



Topic	Area of Quadrilateral
Class description	<b>Math -</b> This session deals with the areas of trapezium, isosceles trapezium and general quadrilaterals.
Class	MID - 21NSBKL08MAT08TH002
Class time	45 - 50 minutes
Goal	Learning and understanding about <ul style="list-style-type: none"><li>1. Area of a trapezium</li><li>2. Area of an isosceles trapezium</li><li>3. Area of a general quadrilateral</li></ul>
Resources Required	<ul style="list-style-type: none"><li>● Teacher resources<ul style="list-style-type: none"><li>○ Earphone with mic</li><li>○ Tablet-Stylus</li></ul></li><li>● Student resources<ul style="list-style-type: none"><li>● Earphone with mic (optional)</li><li>● Paper-Pen</li><li>● Tablet-Stylus (optional)</li></ul></li></ul>

**Warm-up (7 mins)**

- Connect with the student
- Get the student to talk and express

Slide no	Slide screenshot	Whiteboard (if any)	Learning experience   Probing questions
1			<p style="color: red;"><i>&lt;Greet the students and ask about their day&gt;</i></p> <p><b>Narration:</b></p> <ul style="list-style-type: none"> <li>• Hello everyone, I welcome you all to yet another amazing session on Byju's Classes. I hope you all are doing absolutely fine and staying safe, sound, and healthy at your home.</li> </ul> <p style="color: red;"><i>&lt;Pause&gt;</i></p> <p style="color: red;"><i>&lt;Facilitator asks them their names, which school they are from, which city they are from. Weather in their city.....&gt;</i></p> <p>Introduce the features</p> <ol style="list-style-type: none"> <li>1. Chat</li> <li>2. Hand Raise</li> <li>3. Video/ Audio - ON/OFF</li> <li>4. Troubleshooting</li> </ol> <p><b>Narration:</b></p> <ul style="list-style-type: none"> <li>• Have you ever designed a hut or renovated it?</li> <li>• Ask the students if they like gardens around their house.</li> <li>• Today we will see our friend Alex and his father renovating their hut.</li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>• Let's see how they are going to do that.</li> </ul>
2			<p><b>Narration:</b></p> <ul style="list-style-type: none"> <li>• Alex is standing with his dad and we can see their hut.</li> <li>• Alex's dad wants to renovate their hut.</li> <li>• Alex wants to develop a garden around the hut.</li> <li>• To develop a garden, they must know the empty space available</li> </ul>

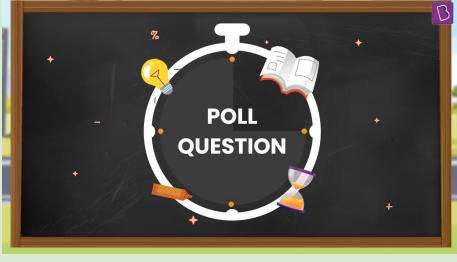
			<p>for garden around the hut.</p> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Let's see how Alex, along with his dad, plan out the things. .</li> </ul>
3			<p><b>Narration:</b></p> <ul style="list-style-type: none"> <li>Alex's dad is saying that they need a rough idea of the total area available for gardening.</li> <li>Alex has drawn the sketches of house, using which they can find the area.</li> <li>I know you are already aware about the area of few basic shapes like rectangle, square and triangle etc.</li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Let's quickly recall the area of plane figures.</li> </ul>
4			<p><b>Tutor points:</b></p> <ul style="list-style-type: none"> <li>Recall and write the areas of the plane figures.</li> </ul> <p><b>Explain and write:</b></p> <ul style="list-style-type: none"> <li>Area of a triangle is half the product of base and height.</li> <li>Let the base be <math>b</math> and height be <math>h</math> units.</li> </ul> <p>&lt;write <math>\frac{1}{2} * b * h</math> in the first box&gt;</p> <ul style="list-style-type: none"> <li>Area of a rectangle is the product of its length and breadth.</li> <li>Let the length be <math>l</math> and breadth be <math>b</math> units.</li> </ul> <p>&lt;write <math>l * b</math> in the second box&gt;</p> <ul style="list-style-type: none"> <li>Square has all its sides of equal length.</li> <li>Let the side be <math>s</math> units.</li> <li>Then the area = <math>a * a = a^2</math> sq.units</li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Alright! Now you guys can very well understand how we can calculate the area of plane figures.</li> <li>Let's help Alex in finding the area for gardening.</li> </ul>

5



Total area of the rectangular plot  
 $= 15 \text{ m} \times 11 \text{ m} = 165 \text{ m}^2$   
 Area of the square hut  
 $= 5 \text{ m} \times 5 \text{ m} = 25 \text{ m}^2$   
 Rectangular area covered by the tiles  
 $= 5 \text{ m} \times 1 \text{ m} = 5 \text{ m}^2$   
 Therefore, the area available for gardening  
 $= 55 - (25 + 5) = 55 - 30 = 25 \text{ m}^2$

6



#### Tutor points:

- Find the area available for gardening.

#### Explain and write:

- Total area of the rectangular plot  
 $= 15 \text{ m} * 11 \text{ m} = 165 \text{ m}^2$
- In order to find the area for gardening, we have to subtract the area of the hut and the area of the tiles from the total plot area.
- Area of the square hut  $= 5 \text{ m} * 5 \text{ m} = 25 \text{ m}^2$
- Rectangular area covered by the tiles  $= 5 \text{ m} * 1 \text{ m} = 5 \text{ m}^2$
- Therefore, the area available for gardening  $= 55 - (25 + 5) = 55 - 30 = 25 \text{ m}^2$

#### Connect:

- Now I have a question for you guys based on this concept.

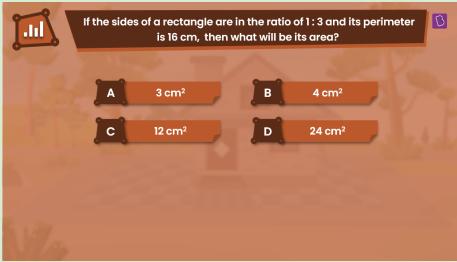
**SA Q01:** If the sides of a rectangle are in the ratio of 1 : 3 and its perimeter is 16 cm, then what will be its area?

