

# 13

# Length

After studying this chapter you will be able to get a good understanding of

- addition, subtraction, multiplication and division of units of length.
- finding the perimeter of triangles, rectangles and squares using formulae.
- applying length for the calculations associated with perimeter.



**The Great wall of China**

- ◆ Length - 6400 km
- ◆ Height- 4.57 m - 9.2 m
- ◆ Breadth of the top - 4.5 m
- ◆ The distance between security points - 180 m

## Activity 13.1



Copy the following table and complete it by determining how the lengths of the figures on the previous page should be measured.

	The most suitable unit/ units	The most suitable measuring instrument
Height of the child		
Width of the table		
Length of a rope		
Thickness of a book		
Perimeter of the trunk of a tree		
The depth of a well		

You have learned about the standard units for measuring length and using relations among

$$10 \text{ mm} = 1 \text{ cm}$$

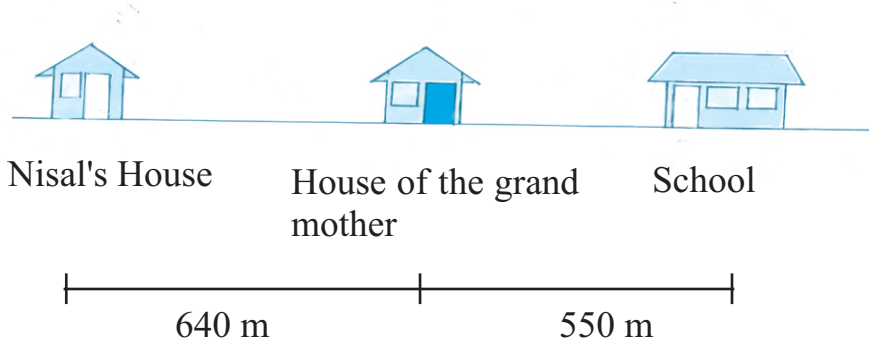
$$100 \text{ cm} = 1 \text{ m}$$

### Activity 13.2

Complete the table given below using the relations among the units. (Examine how the first row has been completed.)

	km	m	cm	mm
35 mm			3	5
637 cm				
436 cm				
7777 cm				
1330 m				
902 cm				
1673 m				
1639 cm				

### 13.1 Addition and subtraction of units of length.



Nisal goes daily to his grandmother's house situated between his home and the school.

The distance from Nisal's home to his grandmother's house = 640m

The distance from the grandmother's house to the school = 550 m

Let us find the distance from Nisal's home to the school.

$$\begin{array}{r}
 640 \text{ m} \\
 + 550 \text{ m} \\
 \hline
 \underline{\underline{1190 \text{ m}}}
 \end{array}$$

The distance from home to the school is 1190 m. This can be expressed by km and m as given below.

The distance from Nisal's home to school is 1 km 190 m.

(Since, 1000 m = 1 km)

#### Example 1

Add 6 m 75 cm and 3 m 86 cm.

It can also be done as follows.

$$\begin{array}{r}
 6 \quad 75 \\
 + 3 \quad 86 \\
 \hline
 10 \quad 61 \\
 \hline
 \underline{\underline{10 \text{ m } 61 \text{ cm}}}
 \end{array}
 \quad \rightarrow \quad
 \begin{array}{r}
 675 \text{ cm} \\
 386 \text{ cm} \\
 \hline
 \underline{\underline{1061 \text{ cm}}}
 \end{array}$$

Since 1 m = 100 cm  
 6 m = 600 cm  
 ∴ 6 m 75 cm = 600 cm + 75 cm  
 = 675 cm  
 Also 3 m = 300 cm  
 ∴ 3 m 86 cm = 300 cm + 86 cm  
 = 386 cm

	m	cm	
	6	75	
	+ 3	86	
	10	61	
1			
100	161		
	100		
	61		

$$75 \text{ cm} + 86 \text{ cm} = 161 \text{ cm}$$

$$= 1 \text{ m } 61 \text{ cm}$$

By taking 1m to the "m" column and adding you get 10 m.

