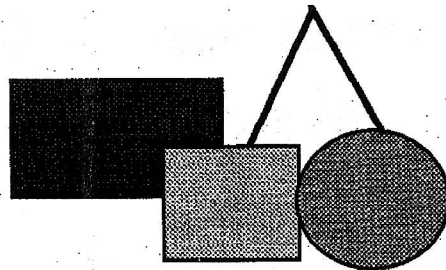


**Basic Competencies of  
Learning in**

# **Mathematics**



**Grade Six**

# *In the name of God, the gracious, the merciful*

## **Introduction:**

This booklet is one of a series of teacher resource books on Dari, Pashto and mathematics. These were developed in 1999 by a group of experienced Afghan educators to help teachers understand the universal basic competencies that primary education programs need to teach. The materials were developed based on various resource materials. In particular, they draw on existing Afghan primary textbooks.

The mathematics booklets are organized as follows:

- There are six booklets, one for each grade (1-6).
- Each booklet contains a full mathematics concept and skills framework for the full primary level. This framework can help teachers in different ways:
  - It helps teachers to understand how different math concepts are broken down into skills for each class level;
  - It helps teachers to understand how the different math concepts and skills need to be built up sequentially through the primary cycle;
  - It shows at which grade level new concepts and skills should be introduced.
- Each grade booklet then provides examples of all the math skills that need to be covered in the specific grade. The examples can help teachers as follows:
  - It ensures that all teachers understand the skills in the same way;
  - Teachers can use the examples to test whether children have learnt the skills;
  - Teachers can use the examples to develop extra practice material for children.

Not only teachers can use the materials. Teacher trainers can use the materials as well, for example to introduce the basic competencies, to teach subject content, and to help teachers develop low-cost teaching aids linked to the competencies. Supervisors can use the examples to test whether children are learning the basic competencies in mathematics. It is the hope of the developers that all Afghan educators will find the materials useful in their work with children.

**Prepared by the representatives of the following organizations:**

OI	Ockenden International
IRC	International Rescue Committee
AG-BASED	Afghan German Basic Education
SCA	Swedish Committee for Afghanistan
SAB	Solidarite Afghanistan Belgium
GTZ-BEFARE	GTZ-Basic Education for Afghan Refugees
AIL	Afghan Institute of Learning
CARE	Cooperative Assistance Relief Everywhere
PSD	Partners for Social Development
SCF-USA	Save the Children Federation -USA
CIC	Children in Crisis
NAC	Norwegian Afghanistan Committee
ECAR	Education Committee for Afghan Refugees
AMNA	Creation of the Pilot Schools in Afghanistan
HCI	Human Concern International
	Afghan Teachers and Schools Union in Quetta

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Afghan Education  
Basic Competencies of Learning in Mathematics May 1999

Math Concepts	I	II	III	IV	V	VI
Place Value	Pre number Concepts Tens; 1 - 99	Hundreds 100-999	Thousands 1000- 100000	Millions 7 Digits Add. and Sub.	Billions 8 - 10 digits Add. and Sub.	Trillion 10 - 13 digits Add and Sub.
Addition and Subtraction	Addition & Subtraction of 1 - 99 and zero without carrying and borrowing	Addition & Subtraction till 999 and zero with carrying/borrowing up to tens	Whole numbers w/wo borrow & carry Repeated addition	Review of multiplication Table		
Multiplication and Division			Multiplication and division by 1 to 9 and zero	Multiplication & division by 10s, 100s, 1000s w/o decimals Multiply/Divoid by 2, 3 and four digits	Review multiplication and division	Review multiplication and division by 10s, 100s, 1000s with decimals
Fractions	Color 1/2 and 1/4 of figures	Matching fraction 1/2, 1/3, 2/3, 1/4, 2/4, 3/4 with figures	Identification of fraction (1/2, 1/3, 2/3, 1/4, 2/4, 3/4, 1/5, 2/5, 3/5, 4/5) with figures	Proper fractions Same denominator Compare Add Subtraction	Four operations on Fractions	Conversion of fractions to decimals and vice versa Compare
Decimals					Multiply/divide by 10s, 100s, 1000s with decimals Compare, add and subtract	Four operations on Decimals Application Ratio Percent
Measurement	Comparison of short and long; big and small and thick and thin	span, foot, steps compare capacity of containers Time; months, days and hours.	m, cm, kg Hours and minutes	Multiples and parts km, hm, dm, m m, dm, cm, mm Conversion without decimals	Multiples and parts km, hm, dm, m m, dm, cm, mm Conversion with decimals	Review m, dm, cm, mm with perimeter $m^2$ , $dm^2$ , $cm^2$ , $mm^2$ with areas of circle, triangle, rectangle and square
Money/Calendar	Coins and bills up to 100 Af.	50 Af., 100 Af. And 500 Af.	Review of 50, 100, 500 1000, 5000, 10,000 Af.	Lunar Calendar	AD Calendar	



# Class Six Math

## Place Value up to 10-13 digit Numbers

The student will be able to:

1. Write the value of the circled numerals:

1,50<sup>0</sup>,240 \_\_\_\_\_

6,403,210,0<sup>9</sup> \_\_\_\_\_

6<sup>0</sup>,002,311,948 \_\_\_\_\_

8,100,5<sup>0</sup>0,300 \_\_\_\_\_

2. Compare the following numbers using  $<$ ,  $>$ ,  $=$

200,470,192,002  200,409,192,002

3. Read and write the following numbers:

304,721,367,002 \_\_\_\_\_

6,092,001,030,101 \_\_\_\_\_

4. Add and write the number in standard form:

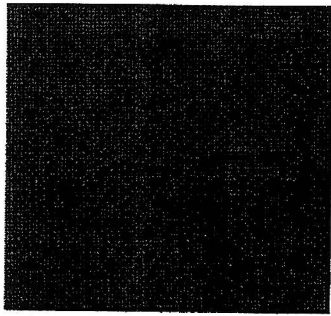
201,000,000 + 729,000 + 1 = \_\_\_\_\_

5. Write in expanded form:

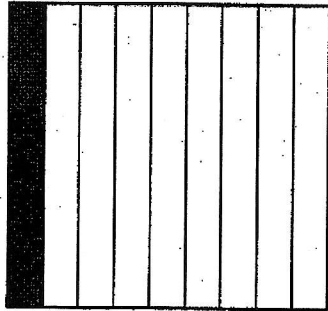
14,320,700,965,001 = \_\_\_\_\_

## Decimal Fractions

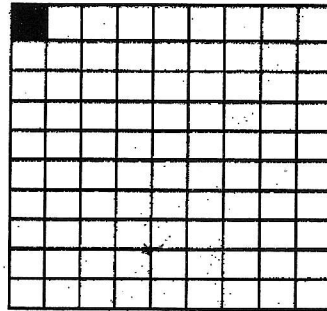
Study the following figures and observe how one whole number and decimal fractions are represented. In dividing a number by 10, 100, 1000, the decimal point is placed to the left of the number by counting one place for 10, two places for 100 and three places for 1000.



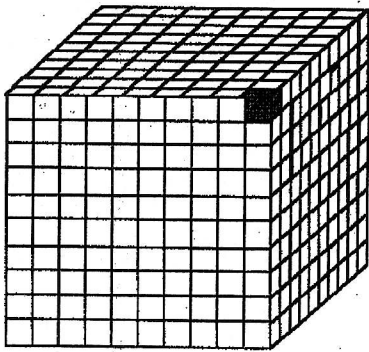
1.000



$$\frac{1}{10} = 0.1$$



$$\frac{1}{100} = 0.01$$



$$\frac{1}{1000} = 0.001$$

**Example:**

$$2 \div 10 = 0.2$$

$$25 \div 10 = 2.5$$

$$2 \div 100 = 0.02$$

$$25 \div 100 = 0.25$$

$$375 \div 100 = 3.75$$

$$1 \div 1000 = 0.001$$

$$24 \div 1000 = 0.024$$

$$375 \div 1000 = 0.375$$

$$1290 \div 1000 = 1.290$$

6. Change these numbers to decimal fractions:

$$6 \div 10 = \underline{\hspace{2cm}}$$

$$11 \div 10 = \underline{\hspace{2cm}}$$

$$4 \div 100 = \underline{\hspace{2cm}}$$

$$24 \div 100 = \underline{\hspace{2cm}}$$

$$22 \div 1000 = \underline{\hspace{2cm}}$$

$$492 \div 1000 = \underline{\hspace{2cm}}$$

The decimal point separates the whole numbers: ones, tens, hundreds; from the decimal fractions: tenths, hundredths, thousandths.

Hundreds	Tens	Ones	Decimal Point	Tenths	Hundredths	Thousandths
		1	•	0		
		0	•	1		
		0	•	0	1	
		0	•	0	0	1

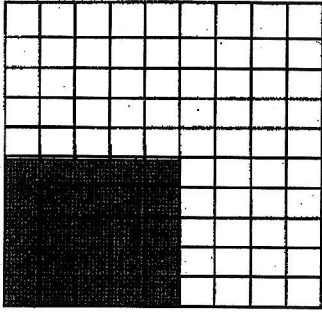
7. Write the numbers below in the chart above:

12.01, 1.002, 3.1

## Changing fractions to Decimal fractions

To change fractions to decimal fractions, we divide the numerator by the denominator.

Example:



$$\frac{1}{4} = \frac{25}{100} = 0.25$$

8. Change the following fractions to decimal fractions

6/15, \_\_\_\_\_

1/2, \_\_\_\_\_

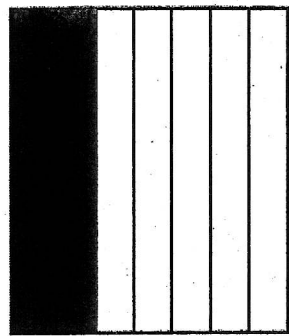
3/4, \_\_\_\_\_

13/100, \_\_\_\_\_

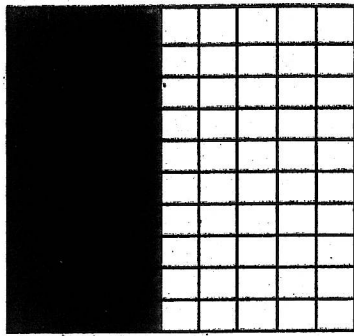
16/25 \_\_\_\_\_

## Comparison of Decimal fractions

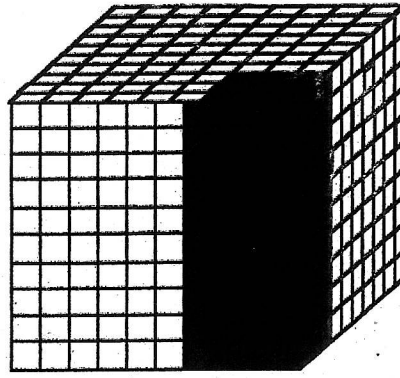
Study these decimal fractions and observe that they are equal.



0.4



0.40



0.400

$$0.4 = 0.40, 0.4000$$

## Addition of Decimal Fractions

In adding the decimal fractions, the decimal points are placed under each other.

Example:

Hundreds	Tens	Ones	Decimal Point	Tenths	Hundredths	Thousandths
1	2	3	•	0	1	7
+	1	0	•	5	8	2
1	3	3	•	5	9	9

9. Add:

$$\begin{array}{r} 1.230 \\ +21.325 \\ \hline 22.555 \end{array}$$

$$\begin{array}{r} 792.075 \\ +16.925 \\ \hline \end{array}$$

$$\begin{array}{r} 231.600 \\ +101.030 \\ \hline 211.001 \\ 543.631 \end{array}$$

10. Word Problem

Saleh went to the market.

