TOPIC 3: OPERATIONS ON WHOLE NUMBERS

Addition of whole numbers up to 99,999,999

Example 1

Work out the sum of 348 and 72

$$\begin{array}{r} 348 \\ +\ 72 \\ \hline 420 \end{array}$$

Example 2

A cement company produced 3842 bags of cement in May and 969 bags in June. How many bags of cement were produced altogether?

$$\begin{array}{r} 3842 \text{ bags} \\ +\ 969 \text{ bags} \\ \hline 4811 \text{ bags} \end{array}$$

Example 3

Add 3,846,989 to 8,936,232

$$\begin{array}{r} 8,936,232 \\ +3,846,989 \\ \hline 12,783,221 \end{array}$$

Example 4

Work out: 12342 + 246287 + 5387

$$\begin{array}{r} 246287 \\ 12342 \\ +\ \ 5387 \\ \hline 264016 \end{array}$$

Exercise 3:1

1. Work out the following;
   a) 432 + 72
   b) 3892 + 113
   c) 482 + 96
   d) 735 + 523
   e) 639 + 145
   f) 65927 + 6773
   g) 39635 + 403659
   h) 1363 + 3686
   i) 7489 + 2165
   j) 45684 + 999
   k) 637987 + 126478
   l) 3268 + 25853
   m) 98543 + 2469
   n) 42587 + 32587 + 25748
   0) 6543709 + 436895 + 3278
2. The District Inspector of Schools(DIS) gave out books to 456 JOY Primary School and 273 to Chris Modern Junior School. How many books did the DIS give out?
3. A bus going to Masaka left Kampala bus park with 35 passengers. At Mpigi, 9 more passengers boarded. How many passengers reached Masaka?
4. The population of people in four villages is as follows: Lyabuguma has 398 people, Luseese has 248 people, Kibonzi has 499 people and Najjanga has 127 people. Find the total population.
5. On 11 April 2020, 53 people in Uganda and 189 people in Kenya had COVID-19. How many people had COVID-19 in the two countries then?
6. Alex weighs 6394 grammes and Ratif weighs 7837 grammes. Find their total weight.
7. Round off the sum of 12356 and 7240 to the nearest thousand.
8. The school spent sh. 2,453,950 in the first month, sh. 1,867,900 in the second month and sh. 945,350 in the third month. How much money did the school spend altogether?
9. Increase 2,364,378 by 317,987.

Subtraction of whole numbers up to 99,999,999

Example 1

Work out: 124 – 45

```
 1 2 4
-  4 5
 0 7 9
```

Example 2

Take away 367 from 2020

```
 2 0 2 0
-  3 6 7
 1 6 5 3
```

Exercise 3:2

1. Work out the following
   a) 138 – 59
   b) 827 – 555
   c) 269 – 30
   d) 56 – 45
   e) 87 – 65
   f) 654 – 423
   g) 13 – 9
   h) 534 – 123
   i) 8437 – 6885
   j) 6702 – 4865
   k) 200 – 112
   l) 21547 – 999
   m) 5327 - 2165
   n) 100,000 - 89987
   o) 72,157,898 – 2,158,649
2. Work out: 3 9 7 - 1 9 9
3. Take away 392 from 4000
4. A school library had 3832 books. 946 books were destroyed by rats. How many books were not destroyed?
5. Kisimba planted 6489 trees before the lockdown. After the lockdown, he found out that 2593 trees had dried up. How many trees remained?
6. A cylindrical tin contains 3080cm^3 of cooking oil. Bashir used 2156cm^3 of the cooking oil. What is the volume of the remaining cooking oil?
7. Kikunta died in 2010 at the age of 88 years. In which year was he born?
8. What must be added to sh. 4950 to become sh. 7000?
9. The reading of the water metre was 045367 units. At the end of the month, it was 045700 units. How many units were used that month?
10. Reduce 63689 by 8897
11. The man's salary was sh. 654,500. It was then decreased by sh. 68,950. Find the man's final salary.
12. A total of 710,000 candidates sat for PLE last year. Of these 398,495 were girls and the rest were boys. How many boys sat for PLE last year?
13. The quantity of milk produced on Muliira's farm has dropped by 5,391 litres from 120,000 litres. Find the final quantity of milk produced on his farm.
14. Take away 34982 from a quarter a million.
15. Find the difference between 56843 and 126800.
16. Calculate the range of; 112537, 72146, 74865, 47289 and 64268.

TOPIC 3: OPERATIONS ON WHOLE NUMBERS

Solving problems involving addition and subtraction

Example 1

The bursar issued receipts numbered consecutively from 0568 to 0617. How many receipts were issued?

$$\begin{array}{r} 0617 \\ -\ 0568 \\ \hline 0049 \end{array} + 1 = 50 \text{ receipts}$$

Example 2

Work out: 32,456 – 234,978 + 243,256

32,456 – 234,978 + 243,256

32,456 + 243,256 – 234,978

$$\begin{array}{r} 243,256 \\ +\ 32,456 \\ \hline 275,712 \end{array} \qquad \begin{array}{r} 275,712 \\ -\ 234,978 \\ \hline 040,734 \end{array}$$

Example 3

The sum of the values in the table below is the same vertically, horizontally and diagonally. Use it to find the unknown values.

d	c	28	17
25	20	19	b
e	24	23	18
26	15	a	29

Magic sum/Magic constant

26 + 24 + 19 + 17 = 86

Value of a

86 – (26+15+29)

86 – 70

16

Value of b

86 – (17+18+29)

86 – 64

22

Value of c

86 – (20+24+15)

86 – 59

27

Value of e

86 – (24+23+18)

86 – 65

21

Value of d

86 – (20+23+29)

86 – 72

14

Exercise 3:3

1. Work out:
   a) 2463 + 246 – 425
   b) 5,207 + 849 – 999
   c) 87,469 + 25,748 – 42,798
   d) 6,321,696 + 94,774 – 2,738,998
   e) 23 – 98 + 100
   f) 543 – 786 + 365
   g) 76,548 – 689,543 + 754,389
   h) 6,468,643 – 7,465,964 + 3,543,097
2. In a school of 720 pupils, 134 of them are in Nursery section, 349 are in Lower Primary section and the rest are in Upper Primary section. Find the number of pupils in Upper Primary section.
3. A man's salary is sh. 920,000. He spends sh. 275000 on school fees, sh. 157,000 on rent, sh. 184,000 on food, sh. 75,500 on clothing and saves the rest. How much money is saved?