### Example 2

(i) Add 5 km 570 m and 8 km 780 m.

#### Method 1

	km	m		
	5	570	→	5570 m
	+ 8	780	→	8780 m
	14	350	←	14350 m

(Since 1 km = 1000 m)

(14 km 350 m)

#### Method 2

	km	m
	5	570
	+ 8	780
	14	350

$$570 \text{ m} + 780 \text{ m} = 1350 \text{ m}$$

$$= 1 \text{ km } 350 \text{ m}$$

By taking 1 km to the, km column and adding it, you get 14 km.

(ii) The height of a beaker having water and a uniform cross section, is 16 cm 8 mm. The height above the water level is 7 cm 6 mm. Let us find the height of the water level.

**Method 1**

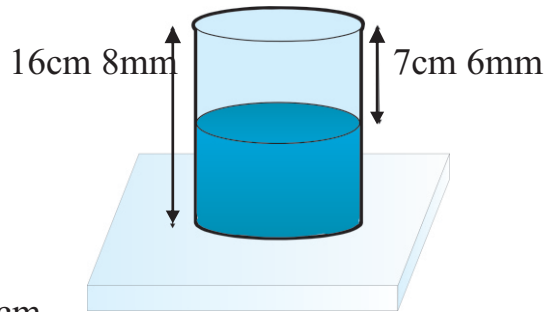
cm	mm		
16	8	→	168 mm
- 7	6	→	<u>76 mm</u>
9	2	←	<u><u>92 mm</u></u>

(Since 1 cm = 10 mm)

(92 mm = 9 cm 2 mm)

**Method 2**

cm	mm
16	8
- 7	6
9	2



**Example 3**

Subtract 3 m 86 cm from 6 m 75 cm.

**Method (1)**

m	cm		
6	75	→	675 cm
- 3	86	→	<u>386 cm</u>
2	89	←	<u><u>289 cm</u></u>

**Method (2)**

m	cm
6	75
- 3	86
2	89

By taking 1 from the metre column to the centimetre column the metre column will be 5 and the centimetre column will be 175 cm. Then

175
- 86
<u>89</u>

**Exercise 13.1**

(1) Simplify.

(i) km	m
7	432
+ 2	740

(ii) cm	mm
42	6
+ 21	8

(iii)  $48\text{ m } 7\text{ cm} + 12\text{ m } 86\text{ cm}$

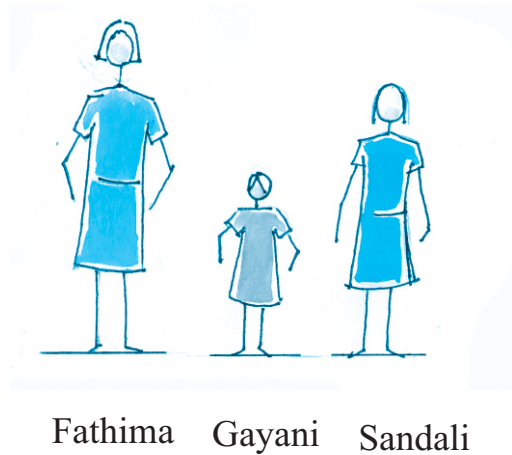
<table style="border-collapse: collapse; width: 100%;"> <tr> <td style="width: 10%;"></td> <td style="width: 10%;">(iv) km</td> <td style="width: 10%;">m</td> </tr> <tr> <td></td> <td>4</td> <td>490</td> </tr> <tr> <td></td> <td>2</td> <td>532</td> </tr> <tr> <td></td> <td>+ 1</td> <td>198</td> </tr> <tr> <td colspan="3" style="border-top: 1px solid black; border-bottom: 3px double black;"></td> </tr> </table>		(iv) km	m		4	490		2	532		+ 1	198				<table style="border-collapse: collapse; width: 100%;"> <tr> <td style="width: 10%;"></td> <td style="width: 10%;">(v) m</td> <td style="width: 10%;">cm</td> </tr> <tr> <td></td> <td>7</td> <td>65</td> </tr> <tr> <td></td> <td>- 2</td> <td>35</td> </tr> <tr> <td colspan="3" style="border-top: 1px solid black; border-bottom: 3px double black;"></td> </tr> </table>		(v) m	cm		7	65		- 2	35				<table style="border-collapse: collapse; width: 100%;"> <tr> <td style="width: 10%;"></td> <td style="width: 10%;">(vi) cm</td> <td style="width: 10%;">mm</td> </tr> <tr> <td></td> <td>6</td> <td>2</td> </tr> <tr> <td></td> <td>- 1</td> <td>6</td> </tr> <tr> <td colspan="3" style="border-top: 1px solid black; border-bottom: 3px double black;"></td> </tr> </table>		(vi) cm	mm		6	2		- 1	6			
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(vii)  $2\text{ m } 36\text{ cm} - 1\text{ m } 42\text{ cm}$