- (A)  $3 \text{ cm}^2$
- (B)  $4 \text{ cm}^2$
- (C)  $12 \text{ cm}^2$
- (D)  $24 \text{ cm}^2$

#### Knowledge Points/Learning evidence:

- Area of a rectangle

7



#### Tutor points:

- Read the question.
- Read the options.

**Time:** 45 seconds

#### Connect:

- Answer slide

8

If the sides of a rectangle are in the ratio of 1:3 and its perimeter is 16 cm, then what will be its area?

A  $3 \text{ cm}^2$   
B  $4 \text{ cm}^2$   
C  $12 \text{ cm}^2$   
D  $24 \text{ cm}^2$

$$\text{Perimeter} = 16 \text{ cm}$$

$$2(l + b) = 16 \text{ cm}$$

$$(l + b) = 8$$

$$3x + x = 8$$

$$4x = 8$$

$$x = 2 \text{ cm}$$

$$\text{Length} = 3x = 6 \text{ cm}$$

$$\text{Breadth} = x = 2 \text{ cm}$$

$$\text{Area} = l \times b = 6 \times 2 = 12 \text{ cm}^2$$

**Answer:** Option C

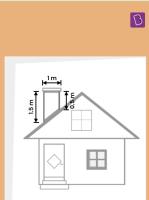
**Discuss the answer:**

- It is a very basic and simple right!
- Given that the ratio of sides of a rectangle is 1:3
- Length is usually greater than breadth in a rectangle.
- Let the length be  $3x$  and the breadth be  $x$
- Perimeter = 16 cm  
 $2(l + b) = 16 \text{ cm}$   
 $(l + b) = 8$   
 $3x + x = 8$   
 $4x = 8$   
 $x = 2 \text{ cm}$
- Length =  $3x = 6 \text{ cm}$
- Breadth =  $x = 2 \text{ cm}$
- Area =  $l \times b = 6 \times 2 = 12 \text{ cm}^2$

**Connect:**

- Let's see the gardening done by Alex and his father.

9



**Narration:**

- Wow! Our friend Alex and his father are done with gardening.
- Also they have made beautiful fencing around the garden.
- Well now, his father wants to paint their hut and asks Alex to find the area of the region they have to paint.
- But Alex is confused about how he can find the area of that trapezium shaped front of the chimney.

**Connect:**

- Let's check our learning nugget to find it out.

10

Area of a Trapezium

Grade: 08 KL  
Chapter: Area of Quadrilaterals  
BTIA: Area of Trapezium  
Timings: 00:00:14 - 00:02:32  
Start: Let's see if we've a trapezium... height into sum of parallel sides.  
End: Duration: 00:02:18  
Link: -

**Video duration:** 00:02:18

**Key takeaways:**

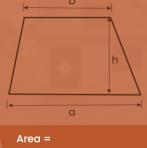
1. Area of a trapezium

**Connect:**

- Let's recall the formula for the area of a trapezium.

11

 Area of a Trapezium 



Area =

**Tutor points:**

- Recall and write the formula for the area of a trapezium.

**Explain and write:**

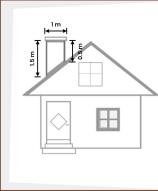
- In this trapezium, the lengths of parallel sides are  $a$  and  $b$  units.
- The distance between the parallel sides is  $h$  units.
- The area of the trapezium is  $(\text{half the sum of the parallel sides}) * (\text{distance between them})$   
 $= \frac{1}{2} * (a + b) * h$

**Connect:**

- Now, we know how to find the area of a trapezium.
- Let's move and find the area of that Trapezium shaped front Chimney.

12

 Area of the front of the chimney: 



$\frac{1}{2} \times \text{sum of parallel sides} \times \text{distance between the parallel sides}$   
 $\frac{1}{2} * (0.5 + 1.5) * 1 = 1 \text{ cm}^2$

**Tutor points:**

- Write answer
- Discuss the answer

**Explain:**

- Area of trapezium.

**Discuss the answer:**

- Area of the front of the chimney is required to be calculated.

**Write:**  $\frac{1}{2} \times \text{sum of parallel sides} \times \text{distance between the parallel sides}$

**Write:**  $\frac{1}{2} * (0.5 + 1.5) * 1 = 1 \text{ cm}^2$

**Connect:**

- Let's solve one more question.

**TA Q01:** The lengths of parallel sides of a trapezium are 7 cm and 10 cm, and the distance between them is 8 cm. Find its area.

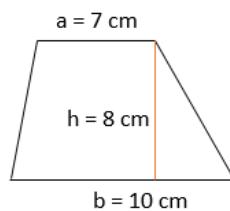
**Knowledge Points/Learning evidence:**

- Area of a trapezium

13



The lengths of parallel sides of a trapezium are 7 cm and 10 cm, and the distance between them is 8 cm. Find its area.



$$\text{Area of trapezium} = \frac{1}{2} \times (a + b) \times h$$

$$A = \frac{1}{2} \times (7 + 10) \times 8 \\ = 17 \times 4 = 68 \text{ cm}^2$$

### Tutor points:

- Read the question.
- Explain and write the answer.

### Explain and write:

- Draw a diagram of trapezium ABCD
- Given the lengths of parallel sides of a trapezium are 7 cm and 10 cm
- Let  $a = 7 \text{ cm}$  and  $b = 10 \text{ cm}$
- Given, the distance between them is 8 cm.  $h = 8 \text{ cm}$
- Area of trapezium  $= \frac{1}{2} * (\text{sum of parallel side}) * \text{distance between them}$   $= \frac{1}{2} * (a + b) * h$
- $A = \frac{1}{2} * (7 + 10) * 8 = 17 * 4 = 68 \text{ cm}^2$

### Connect:

- Hope you got a clear idea of the concept. I have a question for you.

14



<Coming next is a poll question which you guys have to answer in 30 seconds>

And your time starts now...

**SA Q02:** If the area of a trapezium is given as  $48 \text{ cm}^2$  and the sum of the lengths of its parallel sides is 12 cm, then what will be the distance between the parallel sides?