One of his sisters asked him to bring 4.75 m of red cotton cloth.

His other sister, to bring 5.25 yellow cotton cloth.

His brother asked him to bring 3.15 m of green cotton cloth.

How many meters did Saleh buy?

---

## Subtraction of Decimal Fractions

In subtraction decimal fractions, the decimal points placed under each other.

Example:

Hundreds	Tens	Ones	Decimal Point	Tenths	Hundredths	Thousandths
0	10	9	•	9	11	
<del>1</del>	<del>1</del>	<del>10</del>		<del>10</del>	<del>1</del>	7
	7	1	•	5	8	2
0	3	8	•	4	3	5

11. Subtract:

$$\begin{array}{r} 4.80 \\ -2.11 \\ \hline 2.69 \end{array}$$

$$\begin{array}{r} 3.400 \\ -1.056 \\ \hline 2.344 \end{array}$$

$$\begin{array}{r} 100.005 \\ -17.25 \\ \hline \end{array}$$

12. Word Problem:

Lal Gul had 27.98 Kg of tea in his shop.

He sold 12.45 Kg.

How many kilograms of tea are left in the shop?

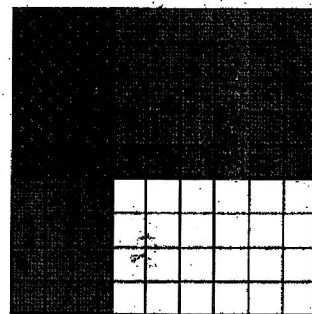
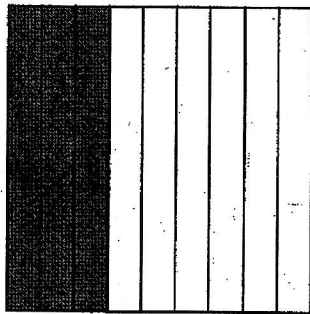
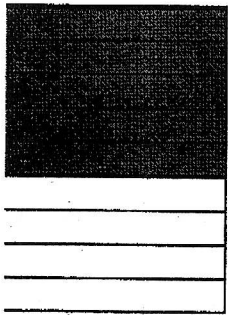
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## Multiplication Decimal Fractions

In multiplying two decimal numbers, count the digits to the right of the decimal point in the two numbers multiplied, e.g.  $2.31 \times 1.09 =$  there are 4 digits to the right of the decimal point. Place the decimal point in the answer after counting the same number of digits to the left 4 places. e. g. the answer is 2.5179

$$2.39 \times 1.09 = 2.5179$$

$$\begin{array}{r} 2.31 \\ \times 1.09 \\ \hline 2079 \\ 0000 \\ 23100 \\ \hline 2.5179 \end{array}$$



$$0.5 \quad \times \quad 0.3 \quad = \quad 0.15$$

13. Multiply:

$$0.4 \times 2 =$$

$$0.5 \times 0.2 =$$

$$0.02 \times 0.05 =$$

$$0.04 \times 0.009 =$$

14. Word Problem:

Nooria needs 5.835m of cloth to make a suit.

How many meters does she need to make 95 suits?

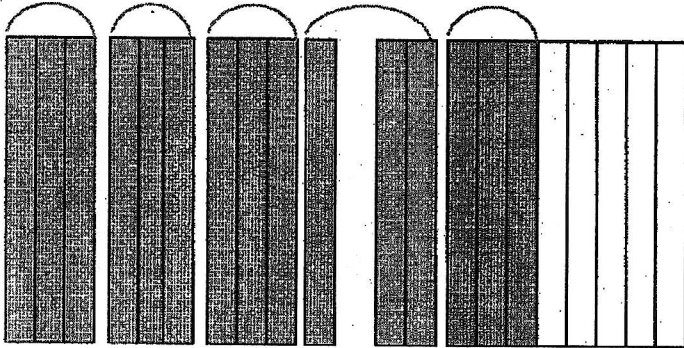
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## Division of decimal Fractions

In dividing decimal fractions by decimal fractions, we remove the decimal point from the number divided by and we count the places after the decimal point. The decimal point in the number divided is moved by the same number of places.

Example:

$$0.3 \overline{) 1.50} = 3 \overline{) 15} = 5$$



$$1.50 \div 0.3 = 5$$

Examples:

$$1.5 \div 0.03 = 50$$

$$1.50 \div 0.03 = 50$$

$$0.36 \div 0.06 = 6$$

$$0.225 \div 0.05 = 4.5$$

$$0.4000 \div 0.002 = 200$$

15. Divide:

$$0.5 \overline{) 0.042}$$

$$0.08 \overline{) 2.88}$$

$$0.003 \overline{) 3.69}$$

$$25 \div 0.5 =$$

$$0.32 \div 0.04 =$$

$$23.40 + 4.005 =$$

$$6.296 - 1.123 =$$

$$0.34 \times 0.01 =$$

$$3.1 \times 2.02 =$$

$$0.5 \times 0.6 =$$

16. Word Problem

Hameed enters 5.346 pages every 24 hours.

How many pages does he enter in three hours.

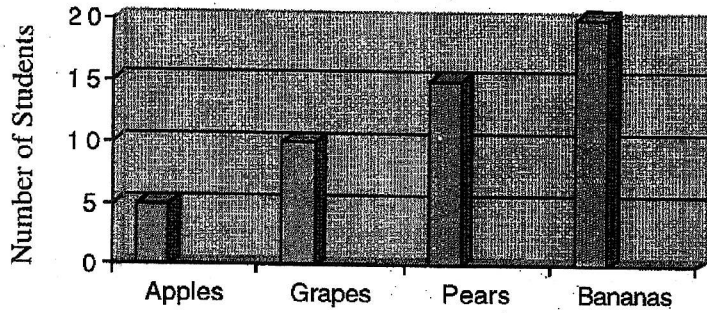


## Ratio:

Ratio is a comparison between two numbers using a fraction.