(viii)  $6\text{ km } 280\text{ m} - 2\text{ km } 432\text{ m}$

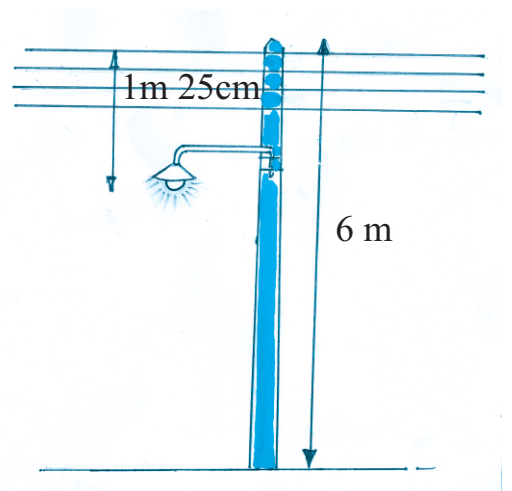
(2)

(i) Sandali's height is 98cm. If Fathima is 21 cm taller than Sandali, find Fathima's height.

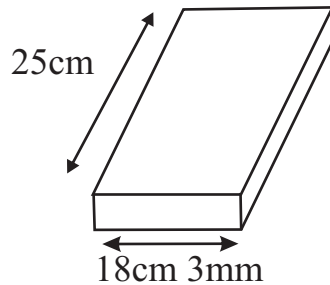


(ii) If Gayani's height is 11cm less than that of Sandali, find the height of Gayani.

(3) The bulb of an electric lamp post is fixed 1 m 25 cm below the top. If the height of the lamp post is 6 m, find the height from the ground to the point where the electric bulb is fixed.



- (4) The length and breadth of a book are 25 cm, and 18 cm 3 mm respectively. By how much is the length more than the breadth? Find the sum of the length and the breadth.



### 13.2 Multiplication and Division

A length of 2m 85 cm of cloth of a certain width is needed to stitch a table cloth. Let us find the length of cloth required to stitch 3 such table cloths.

$$\begin{array}{r}
 \text{m} \quad \quad \times \text{cm} \\
 \hline
 2 \quad \quad 85 \\
 \hline
 8 \quad \quad 55
 \end{array}
 \quad \begin{array}{c} \rightarrow \\ \leftarrow \end{array}
 \quad \begin{array}{r}
 \times \\
 \hline
 285 \text{ cm} \\
 \hline
 3 \\
 \hline
 855 \text{ cm}
 \end{array}$$

It can also be done as follows

$$\begin{array}{r}
 \text{m} \quad \quad \times \text{cm} \\
 \hline
 2 \quad \quad 85 \\
 \hline
 8 \quad \quad 55
 \end{array}$$

$$\begin{aligned}
 85 \text{ cm} \times 3 &= 255 \text{ cm} \\
 &= 2 \text{ m } 55 \text{ cm} \\
 2 \text{ m} \times 3 &= 6 \text{ m} \\
 \text{When added} \\
 (85 \text{ cm} \times 3) + (2 \text{ m} \times 3) \\
 &= 2 \text{ m } 55 \text{ cm} + 6 \text{ m} \\
 &= 2 \text{ m} + 55 \text{ cm} + 6 \text{ m} \\
 &= \underline{\underline{8 \text{ m } 55 \text{ cm}}}
 \end{aligned}$$