4. The total population of three counties A, B, C and D in a certain district is 232,769. A has 74,632 people, B has 52,896 and C has 94,376. Find the number of people in county D
5. A certain farm produced 42,769 eggs in January and 57,294 eggs in February. 19,286 eggs were sold in February, 34,256 were sold in March, 29,347 were sold in April and the rest of the eggs were sold in May. Find the number of eggs sold in May.
6. A total of 832810 candidates sat for PLE last year. Of these, 11,279 were below 11years, 142,786 were 12 years old, 398,732 were 13 years old while the rest were above 13 years. How many candidates were above 13 years of age?
7. A bus conductor issued out tickets numbered consectively from 654486 to 654545. How many tickets were issued out?
8. In a novel, pages are numbered consecutively. Kasoma read from page number 678 to 827. How many pages did he read?
9. In our classroom, desks are numbered consecutively from 2435 to 2464. How many desks are in our classroom.
10. Mugagga had a bundle of notes numbered consecutively from AY 2364895 to AY 2364994. How many notes were in that bundle?
11. The sum of the values in each of the tables below is the same horizontally, verticlly and diagonaly. Find the unknown values

a)

2	7	___
___	5	___
4	___	8

b)

10	___	8
5	___	9
___	11	4

c)

7	c	d
a	4	6
b	g	1

d)

m	y	9
6	8	10
p	12	q

e)

8	k	6
3	5	7
n	9	m

f)

17	w	15
12	14	b
x	y	11

12. Find the mising values in the magic squares below.

a)

4	17	__	7
__	10	9	12
11	__	13	__
16	6	__	19

b)

13	__	27	16
__	19	18	__
20	23	__	17
25	14	15	__

c)

8	21	b	11
a	14	13	d
15	18	c	15
e	9	10	23

d)

1	15	14	k
12	6	r	9
8	n	11	5
13	3	y	16

e)

16	h	2	t
p	10	f	8
9	6	7	12
4	15	14	e

f)

17	24	1	8	t
p	5	7	14	16
4	6	k	20	22
b	12	19	21	3
11	x	25	2	9

TOPIC 3: OPERATIONS ON WHOLE NUMBERS

Multiplication of numbers up to 99,999,999

Example 1

Work out 3 x 5 using repeated addition

3 x 5 = 3 groups of 5

3 x 5 = 5 + 5 + 5

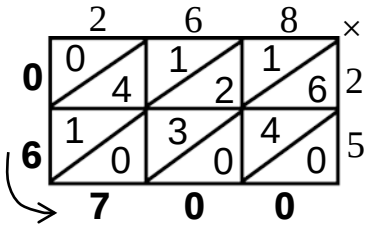
3 x 5 = 15

Example 2

Work out: 268 x 25

$$\begin{array}{r} 268 \\ \times\ 25 \\ \hline 1340 \\ +5360 \\ \hline 6700 \end{array}$$

Lattice Method



268 × 25 = 6700

Exercise 3:4

1. Work out the following;
   a) 43 x 3
   b) 6 x 10
   c) 824 x 5
   d) 34528 x 9
   e) 5364 x 12
   f) 25437 x 75
   g) 6368 x 32
   h) 45 x 5647
   i) 72 x 4256
   j) 6478 x 125
   k) 7,653 x 546
   l) 8,326 x 653
   m) 86,739 x 867
   n) 435,783 x 985
   o) 543,168 x 65,385
2. Use repeated addition to work out:
   a) 6 x 3
   b) 5 x 4
   d) 3 x 6537
3. Work out the following using Lattice method/Napier's rod method.
   a) 827 x 13
   b) 635 x 25
   c) 8,564 x 275
   d) 98,765 x 234
   e) 536 x 2,585
   f) 64,862 x 69,865
   g) 8,636 x 489
   h) 547,479 x 3,689
   i) 93,768 x 2,464
   j) 12,345 x 987
   k) 346,589 x 4,536
   l) 859,325 x 42,589
4. Multiply:
   a) 4 2 3 5 x 5 8
   b) 8 3 4 5 9 x 9 7
   c) 2 4 8 9 x 1 4 5
   d) 7 6 4 8 9 x 8 9 6
5. A pick up carries 25 bags of maize flour per trip. How many bags will the same pick up carry in 12 trips?
6. At a wedding party, guests sat in 48 rows. If each row had 25 seats, how many guests attended the party?
7. Kayondo had 7 bags each containing 12 pencils. How many pencils did he have altogether?

8. A taxi carries 14 passengers while a bus carries 29 passengers. If the two vehicles make two journeys each, how many passengers will they carry altogether?
9. Nalusiba read 15 pages of a noval. Each page had an average of 750 words. How many words did Nalusiba read?
10. A business woman bought 3 bunches of matooke having 12 clusters each. The average number of fingers on each cluster was 10.
    a) How many clusters did the business woman buy?
    b) Find the total number of fingers the business woman bought.
11. Alex bought 3 boxes of tiles. Each box had 25 tiles. If each tile cost sh 7500, how much money did Alex spend on the tiles?
12. Eight schools participated in the mathematics contest. Each school had 30 contesters and each contester paid sh 7000. How much money was collected from all the schools?
13. Books were given out to 54683 schools by the ministry of education. Each school got 275 books. How many books were given out?
15. A factory produces 456 crates of soda everyday. Each crate contains 24 bottles of soda. How many bottles of soda are produced in a week?
16. Obed has 450 cows. Each cow produces an average of 12 litres daily. How much milk does he get in a leap year?
17. Mrs. Akalelu bought 3 cartons of salt containing 40 sachets each. She then sold each sachet at sh 900. How much money did Mrs. Akalelu sell the salt?
18. In a day, a business woman sells 26 trays of eggs at sh. 450 per egg.
    If each tray holds 30 eggs, how much money does she collect in 3 weeks?

Division of whole numbers up to 9,999,999

Example 1

Work out 12 ÷ 4 using repeated subtraction.

