



THIRD SPACE  
LEARNING

# Diagnostic Questions

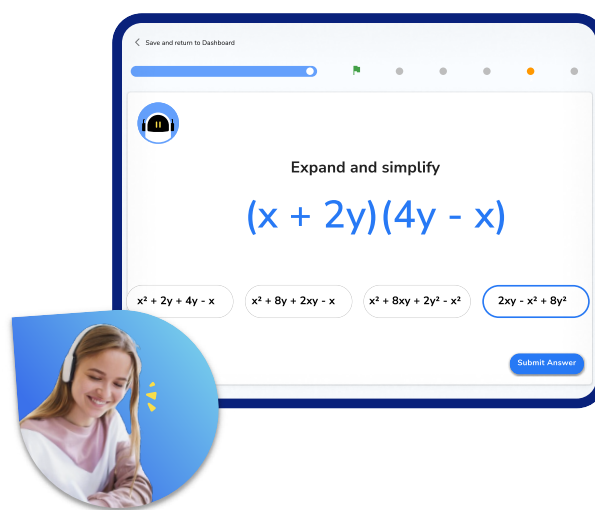
Shapes | Geometry & Measure

## This resource in a nutshell

Diagnostic questions are a quick and easy way of assessing your students' knowledge and understanding of a particular topic.

Students may be struggling with **shapes** for a number of different reasons. Diagnostic questions can help to identify the particular misconception that the student has and help to determine the specific support they will need in order to improve.

They are low stakes and support students developing metacognition around how their learning is progressing and what they need to do to improve further.



At Third Space Learning, we use diagnostic questions before and after online tutoring sessions to identify gaps and track progress, an example of this is shown above.

## How to use the questions in this resource

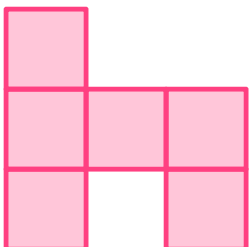
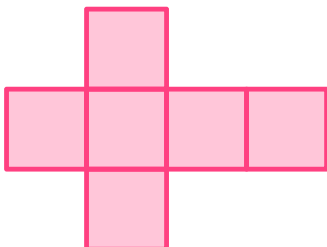
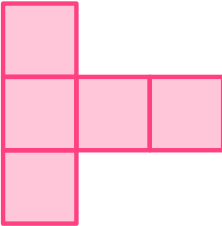
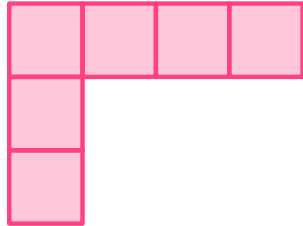
There are 20 multiple choice questions, each designed to assess each of the key skills required to master the given topic. Each question has **one correct answer** and **three carefully chosen incorrect answers** that are designed to identify and highlight fundamental misconceptions, including: **Confusing vertices, edges and faces, Incomplete properties of quadrilaterals**, and the **Order of rotational symmetry**.

When answering these questions, students should be **encouraged to explain why they have chosen a particular answer**, and why the other three answers are incorrect. This can be done verbally in small groups, or written down on the worksheet or in their books.

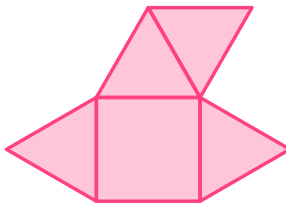
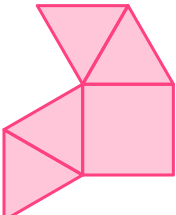
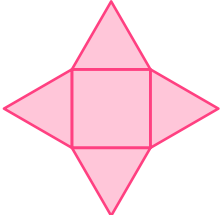
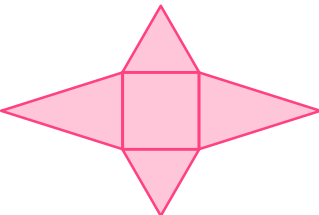
This resource has been designed to be as **flexible** as possible with questions that can be easily chopped up and reordered, and come with a separate answer sheet that details all of the misconceptions highlighted in the answers.

