Grade 6 Mathematics

Terms 1, 2 and 3 - notes for 16 topics

IN EVERY TOPIC

- What you will learn and the key words.
- Short, clear notes with worked examples.
- Questions to try and a topic test, with the answers at the back.

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Strand 1.0 Numbers | Term 1

1.1 Whole Numbers

WHAT YOU WILL LEARN

By the end of this topic you should be able to:

- use place value and total value of digits up to millions in real life
- use numbers up to millions in symbols in real life
- read and write numbers up to 100,000 in words in real life
- order numbers up to 100,000 in real-life situations
- round off numbers up to 100,000 to the nearest thousand in different situations
- apply squares of whole numbers up to 100 in different situations
- apply square roots of perfect squares up to 10,000 in different situations

KEY WORDS

digit, place value, total value, millions, expanded form, ascending, descending, round off, square, square number, square root, perfect square.

1. Place value up to millions

Placing 2,162,202 on a place value chart

Millions 2 | Hundred thousands 1 | Ten thousands 6 | Thousands 2 | Hundreds 2 | Tens 0 | Ones 2.

Digits are grouped in threes from the right: ones group (202), thousands group (162), millions group (2).

The commas separate the groups and help us read the number.

Millions: 2 **Thousands group: 162** **Ones group: 202**

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
2	1	6	2	2	0	2

2,162,202: the commas split the digits into groups of three from the right.

2,162,202 on a place value chart

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2. Total value up to millions

Total value = digit × value of its place

In 3,546,201: 3 × 1,000,000 = 3,000,000; 5 × 100,000 = 500,000; 4 × 10,000 = 40,000.

6 × 1,000 = 6,000; 2 × 100 = 200; 0 × 10 = 0; 1 × 1 = 1.

Check: 3,000,000 + 500,000 + 40,000 + 6,000 + 200 + 1 = 3,546,201.

3. Expanded form

Expanding 1,705,320

1,705,320 = 1,000,000 + 700,000 + 5,000 + 300 + 20.

Zeros have no total value, so they are left out of the expanded form.

Going back: 4,000,000 + 60,000 + 800 + 9 = 4,060,809.

4. Writing numbers up to millions in symbols

Words to symbols

Two million, three hundred and five thousand, one hundred and twelve = 2,305,112.
Steps: write the millions (2), then the thousands group as three digits (305), then the ones group as three digits (112).
Seven million, forty thousand and nine = 7,040,009 (each group always has three digits).

5. Large numbers in real life

Reading data

A county planted 1,250,000 tree seedlings in one year. Read: one million, two hundred and fifty thousand.
A school bus travelled a total of 1,036,450 m in a term.
A water project cost Ksh 4,800,000.
When reading, say the millions, then "thousand" after the middle group.

6. Reading numbers up to 100,000 in words

Reading in words

45,608: forty-five thousand, six hundred and eight.
90,070: ninety thousand and seventy.
100,000: one hundred thousand.
Use "and" before the last tens or ones when there are hundreds before them, and a hyphen in numbers like forty-five.

7. Writing numbers up to 100,000 in words

Writing in words

36,240 = thirty-six thousand, two hundred and forty.
58,005 = fifty-eight thousand and five.
100,000 = one hundred thousand.
Words make it hard to change the amount, which is why receipts and cheques use them.

8. Numbers in words on receipts

Practical: filling receipts

Materials: blank receipt forms.
Receipt 1: school fees Ksh 12,750: twelve thousand, seven hundred and fifty shillings only.
Receipt 2: a dairy cow Ksh 85,000: eighty-five thousand shillings only.
Receipt 3: a water tank Ksh 23,600: twenty-three thousand, six hundred shillings only.
Exchange receipts and check that the words match the figures.

9. Comparing numbers up to 100,000

Comparing

Compare digits from the left. 45,800 and 45,080: ten thousands 4 and 4, thousands 5 and 5, hundreds 8 and 0, so 45,800 > 45,080.
A number with more digits is larger: 100,000 > 99,999.
The symbol opens towards the larger number: 63,210 < 63,250.

10. Ordering numbers up to 100,000

Ordering

Ascending (smallest first): 34,508; 35,408; 43,058; 45,380.

Descending (largest first): 45,380; 43,058; 35,408; 34,508.

Compare the ten thousands first, then the thousands, and so on.

11. Ordering numbers in real-life data

Ordering data

Ascending: 48,215; 48,512; 51,820; 52,180.