12 – 4 = 8

8 – 4 = 4

4 – 4 = 0

So, 12 ÷ 4 = 3

Example 2

Allen a poultry farmer packed 873 eggs in boxes holding 97 eggs each. How many boxes of the same size were used?

```
          0 0 9
      97 ) 8 7 3
0 x 97 =  - 0 ↓
          8 7
0 x 97 =  - 0 ↓
          8 7 3
9 x 97 =  - 8 7 3
          0 0 0
```

So, 9 boxes were used

Example 3

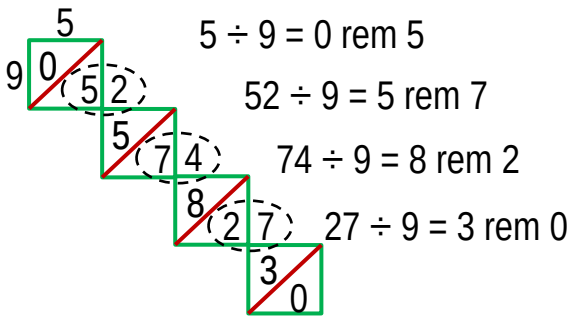
Divide 54,368,979 by 147

```
                0 0 3 6 9 8 5 7
          147 ) 5 4 3 6 8 9 7 9
0 x 147 =     - 0
              5 4
0 x 147 =     - 0
              5 4 3
3 x 147 =     - 4 4 1
              1 0 2 6
6 x 147 =     - 8 8 2
                1 4 4 8
9 x 147 =     - 1 3 2 3
                  1 2 5 9
8 x 147 =     - 1 1 7 6
                    8 3 7
5 x 147 =       - 7 3 5
                    1 0 2 9
7 x 147 =       - 1 0 2 9
                    0 0 0 0
```

So, 54,368,979 ÷ 147 = 369,857

Example 4

Use lattice method to divide 5,247 by 9



5 ÷ 9 = 0 rem 5

52 ÷ 9 = 5 rem 7

74 ÷ 9 = 8 rem 2

27 ÷ 9 = 3 rem 0

Therefore; 5247 ÷ 9 = 583

Example 5

Work out the quotient of 40 and 5

```
          0 8
        5 ) 4 0
0 x 5 =   - 0
            4 0
8 x 5 =   - 4 0
            0 0
```

The quotient of 40 and 5 is 8

Exercise 3:5

1. Work out:

a) 86 ÷ 2
b) 60 ÷ 6
c) 96 ÷ 3
d) 1,717 ÷ 17
e) 1,212 ÷ 3
f) 1,624 ÷ 4
g) 6,363 ÷ 7
h) 324 ÷ 6
i) 175 ÷ 5
j) 2,432 ÷ 8
k) 1,442 ÷ 7
l) 169 ÷ 13
m) 9832 ÷ 8
n) 3784 ÷ 4
o) 6195 ÷ 5
p) 4564 ÷ 7
q) 3222 ÷ 9
r) 2736 ÷ 6

2. Divide:

a) $7\overline{)497}$
b) $9\overline{)2502}$
c) $13\overline{)9412}$
d) $17\overline{)54723}$
e) $42\overline{)4116}$
f) $51\overline{)164016}$
g) $47\overline{)288016}$
h) $35\overline{)25725}$
i) $63\overline{)288288}$
j) $123\overline{)80442}$
k) $120\overline{)115560}$
l) $324\overline{)2119932}$
m) $246\overline{)1609332}$
n) $562\overline{)2076590}$
o) $125\overline{)1094500}$

3. Work out the quotient of 48 and 6.
4. Use repeated subtraction to divide 35 by 7
5. A pick up carries 12 bags of cement per trip. How many trips will it make to in order to carry 288 bags of cement?
6. Mr. Kipako had 4550 sweets. He packed them in sachets such that each sachet contains 70 sweets. How many sachets did Mr. Kipako get?
7. A poultry farmer had a total of 3690 eggs which were sold in trays. How many trays did the farmer sell if a tray holds 30 eggs?
8. A trader had 114 tomatoes to be sold in heaps of 6 tomatoes each. How many heaps did the trader make?
9. The national COVID-19 task force donated 4842kg of maize flour to the people of Bwayise. If each person got 6kg, how many people got the maize flour?
10. On 9th October 2020, nine countries had an equal number of COVID-19 cases. The total number of cases in those countries was 4050. How many COVID-19 cases did each of those countries have then?
11. Three television sets cost sh 1950000. Find the cost of a single television set.
12. Atugonza sells milk using containers of 500ml. One day, 30500ml of milk were sold. How many such containers of milk did Atugonza sell?
13. A secretary writes an average of 45 words per minute. How long will the same secretary take to write a speech of 5535 words at the same rate?
14. Moses made 25 drawing books using of 500 sheets of papers. How many sheets of papers were in each drawing book?
15. Seventy five litres of water lasts a family for a day. How long will 3000 litres of water last that family?
16. A chalk producing company produced 50,000 pieces of chalk. The chalk was packed in boxes that hold 125 pieces of chalk each. How many boxes of chalk did the company make?
17. Muliisa sold 14942 litres of milk in March. How many litres did he sell per day on average?
18. Given that 1 US dollar is equivalent to Ug.sh. 3750. How many dollars are Ug.sh. 1,113,750.
19. A factory produced 18750 pieces. The chalk was packed in 125 boxes which hold the same number of pieces of chalk. How many pieces of chalk are in each box?
20. The total height of students in a certain secondary school is 135054cm. The average height is 123cm. How many students are in that school?

Mixed operations

When working out problems involving two or more operations, we follow BODMAS

→ We first deal with items in brackets (Brackets)
→ Then work out numbers involving powers or square roots (Orders)
→ Then divide (Division)
→ Then multiply (Multiplication)
→ Then add (Addition)
→ Finally subtract (Subtraction)

Example 1

Work out: 23 – 15 + 12

23 – 15 + 12
Re arrange first then add
23 + 12 – 15
35 – 15
20

Example 2

Work out: 19 + (2 x 6) ÷ 4

19 + (2 x 6) ÷ 4
First remove brackets then divide
19 + 12 ÷ 4
19 + 3
22

Example 3

Simplify: 12 – (3+7) ÷ 5

12 – (3+7) ÷ 5
First remove brackets then divide
12 – 10 ÷ 5
12 – 2
10

Example 4

Work out: $\frac{2}{3}$ of 9 – (4 + 8) ÷ 3 + 7

$\frac{2}{3}$ of 9 – (4 + 8) ÷ 3 + 7
First remove brackets then divide
$\frac{2}{3}$ of 9 – (4 + 8) ÷ 3 + 7
$\frac{2}{3}$ of 9 – 12 ÷ 3 + 7
$\frac{2}{3}$ of 9 – 4 + 7
Replace "of" with multiplication "×"
$\frac{2}{3}$ x 9 – 4 + 7
(2x3) – 4 + 7
6 – 4 + 7
Re arrange first then add
6 + 7 – 4
13 – 4
9

