

19. Three-Dimensional Figures

Exercise 19A

1. Question

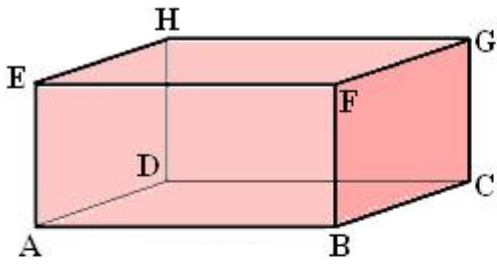
Write down the number of faces of each of the following figures:

- A. Cuboid
- B. Cube
- C. Triangular prism
- D. Square pyramid
- E. Tetrahedron

Answer

- A. 6

Face is also known as sides. A Cuboid has six faces.



The six faces of the cuboid are:

1) ABFE

2) BFGC

3) GHDC

4) HEAD

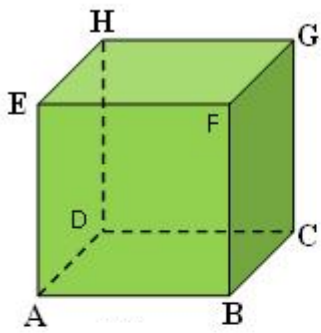
5) DCBA

6) HGFE

Book, Matchbox, Brick etc. are examples of Cuboid.

B.6

A Cube has six faces and all faces are equal in length.



The six faces of the cube are:

1) ABFE

2) BCGF

3) CDHG

4) ADHE

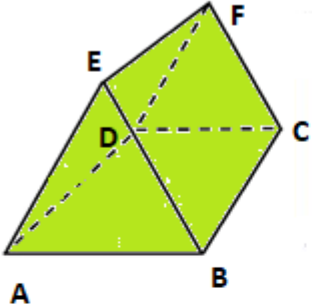
5) GHFE

6) ABCD

Sugar Cubes, Dice etc. are examples of Cube.

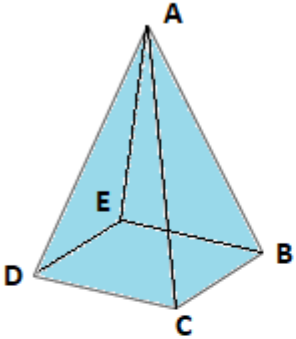
C. 5

A Triangular prism has two triangular faces and three rectangular faces.

| | |
|---|---|
|  | <p><u>The five faces of the triangular prism are:</u></p> <ol style="list-style-type: none">1) ABE2) ABCD3) BCFE4) AEFD5) FDC |
|---|---|

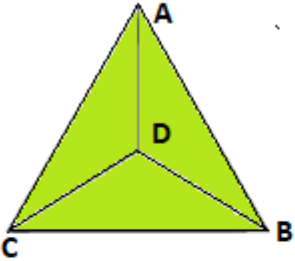
D. 5

A Square pyramid has one square face as a base and four triangular faces as the sides. So, Square pyramid has total five faces.

| | |
|---|---|
|  | <p><u>The five faces of the square pyramid are:</u></p> <ol style="list-style-type: none">1) ABC2) ACD3) ABE4) AED5) BEDC |
|---|---|

E. 4

A Tetrahedron (Triangular Pyramid) has one triangular face as a base and three triangular faces as the sides. So, Tetrahedron has total four faces.

| | |
|---|--|
|  | <p><u>The five faces of the tetrahedron are:</u></p> <ol style="list-style-type: none"> 1) ABC 2) ACD 3) ABE 4) AED 5) BEDC |
|---|--|

2. Question

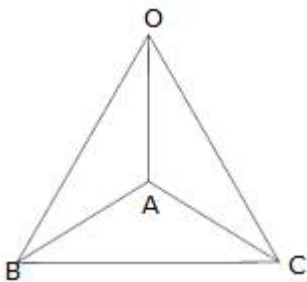
Write down the number of edges of each of the following figures:

- A. Tetrahedron
- B. Rectangular pyramid
- C. Cube
- D. Triangular prism

Answer

A. 6

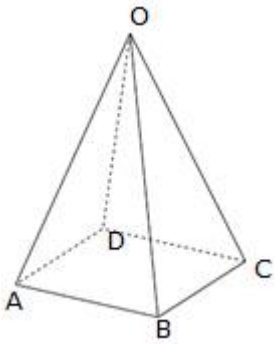
A Tetrahedron has six edges.



OA, OB, OC, AB, AC, BC are the 6 edges.