### Example:

50 students were asked to name their favorite fruit out of four kinds. Compare the number of students preference for each kind of fruit.



$$\text{Apples } \frac{5}{50} = \frac{1}{10} \text{ or } 1:10$$

$$\text{Grapes } \frac{10}{50} = \frac{1}{5} \text{ or } 1:5$$

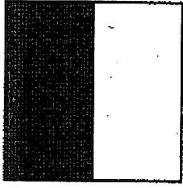
$$\text{Pears } \frac{15}{50} = \frac{3}{10} \text{ or } 3:10$$

$$\text{Bananas } \frac{20}{50} = \frac{2}{5} \text{ or } 2:5$$

## Changing Ratios to Fractions

Ratios can be written as fraction.

Example:



$$1:2 = \frac{1}{2}$$

$$14:11 = \frac{14}{11}$$

$$\frac{15}{19} = 15:19$$

17. Write the ratio of the following numbers:

4 and 5

12 and 96

3.5 and 4.5

18. Word Problems

Nazir's ox ploughs  $4.70\text{m}^2$  of his field in one day.

Akram's ox ploughs  $39.65\text{m}^2$  of his field in one day.

What is the ratio of the two ploughd fields?

---

The cost of 7kg wheet and 7 kg rice is 95,000.78 afs and 120000.59 afs respectively.

Write the ratio of he cost of wheet to the rice.

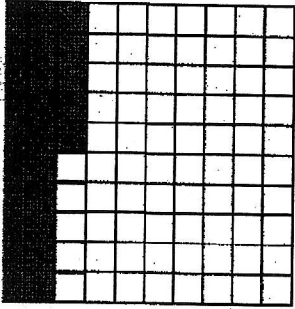
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# Percentage

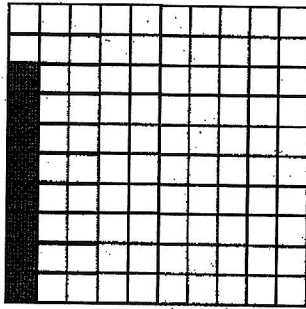
## Change Decimal Fractions to Percentages:

In changing fractions to percentages, we divide the numerator by denominator and multiply the answer by 100.

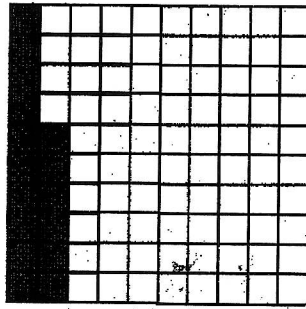
Example:



25%



8%



16%

$$\frac{25}{100} = 0.25 \times 100 = 25\%$$

$$\frac{8}{100} = 0.08 \times 100 = 8\%$$

$$\frac{16}{100} = 0.16 \times 100 = 16\%$$

19. Change these fractions to percentages:

$$16/10 = \underline{\hspace{2cm}}$$

$$2/100 = \underline{\hspace{2cm}}$$

$$275/1000 = \underline{\hspace{2cm}}$$

### Word Problems

Khair Gul bought some watermelon for 5000.987 Afs.

He sold them for 5501.517.

How much profit did he make?

Calculate the percentage of his profit.

---

Ahmad's mother gets 100,000 Afs. per month.

Her salary increased 10,000 Afs.

Calculate the percentage of her salary increase?

---

## Rounding Off

Decimal fractions can be rounded off to the nearest whole number, tenth, hundredth, and thousands.

Example:

The number	Round off to the nearest whole number:	Round off to the nearest Tenth:	Round off to the nearest hundredth	Round off to the nearest thousandth
36.7300	37	36.7	36.73	36.730
15.2001	15	15.2	15.20	15.200
4.4675	5	4.5	4.47	4.478
73.8465	74	73.8	73.85	73.847

To round off to the nearest whole number e.g. 36.73 we look at the tenth digit right after decimal point; if it is five or more, we round it off and add one to the whole number. Thus 36.73 becomes 37. If it is less than five we keep the same number.

To round off to the nearest tenth e.g. 15.2001, we look at the digit in the hundredths place; If it is five or more, we round it off and add one to the tenth digit and if it is less than five we keep the same number. Thus the number becomes 15.2

To round off to the nearest hundredth e.g. 4.4675, we look at the digit in the thousandth place; If it is five or more, we round it off and add one to the hundredth digit. Thus the number becomes 4.47. If it is less than five we keep the same number.

To round off to the nearest thousandth e.g. 37.8465, we look at the digit in the ten thousandth place; If it is five or more, we round it off and add one to the thousandths digit. Thus the number becomes 37.857. If it is less than five we keep the same number.

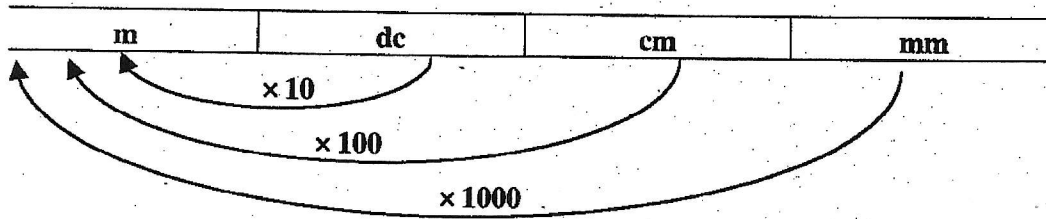
20. Round off and complete the following table:

The number	Round off to the nearest whole number:	Round off to the nearest Tenth:	Round off to the nearest hundredth	Round off to the nearest thousandth
3.70000				
48.2600				
0.6878				
0.3420				
1260800				
37.0030				
.628.1105				
23.4792				
86.5555				
169.2468				
597.8352				

# Measurement

## Units of Measurement

To change large units of measurement to smaller units of measurement we multiply by 10, 100 and 1,000 as indicated in the diagram.