## Diagnostic Questions: Shapes

1. Select the net that forms a cube:

<p>A)</p> 	<p>B)</p> 
<p>C)</p> 	<p>D)</p> 

2. Select the net that forms a square-based pyramid:

<p>A)</p> 	<p>B)</p> 
<p>C)</p> 	<p>D)</p> 

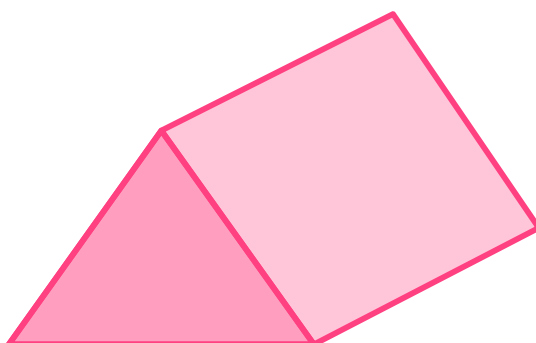
## Diagnostic Questions: Shapes

3. How many vertices does a cuboid have?



A) 6	B) 8
C) 12	D) 7

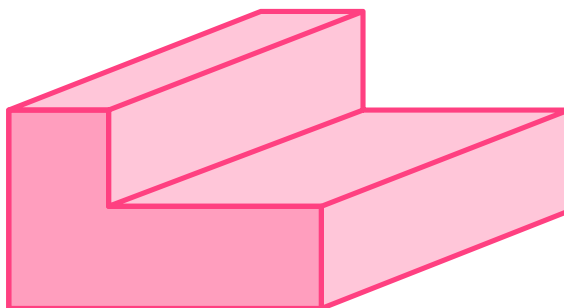
4. How many edges are on a triangular prism?



A) 9	B) 6
C) 5	D) 3

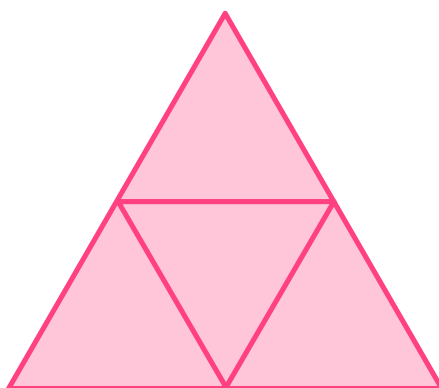
## Diagnostic Questions: Shapes

5. How many faces does an L-shaped prism have?



A) 5	B) 8
C) 6	D) 12

6. Pictured is the net of a tetrahedron. How many edges does this 3D object have?



A) 6	B) 3
C) 9	D) 4

## Diagnostic Questions: Shapes

7. Identify the 2D shape from its properties:

- 4 equal sides
- Opposite angles are equal
- Opposite sides are parallel
- Shape does not contain vertices that meet at  $90^\circ$

A) Square	B) Octagon
C) Rhombus	D) Parallelogram

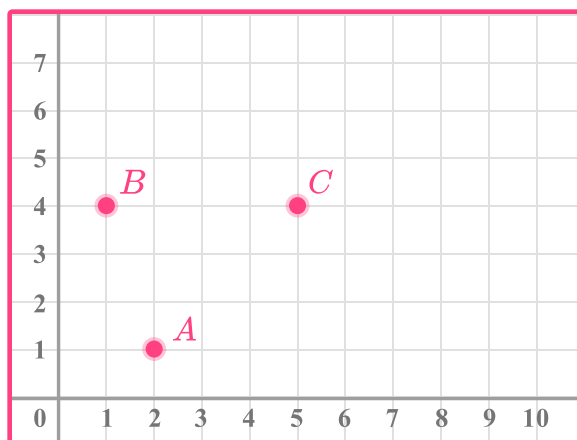
8. Identify the 2D shape from its properties:

- 2 vertices
- One straight side
- One curved side

A) Cone	B) Semicircle
C) Oval	D) Arc

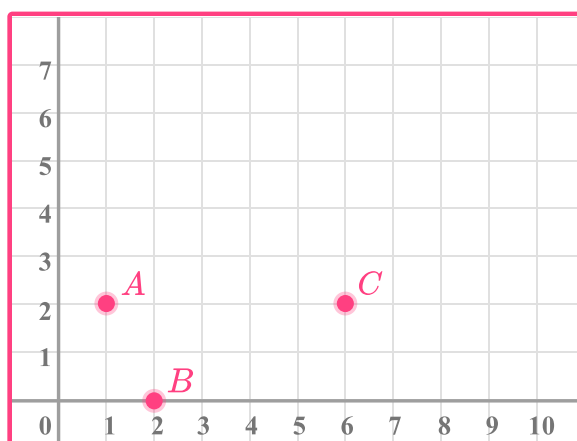
## Diagnostic Questions: Shapes

9. Considering the 1st quadrant only, find the point  $D(x, y)$  that makes  $ABCD$  a parallelogram, such that  $x + y < 10$



A) (2, 5)	B) (4, 7)
C) (4, 1)	D) (6, 1)

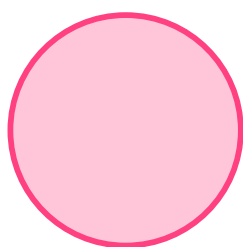
10. Considering the 1st quadrant only, find the point  $D(x, y)$  that makes  $ABCD$  a rectangle:



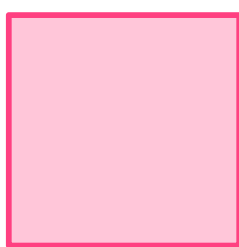
A) (5, 4)	B) (7, 0)
C) (2, 4)	D) (4, 5)