- A) 8 cm
- B) 4 cm
- C) 2 cm
- D) 6 cm

### Knowledge Points/Learning evidence:

- Area of trapezium

15



If the area of a trapezium is given as  $48 \text{ cm}^2$  and the sum of the lengths of its parallel sides is 12 cm, then what will be the distance between the parallel sides?

- |   |      |
|---|------|
| A | 8 cm |
| B | 4 cm |
| C | 2 cm |
| D | 6 cm |

### Tutor points:

- Read the question
- Read the options

**Time:** 30 seconds

### Connect:

- Answer slide

16

If the area of a trapezium is given as  $48 \text{ cm}^2$  and the sum of the lengths of its parallel sides is  $12 \text{ cm}$ , then what will be the distance between the parallel sides?

A: 8 cm  
B: 4 cm  
C: 2 cm  
D: 6 cm

**Answer:** Option A**Discuss the answer:**

- Given area  $A = 48 \text{ cm}^2$
- Sum of lengths of parallel sides  $(a + b) = 12 \text{ cm}$
- $\frac{1}{2} * (a + b) * h = 48$
- $\frac{1}{2} * 12 * h = 48$
- $6 * h = 48$
- $h = 8 \text{ cm}$
- Therefore, the distance between the parallel sides is  $8 \text{ cm}$

**Connect:**

- Let's solve one more question.

**TA Q02:** Calculate the area of the trapezium PQRS shown in the figure below.**Knowledge Points/Learning evidence:**

- Area of trapezium

17

Calculate the area of the trapezium PQRS shown in the figure below.

$$\begin{aligned}(PQ)^2 + (QR)^2 &= (PR)^2 \\ 5^2 + (QR)^2 &= (13)^2 \\ 25 + (QR)^2 &= 169 \\ (QR)^2 &= 144 \\ QR &= 12 \text{ cm}\end{aligned}$$

$$\begin{aligned}\text{Area of trapezium PQRS} &= \\ \frac{1}{2} \times (PQ + SR) \times (QR) &= \\ \frac{1}{2} \times (11 + 5) \times 12 &= \\ 16 \times 6 &= 96 \text{ cm}^2\end{aligned}$$

**Tutor points:**

- Read the question.
- Explain and write the answer.

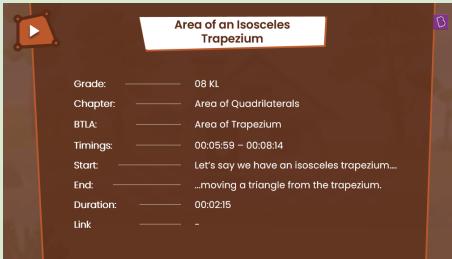
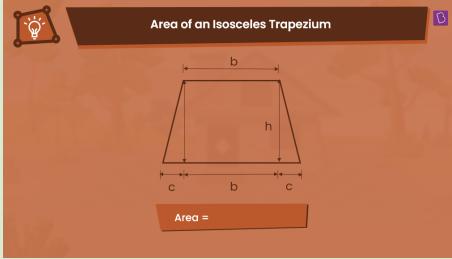
**Explain and write:**

- Here, the lengths of parallel sides are given. But the distance between them is not given.
- Given, PQR is a right-angled triangle.
- QR is the distance between them, let's find the distance using pythagoras formula.
- $(PQ)^2 + (QR)^2 = (PR)^2$
- $5^2 + (QR)^2 = (13)^2$
- $25 + (QR)^2 = 169$
- $(QR)^2 = 144$
- $QR = 12 \text{ cm}$
- $\text{Area of trapezium PQRS} = \frac{1}{2} * (PQ + SR) * (QR)$   
 $= \frac{1}{2} * (11 + 5) * 12 = 16 * 6 = 96 \text{ cm}^2$

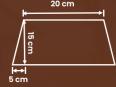
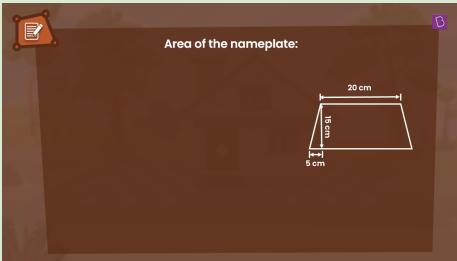
**Connect:**

- Let's get back and see what Alex and his father are planning now.

18			<p><b>Narration:</b></p> <ul style="list-style-type: none"> <li>• Alex and his dad are now thinking of adding a name plate to the house.</li> <li>• Alex is now adding a name plate in the blueprint for the reference.</li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>• Let's see the name plate which Alex has designed.</li> </ul>
19			<p><b>Narration:</b></p> <ul style="list-style-type: none"> <li>• Alex added a isosceles trapezium shaped name plate.</li> </ul> <p><b>Ask:</b> Do you guys remember what an isosceles trapezium is?</p> <ul style="list-style-type: none"> <li>• A trapezium in which the two non-parallel sides are equal in length is called an isosceles trapezium.</li> <li>• In Order to paint the nameplate, Alex wants to know the area of an isosceles trapezium.</li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>• But do you know that an isosceles trapezium can be formed from a rectangle?</li> <li>• Let's see how this works.</li> </ul>
20			<p><b>Tutor points:</b></p> <ul style="list-style-type: none"> <li>• Explain how an isosceles trapezium is formed from a rectangle.</li> </ul> <p><b>Narration:</b></p> <ul style="list-style-type: none"> <li>• The first is a rectangle, right!</li> <li>• And when a right angled triangle is cut from the left end and placed at the right end, a parallelogram is formed.</li> <li>• Now, if we just flip this right-angled triangle at the right-end, what do we get?</li> <li>• Yes, we can see that an isosceles trapezium is formed.</li> <li>• This is how an isosceles trapezium is formed from a rectangle.</li> <li>• You guys can try this activity with paper and scissors.</li> <li>• We have not added any extra area and haven't removed any</li> </ul>