### Example:

$$25 \text{ m} = 25 \times 10 = 250 \text{ dc}$$

$$25 \text{ m} = 25 \times 100 = 2500 \text{ cm}$$

$$25 \text{ m} = 25 \times 1000 = 25000 \text{ mm}$$

21. Change these units of measurement as indicated below:

$$3.6 \text{ m} = \boxed{\phantom{00}} \text{ dc}$$

$$9.66 \text{ m} = \boxed{\phantom{00}} \text{ mm}$$

$$4.9 \text{ dc} = \boxed{\phantom{00}} \text{ cm}$$

$$25 \text{ dc} = \boxed{\phantom{00}} \text{ mm}$$

$$1.64 \text{ cm} = \boxed{\phantom{00}} \text{ mm}$$

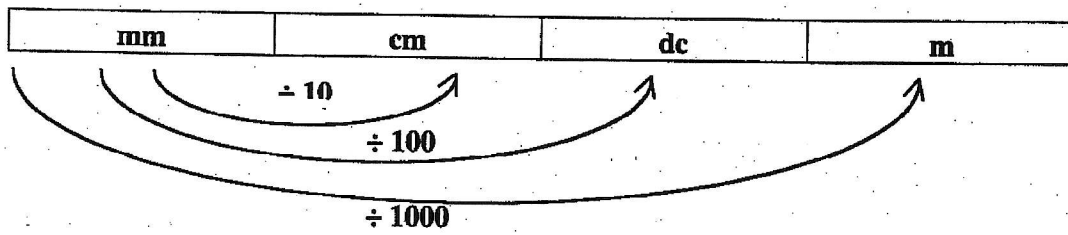
$$743 \text{ m} = \boxed{\phantom{00}} \text{ mm}$$

$$56 \text{ m} = \boxed{\phantom{00}} \text{ cm}$$

$$8.04 \text{ dm} = \boxed{\phantom{00}} \text{ cm}$$

$$200 \text{ cm} = \boxed{\phantom{00}} \text{ mm}$$

To change small units of measurement to large units of measurement, we divide by 10, 100, and 1000 as indicated in the diagram.



**Example:**

$$2 \text{ mm} = 2 \div 100 = 0.02 \text{ dc}$$

$$5 \text{ cm} = 5 \div 100 = 0.5 \text{ m}$$

$$120 \text{ mm} = 120 \div 1000 = 0.12 \text{ m}$$

22. Change these units of measurement as indicated below:

$$7.9 \text{ dc} = \boxed{\phantom{00}} \text{ m}$$

$$4.9 \text{ cm} = \boxed{\phantom{00}} \text{ dc}$$

$$66.95 \text{ mm} = \boxed{\phantom{00}} \text{ m}$$

$$147 \text{ dc} = \boxed{\phantom{00}} \text{ mm}$$

$$6.14 \text{ cm} = \boxed{\phantom{00}} \text{ mm}$$

$$743 \text{ m} = \boxed{\phantom{00}} \text{ mm}$$

$$56 \text{ cm} = \boxed{\phantom{00}} \text{ m}$$

$$8.04 \text{ dm} = \boxed{\phantom{00}} \text{ m}$$

$$1200 \text{ mm} = \boxed{\phantom{00}} \text{ m}$$

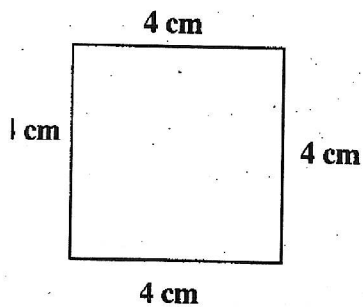
## Perimeter

The distance around the figure is called the perimeter of the figure.

### Perimeter of a Square

To find out the perimeter of a square, we add the sides.

Example:



The perimeter of this square is:

$$S+S+S+S$$

$$4+4+4+4 = 16 \text{ cm}$$

$$4 \times 4 = 16 \text{ cm}$$

### 23. Word Problems:

We want to fence our small square garden.

The side of the garden is 14.5 m.

How many meters of barbed wire will be required to fence the garden?

---

Hameed has a square shaped table.

The side of the table is 2.5 m.

How many meters are needed to strip the sides of the table?

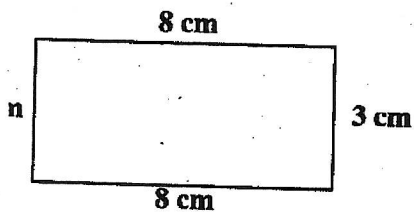
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## Perimeter of a rectangle

To find out the perimeter of a rectangle, we add the sides.

Example:



The perimeter of this rectangle

is:

$$S+S+S+S$$

$$8+3+8+3 = 22 \text{ cm}$$

$$2 \times (8+3) = 22 \text{ cm}$$

24. Word Problem:

A rectangular shaped garden is 32 meter long and 20 meters wide.

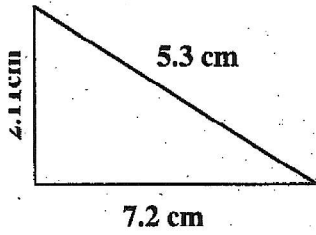
How many meters of barbed wire is needed to fence the garden?

---

## The Perimeter of a Triangle

To find out the perimeter of a triangle, we add the sides.