B. 8

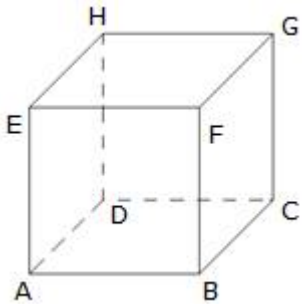
A Rectangular Pyramid has eight edges.



AB, BC, CD, DA, OA, OB, DC, OD are the 8 edges.

C. 12

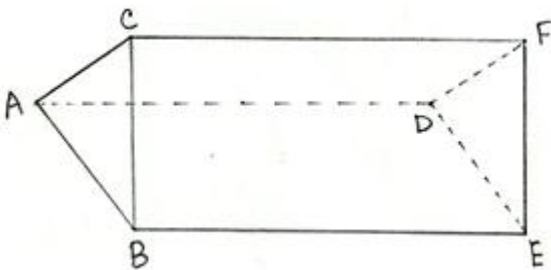
A Cube has twelve edges.



AB, BC, CD, DA, EF, FG, GH, HE, AE, DH, BF, CG are the edges.

D. 9

A Triangular prism has nine edges.



AB, BC, CA, DE, EF, FD, AD, BE, CF are the 9 edges.

3. Question

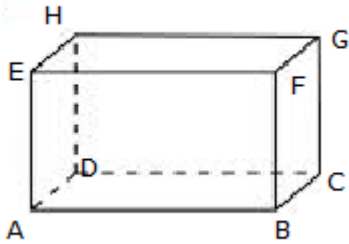
Write down the number of vertices of each of the following figures:

- A. Cuboid
- B. Square pyramid
- C. Tetrahedron
- D. Triangular prism

Answer

A. 8

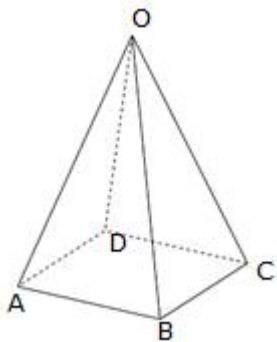
A Cuboid has eight vertices.



A, B, C, D, E, F, G, H are the 8 vertices.

B. 5

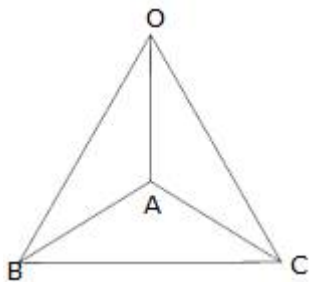
A Square Pyramid has five vertices.



O, A, B, C, D are the 5 vertices.

C. 4

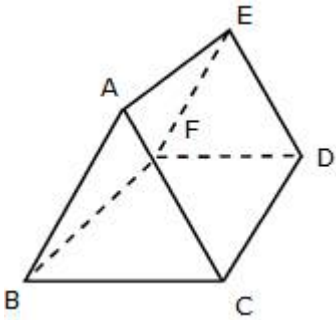
A Tetrahedron has four vertices.



O, A, B, C are the vertices.

D. 6

A Triangular prism has six vertices.



A, B, C, D, E, F are the vertices.

4. Question

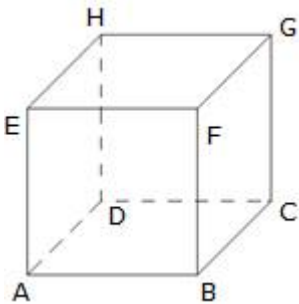
Fill in the blanks:

- A. A cube has..... vertices,edges andfaces.
- B. The point at which three faces of a figure meet is known as its.....
- C. A cuboid is also known as a rectangular.....
- D. A triangular pyramid is called a.....

Answer

A. 8, 12, 6

A Cube has 8 vertices, 12 edges and 6 faces.



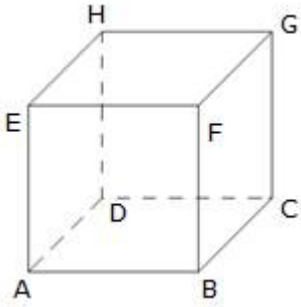
A, B, C, D, E, F, G, H are the 8 vertices.

AB, BC, CD, DA, EF, FG, GH, HE, AE, DH, BF, CG are the 12 edges.

ABCD, EFGH, ADHE, BCGF, ABFE and DCGH are the 6 faces

B. vertex

Vertex is the point where faces meet.



A is the vertex for AB, AD and EA.

C. Prism

A cuboid is also known as rectangular prism because a rectangular prism has six rectangular shaped sides with all sides at an angle 90° to each other.

Therefore, it can also be called a cuboid.

D. Tetrahedron

The tetrahedron is a polyhedron with a flat polygon base and the triangular faces that connect the base to a common point. Therefore, it is called a triangular pyramid.