### Example 4

cm	mm	
9	3	→ 93 mm
	× 5	
46	5	← 465 mm
46	5	465 mm

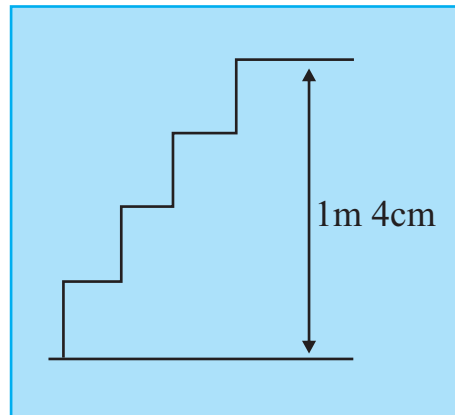
$$\begin{aligned}
 3 \text{ mm} \times 5 &= 15 \text{ mm} \\
 &= 1 \text{ cm } 5 \text{ mm} \\
 9 \text{ cm} \times 5 &= 45 \text{ cm} \\
 \therefore (3 \text{ mm} \times 5) + (9 \text{ cm} \times 5) \\
 &= 1 \text{ cm } 5 \text{ mm} + 45 \text{ cm} \\
 &= 46 \text{ cm } 5 \text{ mm}
 \end{aligned}$$

### Example 5

km	m	
3	445	→ 3445 m
	× 5	
17	225	← 17225 m
17	225	17225 m

$$\begin{aligned}
 445 \text{ m} \times 5 &= 2225 \text{ m} \\
 &= 2 \text{ km } 225 \text{ m} \\
 3 \text{ km} \times 5 &= 15 \text{ km} \\
 \therefore (445 \text{ m} \times 5) + (3 \text{ km} \times 5) \\
 &= 2 \text{ km } 225 \text{ m} + 15 \text{ km} \\
 &= 17 \text{ km } 225 \text{ m}
 \end{aligned}$$

Let us consider the dividing a length. The stage in the main building of the school is built in such a way that it is 1 m 4 cm above the floor. There are 4 steps to climb on to the stage. Let us find the height of one step.



$$\begin{aligned}
 \text{Total height} &= 1 \text{ m } 4 \text{ cm} \\
 \text{Height of one step} &= 1 \text{ m } 4 \text{ cm} \div 4 \\
 &= 104 \text{ cm} \div 4 \\
 &= 26 \text{ cm}
 \end{aligned}$$

$$\begin{array}{r}
 4 \overline{)104} \\
 \underline{26} \\
 0
 \end{array}$$

### Example 6

Give the result of  $11 \text{ m } 20 \text{ cm} \div 4$  in metres and centimetres.

$$\begin{aligned}
 1120 \div 4 &= 280 \text{ cm} \\
 &= 2 \text{ m } 80 \text{ cm} \\
 \therefore 11 \text{ m } 20 \text{ cm} \div 4 &= \underline{\underline{2 \text{ m } 80 \text{ cm}}}
 \end{aligned}$$



### Exercise 13.2

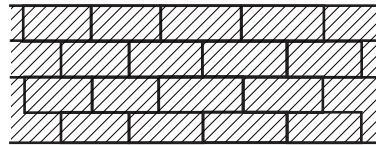
<p>(1) (i) <math>\begin{array}{r} \text{m} \quad \text{cm} \\ 7 \quad 42 \\ \times 4 \\ \hline \hline \end{array}</math></p>	<p>(ii) <math>\begin{array}{r} \text{km} \quad \text{m} \\ 2 \quad 762 \\ \times 3 \\ \hline \hline \end{array}</math></p>	<p>(iii) <math>\begin{array}{r} \text{m} \quad \text{cm} \\ 2 \quad 12 \\ \times 10 \\ \hline \hline \end{array}</math></p>
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(iv)  $12 \text{ m} \div 5$