## Diagnostic Questions: Shapes

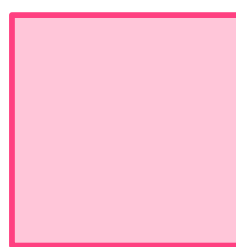
11. Identify the 3D object given by:



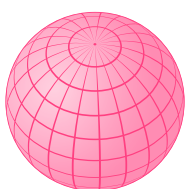
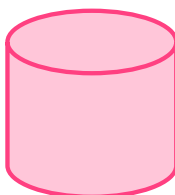
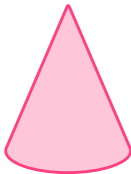

Plan



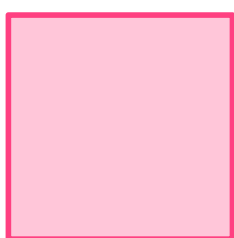
Front elevation



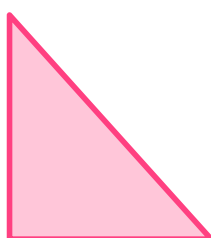
Side elevation

<p>A)</p> 	<p>B)</p> 
<p>C)</p> 	<p>D)</p> 

12. Identify the 3D object given by:



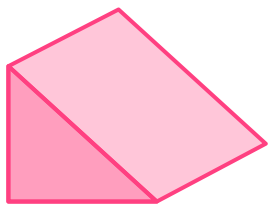
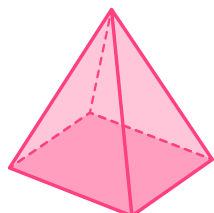
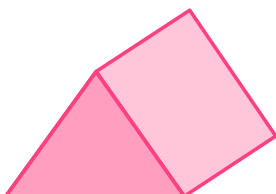
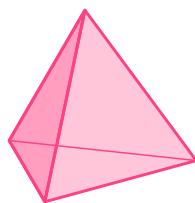
Plan



Front elevation




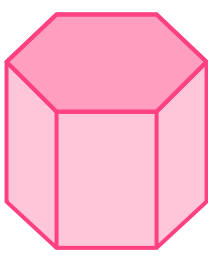
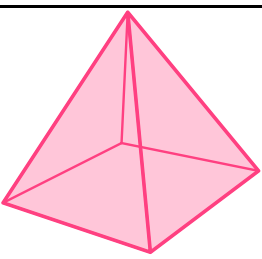
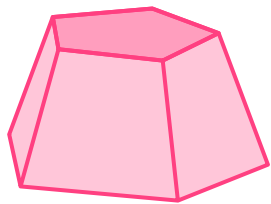
Side elevation

<p>A)</p> 	<p>B)</p> 
<p>C)</p> 	<p>D)</p> 


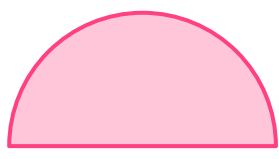
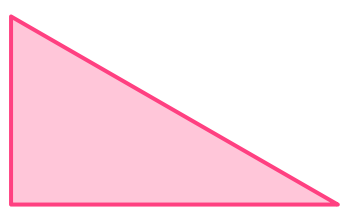
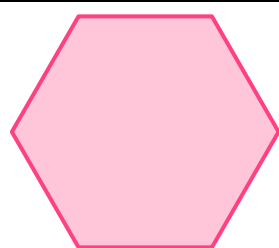


## Diagnostic Questions: Shapes

13. Identify the prism:


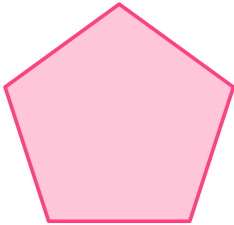
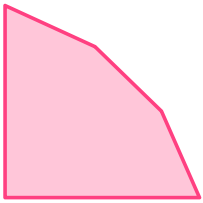
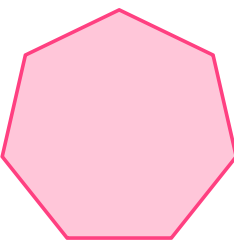
A) 	B) 
C) 	D) 

14. Identify the shape that is not a polygon:

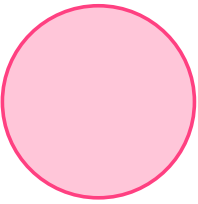
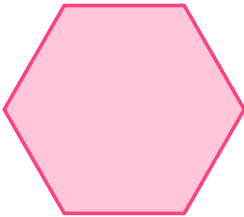
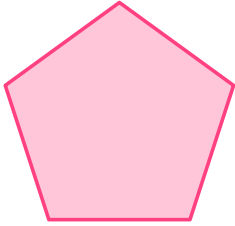
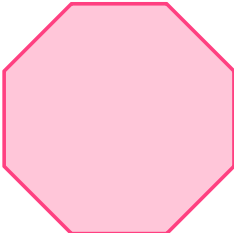
A) 	B) 
C) 	D) 

## Diagnostic Questions: Shapes

15. Identify the regular pentagon:


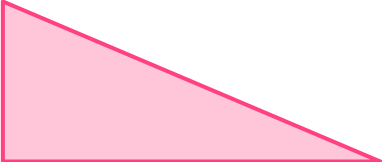


A) 	B) 
C) 	D) 

