$ (5)
 - 1.2 $5\ 346 + 1\ 708$ (2)
 - 1.3 $1\ 714 - 829$ (2)
 - 1.4 18×36 (3)
2. Round off and compensate to calculate each of the following accurately:
 - 2.1 $473 + 638$ (6)
 - 2.2 $3\ 017 - 2\ 572$ (6)

MULTIPLES AND FACTORS

- Use prime factorisation of numbers to find LCM and HCF.

Routine Procedure

1. Use prime factorisation to determine LCM and HCF of 540 and 1800. (4)
2. The following three numbers are given.

216 ; 252 ; 900

- 2.1 Using prime factorisation, determine the LCM of the three numbers. Show all your workings. (5)

- 2.2 Determine the $\sqrt{900}$ using prime factorisation. Show all your workings (4)

3. Calculate by using prime factorisation:

$$\sqrt[3]{4096}$$

(4)

Complex Procedure

4. Use prime factorisation to determine with reason if 225 is a factor of $3^{50} \times 5^{30} \times 7^{20}$ or not. (3)

Problem solving

5. Tracy is buying nuts and bolts at a local hardware store. The store sells nuts in packs of 5 and bolts in packs of 9. If Tracy wishes to buy the same number of nuts and bolts, what is the smallest number of nuts that she can buy? (3)
6. At Mbombela Station, a bus arrives every 35 minutes and a train arrives every 30 minutes. The bus and the train at the same time at 11 am. After how many minutes will they both arrive at the same time? (Assuming that the buses and the trains are always on time) (4)

SOLVE PROBLEM

- Solve problems in context involving:
 - ratio and rate
 - direct and indirect proportion.
- Solve problems that involve whole numbers, percentages and decimal fractions in financial contexts such as:
 - profit, loss, discount and VAT
 - budgets
 - accounts
 - loans
 - simple interest
 - hire purchase
 - exchange rate
 - commissions
 - rentals
 - compound interest

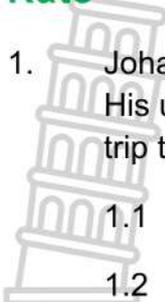
Routine Procedure

Ratios

1. Alex and Thomas share 30 sweets. They divide them in the ratio 3:2. How many sweets does Thomas have? (3)
2. Alice and Busi split a bill of R750 in the ratio Alice: Busi = 2: 1. How much does Busi have to pay according to the ratio split? (3)
3. Tim and Mpho buy a box containing 20 easter eggs. The cost of the box is R250. Tim contributes R150 and Mpho, the balance. How many eggs will each of them receive. (4)
4. There are 854 Learners in the School. How many boys are in the school, if $\frac{3}{7}$ of the Learners are girls? (1)

A 366 B 244 C. 122 D. 488
5. There are 854 Learners in the School. How many boys are in the school, if $\frac{3}{7}$ of the Learners are girls? (4)

Rate

- 
1. Johannes leaves his hometown to meet his uncle. He travels for 4 hours. His uncle's house is 300 kilometres away from his hometown. His return trip takes 3 hours.
- 1.1 What is the average speed at which he travels to meet his uncle? (3)
- 1.2 What is his average speed on his return journey? (3)
2. Tshepo is driving his car at 60km/h. How far does he drive in 90 minutes (4)
3. The distance between Kimberley and Durban is 460 km. A train covers the distance in 345 minutes. Find the speed of the train in km/h. (4)
4. Mr. Mkhize Washes 13 cups each minute. How many cups will he wash in 4 minutes? (3)
5. The price of 3 kg washing powder is R63. What is the price of 2 kg? (3)
6. A car travelling at 120 km/h covers a certain distance in 2 hours 45 minutes. The car then travels the same distance in 3 hours and 12 minutes. What is the constant speed that the car travels? (1)
- A 103,13 km/h
- B 330 km/h
- C 94,23 km/h
- D 294 km/h
7. Tshepo read a total of 15 books over 3 months. After belonging to the book club for 4 months, how many books will Tshepo have read in all? (4)
- 

Proportionality

1. The number of the mechanics versus the number of fixed cars in a day is shown in the table below.

Number of mechanics	24	12	6
Number of cars	36	18	9

Knowledge

- 1.1 Is this an example of direct or inverse proportion? (1)