Example:

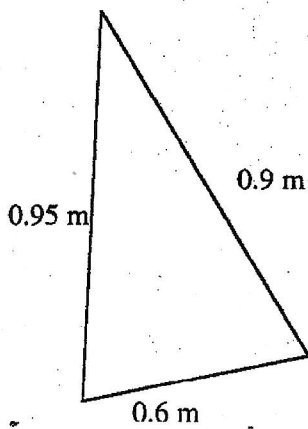
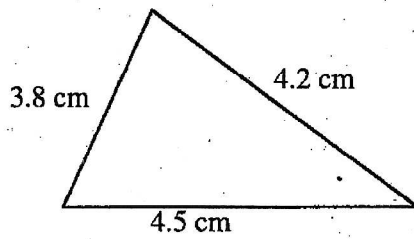


The perimeter of a triangle is:

$$S+S+S$$

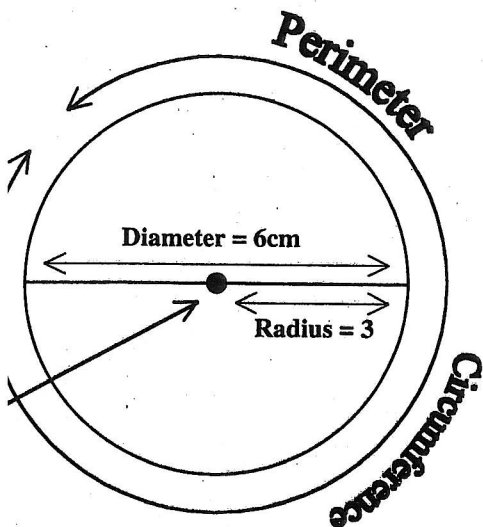
$$7.1 + 7.2 + 5.3 = 19.6 \text{ cm}$$

25. Find the perimeter of the following triangle:



## The perimeter of a circle

The perimeter of a circle is the distance around the circle.



$$\text{Diameter} = \text{radius} \times 2$$

$$= 3 \times 2 = 6 \text{ cm}$$

$$\pi = \frac{\text{Circumference of a circle}}{\text{Diameter of a circle}}$$

$$\pi = \frac{22}{7} = 3.14$$

$\pi$  is a constant value used in finding the perimeter and the area of a circle.

$$\text{Perimeter of the circle} = \text{diameter} \times \pi$$

## 6. Word Problem

Wasim wants to make a fountain around a circular pool, the distance between the circumference and the center is 3.5 meters.

Write the length in meters of the pipe encircling the pool.

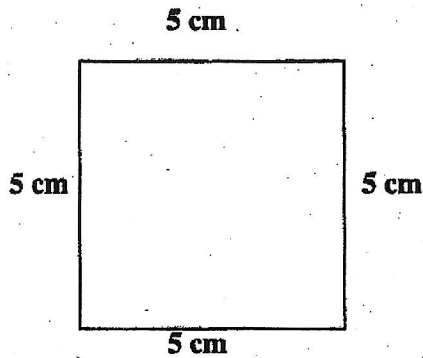
Round it off to the nearest tenth of a meter.

## Area

### Area of a Square

The area of a square is the number of squares inside the square.

Example:



Area of the square:

$$S \times S = S^2$$

$$5\text{cm} \times 5\text{cm} = 25\text{ cm}^2$$

27. Word Problems:

A square-shaped room is 7.5m long.

What would be the size of a carpet to cover the room leaving 1 meter between the carpet and the wall?

---

A square-shaped yard is 10.25m long.

What is the area of the yard in  $\text{m}^2$ ?

---

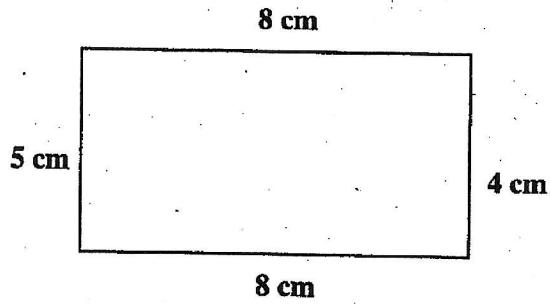
What is the area of a square-shaped carpet, if each side is 2.5m ?

---

## Area of a Rectangle

The area of a rectangle is the number of squares inside the rectangle.

Example:



Area of the rectangle:  
length  $\times$  width = area  
 $8\text{cm} \times 4\text{cm} = 32\text{ cm}^2$

28. Word Problems:

A garden is 9.50m long and 6.25m wide.

What is the area of the garden?

---

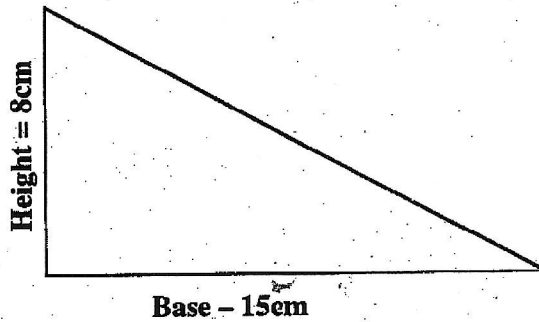
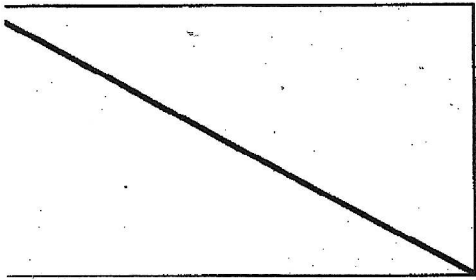
Find the area of a playground that is 19.25m long and 17.60m wide.

---

## Area of a Triangle

The area of a triangle is the number of squares inside the triangle.

Example:

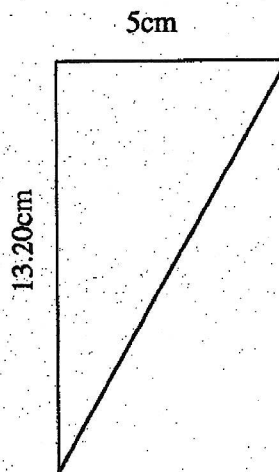
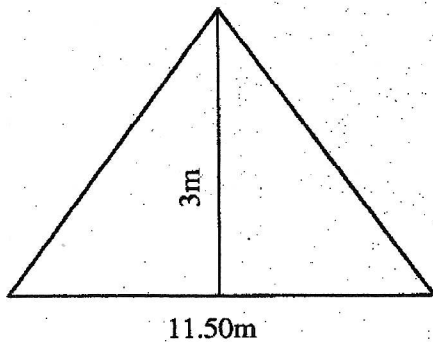


Remember that the area of a triangle is half of the area of a rectangle.