16. Identify the shape that tessellates:

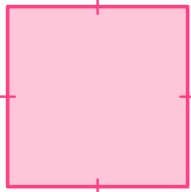
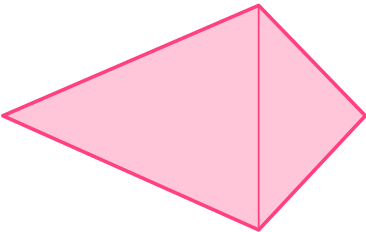

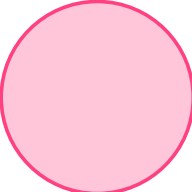
A) 	B) 
C) 	D) 

## Diagnostic Questions: Shapes

17. Identify the shape that has reflection symmetry:

A) 	B) 
C) 	D) 

18. Identify the shape that has rotational symmetry of order 2:

A) 	B) 
C) 	D) 

## Diagnostic Questions: Shapes

19. An  $n$ -sided polygon can be divided into how many triangles?

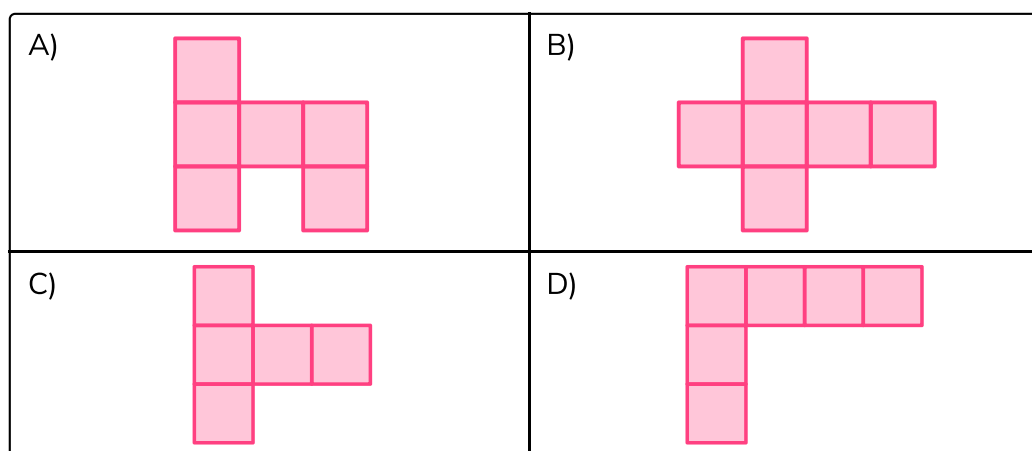
A) 1	B) $n$
C) $n - 2$	D) $n - 1$

20. Which congruent regular polygon can a regular hexagon be divided into exactly six times?

A) rhombuses	B) isosceles trapezia
C) equilateral triangles	D) regular hexagons

## Diagnostic Questions: Shapes Answers

1. Select the net that forms a cube:



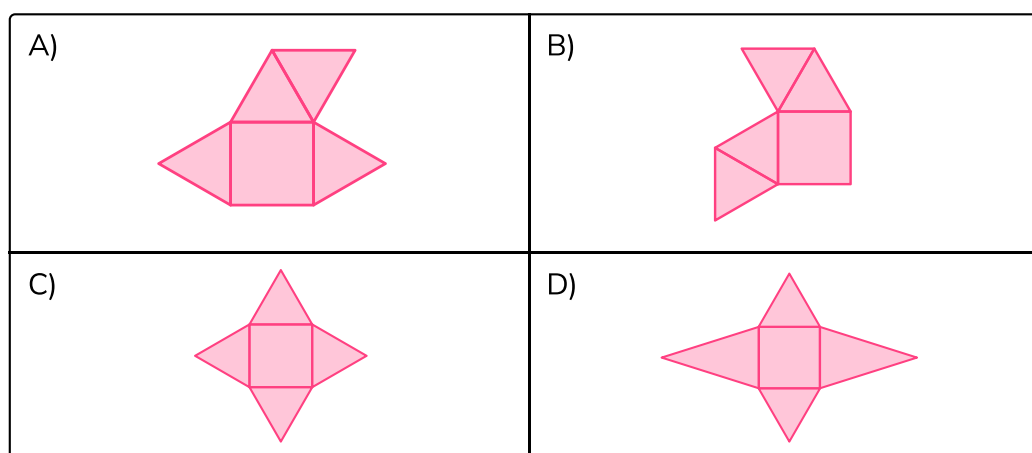
A) Student does not recognise when two faces overlap

B) **Correct answer**

C) Student does not know that a cube is made from 6 square faces

D) Student does not recognise when two faces overlap

2. Select the net that forms a square-based pyramid:



A) Student does not recognise when two faces overlap

B) Student does not recognise when two faces overlap

C) **Correct answer**

D) Student does not understand that touching sides of a net must be the same length