			<p>part.</p> <ul style="list-style-type: none"> <li>• So the area of these three figures is the same.</li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>• Alright! Let's find the area of an isosceles trapezium by watching a learning capsule.</li> </ul>
21	 <p>Grade: 08 KL Chapter: Area of Quadrilaterals BTLA: Area of Trapezium Timings: 00:05:59 – 00:08:14 Start: Let's say we have an isosceles trapezium... End: ...moving a triangle from the trapezium. Duration: 00:02:15 Link: -</p>		<p><b>Video duration:</b> 00:02:15</p> <p><b>Key takeaways:</b></p> <ul style="list-style-type: none"> <li>• Area of an isosceles trapezium</li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>• Let's recall the formula</li> </ul>
22	 <p>Area =</p>		<p><b>Narration:</b></p> <ul style="list-style-type: none"> <li>• The formula remains the same for a general trapezium and an isosceles trapezium.</li> <li>• <math>\text{Area} = \frac{1}{2} * \text{sum of parallel sides} * h = \frac{1}{2} (b + c + b + c) * h = (b + c) * h</math></li> <li>• But an isosceles trapezium is a combination of two right-angled triangles and a rectangle.</li> <li>• <math>\text{Area} = 2(\text{area of right-angled triangle}) + \text{area of rectangle}</math>  <math>= 2 * (\frac{1}{2} * c * h) + bh = (c + b) * h = (b + c) * h</math></li> </ul> <p>Formula is the same, what you guys have to remember is that the isosceles trapezium is a combination of a rectangle and two equal right-angled triangles.</p> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>• Let's now calculate the area of the nameplate which Alex and his dad want to paint.</li> </ul>

23



$$\begin{aligned}a &= 5 \text{ cm}, b = 20 \text{ cm}, h = 15 \text{ cm} \\ \text{Area } A &= (a + b) \times h = (5 + 20) \times 15 \\ &= 25 \times 15 \\ &= 375 \text{ cm}^2\end{aligned}$$

Or

$$\begin{aligned}\text{Lower base} &= 5 + 20 + 5 = 30 \text{ cm} \\ \text{Area} &= \frac{1}{2} \times \text{sum of parallel sides} \times \text{distance between them} \\ &= \frac{1}{2} \times (20 + 30) \times 15 \\ &= \frac{1}{2} \times 50 \times 15 \\ &= 25 \times 15 \\ &= 375 \text{ cm}^2\end{aligned}$$

**Tutor points:**

- Find the area of the nameplate

**Explain and write:**

- Here  $a = 5 \text{ cm}$ ,  $b = 20 \text{ cm}$ ,  $h = 15 \text{ cm}$
- $\text{Area } A = (a + b) \times h = (5 + 20) \times 15 = 25 \times 15 = 375 \text{ cm}^2$   
Or
- If you guys don't want to remember this formula, you can split the isosceles trapezium into rectangle and right-angled triangles
- Lower base  $= 5 + 20 + 5 = 30 \text{ cm}$
- $\text{Area} = \frac{1}{2} \times \text{sum of parallel sides} \times \text{distance between them}$   
 $= \frac{1}{2} \times (20 + 30) \times 15 = \frac{1}{2} \times 50 \times 15 = 25 \times 15 = 375 \text{ cm}^2$

**Connect:**

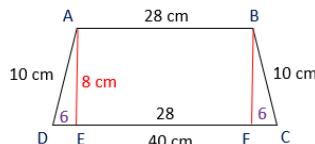
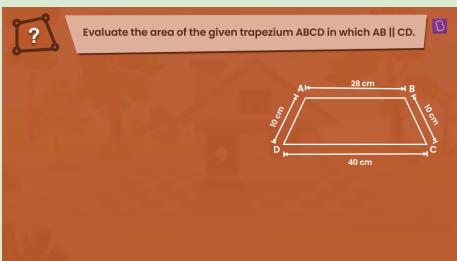
- Hope it's clear. Let's solve one more question for better understanding.

**TA Q03:** Evaluate the area of the given trapezium ABCD in which  $AB \parallel CD$ .

**Knowledge Points/Learning evidence:**

- Area of an isosceles trapezium

24



$$\begin{aligned}(AD)^2 &= (AE)^2 + (DE)^2 \\ (10)^2 &= (AE)^2 + 6^2 \\ 100 - 36 &= (AE)^2 \\ 64 &= (AE)^2 \\ AE &= 8 \text{ cm} \\ \text{Area of trapezium ABCD} &= \frac{1}{2} \times (AB + CD) \times AE \\ &= \frac{1}{2} \times (28 + 40) \times 8 \\ &= 68 \times 4 \\ &= 272 \text{ cm}^2\end{aligned}$$

**Tutor points:**

- Read the question.
- Explain and write the answer.

**Explain and write:**

- Given AB is parallel to CD and  $AD = BC$
- Therefore, it is an isosceles trapezium.
- Let split the trapezium into rectangle and right-angled triangles

<draw AE perpendicular to DC and BF perpendicular to DC>

- The length of rectangle is 28 cm
- The base of right-angled triangle  $= (40 - 28)/2 = 6 \text{ cm}$
- In the right-angled triangle, ADE,  $(AD)^2 = (AE)^2 + (DE)^2$   
 $(10)^2 = (AE)^2 + 6^2$   
 $100 - 36 = (AE)^2$

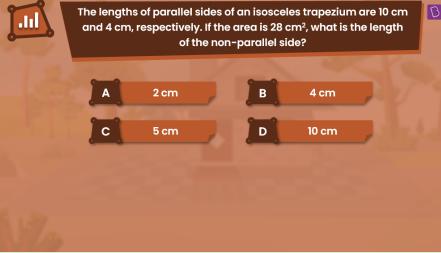
			$64 = (AE)^2$ $AE = 8 \text{ cm}$ <ul style="list-style-type: none"> <li>• Area of trapezium ABCD = <math>\frac{1}{2} * (AB + CD) * AE = \frac{1}{2} * (28 + 40) * 8 = 68 * 4 = 272 \text{ cm}^2</math></li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>• Okay, here is a question for you.</li> </ul>
25			<p>&lt;Coming next is a poll question which you guys have to answer in 30 seconds&gt;</p> <p>And your time starts now...</p>

**SA Q03:** The lengths of parallel sides of an isosceles trapezium are 10 cm and 4 cm, respectively. If the area is  $28 \text{ cm}^2$ , what is the length of the non-parallel side?