Exercise 19B

1. Question

Define Euler's relation between the number of faces, number of edges and number of vertices for various 3-dimensional figures.

Answer

Leonhard Euler has defined the relation between the number of faces, number of edges and number of vertices for various 3-dimensional figures is called as Euler's formula. This formula works with shapes called Polyhedron. A Polyhedron is a closed solid shape which has flat faces and straight edges like cube.

According to him

$$F + V - E = 2$$

Where F denotes the number of face

V denotes the number of vertices

E denotes the number of edges.

| Shape | Faces | Vertices | Edges | $F + V - E$ |
|------------|-------|----------|-------|-------------|
| Cube | 6 | 8 | 12 | 2 |
| Octahedron | 8 | 6 | 12 | 2 |

2. Question

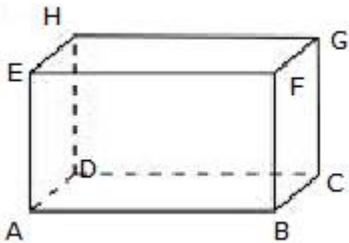
How many edges are there in a

- A. cuboid
- B. tetrahedron
- C. triangular prism
- D. square pyramid?

Answer

- A. 12

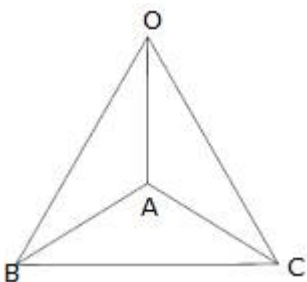
A Cuboid has twelve edges.



AB, BC, CD, DA, EF, FG, GH, HE, AE, DH, BF, CG are the 12 edges.

- B. 6

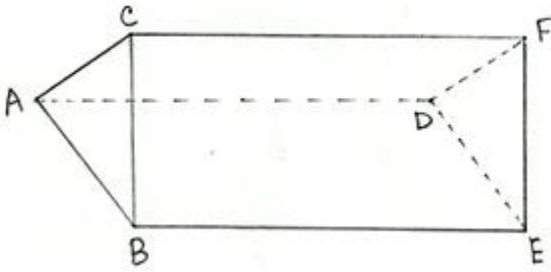
A Tetrahedron has six edges.



OA, OB, OC, AB, AC, BC are the 6 edges.

C. 9

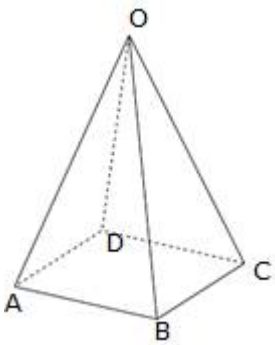
A Triangular prism has nine edges.



AB, BC, CA, DE, EF, FD, AD, BE, CF are the edges.

D. 8

A Square Pyramid has eight edges.



AB, BC, CD, DA, OA, OB, DC, OD are the edges.

3. Question

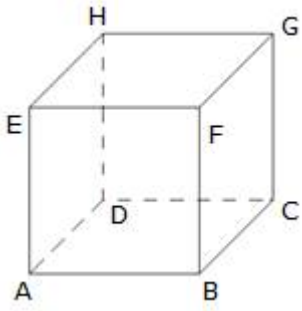
How many faces are there in a

- A. cube
- B. pentagonal prism
- C. tetrahedron
- D. pentagonal pyramid?

Answer

A. 6

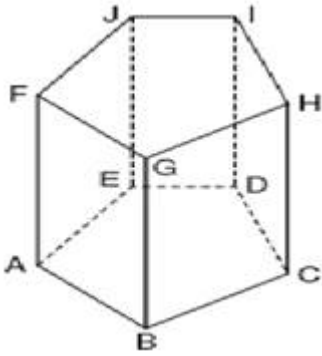
A Cube has six faces.



ABCD, EFGH, ADHE, BCGF, ABFE and DCGH are the 6 faces

B. 7

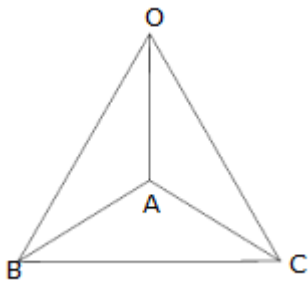
A pentagonal prism has seven faces.



ABGF, AEJF, EDIJ, CDIH, BCGH, ABCDE and FGHIJ are the faces.