(v)  $12 \text{ cm } 8 \text{ mm} \div 4$

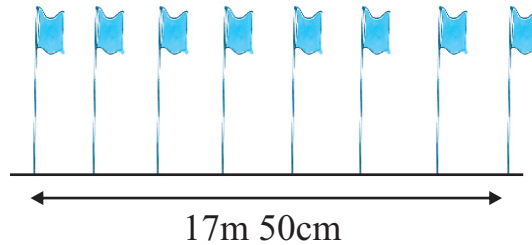
(vi)  $3 \text{ km } 284 \text{ m} \div 4$

- (2) A parapet wall is built with 4 layers of bricks. The height of one layer of bricks is 9 cm 3 mm. Find the height of the parapet wall.



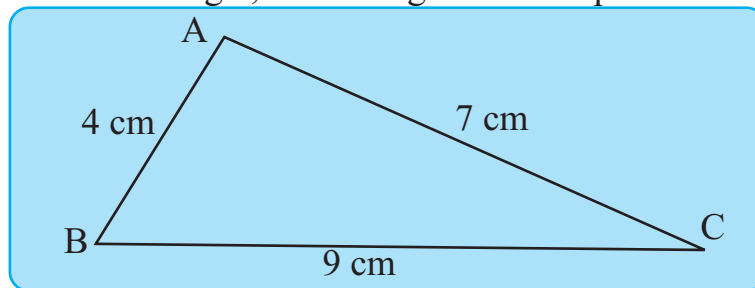
- (3) 3 m 25 cm of cloth is needed to stitch the dress for one member of an oriental music group of a school. What is the length of cloth needed for 12 members?
- (4) 6 pieces each of length 2 m 65 cm were cut out of a roll of cloth having 40 m.
- (i) What is the total length of the 6 pieces?
- (2) Find the remaining length of the cloth.
- (5) If a length of 12 m of cloth was cut into five pieces of equal length, what is the length of one piece?

- (6) For a festival, 8 flag posts were fixed in front of a building in a row keeping equal gaps. The distance between the two posts at the two ends is 17 m 50 cm. Find the gap between two posts next to each other.

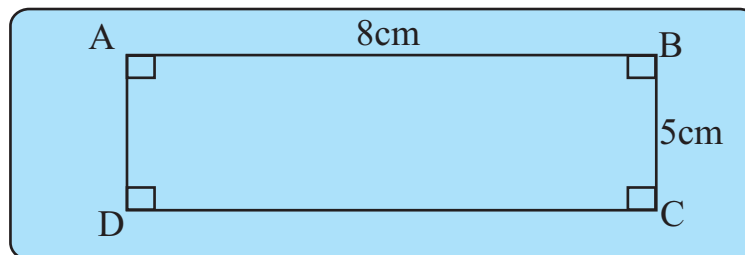


### 13.3 Formulae for the Perimeters of Plane Figures

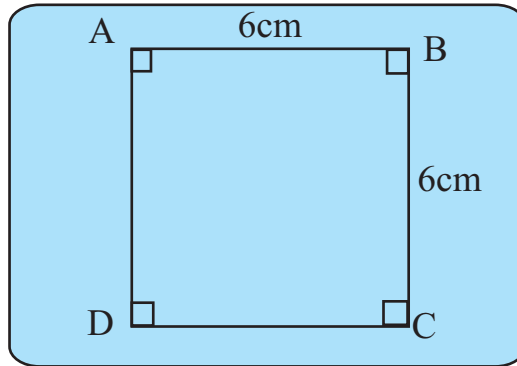
We know that the perimeter of a plane figure is the length around the figure. Accordingly let us revise the method by which we found the perimeters of the triangle, the rectangle and the square.