Example 5

Work out: 3 – 7 x 6 ÷ 3 + $\frac{1}{2}$ of 24

Divide first
3 – 7 x 6 ÷ 3 + $\frac{1}{2}$ of 24
3 – 7 x 2 + $\frac{1}{2}$ of 24
Replace "of" with multiplication "×" then multiply
3 – 7 x 2 + $\frac{1}{2}$ x 24
3 – 14 + 12
Re arrange first then add
3 + 12 – 14
15 – 14
1

Exercise 3:6

1. Work out:

a) 1 – 3 + 5
b) 15 – 12 + 20
c) 123 – 150 + 75
d) 3 – (2 x 3) + 8
e) (4 + 5) ÷ 3
f) 20 ÷ 5 x 2
g) (5 – 3) x 6
h) 6 ÷ (12 – 10)
i) 15 x (3 + 7)
j) 13 – (6 + 2)
k) 20 ÷ (2 x 5)
l) 14 – (3 x 6) ÷ 9
m) 3 + (5 x 6) ÷ 10
n) 24 ÷ 6 + 5 – 7
o) 4 x 2 + 5 – 12
p) 8 ÷ 2(2 + 2)
q) 15 ÷ 3 – 4 ÷ 2 + 6
r) 20 – (4 x 3) ÷ 6 + 3

2. Simplify:

a) $\frac{3}{4}$ of 24
b) $\frac{1}{2}$ of 12 + 6(5 – 2)
c) 1 + $\frac{1}{4}$ of 6
d) 6 x $\frac{1}{4}$(2 + 5)
e) $\frac{2}{3}$ of 9 + 8 ÷ 4
f) 5 – 6 ÷ 2 + 1
g) 7+ $\frac{1}{4}$ of (16 ÷ 2) – 3
h) 6 – $\frac{5}{6}$ of 12 ÷ 3 + 5(4 – 3)

Word problems involving mixed operations

Example 1

Kakembo picked 450 tomatoes in the morning, he sold 340 tomatoes and picked 120 tomatoes in the evening. How many tomatoes does he have now?

450 – 340 + 120
450 + 120 – 340
570 – 340
230 tomatoes

Example 2

Ssemata had sh. 14000, he used half of it to buy soap, he later sold 7 eggs at sh. 500 each. How much money does he have now?

(sh. 14000 - $\frac{1}{2}$ of sh. 14000) + (7 x sh. 500)
(sh. 14000 - $\frac{1}{2}$ x sh. 14000) + sh. 3500
(sh. 14000 – sh. 7000) + sh. 3500
sh. 7000 + sh. 3500
sh. 10500

Exercise 3:7

1. There were 567 pupils in a certain school last year, this year 21 pupils left and 64 joined. How many pupils are in the school this year?
2. On Mr. Kasuka's farm, there were 76 bulls. 39 bulls were slaughtered for Christmas. If Kasuka bought more 19 bulls after christmas, how many bulls are on his farm now?
3. Take away half of the sum of 5 and 7 from the product of 3 and 4 added to 2
4. Divide 42 by the product of 7 and 2 and multiply the result by 2

5. Mr. Ogala had 40 sacks of beans and sold 24 sacks. He later harvested 20 more sacks and donated $\frac{1}{4}$ of the harvested sacks of beans to the Orphanage. How many sacks of beans does he have now?
6. A man left his wife with sh. 15000 to be used throughout the day. The wife bought 2kg of rice at sh. 3500 each and half kilogram of meat at sh. 14000 per kg. She later sold 3 bunches of matooke at sh. 12000 each. How much money did she have at last?
7. Leticia got 20 litres of milk from her cow in the morning and sold 16 litres . The milk she got in the evening was $\frac{3}{4}$ of the milk she sold. How much milk did she have at the end of the day?
8. Opio had sh. 90000, he used $\frac{1}{2}$ of it to pay for school fees, he later sold his 2 cocks at sh. 35000 each. How much money did he have at last?
9. Mpanga bought 3 cartons of salt. Each carton contains 40 sachets of salt. He used $\frac{3}{4}$ of the salt he bought on his farm. He later bought more 2 cartons of salt. Then sold all the remaining salt to Chepuku at sh. 800 per sachet.
   a) How many sachets of salt did Chepuku buy?
   b) How much money did Chepuku spend on salt?
10. Take away 6 divided by 2 from 8 and add the product of 3 and 4 to the result
11. Increase 5 by half of 10
12. Reduce 8 by $\frac{1}{2}$ of 12 and add 4 to the result.
13. Take away the product of 2 and 3 from $\frac{1}{3}$ of 9 increased by 5
14. Reduce 35 by 12, increase the result by three quarters of the sum 7 and 9, then divide the result by 5

Number properties

We use number properties as the quickest way of calculating numbers.

- Commutative property

Look at this

$2 \times 3 = 6$

$3 \times 2 = 6$

so, $2 \times 3 = 3 \times 2$

The order in which two numbers are added or multiplied does not change the answer(result)

- Associative property

Look at this:

$7 + 2 + 3 = 12$

$7 + 3 + 2 = 12$

so, $7 + 2 + 3 = 7 + 3 + 2$

The order in which more than numbers are added or multiplied does not change the answer(result)

- Distributive property

Work out the following using distributive property:

Example 1

i) (8 x 6) + (92 x 6)

(8 x 6) + (92 x 6)
6(8 + 92)
6 x 100
600

Example 2

ii) (68 x 7) – (7 x 18)

(68 x 7) – (7 x 18)
7(68 – 18)
7 x 50
350

Example 3

iii) (1 ÷ 9) + (17 ÷ 9)

(1 ÷ 9) + (17 ÷ 9)
(1 + 17) ÷ 9
18 ÷ 9
2

Example 4

iv) (505÷6)-(469÷ 6)