The area of a triangle =  $\frac{\text{Base} \times \text{Height}}{2}$

$$\frac{15\text{cm} \times 8\text{cm}}{2} = 60\text{cm}^2$$

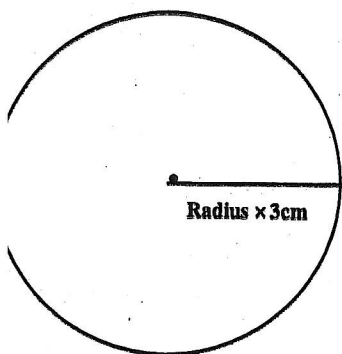
29. Find the areas of the following triangles:



The area of a Circle

The area of circle is the number of squares inside the circle.

Example:



Area of the circle:

$$\pi \times r^2$$

$$3,14 \times 3 \times 3 = 28.26 \text{ cm}^2$$

30. Word Problems:

What is the area of a circle whose diameter is 16.50 m?

---

Nooria wants to from a circular-shaped flowerbed.

The radius of each flowerbed is 5cm.

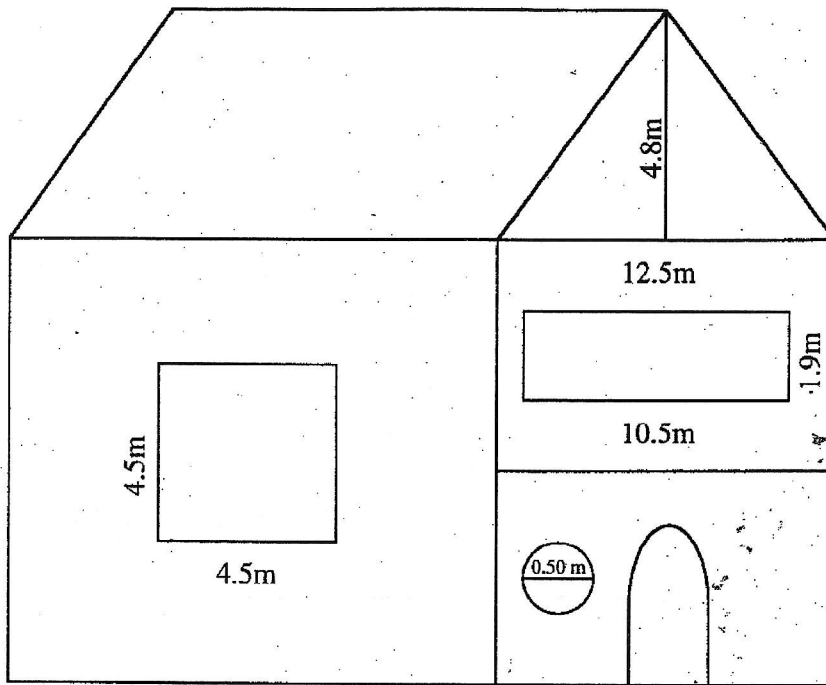
What is the area of each flowerbed?

If the area of the garden is 10205cm<sup>2</sup>,

How many flowers will she need?

---

31. Answer the following questions:



What is the area of the front part of the roof, whose base is 12.5m and height is 4.8m?

---

What is the area of the side window, whose length is 4.5m?

---

What is the area of the front window, whose length is 10.5m and width is 1.9m?

---

What is the area of the nametag, near the door?

---

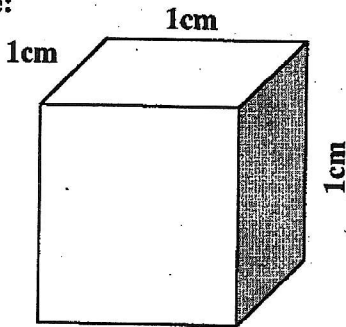


## Volume

### The Volume of a Cube

The volume of a cube is the amount of space it contains in cubic units.

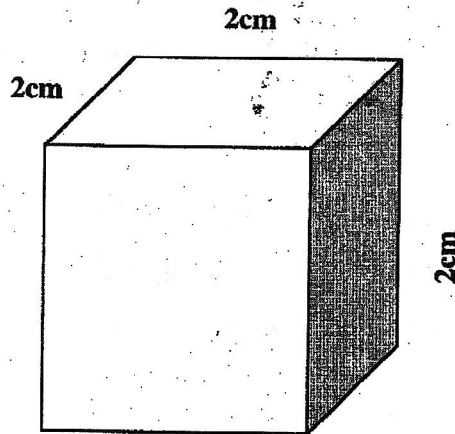
Example:



The volume of the cube:  
Length  $\times$  width  $\times$  height  
 $1\text{cm} \times 1\text{cm} \times 1\text{cm} = 1\text{cm}^3$

32. Answer the following questions:

Find the volume of the following cube:



---

Draw a cube, whose length, width and height are 3.6cm.

Find the volume of the cube.

---

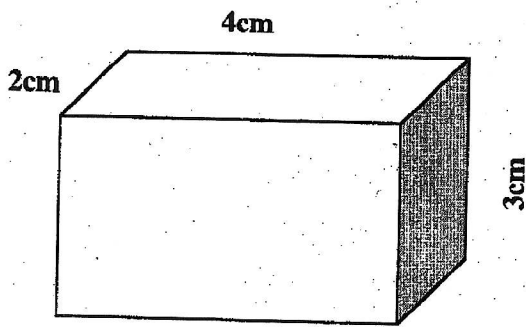
Find the volume of a tea container, whose length, width and height are 40cm each.