- A) 2 cm
- B) 4 cm
- C) 5 cm
- D) 10 cm

#### Knowledge Points/Learning evidence:

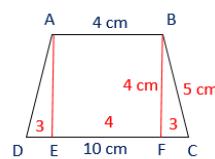
- Area of an isosceles trapezium

26	 <p>The lengths of parallel sides of an isosceles trapezium are 10 cm and 4 cm, respectively. If the area is <math>28 \text{ cm}^2</math>, what is the length of the non-parallel side?</p> <table border="0"> <tr> <td>A 2 cm</td> <td>B 4 cm</td> </tr> <tr> <td>C 5 cm</td> <td>D 10 cm</td> </tr> </table>	A 2 cm	B 4 cm	C 5 cm	D 10 cm		<p><b>Tutor points:</b></p> <ul style="list-style-type: none"> <li>• Read the question</li> <li>• Read the options</li> </ul> <p><b>Time:</b> 30 seconds</p> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>• Answer slide</li> </ul>
A 2 cm	B 4 cm						
C 5 cm	D 10 cm						

27

The lengths of parallel sides of an isosceles trapezium are 10 cm and 4 cm, respectively. If the area is 28 cm<sup>2</sup>, what is the length of the non-parallel side?

**A** 2 cm    **B** 4 cm  
**C** 5 cm    **D** 10 cm



$$\frac{1}{2} (10 + 4) * h = 28$$

$$h = 4 \text{ cm}$$

$$\text{The length } DE = (10 - 4)/2 = 3 \text{ cm}$$

$$AE = h = 4 \text{ cm}, DE = 3 \text{ cm}$$

$$\triangle AED \text{ is a right-angled triangle}$$

$$(AD)^2 = 4^2 + 3^2 = 25$$

$$AD = 5 \text{ cm}$$

**Answer:** Option C**Discuss the answer:**

- Let us draw a rough sketch of an isosceles trapezium. Let the vertices be A, B, C and D
- Given area = 28 cm<sup>2</sup>
- $\frac{1}{2} (10 + 4) * h = 28$
- $h = 4 \text{ cm}$
- Non-parallel sides are 10 cm and 4 cm.
- The length  $DE = (10 - 4)/2 = 3 \text{ cm}$
- $AE = h = 4 \text{ cm}, DE = 3 \text{ cm}$
- $\triangle AED \text{ is a right-angled triangle}$
- $(AD)^2 = 4^2 + 3^2 = 25$
- $AD = 5 \text{ cm}$

The length of non-parallel side = AD = BC = 5 cm

**Connect:**

- Let's solve one more question.

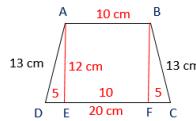
**TA Q04:** The perimeter of a trapezium is 56 cm. Find the area of the trapezium if the lengths of the parallel sides are in the ratio of 1 : 2, and the length of each non-parallel side is 13 cm.

### Knowledge Points/Learning evidence:

- Area of an isosceles trapezium

28

The perimeter of a trapezium is 56 cm. Find the area of the trapezium if the lengths of the parallel sides are in the ratio of 1:2, and the length of each non-parallel side is 13 cm.



$$\text{Let } a = x \text{ cm and } b = 2x \text{ cm}$$

$$a + b + 13 + 13 = 56$$

$$x + 2x + 26 = 56$$

$$3x = 30$$

$$x = 10 \text{ cm}$$

$$\text{Therefore, } a = 10 \text{ cm and } b = 20 \text{ cm}$$

Let AE and BF be the perpendiculars to CD

$$DE = CF = (20 - 10)/2 = 5 \text{ cm}$$

Consider  $\triangle BFC$ ,

$$(BC)^2 = (BF)^2 + (CF)^2$$

$$(13)^2 = (BF)^2 + 5^2$$

$$(BF)^2 = 169 - 25 = 144$$

$$BF = 12 \text{ cm}$$

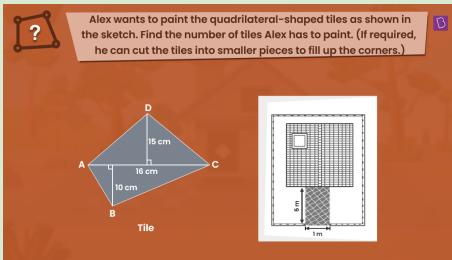
Area of isosceles trapezium ABCD =  $(DE + AB) \times BF$   
 $= (5 + 10) \times 12 = 180 \text{ cm}^2$

**Tutor points:**

- Read the question.
- Explain and write the answer.

**Explain and write:**

- Consider a trapezium ABCD
- Given each non-parallel side is 13 cm, so it is an isosceles trapezium
- Let the parallel sides be a and b cm
- Given ratio of parallel sides is 1:2. Let a = x cm and b = 2x cm  
 $a + b + 13 + 13 = 56$   
 $x + 2x + 26 = 56$   
 $3x = 30$   
 $x = 10 \text{ cm}$   
 $\text{Therefore, } a = 10 \text{ cm and } b = 20 \text{ cm}$
- Given the length of each non-parallel side is 13 cm. So the given trapezium is an isosceles trapezium.

