RD Sharma Solutions for Class 8 Math Chapter 19 - Visualising Shapes

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Question 7:

Using Euler's formula find the unknown:

Faces	?	5	20
Vertices	6	?	12
Edges	12	9	?

ANSWER:

We know that the Euler's formula is: $F+V = E+2$

(i)

The number of vertices V is 6 and the number of edges E is 12.

Using Euler's formula:

$F+6 = 12+2$

$F+6 = 14$

$F = 14-6$

$F = 8$

So, the number of faces in this polyhedron is 8.

(ii)

Faces, $F = 5$

Edges, $E = 9$.

We have to find the number of vertices.

Putting these values in Euler's formula:

$5+V = 9+2$

$5+V = 11$

$V = 11-5$

$V = 6$

So, the number of vertices in this polyhedron is 6.

(iii)

Number of faces $F = 20$

Number of vertices $V = 12$

Using Euler's formula:

$20+12 = E+2$

$32 = E+2$

$E+2 = 32$

$E = 32-2$

$E = 30$.

So, the number of edges in this polyhedron is 30.

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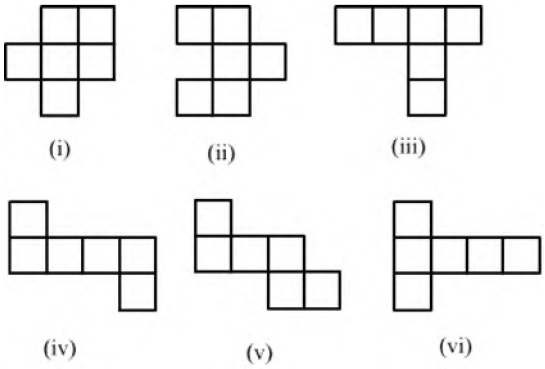
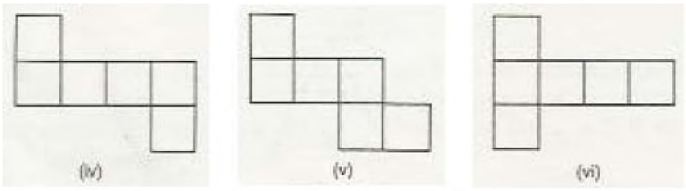
Question 1:

Which among the following are nets for a cube?



ANSWER:

To create a cube, we need six equal faces that enclose a closed box. In the given figure, only (iv), (v) and (vi) are such nets that enclose a box when we fold each face from the edge.



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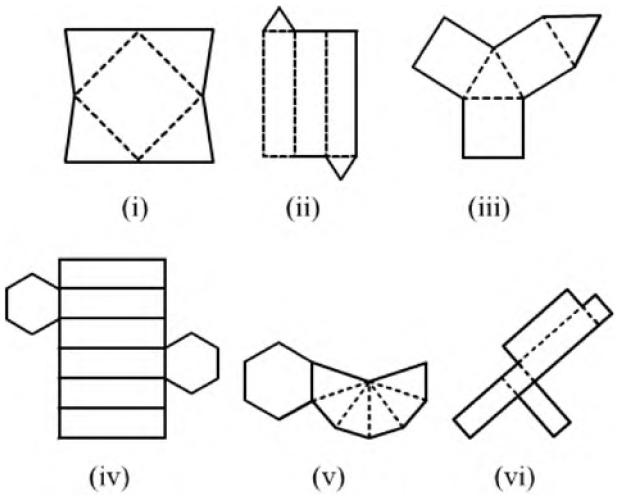
Question 2:

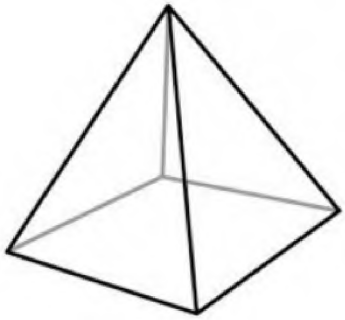
Name the polyhedron that can be made by folding each net:



ANSWER:

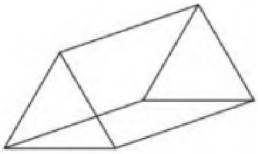
(i)

If we fold the given figure from the edges, we'll get a pyramid with a square base.



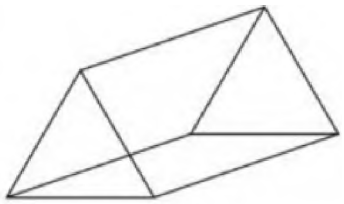
(ii)

If we fold the given polyhedron from the edges, we'll get a triangular prism.



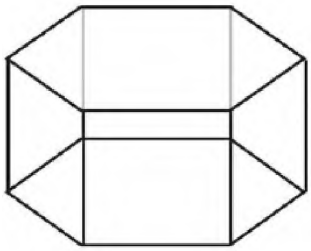
(iii)

If we fold the given polyhedron from the edges, we'll get a triangular prism.



(iv)

If we fold the given polyhedron from the edges, we'll get a hexagonal prism.