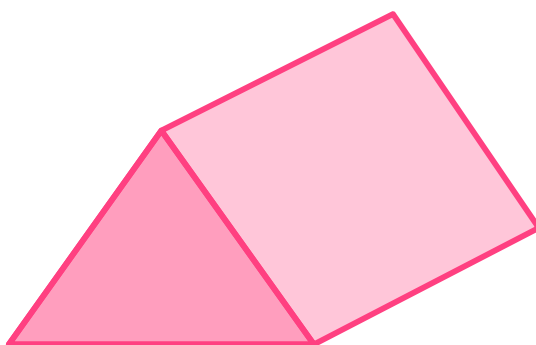
## Diagnostic Questions: Shapes Answers

3. How many vertices does a cuboid have?



- A) 6 Student counted the number of faces
- B) 8 Correct answer
- C) 12 Student counted the number of edges
- D) 7 Student counted the number of visible vertices

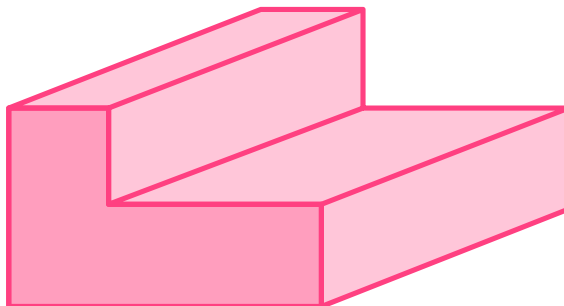
4. How many edges are on a triangular prism?



- A) 9 Correct answer
- B) 6 Student determined the number of visible edges
- C) 5 Student determined the number of visible vertices
- D) 3 Student counted the number of edges on the cross-section of the prism

## Diagnostic Questions: Shapes Answers

5. How many faces does an L-shaped prism have?



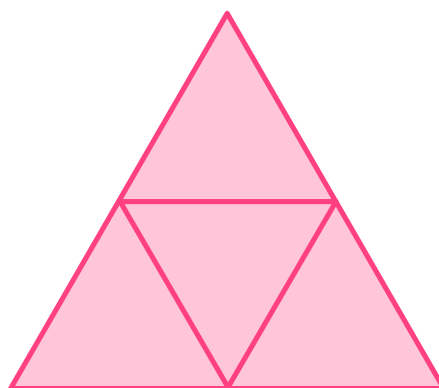
A) 5 Student counted the visible faces

B) 8 Correct answer

C) 6 Student forgot to include the faces of the cross section

D) 12 Student counted the number of vertices

6. Pictured is the net of a tetrahedron. How many edges does this 3D object have?



A) 6 Correct answer

B) 3 Student counted the number of sides of the net

C) 9 Student did not visualise the folded net as a 3D object

D) 4 Student counted the number of faces (or vertices)

## Diagnostic Questions: Shapes Answers

7. Identify the 2D shape from its properties:

- 4 equal sides
- Opposite angles are equal
- Opposite sides are parallel
- Shape does not contain corners of  $90^\circ$

A) Square Student did not use the condition on the angle sizes

B) Octagon Student considered a shape with more than 4 sides

C) Rhombus Correct answer

D) Parallelogram Student did not use the information of 4 equal sides

8. Identify the 2D shape from its properties:

- 2 vertices
- One straight side
- One curved side

A) Cone Student identified a 3D object

B) Semicircle Correct answer

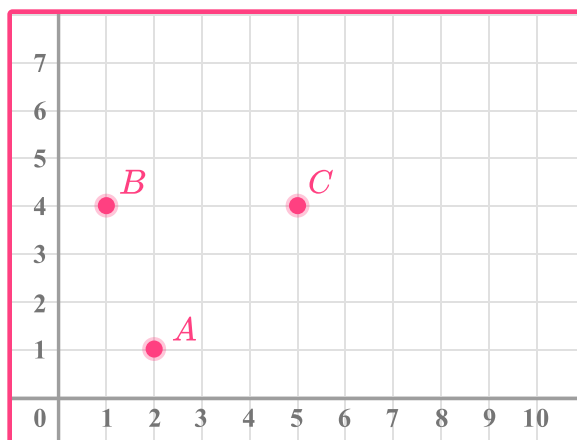
C) Oval Student does not understand what vertices are

D) Arc Student identified part of a shape, rather than a closed object



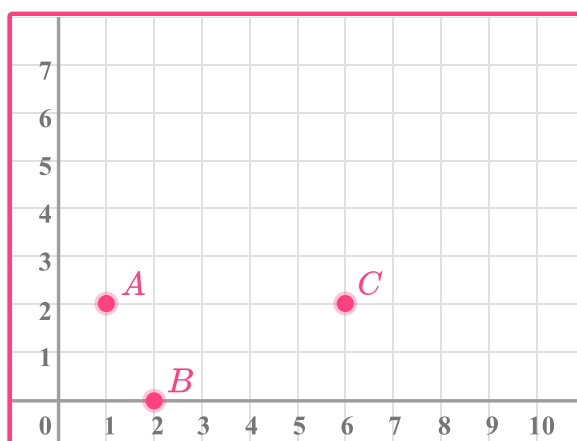
## Diagnostic Questions: Shapes Answers

9. Considering the 1st quadrant only, find the point  $D(x, y)$  that makes  $ABCD$  a parallelogram, such that  $x + y < 10$