Routine Procedure

- 1.2 Find the number of mechanics required to fix 108 cars. (3)

2. The time taken to paint a house versus the number of painters is given in the table below.

Number of painters	20	10	5
Time in hours	4	8	16

Knowledge

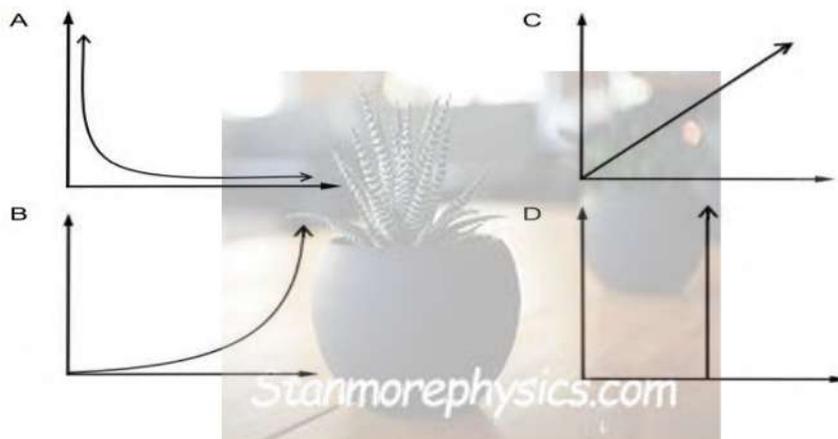
- 2.1 Is this an example of direct or inverse proportion? (1)

Routine Procedure

- 2.2 How long will it take for 12 painters to paint the house? (3)

Knowledge

3. Which graph represents direct proportion?



Budget

1. The Noxi family budget for August looks as follows:

Category	Budgeted amount
INCOME	
Salaries	R 10 000
EXPENDITURE	
Water and Sewerage	R 350
Rent and electricity	R 1 000
Phone	R 250
Food	R 3 000
School	R 2 000
Transport	R 800
Entertainment	R 1 000

- 1.1 Will the Noxi family be within the budget by the end of August? (4)
- 1.2 If the Noxi family suddenly had a medical emergency expense of R2 000 that needed to be accounted for in August, would they be able to afford to pay it without changing their budget? (1)
- 1.3 How much would they need to use from a different category in order to cover the medical emergency? Which category/categories would they be able to adjust? Show all working and explain your answer. (3)
2. Sophia budget for February included R50 for phone, R150 for entertainment and R120 for food. Is Sophia still within budget by the end of the month if her actual phone costs were R70, her actual entertainment costs R230, but her food costs R50? Show all calculations. (5)

Rentals

1. Jackson wants to rent a car for his holiday trip. He needs to travel 500 km. A car rental firm charges R300 per day. An additional R1,60 per km is charged for every kilometre that exceeds 100 km. Another car rental firm charges R240 per day. This firm charges R2,00 per kilometre for every kilometre that exceeds 120 km. Which is the better option? (6)

2. A car rental company has the arrangement of hiring their cars out at R175 a day plus R2 per km for mileage over and above the included mileage of 500 km. What would the total cost be if a car is rented for 5 days and 850 km is covered in mileage? (3)
3. Jo and Kadish meet for a game of 10 pin bowling. It costs R50 per person for one round and to hire shoes costs R20.
- 3.1 If only Jo needs to hire shoes, how many rounds will they be able to play if between them they have R250? (3)
- 3.2 How much change would they have? (2)

Accounts and Loans

1. Jacob borrowed R2 000 from his parents. If he paid it back within a year his parents would not charge him interest. He decided to pay them equal monthly payments of R170.
- 1.1 Would he manage to pay it back within a year? Show all your workings. (2)
- 1.2 What would his final monthly's payment be for the total payback amount to be exact? (2)
2. Thabo has an account with his pharmacy which is interest free. Complete the following table and answer the questions which follows.