48,215 and 48,512 both start 48, so compare hundreds: 2 < 5.

The sub-county with the most learners has 52,180; the fewest 48,215.

Difference between the most and the fewest: 52,180 - 48,215 = 3,965.

12. Rounding off to the nearest thousand

Rounding to the nearest thousand

Look at the hundreds digit. If it is 5 or more, round up; if it is less than 5, round down.

45,780: the hundreds digit is 7, so round up to 46,000.

73,402: the hundreds digit is 4, so round down to 73,000.

29,500: the hundreds digit is 5, so round up to 30,000.

13. Rounding off on a number line

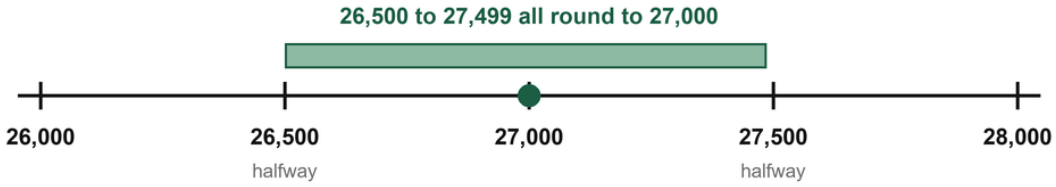
Halfway points

Between 27,000 and 28,000 the halfway point is 27,500.

Numbers from 27,500 to 27,999 are nearer 28,000 (or at the halfway point) and round up.

Numbers from 27,001 to 27,499 are nearer 27,000 and round down.

So all whole numbers from 26,500 to 27,499 round to 27,000.



27,500 is halfway between 27,000 and 28,000: it rounds up to 28,000.

Rounding to the nearest thousand

14. Rounding off in real life

Estimating with rounding

A farmer sold maize for Ksh 23,800 and beans for Ksh 15,300.

Rounded: Ksh 24,000 and Ksh 15,000. Estimated total: 24,000 + 15,000 = 39,000.

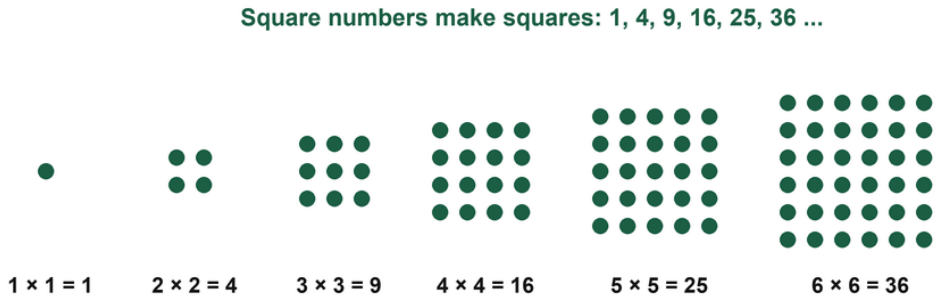
Exact total: 23,800 + 15,300 = 39,100.

The estimate is close; it helps to check that the exact answer is sensible.

15. What a square number is

Squares

The square of a number is the number multiplied by itself.
The square of 6 is 6 × 6 = 36, written 6^2 and read "six squared".
Square numbers can be arranged as a square: 1, 4, 9, 16, 25, 36...
4 × 4 = 16; 5 × 5 = 25; 7 × 7 = 49.



Square numbers

16. Squares of numbers from 10 to 20

Working out squares

10 × 10 = 100; 11 × 11 = 121; 12 × 12 = 144; 13 × 13 = 169.
14 × 14 = 196; 15 × 15 = 225; 16 × 16 = 256.
17 × 17 = 289; 18 × 18 = 324; 19 × 19 = 361; 20 × 20 = 400.
Pattern: the gap between squares grows by 2 each time (121 - 100 = 21, 144 - 121 = 23).

17. Squares of numbers up to 100

Larger squares

Multiples of 10: 30 × 30 = 900; 50 × 50 = 2,500; 100 × 100 = 10,000.
Other numbers by long multiplication: 25 × 25 = 625.
45 × 45 = 2,025.
64 × 64 = 4,096.
99 × 99 = 9,801.

18. Square roots of perfect squares

Square roots

The square root of a number is the number that, multiplied by itself, gives that number.
7 × 7 = 49, so the square root of 49 is 7. 9 × 9 = 81, so the square root of 81 is 9.
A perfect square is a whole number whose square root is a whole number: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144...
Area link: a square of area 144 cm^2 has side 12 cm because 12 × 12 = 144.