(505÷6) – (469÷6)
(505 – 469)÷6
36÷6
6

Exercise 3:8

1. Fill in the missing numbers to complete the statements below.
   i) 16 x ____ = 4 x ____
   ii) 7 + 8 + ____ = 3 +____+ ____
   iii) 2 x 7 x 5 = ____ x 2 x 7
   iv) ____ x 4 x ____ = 9 x ____ x 6
2. Work out the following using distributive property
   a) (6 x 2) + (6 x 8)
   b) (125 x 4) + (25 x 4)
   c) (249 x 19) + (19 x 751)
   d) (49 x 39) + (61 x 49)
   e) (77 x 123) + (123 x 23)
   f) (567 x 365) + (567 x 9635)
   g) (23 x 841) – (23 x 491)
   h) (78 x 125) – (78 x 25)
   i) (8 x 576) – (8 x 276)
   j) (65 x 1235) – (65 x 535)
   k) (98 x 5278) – (98 x 5178)
   l) (150 x 9104) – (150 x 8954)
3. Factorise and work out the following:
   a) (8 ÷ 3) + (1÷ 3)
   b) (16 ÷ 5) + (34 ÷ 5)
   c) (56 ÷ 25) + (44 ÷ 25)
   d) (568 ÷10) + (432 ÷10)
   e) (17 ÷13) – (4 ÷ 13)
   f) (418 ÷ 5) – (398 ÷ 5)
   g) (589 ÷ 12) + (611 ÷ 12)
   h) (326 ÷ 6) – (284 ÷ 6)
   i) (1000 ÷ 7) – (650 ÷ 7)
   j) (719 ÷ 13) + (9 ÷ 13)
   k) ($\frac{5}{6}$ of 3521) – ($\frac{5}{6}$ of 3485)
   l) (226÷7) – (345÷7) + (168÷7)

TOPIC 3: OPERATIONS ON WHOLE NUMBERS

Word problems involving mixed operations integrated with number properties

Example 1

The three classes in a certain school have three streams each. Each stream has 10 desks. Five pupils sit on one desk in each of the streams. How many pupils are in the 3 classes?

Number of streams
3 x 3 = 9 streams

Number of desks
9 x 10 = 90 desks

Number of pupils
5 x 90 = 450 pupils

The school has 450 pupils

Approach 2

(3 x 3 x 10 x 5) pupils
450 pupils

Example 2

A trader bought four trays of eggs at sh 350 an egg. On his way back home, 3 eggs got broken from each tray. The trader sold the remaining eggs at sh 400 each. Calculate the profit the trader made after selling all eggs if a tray holds 30 eggs.

Number of eggs bought
4 x 30 eggs = 120eggs

Buying price of the eggs
sh 350 x 120
sh 42000

Broken eggs
4 x 3 = 12 eggs

Remaining eggs
(120 – 12) = 108 eggs

Selling price
sh 400 x 108
sh 43200

Profit
sh 43200 - sh 42000 = sh. 1200

Approach 2

Buying price
4 x 30x sh. 350 = sh. 42000

Remaining eggs
(4x30) – (4x3) = 120 – 12
= 108 eggs

Selling price
108 x sh. 400 = sh. 43200

Profit
sh 43200 - sh 42000 = sh. 1200

Note: *You are advised to answer such questions step by step"*

Exercise 3:9

1. A school charges sh. 65750 for a school uniform and sh. 34250 for a sweater. How much money will the school bursar collect from a class with 76 pupils if each pupil pays for both the school uniform and the sweater?
2. In January, Mr. Katumba collected 547 eggs everyday from his poultry farm and 453 eggs everyday in March. How many eggs did he collect altogether?
3. In SBK junior school, there are 625 pupils in Upper Primary classes. Each of the pupils has 3 black pens, 5 blue pens and 2 red pens. How many pens are there altogether?
4. In P.7 class, there are 150 candidates. Their class teacher gave them 349 oranges and 101 mangoes to be shared equally. How many fruits did each get?
5. Katwere paid sh. 7150 for 9 books and sh. 4450 for 9 pens. How much more did he spend on one book than one pen?
6. The member of parliament of a certain district donated 5000kg of maize flour to a certain village. Of these, 104kg were stolen. The remaining maize flour was shared among the village members such that each gets 6kg. How many village members got the maize flour?
7. A factory produces 336 bottles of soda a day. The soda is sold at sh 18000 per crate. Each crate contains 24 bottles. How much money does the factory collect in a week?
8. The head teacher gave 167 sweets to a class of 24 pupils. The dean of studies gave 145 sweets to the same pupils. How many sweets did each pupil get altogether?
10. A farmer harvested 247 tomatoes on the first day and 203 tomatoes on the second day. The farmer sold all the harvested tomatoes at sh 600 for every heap of 5 tomatoes. How much money did the farmer get from the tomatoes?
11. A pickup carries trip of 1200 bricks at sh 30000. Jack built his house with 13760 bricks and a latrine with 1840 bricks. How much money did Jack spend to transport the bricks?
12. A business woman bought 3 bunches of matooke at Sh 12,000 each. Each bunch had 8 clusters. Each cluster had 12 fingers.
    a) How much money did the business woman buy the three bunches of matooke?
    b) If the business woman sold each finger at Sh 150, how much profit did she get?
13. An iron bar is 600cm long. A welder bought 4 iron bars which he used to make stools. The length of the iron bar used to make each stool was 800cm. The welder sold each stool at sh 28000
    a) How many stools did the welder make?
    b) How much money did the welder get from selling all the stool?

14. A box of papers contains five reams of 500 sheets each.
    a) How many sheets of papers are in the box?
    b) How many books of 24 sheets can be made from 6 boxes of papers?
15. A wire of length 161 metres was shared by boys of P.7 class. The average length of wire each boy got was 23 metres. The number of boys is 18 less than that of girls.
    a) Find the number of boys who shared the wire.
    b) Calculate the total number of pupils in P.7 class.
16. A man sells mangoes in heaps of fives and eights. A heap of five mangoes costs sh 500 and a heap of eight mangoes costs sh 1000. He had 12 heaps of five and 14 heaps of eight mangoes.
    a) How many mangoes did he have altogether?
    b) How much money did he get after selling all the mangoes?
17. A businessman had 200 bags of maize flour each weighing 50kg. A pick up carries 2000kg per trip.
    a) Work out the number of bags the pickup can carry per trip.
    b) If the businessman spends sh 25000 per trip, how much money will he pay to transport all the flour from the milling machine to his soap.
18. A school hired 10 bus and 5 taxis to take all pupils in the school for a tour. Each bus carried 33 pupils and 14 pupils by each taxi. Each pupil paid sh 45000.
    a) How many pupils are in the school?
    b) How much money did the pupils pay altogether?
19. Kaliso's poultry farm produces 3000 eggs in a day. If the eggs are packed in trays of 30 eggs each.
    a) How many trays of eggs does he produce in a week?
    b) If each tray costs sh 9500, how much money does he get in a week?
20. A bus left Ssembabule for Masaka city with 60 passengers. At Kagologolo, 13 got out, at Kitaasa, 9 boarded and at Kawoko, 7 got out. It then travelled straight to Masaka city and the rest of the passengers got out.
    a) How many passengers reached Masaka city?
    b) How much money was collected from those reached Kawoko if each paid sh 6500?
21. A trader bought 600 oranges at sh. 250 each. The trader then sold 200 of the oranges at sh. 300 each and the rest at sh. 350 each. Calculate the profit he made.
22. Work out: $3 \div \frac{1}{2}$ of 4
23. Work out: 1+2+3(1+2+3)

TOPIC 3: OPERATIONS ON WHOLE NUMBERS

Powers/Indices

The multiplication statement 6x6x6x6 can be written as 6^4 where 6 is the base and 4 is the power/index that shows the number of times the base(6) is multiplied.