- A) (2, 5) Student does not understand the properties of a parallelogram vs a trapezium  
 B) (4, 7) Student forgot to check  $x$  and  $y$  satisfy the inequality  
 C) (4, 1) Student does not understand the properties of a parallelogram  
 D) (6, 1) Correct answer

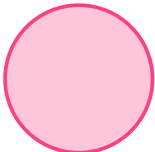
10. Considering the 1st quadrant only, find the point  $D(x, y)$  that makes  $ABCD$  a rectangle:



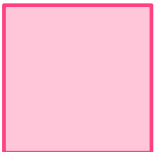
- A) (5, 4) Correct answer  
 B) (7, 0) Student does not understand the properties of a rectangle vs a parallelogram  
 C) (2, 4) Student does not understand the properties of a rectangle vs a kite  
 D) (4, 5) Student wrote the coordinates in the wrong order

## Diagnostic Questions: Shapes Answers


11. Identify the 3D object given by:







Plan



Front elevation



Side elevation

<p>A)</p> 	<p>B)</p> 
<p>C)</p> 	<p>D)</p> 

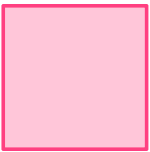
A) Student only used the plan to make their choice

**B) Correct answer**

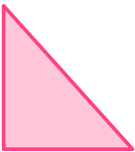
C) Student does not understand that the front and side elevations would be triangles

D) Student does not understand that the front and side elevations would be semicircles

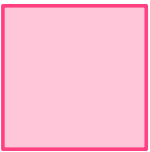
12. Identify the 3D object given by:



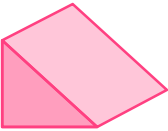
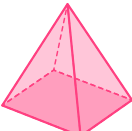
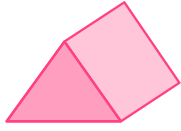

Plan



Front elevation



Side elevation

<p>A)</p> 	<p>B)</p> 
<p>C)</p> 	<p>D)</p> 

**A) Correct answer**

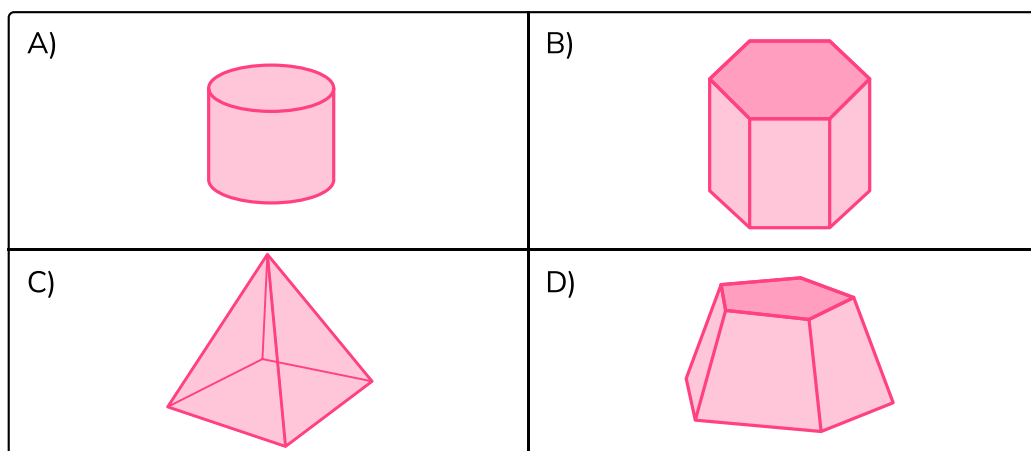
B) Student does not understand that the front and side elevations would be the same for this shape