19. Square roots up to 10,000 and real-life problems

Larger square roots

Known squares: 50 × 50 = 2,500, so the square root of 2,500 is 50. 100 × 100 = 10,000, so the square root of 10,000 is 100.

Factor method: 576 = 2 × 2 × 2 × 2 × 2 × 2 × 3 × 3. Make pairs and take one from each pair: 2 × 2 × 2 × 3 = 24. Check: 24 × 24 = 576.

1,764 = 2 × 2 × 3 × 3 × 7 × 7. One from each pair: 2 × 3 × 7 = 42. Check: 42 × 42 = 1,764.

Problem: 400 plants in a square block have 20 rows of 20, because 20 × 20 = 400.

20. Review: whole numbers

Summary

Place value up to millions: 3,546,201 has 3 in the millions place.

Words up to 100,000: 45,608 is forty-five thousand, six hundred and eight.

Ordering: compare from the left.

Rounding to the nearest thousand: look at the hundreds digit.

Squares: a number times itself, for example 25 × 25 = 625. Square roots reverse this: the square root of 625 is 25.

TRY THESE

1. Write the place value of 5 in 5,302,148.
2. Write the place value of 8 in 1,480,263.
3. What is the total value of 7 in 7,215,036?
4. What is the total value of 4 in 2,843,190?
5. Write 2,431,000 in expanded form.
6. Write 5,000,000 + 200,000 + 70 as one number.
7. Write five million, two hundred thousand in symbols.
8. Write one million, sixty thousand, four hundred in symbols.
9. Read 3,400,000 in words.
10. Which is larger: 1,250,000 or 1,205,000?
11. Read 23,415 in words.
12. Read 70,009 in words.
13. Write 14,302 in words.
14. Write 60,450 in words.
15. Write Ksh 9,450 in words.
16. Write Ksh 40,008 in words.
17. Use > or <: 78,400 ___ 78,040
18. Use > or <: 19,999 ___ 20,000
19. Arrange in ascending order: 62,100; 26,100; 61,200
20. Arrange in descending order: 8,750; 87,500; 78,500
21. Arrange in descending order: 33,450; 34,350; 33,540
22. Which is the second smallest: 70,100; 71,000; 70,010; 70,001?
23. Round 18,649 to the nearest thousand.
24. Round 62,381 to the nearest thousand.
25. What is the halfway point between 54,000 and 55,000?
26. Does 54,499 round to 54,000 or 55,000?
27. Round 31,600 and 18,200 to the nearest thousand, then add.
28. 31,600 + 18,200 = ?
29. 8 × 8 = ?

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30. What is 9 squared?
31. 12 × 12 = ?
32. 15 × 15 = ?
33. 40 × 40 = ?
34. 24 × 24 = ?
35. What is the square root of 64?
36. What is the square root of 121?
37. What is the square root of 6,400?
38. What is the square root of 1,225?
39. What is the total value of 5 in 5,031,400?
40. Write 60,307 in words.

TOPIC TEST

T1. Using the digits 7, 0, 2, 9, 4, 1 and 5 once each, make the largest 7-digit number.
T2. The total value of a digit 6 is 600,000. In which place is it?
T3. Write 6,606,606 in expanded form.
T4. Write the number one more than 2,999,999.
T5. Find a number in millions in a newspaper and read it to the class.
T6. Which number is "sixty thousand and six"?
T7. Write your school's enrolment in words.
T8. Make a receipt for Ksh 99,990 and write it in words.
T9. Write three numbers between 49,990 and 50,000.
T10. Make the smallest and largest 5-digit numbers using 3, 0, 8, 1, 6 once each.
T11. Collect the enrolment of four schools near you and arrange them in ascending order.
T12. Give the smallest whole number that rounds to 50,000.
T13. How many whole numbers round to 12,000?
T14. Estimate 48,700 - 21,400 by rounding, then find the exact answer.
T15. List the square numbers less than 50.
T16. Use the pattern to find 21^2 from $20^2 = 400$.
T17. Squares of numbers ending in 5 end in 25. Check with 55^2.
T18. Find the side of a square plot of area 400 m².
T19. Find the square root of 3,025 by the factor method.
T20. Write a 7-digit number, read it, round its last five digits to the nearest thousand and square its first digit.

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