Examples

Write the following in short.

i) $4x4x4x4x4x4x4 = 4^7$

ii) $mxmxmxmxm = m^5$

iii) $axaxa = a^3$

iv) $5px6px2p = 5xpx6xpx2xp$
$= 5\ x6x2xpxpxp$
$= 60p^3$

Exercise 3:10

Write the following in short

i) h x h

ii) 7 x 7 x 7 x 7 x 7

iii) r x r x r

iv) y x y x y x y x y x y x y

v) 2p x 3p

vi) n x n x 2n x 4n

vii) 2d x d x 3d

viii) 5r x 4r x r x r

ix) h x 6h x h x 3h

x) 3r x y x y x 2r x r

xi) 6 x 6 x 6 x 6 x 6 x 6 x 6 x 6 x 6 x 6

xii) 9 x 9 x 9 x 9 x 9 x 9

Meaning of powers

Note

- The power shows the number of times the base is multiplied e.g. $4^3 = 4 \times 4 \times 4$.

a^4 means a x a x a x a

5^7 means 5 x 5 x 5 x 5 x 5 x 5 x 5

$3p^3$ means 3 x p x p x p

$(2h)^4$ means 2h x 2h x 2h x 2h

3^{-1} means $\frac{1}{3}$

2^{-5} means $\frac{1}{2x2x2x2x2}$

g^{-3} means $\frac{1}{gxgxg}$

- Any number raised to power one(1), the result is that very number e.g. $6^1 = 6$ and $4^1 = 4$
- Any number raised to power zero(0), the result is always one e.g. $7^0 = 1$ and $99^0 = 1$

Example 1

Work out: $4^3 + 6^0$

$4^3 + 6^0$
$(4 \times 4 \times 4) + 1$
$64 + 1$
65

Example 2

Evaluate: $3^2 - 2^3 + 99^0$

$3^2 - 2^3 + 99^0$
$(3 \times 3) - (2 \times 2 \times 2) + 1$
$9 - 8 + 1$
$9 + 1 - 8$
$10 - 8 = 2$

Example 3

Work out: $2^3 \times 3^1 - 5^2$

$2^3 \times 3^1 - 5^2$
$(2 \times 2 \times 2) \times 3 - (5 \times 5)$
$(8x3) - 25$
$24 - 25$
-1

Exercise 3:11

Evaluate

a) $4^2 - 3^2$
b) $2^5 - 5^2$
c) $6^2 + 2^3$
d) $3^3 + 4^2 + 2^2$
e) $10^2 - 4^3$
f) $2^0 + 3^2$
g) $3^4 + 2^2 - 4^2$
h) $6^2 - 5^2 + 3^3$
i) $4^4 - 2^5 + 87^0$
j) $5^2 + g^0 - 4^2$
k) $\frac{6^2 + 2^4 - 2^1}{5^2}$

SCIENTIFIC / STANDARD FORM.

* This is the system of writing numbers in form of a x 10^n where a is a counting digit between 0 and 10 i.e. a = {1,2,3,4,5,6,7,8,9} and n is an integer(Positive/Negative).

Writing whole numbers greater than or equal to 1 in standard form

* Divide the given number by 10 repeatedly until only one counting digit is left on the side of whole numbers.
* Count the number of times you have divided.
* Write the final quotient in form of a x 10^n

Write the following in scientific notation

Example 1

a) 70000

70000 ÷ 10 = 7000
7000 ÷ 10 = 700
700 ÷ 10 = 70
70 ÷ 10 = 7

So, 70000 = 7 x 10^4

Example 2

b) 8690

8690 ÷ 10 = 869
869 ÷ 10 = 86.9
86.9 ÷ 10 = 8.69

So, 8690 = 8.69 x 10^3

Exercise 3:12

Write the following in scientific form

i) 370
ii) 4892
iii) 603402
iv) 2023
v) 9000000
vi) 7029
viii) 230.7
vii) 634.8
ix) 3056.7
x) 70608.4
xi) 64900
xii) 42000
xiii) 4500000
xiv) 21000
xv) 10870
xvi) 800800
xvii) 69010
xviii) 902.09
xix) 3,245
xx) 234
xxi) 19,040
xxii) 1,200,000
xxiii) 9
xxiv) 10,009
xxv) 2,002
xxvi 4,090,012
xxvii 52,800,000

Writing numbers less than 1 in scientific notation

* Multiply the given number by 10 until one counting digit is left on the side of whole numbers.
* Count the number of times you have multiplied.
* Write the final number in terms of a x 10^n

Write the following in standard form.

Example 1

a) 0.002

0.002 x 10 = 0.02
0.02 x 10 = 0.2
0.2 x 10 = 2

0.002 = 2 x 10^{-3}

Example 2

b) 0.075

0.075 x 10 = 0.75
0.75 x 10 = 7.5

0.075 = 7.5 x 10^{-2}

Example 3

c) 0.0000403

0.0000403 x 10 = 0.000403
0.000403 x 10 = 0.00403
0.00403 x 10 = 0.0403
0.0403 x 10 = 0.403
0.0403 x 10 = 4.03

0.0000403 = 4.03 x 10^{-5}

Exercise 3:13

Write in standard form

i) 0.4
ii) 0.008
iii) 0.072
iv) 0.00096
v) 0.034
vi) 0.9
vii) 0.053
viii) 0.0304
ix) 0.3279
x) 0.0003
xi) 0.0043
xii) 0.00089
xiii) 0.2345
xiv) 0.20008
xv) 0.000000906

Finding the number written in scientific notation

* Write the given number as a common fraction.
* Give the meaning of the given power.
* Operate accurately.