---

### The Volume of a Rectangular Cube

The volume of a rectangular cube is the amount of space it contains in cubic units.

Example:



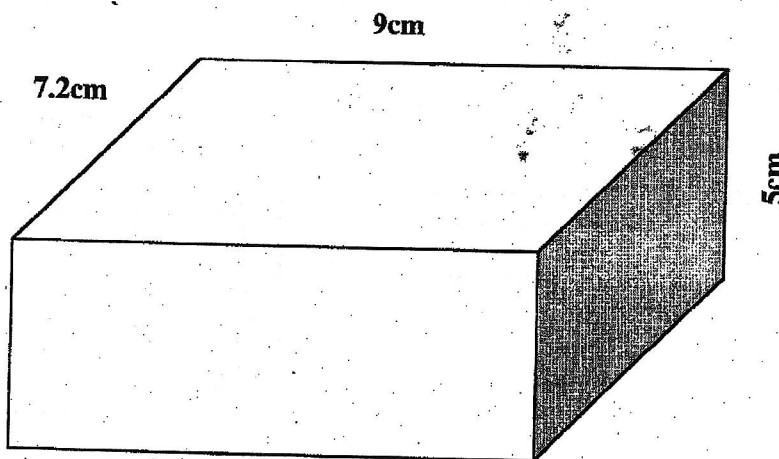
The volume of the rectangular cube:

Length  $\times$  width  $\times$  height

$$4\text{cm} \times 2\text{cm} \times 3\text{cm} = 24\text{cm}^3$$

33. Answer the following questions:

Find the volume of the following rectangular cube:



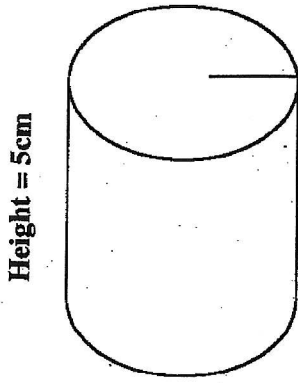
Find the volume of a sugar container, whose length is 6.9 cm, width 5.1 cm, and height 4.3 cm.

---

Find the volume of a cement block, whose length is 12.4 m, width 6.8 m and height 8.6m.

---

**Example:**



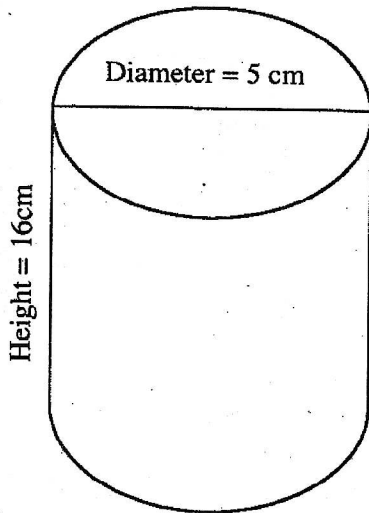
**A cylinder has two circular bases that are congruent and parallel.**

**The volume of the cylinder:  
The area of the base  $\times$  height**

$$2 \times 2 \times 3.14 \times 5 = 62.50\text{cm}^3$$

34. Answer the following questions:

Find the volume of the following cylinder:



35. Word Problem:

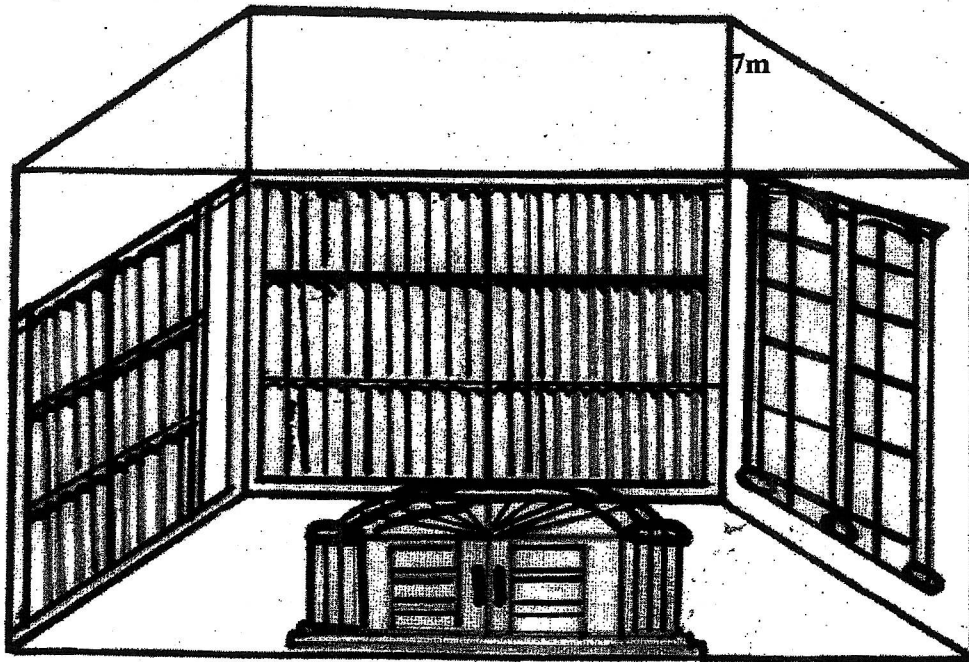
Find the volume a cylinder coffee container whose diameter of 3cm and height is 7cm.

---

A cylinder water tank whose radius is 5m and height is 10m. What is the volume of the tank in  $\text{cm}^3$ ?

---

36. Answer the following questions:



10m

A library is 10m long, 7m wide and 5m high.  
In winter the library is heated.  
How many cubic meters are there to be heated?

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If we double the dimensions of the library: the length, the width and the height.  
How many cubic meter of air will it hold?

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