- ◆ The perimeter of triangle ABC is,  
 $4\text{ cm} + 7\text{ cm} + 9\text{ cm} = \underline{\underline{20\text{ cm}}}$



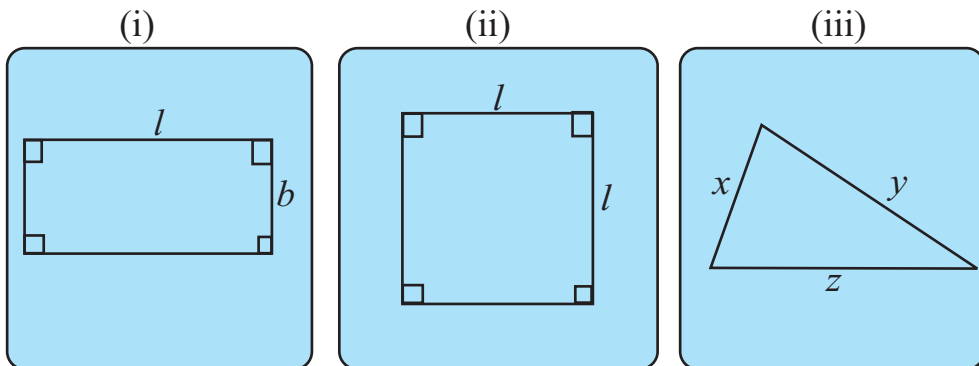
- ◆ The perimeter of rectangle ABCD is,  
 $= 8\text{ cm} + 5\text{ cm} + 8\text{ cm} + 5\text{ cm}$   
 $= \underline{\underline{26\text{ cm}}}$



◆ The perimeter of square ABCD is,  
 $= 6 \text{ cm} + 6 \text{ cm} + 6 \text{ cm} + 6 \text{ cm}$   
 $= \underline{\underline{24 \text{ cm}}}$

$6 \text{ cm} \times 4 = 24 \text{ cm}$
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**Activity 13.3**



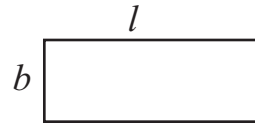
Form expressions for the perimeters of the above figures.

	length	breadth	Expression for the perimeter
(i)	$l$	$b$	
(ii)	$l$	$l$	
(iii)			

If 'p' is the perimeter, the following formulae can be built up by the expressions you obtained.

★ The perimeter of a rectangle of length ' $l$ ' units and breadth ' $b$ ' units is,

$$P = 2l + 2b$$



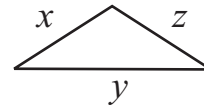
★ The perimeter of a square of one side ' $l$ ' units is,

$$P = 4l$$



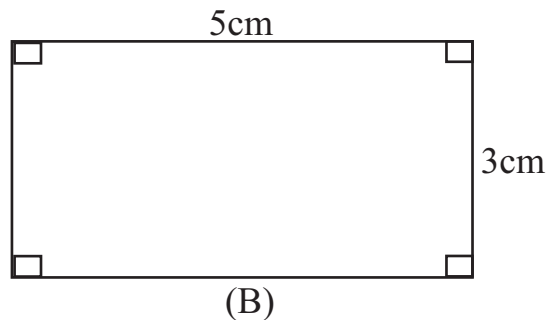
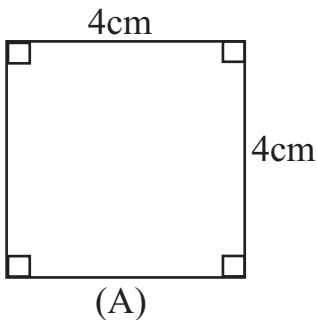
★ The perimeter of a triangle of sides of units ' $x$ ', ' $y$ ' and ' $z$ ' is,

$$P = x + y + z$$



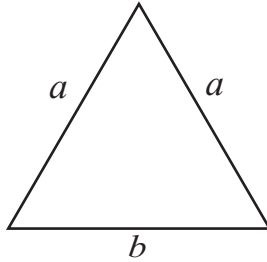
These formulae can be applied to find the perimeters of triangles squares and rectangles.