Example 1

Write in short: 3.64 x 10^4

3.64 x 10^4

$\frac{364}{100}$ x 10000

364 x 100

36400

Example 2

Simplify: 9.4 x 10^{-2}

9.4 x 10^{-2}

$\frac{94}{10} \times \frac{1}{100}$

$\frac{94}{1000}$

0.094

Exercise 3:14

What number has been expressed in standard form as;

a) 4×10^4
b) 6×10^0
c) 5×10^4
d) 7.35×10^3
e) 9.6×10^5
f) 3.02×10^6
h) 4.045×10^2
i) 6.045×10^1
j) 5.09×10^7
k) 2.0809×10^3
l) 8×10^{-1}
m) 1.2×10^{-3}
n) 9.5×10^{-4}
o) 8.06×10^{-1}
p) 2.09×10^{-7}

Laws of indices

Do this in pairs

Write the following in short.

i) $2 \times 2 \times 2 \times 2 \times 2 \times 2 =$ ___
ii) $4 \times 4 \times 4 =$ ___
iii) $a \times a \times a \times a \times a =$ ___
iv) $r \times r =$ ___

Multiplying of powers of the same base

Example 1

Work out: $3^2 \times 3^7$

Approach a

$3^2 \times 3^7$
$(3x3) \times (3x3x3x3x3x3x3)$
$3x3x3x3x3x3x3x3x3$
3^9

Approach b

$3^2 \times 3^7$
3^{2+7}
3^9

Example 2

Simplify: $a^6 \times a$

Approach a

$a^6 \times a$
$(axaxaxaxaxa) \times a$
$a \times a \times a \times a \times a \times a \times a$
a^7

Approach b

$a^6 \times a$
$a^6 \times a^1$
a^{6+1}
a^7

Example 3

Work out: $3^8 \times 27$

$3^8 \times 27$
$3^8 \times (3 \times 3 \times 3)$
$3^8 \times 3^3$
3^{8+3}
3^{11}

3	27
3	9
3	3
	1

$27 = 3x3x3$

Example 4

Simplify: $6g^5 \times 4g^8$
$6g^5 \times 4g^8$
$6xg^5 \times 4xg^8$
$6x4 \times g^5xg^8$
$24g^{5+8}$
$24g^{13}$

Note:

** When multiplying powers of the same base, we maintain the common base and add the powers.*

Exercise 3:15

1. Write in the following in short.

a) $r \times r \times r \times r \times r \times r$
b) $y \times y \times y \times y \times y$
c) $6 \times 6 \times 6 \times 6 \times 6 \times 6$

2. Simplify the following:

i) $2^4 \times 2^6$
ii) $3^1 \times 3^7$
iii) $8^2 \times 8^3$
iv) $d^3 \times d^4$
v) $m^2 \times m$
vi) $3^5 \times 3^6$
vii) $7^2 \times 7^8$
viii) $2^5 \times 2^2$
ix) $a^3 \times a^5$
x) $g^5 \times g^1$
xi) $3^4 \times 3^2 \times 3$
xii) $10 \times 10^2 \times 10^6$
xiii) $4^3 \times 16$
xiv) $2^5 \times 32$
xv) $27 \times 3^4 \times 3^0$

Dividing of powers of the same base

Example 1

Simplify: $2^7 \div 2^4$

Approach a

$2^7 \div 2^4 = \frac{2^7}{2^4}$

$= \frac{2x2x2x2x2x2x2}{2x2x2x2}$

$= 2x2x2$

$= 2^3$ or 8

Approach b

$2^7 \div 2^4$

2^{7-4}

2^3

Example 2

Simplify: $4^9 \div 64$

$4^9 \div 64$

4	64
4	16
4	4
	1

$4^9 \div (4 \times 4 \times 4)$

$4^9 \div 4^3$

4^{9-3}

4^6

Note:

* *When dividing powers of the same base, we maintain the common base and subtract the powers.*

Exercise 3:16

Simplify the following

a) $2^5 \div 2^2$
b) $5^6 \div 5^5$
c) $3^7 \div 3^2$
d)) $6^{11} \div 6^9$
e) $4^5 \div 4$
f) $a^8 \div a^7$
g) $13^{10} \div 13^7$
h) $7^5 \div 7^2$
i) $10^9 \div 2^5$
j) $3^{14} \div 3^{11}$
k) $6^{7y} \div 6^{2y}$
l) $11^{11} \div 11^3$
m) $8^{24} \div 8^{15}$
n) $12^{17} \div 12^{13}$
o) $r^5 \div r^2$
p) $k^{15} \div k^{14}$
q) $y^9 \div y^4$
r) $d^{12} \div d^7$
s) $p^2 \div p^5$
t) $5^6 \div 25$
u) $64 \div 2^4$
v) $128 \div 2^2$
w) $27 \div 3^3$
x) $5^{13} \div 125$
y) $2^{10} \div 16 \div 2^2$
z) $4^5 \div 4^2 \div 4^4$
aa) $x^{24} \div x^{19} \div x^2$