Month	Purchases	Total amount paid	Amount owing
Balance brought forward			R 425,00
January	R 100,00	R 80,00	
February	R 289,00	R 80,00	R 654,00
March	R 43,84		R 597,84
April	R 578,50	R 300,00	
May	R 0,00		R 576,34
June		R 200,00	R 458,69
July			

- If his purchase in July were to the amount of R153, how much to pay in order to have a balance of R100? (5)

Simple interest

1. Suppose that you invest R100 000 and earn 2% simple interest per month. How much will you have saved after 5 years? (3)
2. Ruan invest R10325 for 5 years at 12,3% p.a. simple interest. Determine the value of the investment after 5 years. (3)
3. Tshepo invests R1000 at 9% simple interest per year.
 - 3.1 How much money does Tshepo earn interest in the first year? (2)
 - 3.2 How much money does Tshepo have in the account 14 years after he opened the account? (3)
4. Joanne loans R4 800 from a bank to buy a washing machine. The loan is for 3 years at an interest rate of 16,5% simple interest per annum.
 - 4.1 What will be the total amount that she owes the bank? (3)
 - 4.2 How much interest did she pay? (2)

Hire purchase

1. Lauren buys a flatscreen TV costing R17 000 on a hire purchase agreement. She will be required to make 24 monthly payments of R960.
 - 1.1 How much will she pay in total for the flatscreen TV? (2)
 - 1.2 How much interest did she pay? (2)

Complex procedure

2. Palesa wants to buy a washing machine for R4 999. She is offered a hire purchase agreement that gives a simple interest rate of 12% per annum for a period of 3 years. Determine the monthly payment (5)
3. Nadia buys furniture for her new apartment. The cash price of the furniture is R18 500. She pays a deposit of R1240 and makes equal monthly payments of R590 for 3 years.
 - 3.1 Determine the total amount that Nadia will pay for the furniture. (3)
 - 3.2 Determine the interest that Nadia must pay for the furniture. (3)

4. Katlego is a remote-control car fanatic. He saw the advert below on a website on the internet and decides to import this truck from America.



- **HAIBOXING 1:18 Scale All Terrain RC Car 18859,**
- **36 KPH High Speed 4WD Electric Remote-controlled vehicle**

LIMITED DEAL:

- Discounted price: \$66,39
- Shipping & Import Charges to South Africa: \$33,45



- 4.1 Show that Katlego will pay R1 848,89, if he should import this truck from America. The current rand-dollar exchange rate is $R1 = \$0,054$. (3)
- 4.2 Katlego decides to enter into a hire purchase agreement. The financial institution provided the following terms and conditions:

Hire purchase agreement between Katlego and ABC financial institution:

Date: 2024/06/30

- Cost Price: R1 848,89
- Deposit: 10% of cost price.
- Duration of hire purchase agreement: Two years
- Interest rate: 11% p.a

Signed: Katlego 

Analyse the hire purchase agreement and answer the following questions:

- 4.2.1 Calculate the deposit that Katlego needs to pay. (2)
- 4.2.2 Calculate the outstanding balance, after the deposit is paid. (1)

Complex procedure

- 4.2.3 Calculate Katlego's monthly instalments. (5)

Routine Procedure

- 4.2.4 What is the total amount that Katlego will pay for this imported truck. (2)

Complex procedure

Compound interest

1. Show by calculation which is the better investment? (6)
R10 000 invested at 4,5% compound interest per annum for 4 years, or
R10 000 invested at 8,5% simple interest per annum for 4 years.

Routine Procedure

2. Thapelo took R9 800 as a loan from a bank at 7% compound interest per annum for 5 years. How much must he repay at the end of 5 years? (3)

Complex procedure

3. Calculate the number of years required for an investment of R4 000 at 9% per annum simple interest to earn an interest of R2 520. (4)
4. R5 265 is invested at 12% per annum compound interest for 24 months. How much interest will the investment earn in 24 months? (1)

A R79915,48

B R74650,48

C R6604,42

D R1339,42

Routine Procedure

Exchange rate

1. A new brand of shoes selling in the UK is £140. If you buy the shoes online, and the current exchange rate is £1 = R19,24, calculate the cost of the shoes in rands. (2)
2. The current US dollar-rand exchange rate is \$1 = R14,62. How many US dollars will you get for R20 000? (3)
3. Mandla has \$4 USD. The computer game he wants to buy costs \$10 AUD. \$1 USD = \$1,48 AUD. Does he have enough money to buy the game? (3)
4. Tshepo checks the newspaper and sees that the exchange rate between the South African rand (R) and the euro (€) is 1€ = R14. How much in rands will be equal to 2€? (2)
5. You want to buy an item from America. The cost is \$120. You know that \$1 = R16. How much does the item cost in rands? (2)