			<ul style="list-style-type: none"> <li>Let <math>AE</math> and <math>BF</math> be the perpendiculars to <math>CD</math> from <math>A</math> and <math>B</math> respectively.</li> <li><math>DE = CF = (20 - 10)/2 = 5 \text{ cm}</math></li> <li>Consider <math>\Delta BFC</math>,</li> </ul> $(BC)^2 = (BF)^2 + (CF)^2$ $(13)^2 = (BF)^2 + 5^2$ $(BF)^2 = 169 - 25 = 144$ $BF = 12 \text{ cm}$ <ul style="list-style-type: none"> <li>Area of isosceles trapezium <math>ABCD = (DE + AB) * BF</math></li> <li><math>= (5 + 10) * 12 = 180 \text{ cm}^2</math></li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Doubt board</li> </ul>
29			<p><b>Tutor points:</b></p> <ul style="list-style-type: none"> <li>Encourage students to ask doubts.</li> <li>Clarify the doubts asked by the students.</li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Alex and his father are thinking of painting the tiles.</li> </ul>
30			<p><b>Narration:</b></p> <ul style="list-style-type: none"> <li>Alex and his father are thinking about painting the tiles.</li> <li>Tiles are quadrilateral-shaped.</li> <li>Alex is asking his father how a random quadrilateral area can be found.</li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Before finding the area of tiles, let's look at the shape and measurement of the tile.</li> </ul>
<p><b>TA Q05:</b> Alex wants to paint the quadrilateral-shaped tiles as shown in the sketch. Find the number of tiles Alex has to paint. (If required, he can cut the tiles into smaller pieces to fill up the corners.)</p>			
<p><b>Knowledge Points/Learning evidence:</b></p> <ul style="list-style-type: none"> <li>Area of a general quadrilateral</li> </ul>			
31			<p><b>Tutor points:</b></p> <ul style="list-style-type: none"> <li>Read the question.</li> </ul> <p><b>Explain:</b></p> <ul style="list-style-type: none"> <li>We need to find the number of tiles required. But before that we need to find the area of tile and area of path.</li> <li>But the tile is in the shape of a</li> </ul>

			<p>quadrilateral, and we don't know how to find the area of the quadrilateral.</p> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Let's go through our learning nugget to know how we can find the area of a general quadrilateral.</li> </ul>
32	<p>Grade: 08 KL Chapter: Area of Quadrilaterals BTLA: Area of quadrilateral Timings: 00:00:07 – 00:01:54 Start: Let's say we've a generic... End: ...So that will be able to calculate the area that's it. Duration: 00:01:47 Link: -</p>		<p><b>Video duration</b> = 00:01:47</p> <p><b>Key takeaways :</b></p> <ul style="list-style-type: none"> <li>Area of general quadrilateral.</li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Let's summarise the video.</li> </ul>
33	<p>Area =</p>		<p><b>Narration:</b></p> <ul style="list-style-type: none"> <li>Let ABCD be a general quadrilateral.</li> <li>Given the diagonal BD and the lengths of perpendiculars from A to BD and C to BD.</li> <li>Therefore, the area of the quadrilateral is the sum of areas of the two triangles</li> <li><math>A = \frac{1}{2} * BD * h_1 + \frac{1}{2} * BD * h_2</math></li> <li><math>A = \frac{1}{2} * BD (h_1 + h_2)</math></li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Now, we know how to find the area of a general quadrilateral.</li> <li>Let's move on and solve our problem.</li> </ul>
34	<p>Area of the tile: Area of the path: Number of tiles required:</p>	<p><b>Area of the Tile:</b> <math>\Rightarrow \text{Area of the tile} = \frac{1}{2} \times 16 \times (10 + 15) = \frac{1}{2} \times 16 \times 25 = 8 \times 25 = 200 \text{ cm}^2</math></p> <p><b>Area of the path:</b> <math>\Rightarrow 5 \text{ m} = 5 \times 100 \text{ cm} = 500 \text{ cm}</math> <math>\Rightarrow \text{Area of the path} = 100 \times 500 = 50,000 \text{ cm}^2</math></p> <p><b>Number of tiles required:</b> <math>\text{Number of tiles required} = \frac{\text{Area of path}}{\text{Area of tile}} = \frac{50,000}{200} = 250</math></p>	<p><b>Tutor points:</b></p> <ul style="list-style-type: none"> <li>Explain and write the answer.</li> </ul> <p><b>Explain and write:</b></p> <ul style="list-style-type: none"> <li>As we can see that the tile is the combination of two triangles.</li> </ul> <p>&lt;Show them triangles forming the tile&gt;</p> <ul style="list-style-type: none"> <li>So first begin with Area of <math>\Delta ACB</math>,</li> </ul> <p><b>Write:</b></p> <p><math>\frac{1}{2} * b * h = \frac{1}{2} * 16 * 10 = 80 \text{ cm}^2</math></p> <ul style="list-style-type: none"> <li>Now, Area of <math>\Delta ACD</math>,</li> </ul>

**Write:**

$$\frac{1}{2} * b * h = \frac{1}{2} * 16 * 15 = 120 \text{ cm}^2$$

- Now, the total area of the tile will be,

Area of  $\triangle ACD$  + Area of  $\triangle ACB$

$$\text{Write: } 80 + 120 = 200 \text{ cm}^2$$

- Now calculate the area of the path which is in the shape of the rectangle,
- So, area of the path will be

$$\text{Write: } l * b = 5 * 1 \text{ m}^2$$

- We know that  $1 \text{ m} = 100 \text{ cm}$ , so,  $1 \text{ m}^2 = 10000 \text{ cm}^2$
- So, the area of the path will be

$$\text{Write: } 5 \text{ m}^2 = 5 * 10000 = 50000 \text{ cm}^2$$

- So, to cover the area of  $50000 \text{ cm}^2$  the number of tiles required will be,

$$\text{Write: } 50000/200 = 250 \text{ tiles}$$

**Connect:**

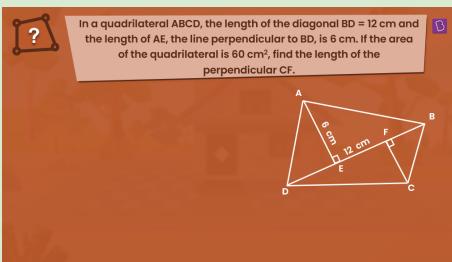
- Let's solve one more question to understand this concept better.

**TA Q06:** In a quadrilateral ABCD, the length of the diagonal BD = 12 cm and the length of AE, the line perpendicular to BD, is 6 cm. If the area of the quadrilateral is  $60 \text{ cm}^2$ , find the length of the perpendicular CF.