TOPIC 3: OPERATIONS ON WHOLE NUMBERS

Problems involving division and multiplication of powers of the same bases

Example

Simplify: $3^2 \times 3^5 \div 3^3$

Approach a

$3^2 \times 3^5 \div 3^3$

$\frac{3^2 \times 3^5}{3^3}$

$\frac{(3x3) \times (3x3x3x3x3)}{(3x3x3)}$

$\frac{3x3x3x3x3x3x3}{3x3x3}$

$3x3x3x3$

3^4

Approach b

$3^2 \times 3^5 \div 3^3$

$3^{(2+5)} \div 3^3$

$3^7 \div 3^3$

3^{7-3}

3^4

Exercise 3:17

Simplify the following

i) $a^3 \times a^2 \div a$

ii) $3^2 \times 3^3 \div 3^4$

iii) $5^6 \times 5^2 \div 5^3$

iv) $\frac{8^4 \times 8^6}{8^8}$

v) $\frac{7^6 \times 7^2}{7^3}$

vi) $m^3 \div m^5 \times m^8$

vii) $9^2 \div 9^5 \times 9^8$

viii) $\frac{7^5 \times 7^6}{7^3}$

ix) $\frac{5^2 \times 5^5}{5^6}$

x) $\frac{6^4 \times 6^7}{6^3}$

xi) $\frac{12^2 \times 12^5}{12^7}$

xii) $\frac{h^7 \times h^3}{h^4}$

xiii) $\frac{a^7 \times a^6}{a^3}$

xiv) $\frac{b^3 \times b^5}{b^6}$

xv) $\frac{e^7 \times e^8}{e^5}$

xvi) $\frac{t^7 \times t^5}{t^4}$

xvii) $\frac{16h^4 \times 18h^7}{24h^5}$

Finding the value of the unknown index / power involving multiplication

Example 1

Find the value of a if $2^a = 16$

$2^a = 16$

$2^a = 2x2x2x2$

$2^a = 2^4$

$a = 4$

2	16
2	8
2	4
2	2
	1

Example 2

Solve: $3^d \times 3^4 = 3^7$

$3^d \times 3^4 = 3^7$

$3^{d+4} = 3^7$

$d + 4 = 7$

$d + 4 - 4 = 7 - 4$

$d = 3$

Example 3

Solve: $4^t \times 4^2 = 256$

$4^t \times 4^2 = 256$

$4^t \times 4^2 = 4x4x4x4$

$4^t \times 4^2 = 4^4$

$4^{t+2} = 4^4$

$t + 2 = 4$

$t + 2 - 2 = 4 - 2$

$t = 2$

4	256
4	64
4	16
4	4
	1

Example 4

Solve: $2^3 \times 3^y = 72$

$2^3 \times 3^y = 72$

$2^3 \times 3^y = 2x2x2x3x3$

$2^3 \times 3^y = 2^3 \times 3^2$

$2^3 \div 2^3 \times 3^y = 2^3 \div 2^3 \times 3^2$

$3^y = 3^2$

$y = 2$

2	72
2	36
2	18
3	9
3	3
	1

Exercise 3:18

Solve for the unknowns

a) $3^e = 3^7$

b) $2^d = 2^{13}$

c) $4^r = 64$

d) $2^n = 32$

e) $3^p = 9$

f) $5^t = 125$

g) $3^k = 27$

h) $2^y \times 2^2 = 2^6$

i) $3^m \times 3^7 = 3^{10}$

j) $5^5 \times 5^a = 5^8$

k) $a^n \times a^3 = a^8$

l) $m^e \times m = m^7$

m) $2^x \times 2^3 = 32$

o) $3^b \times 3^2 = 243$

p) $4^a \times 4^a = 256$

q) $6^t \times 6 = 216$

r) $3^{2a} \times 3^2 = 729$

s) $2^b \times 3^3 = 108$

t) $2^m \times 3^2 = 36$

u) $5^k \times 2^3 = 200$

v) $2^{2n} \times 3^2 = 144$

Finding the value of the unkown index / power involving division

Example 1

Solve: $3^5 \div 3^n = 9$

$3^n \div 3^3 = 9$

3	9
3	3
	1

$3^n \div 3^3 = 3x3$

$3^n \div 3^3 = 3^2$

$3^{n-3} = 3^2$

$n - 3 = 2$

$n - 3 + 3 = 2 + 3$

$n = 5$

Example 2

Solve: $2^{2y} \div 16 = 2^{10}$

$2^{2y} \div 16 = 2^{10}$

2	16
2	8
2	4
2	2
	1

$2^{2y} \div 2x2x2x2 = 2^{10}$

$2^{2y} \div 2^4 = 2^{10}$

$2^{2y-4} = 2^{10}$

$2y - 4 = 10$

$2y - 4 + 4 = 10 + 4$

$2y = 14$

$\frac{2y}{2} = \frac{14}{2}$

$y = 7$

Example 3

Solve: $5^n \div 125 = 1$

$5^n \div 125 = 1$

$5^n \div 125 \times 125 = 1 \times 125$

$5^n = 125$

5	125
5	25
5	5
	1

$5^n = 5 \times 5 \times 5$

$5^n = 5^3$

$n = 3$

Exercise 3:19

1. Solve the following:

a) $2^d \div 2^3 = 2^2$
b) $2^n \div 2^6 = 2^4$
c) $3^m \div 3^4 = 3^1$
d) $5^k \div 5^3 = 25$
e) $4^a \div 4^1 = 4^8$
f) $3^d \div 81 = 3^3$
g) $6^x \div 6^1 = 36$
h) $3^t \div 3^2 = 27$
i) $4^a \div 4^2 = 16$
j) $3^e \div 3^3 = 81$
k) $2^{3a} \div 2^a = 64$
l) $5^{3t} \div 5^t = 625$
m) $3^e \div 27 = 3^4$
n) $4^k \div 16 = 4^6$
o) $2^{3d} \div 16 = 2^d$
p) $8^n \div 64 = 8^5$
q) $5^m \div 125 = 5^0$
r) $6^n \div 216 = 1$

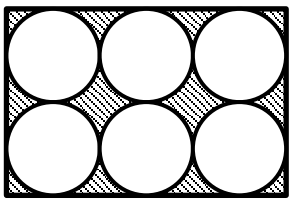
2. Find the value of the unknown values

a) $3^n + 3 = 30$
b) $2^{2h} + 7 = 23$
c) $4^t + 1 = 65$
d) $2^k + 6 = 38$
e) $3^d - 6 = 75$
f) $2^m - 5 = 59$
g) $4^t - 9 = 7$
h) $3^t - 4 = 5$
i) $2^n - 2^5 = 96$
j) $3^{3x} + 22 = 7^2$
k) $2^w + 3^2 = 5^2$
l) $2^{2h} - 4^2 = 2^4$

"Think as a mathematician"

1. In Premier league, 20 teams play against each other every week home and away. There are 10 fixtures per week. Find the total number of Premier league matches in a season.

2. The area of one circle in the figure below is 5544cm^2. Study the figure carefully and use it to answer questions that follow.



a) Find the area of the rectangle in cm^2
b) Calculate the area of the shaded part.

3. A poultry farm produces 600 eggs every week and delivers them equally to 10 shops. The shopkeepers charge sh. 500 for every good egg but they have to give sh. 200 to the customer if the egg comes out to be rotten. A shopkeeper could only earn sh. 27600 despite selling all the eggs. How many eggs were rotten?

4. In a class, the highest mark obtained by pupils was twice the lowest mark plus 7. The highest score was 93. Find the range of marks

5. Binojjo has sh. 41200 in denominations of 200 shilling coins and 500 shilling coins. He has forty 500 shilling coins. How many 200 shilling coins does he have?

6. Ronald bought 3 sofa sets at an average price of sh. 1452900. He spent sh. 92100 to repair them, at what price must he sell each of them to raise a profit of sh. 424000?