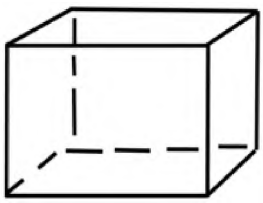


(v)

If we fold the given net from the edges, we'll get a hexagonal pyramid.

(vi)

If we fold the given net from the edges, we'll get a cuboid.



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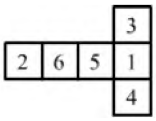
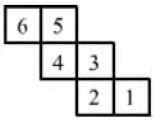
Question 3:

Dice are cubes where the numbers on the opposite faces must total 7. Which of the following are dice?

(i)

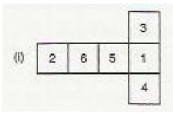


(ii)



ANSWER:

Among the given figures, only figure (i) is a dice.
This is because if we fold the given net from the edges, we'll get a cube in which the sum of the opposite faces is 7.



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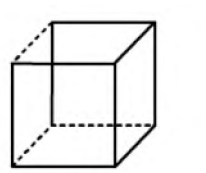
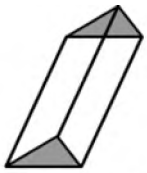
Question 4:

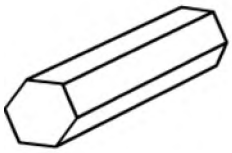
Draw nets for each of the following polyhedrons:



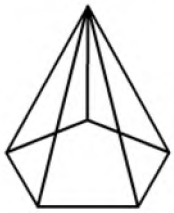
A cube



A triangular prism



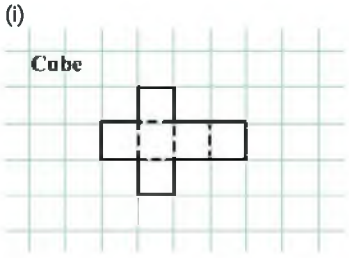
A hexagonal prism



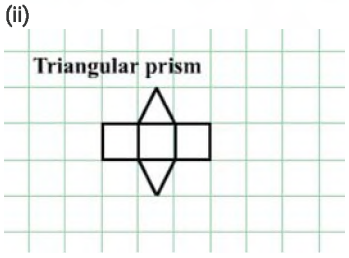
A pentagonal pyramid

ANSWER:

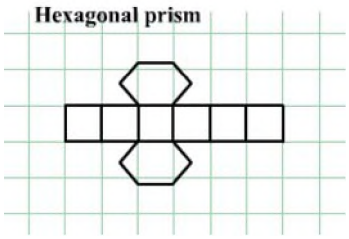
(i)



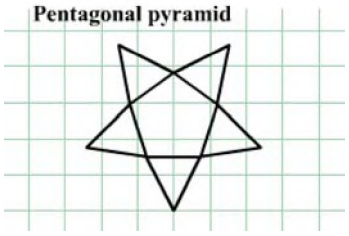
(ii)



(iii)



(iv)



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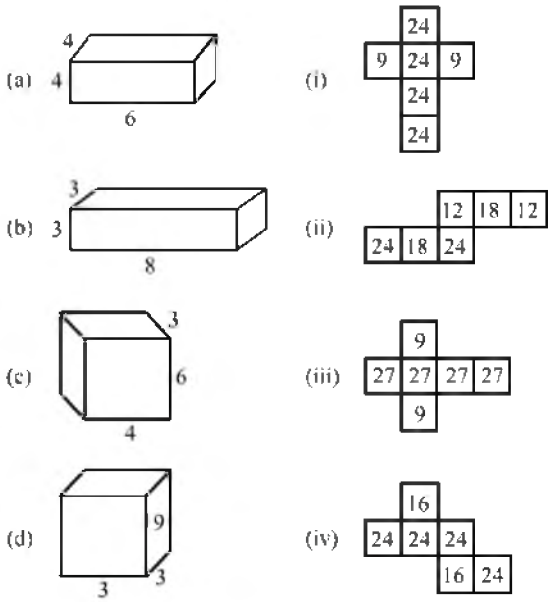
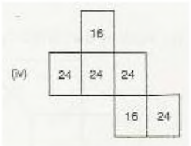
Question 5:

Match the following figures:



ANSWER:

(a)The given figure is a cuboid with sides 4, 4 and 6 units.Area of a rectangle =length×width ∴ Area of the rectangu



(b)

The given figure is a cuboid with sides 3, 3 and 8.

Area of a rectangle =length×width

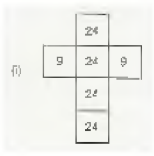
∴ Area of the rectangular face sith sides 3 and 3 =3×3=9

And the area of the other face with sides 3 and 8 =3×8=24

Thus, the net for given figure will have four faces with area 24 and two faces with area 9.

Observe that net (i) satisfies this.

Thus, the net of figure (b) is net (i).



(c)

The given figure is a cuboid with sides 3, 4 and 6.