#### Knowledge Points/Learning evidence:

- Area of a general quadrilateral

35



$$\begin{aligned} \text{Area of quadrilateral ABCD} &= (\frac{1}{2} * BD * AE) + (\frac{1}{2} * BD * CF) \\ &= \frac{1}{2} * 12 * (6 + CF) = 60 \\ &\frac{1}{2} * 12 * (6 + CF) = 60 \\ &6 + CF = 10 \\ &CF = 4 \text{ cm} \end{aligned}$$

**Tutor points:**

- Read the question.
- Explain and write the answer.

**Explain and write:**

- Area of quadrilateral ABCD =  $(\frac{1}{2} * BD * AE) + (\frac{1}{2} * BD * CF)$
- $\frac{1}{2} * BD * (AE + CF) = 60$
- $\frac{1}{2} * 12 * (6 + CF) = 60$
- $6 + CF = 10$
- $CF = 4 \text{ cm}$

**Connect:**

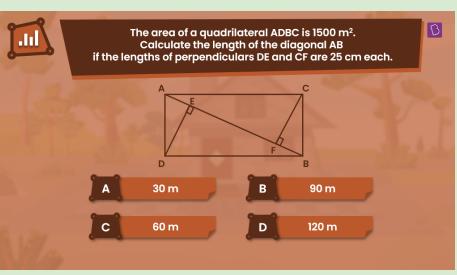
- Now I have a question for you all based on this concept.

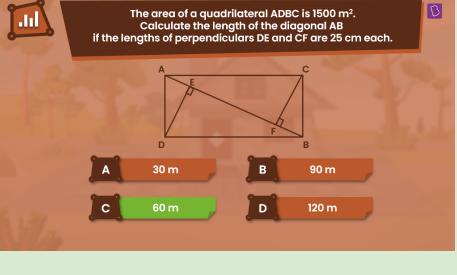
36		<p>&lt;Coming next is a poll question which you guys have to answer in 30 seconds&gt;</p> <p><b>And your time starts now...</b></p>
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**SA Q04:** The area of a quadrilateral ADBC is  $1500 \text{ m}^2$ . Calculate the length of the diagonal AB if the lengths of perpendiculars DE and CF are 25 cm each.

#### Knowledge Points/Learning evidence:

- Area of a general quadrilateral

37	 <p>The area of a quadrilateral ADBC is <math>1500 \text{ m}^2</math>. Calculate the length of the diagonal AB if the lengths of perpendiculars DE and CF are 25 cm each.</p> <p>A diagram of quadrilateral ADBC with diagonal AB. Perpendicular DE is drawn from D to AB at point E, and perpendicular CF is drawn from C to AB at point F.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;"></td> </tr> <tr> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;"></td> </tr> <tr> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;"></td> </tr> <tr> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;"></td> </tr> </table> <p><b>A</b> 30 m      <b>B</b> 90 m  <b>C</b> 60 m      <b>D</b> 120 m</p>									<p><b>Tutor points:</b></p> <ul style="list-style-type: none"> <li>• Read the question</li> <li>• Read the options</li> </ul> <p><b>Time:</b> 30 seconds</p> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>• Answer slide</li> </ul>

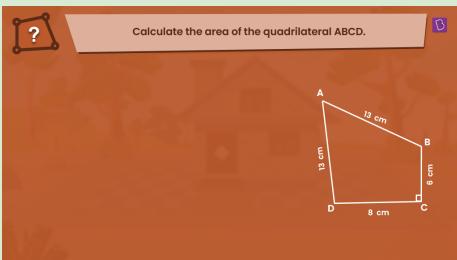
38	 <p>The area of a quadrilateral ADBC is <math>1500 \text{ m}^2</math>. Calculate the length of the diagonal AB if the lengths of perpendiculars DE and CF are 25 cm each.</p> <p>A diagram of quadrilateral ADBC with diagonal AB. Perpendicular DE is drawn from D to AB at point E, and perpendicular CF is drawn from C to AB at point F.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;"></td> </tr> <tr> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;"></td> </tr> <tr> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;"></td> </tr> <tr> <td style="width: 25px; height: 25px;"></td> <td style="width: 25px; height: 25px;"></td> </tr> </table> <p><b>A</b> 30 m      <b>B</b> 90 m  <b>C</b> 60 m      <b>D</b> 120 m</p>									<p><b>Answer:</b> Option C</p> <p><b>Discuss the answer:</b></p> <ul style="list-style-type: none"> <li>• As we know that the area of quadrilateral ADBC is <math>1500 \text{ m}^2</math>,</li> </ul> <p><b>Write:</b></p> $\frac{1}{2} * AB * (CF + DE) = 1500$ $AB * (25 + 25) = 3000$ $AB * 50 = 1500$ $AB = 60 \text{ m}$ <p>&lt;Mark option C as correct&gt;</p> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>• Let's look at the final question.</li> </ul>

**TA Q07:** Calculate the area of the quadrilateral ABCD.

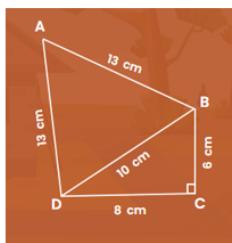
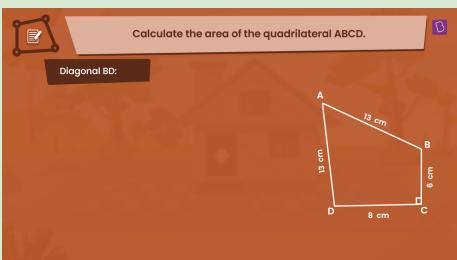
#### Knowledge Points/Learning evidence:

- Area of a general quadrilateral

39

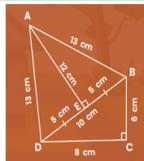
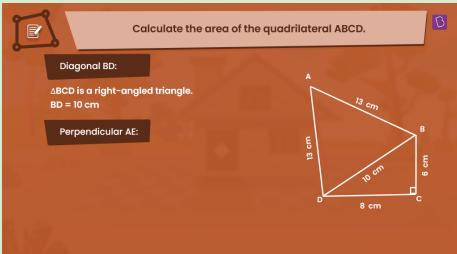