C) Student did not fully consider the front elevation

D) Student does not understand that a tetrahedron has 4 triangular faces

## Diagnostic Questions: Shapes Answers

13. Identify the prism:



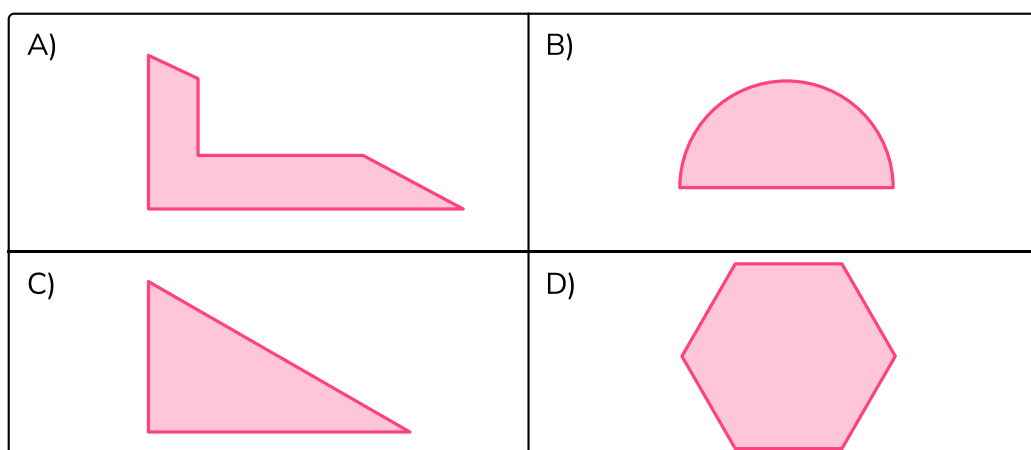
A) Student does not understand that a cylinder is not a prism

B) **Correct answer**

C) Student does not understand that a prism has the same cross-section

D) Student does not understand that a pentagonal frustum does not have the same cross-section

14. Identify the shape that is not a polygon:



A) Student does not understand that a polygon can be irregular.

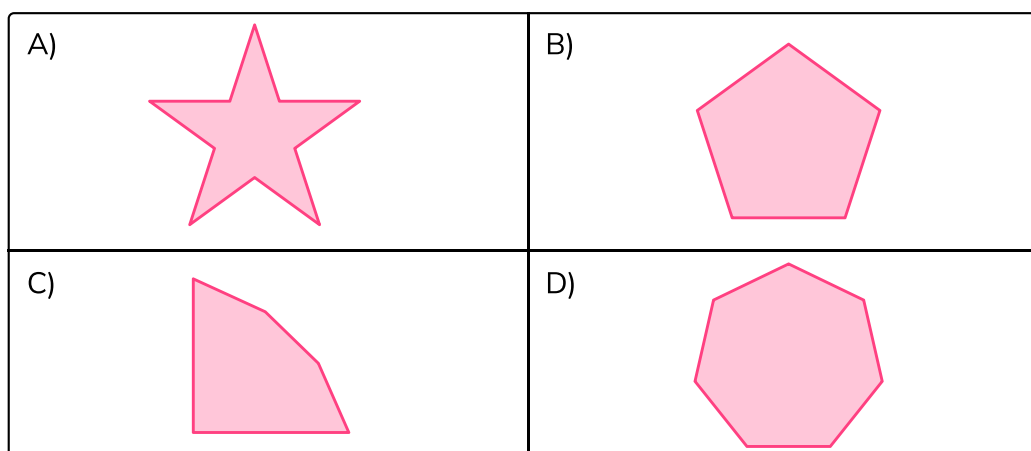
B) **Correct answer**

C) Student does not understand that a polygon can be a scalene triangle

D) Student does not understand the definition of a polygon

## Diagnostic Questions: Shapes Answers

15. Identify the regular pentagon:



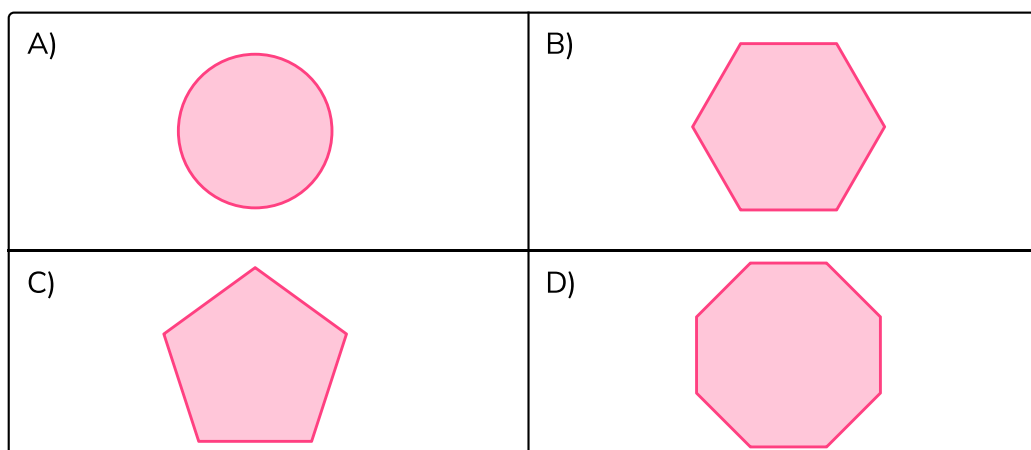
A) Student does not understand the definition of a pentagon (5-sided shape)

B) Correct answer

C) Student does not understand what makes a shape regular.