6. Mpho wants to buy a good quality baseball bat and decides to buy one online from America. The online price of the baseball bat is \$350. If the exchange rate is \$ 1 = R18,57, determine the price of the baseball bat in rand (R). (2)
7. 2 tonnes of avocados are exported to Mauritius. If the Rand : Rupee exchange rate is R1:2,5 rupees, how many Rupees are paid if 1 tonne of avocados costs R3 200? (3)



2003TIMSS ITEMS

52. Which of these is closest to $11^2 + 9^2$? (1)

- | | | | |
|---|------------|---|------------|
| A | $20 + 20$ | B | $20 + 80$ |
| C | $120 + 20$ | D | $120 + 80$ |

53. Which of these is equal to $370 \times 998 + 370 \times 2$? (1)

- | | | | |
|---|-------------------|---|---------------------------|
| A | 370×1000 | B | 372×998 |
| C | 740×998 | D | $370 \times 998 \times 2$ |

54. The four digits below are to be arranged from largest to smallest to form a four-digit number. The same four digits are then to be arranged from smallest to largest to form another four-digit number. (1)

9	1	4	5
---	---	---	---

What is the difference between the two resulting four-digit numbers?

- | | | | | | |
|---|------|---|------|---|------|
| A | 3726 | B | 4726 | C | 8082 |
| D | 8182 | E | 8192 | | |

55. About 7,000 copies of a magazine are sold each week. Approximately how many magazines are sold each year? (1)

- | | | | | | |
|---|---------|---|-----------|---|--------|
| A | 8 400 | B | 35 000 | C | 84 000 |
| D | 350 000 | E | 3 500 000 | | |

56. The teachers at Parkway School plan to send 6 newsletters per year to each of the 620 families with children at the school. The newsletters each need 2 sheets of paper. The paper is sold in packs of 500 sheets. What is the least number of packs of paper needed to print the school newsletter for the year? (4)

57. A garden has 14 rows. Each row has 20 plants. The gardener then plants 6 more rows with 20 plants in each row. How many plants are now there altogether? (3)

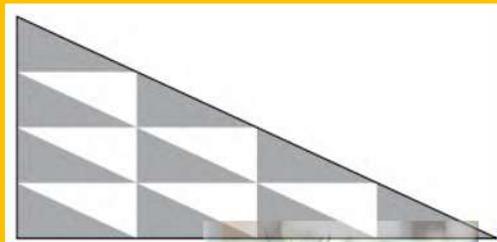
26. In a car rally two checkpoints are 160 km apart. Drivers must travel from one checkpoint to the other in exactly 2.5 hours to earn maximum points. What must the average speed be to travel the 160 km in this time? (3)

27. A driver took 1 hour to travel through a 40 km hilly section at the beginning of the course. What must the average speed in kilometres per hour, be for the remaining 120 km if the total time between checkpoints is to be 2.5 hours? (4)

44. When a new highway is built, the average time it takes a bus to travel from one town to another is reduced from 25 minutes to 20 minutes. What is the percent decrease in time taken to travel between the two towns? (1)

A 4% B 5% C 20% D 25%

45. In the figure below, each of the smaller triangles has the same area. (1)



What is the ratio of the shaded area to the unshaded area?

A 5:3 B 8:5 C 5:8 D 3:5

46. A computer club had 40 members, and 60% of the members were girls. Later, 10 boys joined the club. What percent of the members now are girls? Show the calculations that led to your answer. (4)

47. Alice can run 4 laps around a track in the same time that Carol can run 3 laps. When Carol has run 12 laps, how many laps has Alice run? (1)

A 9 B 11 C 13 D 16

48. A shop increased its prices by 20%. What is the new price of an item which previously sold for 800 zeds? (1)

A 640 zeds B 900 zeds
C 960 zeds D 1,000 zeds

49. A machine uses 2.4 litres of gasoline for every 30 hours of operation. How many litres of gasoline will the machine use in 100 hours? (1)

A 7.2 B 8.0 C 8.4 D 9.6

50. Three brothers, Bob, Dan, and Mark, receive a gift of 45,000 zeds from their father. The money is shared between the brothers in proportion to