40



$\triangle ABCD$  is a right-angled triangle.  
 $(BD)^2 = (BC)^2 + (CD)^2$   
 $(BD)^2 = 6^2 + 8^2$   
 $(BD)^2 = 36 + 64 = 100$   
 $BD = 10 \text{ cm}$

41



Let AE be the perpendicular from A to BD.  
Since  $\triangle ABD$  is an isosceles triangle with  $AD = AB$ ,  
AE is perpendicular bisector of BD.  
 $DE = EB = 5 \text{ cm}$   
 $\triangle AED$  and  $\triangle AEB$  are right-angled triangles.  
In  $\triangle AED$ ,  
 $(AD)^2 = (AE)^2 + (ED)^2$   
 $13^2 = (AE)^2 + 5^2$   
 $(AE)^2 = 169 - 25 = 144$   
 $AE = 12 \text{ cm}$

### Tutor points:

- Read the question.
- Explain that the lengths of sides are given.
- And given that angle C is a right-angle.
- Since angle C is a right-angle, diagonal BD = hypotenuse of the right-angled triangle BCD.

### Connect:

- Let's find the measure of diagonal BD

### Tutor points:

- Explain and write the measure of diagonal BD.

### Explain and write:

- $\triangle ABCD$  is a right-angled triangle.  
 $(BD)^2 = (BC)^2 + (CD)^2$   
 $(BD)^2 = 6^2 + 8^2$   
 $(BD)^2 = 36 + 64 = 100$   
 $BD = 10 \text{ cm}$

### Connect:

- We have the diagonal BD, perpendicular BC and we need perpendicular from A to BD to calculate the area of the quadrilateral.

### Tutor points:

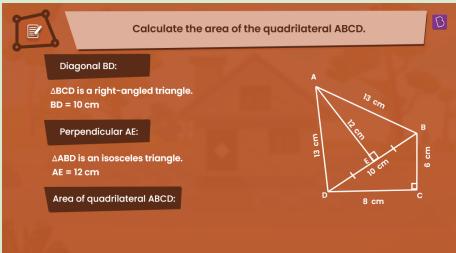
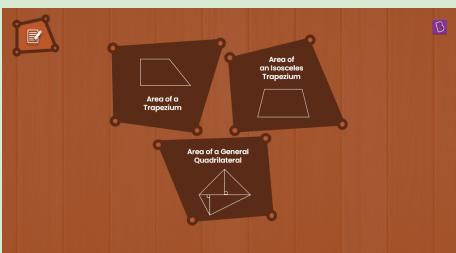
- Explain and write the measure of perpendicular AE.

### Explain and write:

- Let AE be the perpendicular from A to BD.
- Given,  $AB = AD = 13 \text{ cm}$
- So  $\triangle ABD$  is an isosceles triangle.
- Since  $\triangle ABD$  is an isosceles triangle with  $AB = AD$ , AE is the perpendicular bisector of BD.

- $DE = EB = 5 \text{ cm}$
- $\triangle AED$  and  $\triangle AEB$  are right-angled triangles.

In  $\triangle AED$ ,  
 $(AD)^2 = (AE)^2 + (ED)^2$   
 $13^2 = (AE)^2 + 5^2$   
 $(AE)^2 = 169 - 25 = 144$   
 $AE = 12 \text{ cm}$

			<p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Let's find the area of the quadrilateral.</li> </ul>
42	 <p>Calculate the area of the quadrilateral ABCD.</p> <p>Diagonal BD:  <math>\triangle BCD</math> is a right-angled triangle.  <math>BD = 10 \text{ cm}</math></p> <p>Perpendicular AE:  <math>\triangle ABD</math> is an isosceles triangle.  <math>AE = 12 \text{ cm}</math></p> <p>Area of quadrilateral ABCD:</p>	<p>Area of quadrilateral ABCD  <math>= \text{area of } \triangle ABD + \text{area of } \triangle BCD</math>  <math>= (\frac{1}{2} \times BD \times AE) + (\frac{1}{2} \times BD \times BC)</math>  <math>= \frac{1}{2} \times BD \times (AE + BC)</math>  <math>= \frac{1}{2} \times 10 \times (12 + 6)</math>  <math>= 5 \times 18</math>  <math>= 90 \text{ cm}^2</math></p>	<p><b>Tutor points:</b></p> <ul style="list-style-type: none"> <li>Explain and write the area of quadrilateral.</li> </ul> <p><b>Explain and write:</b></p> <ul style="list-style-type: none"> <li>Area of quadrilateral ABCD = area of <math>\triangle ABD</math> + area of <math>\triangle BCD</math>  <math>= (\frac{1}{2} * BD * AE) + (\frac{1}{2} * BD * BC)</math>  <math>= \frac{1}{2} * BD * (AE + BC)</math>  <math>= \frac{1}{2} * 10 * (12 + 6)</math>  <math>= 5 * 18</math>  <math>= 90 \text{ cm}^2</math></li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Moving on! Let's see what our friend Alex and his father are doing.</li> </ul>
43			<p><b>Narration:</b></p> <ul style="list-style-type: none"> <li>Wow, now their hut looks really good.</li> <li>Finally they are done with renovation.</li> <li>They are very happy that they are done with renovation.</li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Now it is your turn to speak.</li> </ul>
44	 <p>Doubt Board</p>		<p><b>Tutor points:</b></p> <ul style="list-style-type: none"> <li>Encourage students to ask doubts.</li> <li>Clarify the doubts asked by the students.</li> </ul> <p><b>Connect:</b></p> <ul style="list-style-type: none"> <li>Now that all doubts are cleared out, we have reached to summarize what we have learnt in this session.</li> </ul>
45			<p><b>Summarise:</b></p> <ul style="list-style-type: none"> <li>Area of trapezium</li> <li>Area of an isosceles trapezium</li> <li>Area of general quadrilateral</li> </ul> <p><b>Closure:</b></p> <ul style="list-style-type: none"> <li>Say that we are at the end of this session.</li> <li>Ask the students to visit the</li> </ul>

			<p>BYJU's-The learning app to practice more quality questions until the topic completely crystallizes in your mind.</p> <ul style="list-style-type: none"> <li>• Goodbye to the students.</li> </ul>
46			<p><b>End of the Session.</b></p>