### Exercise 13.3



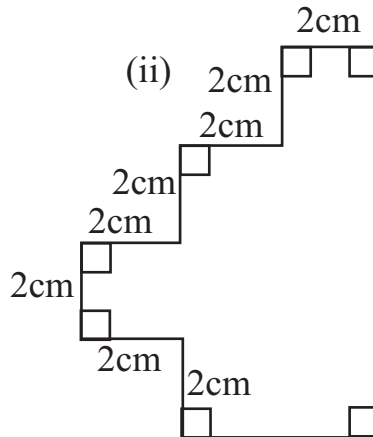
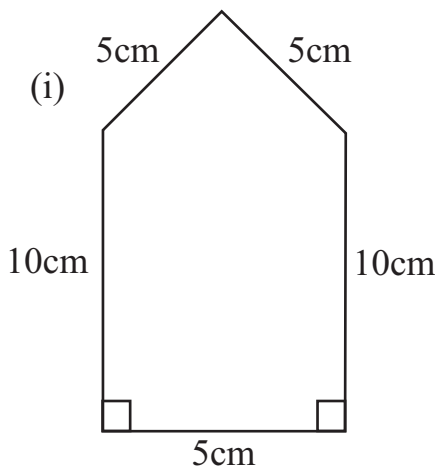
- (1) (i) What is the relation between the perimeters of these two figures?
- (ii) What is the decision you will arrive at on that relation?
- (2) The length of a rectangle is 8 cm and its breadth is 3 cm. Find its perimeter.
- (3) The length of a rectangle is 3 cm more than its breadth. If the length is 8 cm, find the perimeter.

- (4) The perimeter of a square is 25 cm. Find the length of one side of the square.
- (5) The lengths of the sides of the triangle shown below are marked. Find an expression for the perimeter of the triangle.

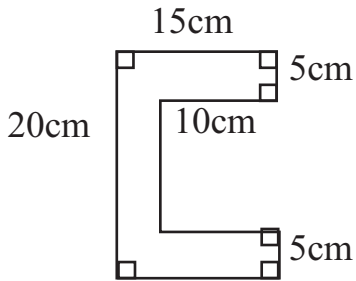


- (06) The perimeter of a square is 40 cm. Select the values out of the following, which can be the length and breadth of a rectangle having the same perimeter.
- (i) 13 cm, 7 cm
  - (ii) 8 cm, 5 cm
  - (iii) 10 cm, 4 cm
  - (iv) 18 cm, 2 cm
- (7) The perimeter of a square shaped stamp is 13 cm 2 mm. Find the length of one side of it.

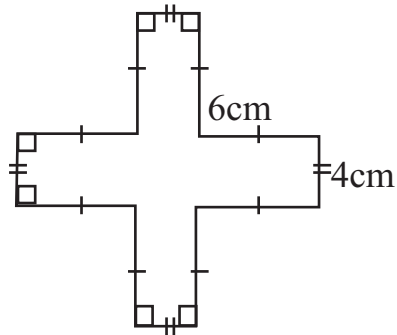
- (8) Find the perimeter of each of the following figures.



(iii)

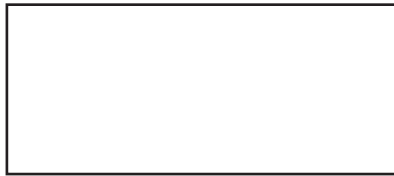


(iv)



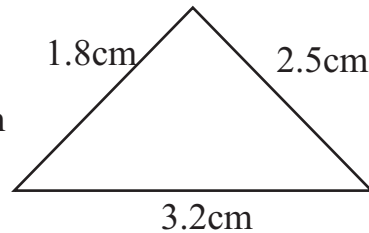
(v)

$7\frac{1}{2}$  m



$3\frac{1}{4}$  m

(vi)



### Summary

- ★ The standard units of measuring length are km , m , cm , mm.

$$10 \text{ mm} \rightleftharpoons 1 \text{ cm}$$

$$100 \text{ cm} \rightleftharpoons 1 \text{ m}$$

$$1000 \text{ m} \rightleftharpoons 1 \text{ km}$$

- ★ If the perimeter of a triangle of sides 'x', 'y', 'z' in length is 'P' then

$$P = x + y + z$$

- ★ If the perimeter of a rectangle of length 'l' and breadth 'b' is 'P', then  $P = 2(l + b)$

- ★ If 'P' is the perimeter of a square of which the length of one side is 'l',

$$P = 4l$$