Area of a **rectangle** =length×width

∴ Area of the rectangular face sith sides 3 and 4 =3×4=12,

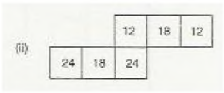
Area of the rectangular face with sides 4 and 6 =4×6=24

And, area of the other face with sides 3 and 6 =3×6=18

Thus, the net for given figure will have two faces with area 24, two faces with area 18 and two faces with area 12.

Observe that net (ii) satisfies this.

Thus, the net of figure (c) is net (ii).



(d)

The given figure is a cuboid with sides 3, 3 and 9.

Area of a **rectangle** =length×width

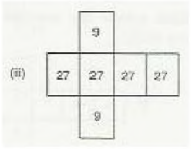
Area of the rectangular face with sides 3 and 3 =3×3=9,

And, area of the other face with sides 3 and 9 =3×9=27

Thus, the net for given figure will have four faces with area 27 and two faces with area 9.

Observe that net (iii) satisfies this.

Thus, the net of figure (d) is net (iii).



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Question 1:

What is the least number of planes that can enclose a solid? What is the name of the solid?

ANSWER:

The least number of planes that can enclose a solid is 4.

Tetrahedron is a solid with four planes (faces).

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Question 2:

Can a polyhedron have for its faces:
(i) 3 triangles?
(ii) 4 triangles?
(iii) a square and four triangles?

ANSWER:

(i)
No, because in order to complete a polyhedron, we need at least four triangular faces.
(ii)
Yes, a polyhedron with 4 triangular faces is a tetrahedron.
(iii)
Yes, with the help of a square bottom and four triangle faces, we can form a pyramid.

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Question 3:

Is it possible to have a polyhedron with any given number of faces?

ANSWER:

Yes, it is possible to have a polyhedron with any number of faces.
The only condition is that there should be at least four faces.
This is because there is no possible polyhedron with 3 or less faces.

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Question 4:

Is a square prism same as a cube?

ANSWER:

Yes, a square prism and a cube are the same.
Both of them have 6 faces, 8 vertices and 12 edges.
The only difference is that a cube has 6 equal faces, while a square prism has a shape like a cuboid with two square faces, one at the top and the other at the bottom and with, possibly, 4 rectangular faces in between.

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Question 5:

Can a polyhedron have 10 faces, 20 edges and 15 vertices?

ANSWER:

No, because every polyhedron satisfies Euler's formula, given below:
$F+V=E+2$
Here, number of faces $F = 10$
Number of edges $E = 20$
Number of vertices $V = 15$
So, by Euler's formula:
LHS : $10+15 = 25$
RHS : $20 + 2 = 22,$
which is not true because $25 \neq 22$
Hence, Eulers formula is not satisfied and no polyhedron may be formed.

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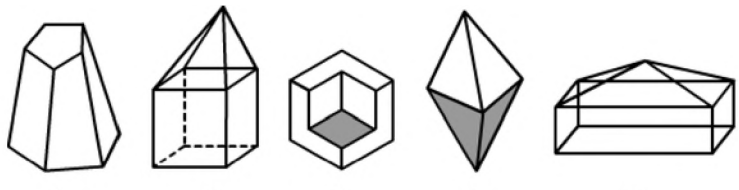
Question 6:

Verify Euler's formula for each of the following polyhedrons:



(i) (ii) (iii) (iv) (v)

ANSWER:

(i)

In the given polyhedron:

Edges E=15

Faces F=7

Vertices V=10

(i)

Now, putting these values in Euler's formula:

LHS : F+V

$= 7+10$

$= 17$

LHS : $\mathbf{E+2}$

$= 15+2$

$= 17$

LHS = RHS

Hence, the Euler's formula is satisfied.

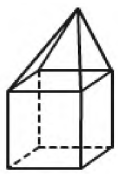
(ii)

In the given polyhedron:

Edges E=16

Faces F=9

Vertices V=9



(ii)

Now, putting these values in Euler's formula:

RHS : F+V

$= 9+9$

$= 18$

LHS : $\mathbf{E+2}$

$= 16+2$

$= 18$

LHS = RHS

Hence, Euler's formula is satisfied.

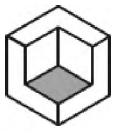
(iii)

In the following polyhedron:

Edges E=21

Faces F=9

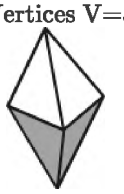
Vertices V=14



(iii)

Now, putting these values in Euler's formula:
LHS : F+V
= 9+14
= 23
RHS : E+2
=21+2
=23
This is true.
Hence, Euler's formula is satisfied.

(iv)
In the following polyhedron:
Edges E=8
Faces F=5
Vertices V=5



(iv)

Now, putting these values in Euler's formula:
LHS : F+V
= 5 + 5
= 10
RHS : E + 2
=8+2
=10
LHS = RHS
Hence, Euler's formula is satisfied.

(v)
In the following polyhedron:
Edges E=16
Faces F=9
Vertices V=9

(v)

Now, putting these values in Euler's formula:
LHS : F+V
= 9 + 9
= 18
RHS : E + 2
=16+2
=18
LHS = RHS
Hence, Euler's formula is satisfied.