D) Student does not understand the definition of a pentagon (5-sided shape)

16. Identify the shape that tessellates:



A) Student does not understand the definition of tessellation

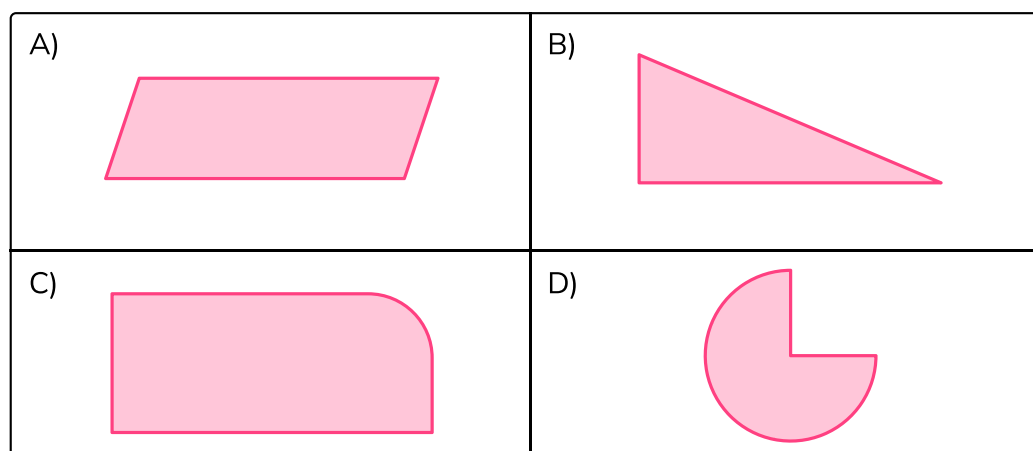
B) Correct answer

C) Student does not understand that  $360^\circ$  divided by the interior angle of a regular pentagon is not an integer ( $360 \div 108 = 3.\bar{3}$ )

D) Student does not understand that octagons form a semi-tessellation (with squares)

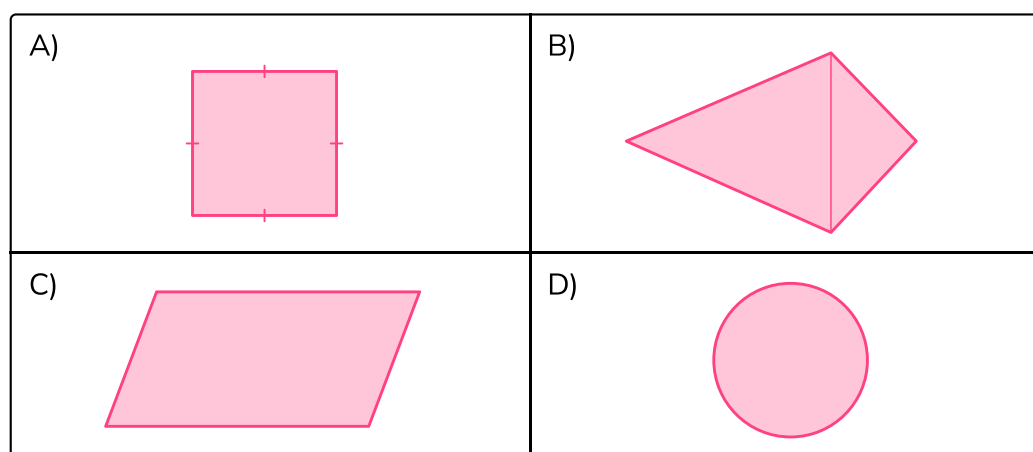
## Diagnostic Questions: Shapes Answers

17. Identify the shape that has reflection symmetry:



- A) Student incorrectly assumed lines of symmetry along the diagonals  
 B) Student assumed a line of symmetry perpendicular to the longest side  
 C) Student did not take the curved corner of the shape into account  
 D) **Correct answer**

18. Identify the shape that has rotational symmetry of order 2:



- A) Student only considered a  $180^\circ$  turn for a square, twice  
 B) Student did not rotate the kite about its centre and did not carefully match the image to the original object  
 C) **Correct answer**  
 D) Student only considered a  $180^\circ$  turn for a circle, twice

## Diagnostic Questions: Shapes Answers

19. An  $n$ -sided polygon can be divided into how many triangles?

- A) 1 Student thought the  $n$ -sided shape was a triangle
- B)  $n$  Student matched the number of triangles to the number of sides
- C)  $n - 2$  Correct answer
- D)  $n - 1$  Student attempted to count the number of dividing lines needed

20. Which congruent regular polygon can a regular hexagon be divided into exactly six times?

- A) Rhombus Student did not consider the number of times the regular polygon is divided into a rhombus (e.g. 3 or 12).
- B) Isosceles trapezia Student did not consider the number of times the regular polygon is divided into an isosceles trapezium (2)
- C) Equilateral triangles Correct answer
- D) Regular hexagons Student confused the concepts of similarity and congruence

# Where to go next?

For more diagnostic questions, and GCSE maths revision resources and worksheets to support students in fixing any misconceptions take a look at the free Third Space Learning [GCSE maths revision](#) pages.

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