C. 4

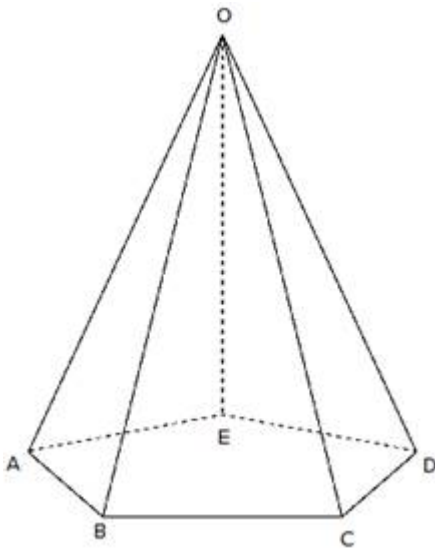
A Tetrahedron has four faces



OAB, OAC, OBC and ABC are the faces.

D. 6

A pentagonal pyramid has six faces.



OAB, OBC, OCD, OAE, ODE and ABCDE are the faces.

4. Question

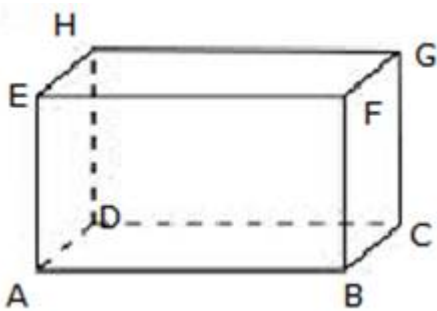
How many vertices are there in a

- A. cuboid
- B. tetrahedron
- C. pentagonal prism
- D. square pyramid?

Answer

- A. 8

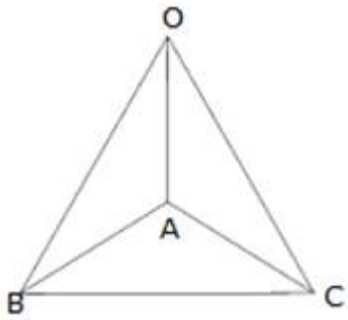
A Cuboid has eight vertices.



A, B, C, D, E, F, G, H are the vertices.

- B. 4

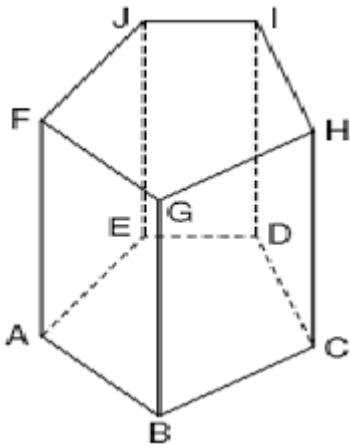
A Tetrahedron has four vertices.



O, A, B, C are 4 the vertices.

C. 10

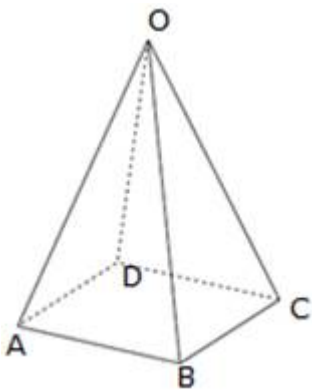
A pentagonal prism has ten vertices.



A, B, C, D, E, F, G, H, I, J are the 10 vertices.

D. 5

A Square Pyramid has five vertices.



O, A, B, C, D are the vertices.

5. Question

Verify Euler's relation for each of the following:

A. A cube

B. A tetrahedron

C. A triangular prism

D. A square pyramid

Answer

A.

According to Euler's Formula

$$F + V - E = 2$$

Where F denotes the number of face

V denotes the number of vertices

E denotes the number of edges.

| Shape | Faces | Vertices | Edges | F + V - E |
|-------|-------|----------|-------|-----------|
| Cube | 6 | 8 | 12 | 2 |

B.

According to Euler's Formula

$$F + V - E = 2$$

Where F denotes the number of face

V denotes the number of vertices

E denotes the number of edges.

| Shape | Faces | Vertices | Edges | F + V - E |
|-------------|-------|----------|-------|-----------|
| Tetrahedron | 4 | 4 | 8 | 2 |

C.

According to Euler's Formula

$$F + V - E = 2$$

Where F denotes the number of face

V denotes the number of vertices

E denotes the number of edges.

| Shape | Faces | Vertices | Edges | $F + V - E$ |
|------------------|-------|----------|-------|-------------|
| Triangular Prism | 5 | 6 | 9 | 2 |

D.

According to Euler's Formula

$$F + V - E = 2$$

Where F denotes the number of face

V denotes the number of vertices

E denotes the number of edges.

| Shape | Faces | Vertices | Edges | $F + V - E$ |
|----------------|-------|----------|-------|-------------|
| Square Pyramid | 5 | 5 | 8 | 2 |