Section	Topic	Teaching Notes	Classwork or Homework
3.1	3-dimensional Figures Construction	- Students should be able to use the techniques learnt in Design and Technology to construct figures of (a) *orthographic projection* (正投影法) in First Angle Projection (第一角投影法) including *front view* (正視圖), *side view* (側視圖), and *top view* (俯視圖) on a *quad paper* (方格紙), (b) 3-dimensional figures on a *isometric graph / grid paper* (等距方格／等角投影紙) *(c) *oblique projection* (斜角投影圖) on a *oblique graph paper* (斜角投影紙).	Ex.3A Q.1-2 Ex.3A Q.3-4
3.2	Properties between Lines and Planes of a Solid	- Students should be able to label the *projection* (投影) of points and lines on a plane. - Students should be able to identify lines which is *normal* (垂直) to a plane. - Students should be able to identify the angle between a line and a plane. - Students should be able to identify the angle between 2 planes.	Ex.3B Q.1 Ex.3B Q.2 Ex.3B Q.3 Ex.3B Q.8
3.3	Symmetric Properties of Solid	- Students should be able to identify the *reflectional symmetric property* (反射對稱) of a solid and label the *plane of reflection* (反射面). - Students should be able to label the 9 planes of reflection of a cube. - Students should be able to label the 6 planes of reflection of a tetrahedron. - Students should be able to identify the *rotational symmetric property* (旋轉對稱) of a solid and label the *axis of rotation* (旋轉軸) as well as the *degree of rotational symmetric* (重旋轉對稱／折式旋轉對稱). - Students should be able to label the 13 axes of rotation of a cube. - Students should be able to label the 7 axes of rotation of a tetrahedron.	Ex.3C Q.1-2 Appendix Appendix Ex.3C Q.1-2 Appendix Appendix

Section	Topic	Teaching Notes	Classwork or Homework
3.4	Folding paper	- Students should be able to choose the correct folding paper for the required solid. - Students should be able to identify and name the solid formed from a given folding paper.	Ex.3C Q.3-4 Ex.3C Q.8, 12

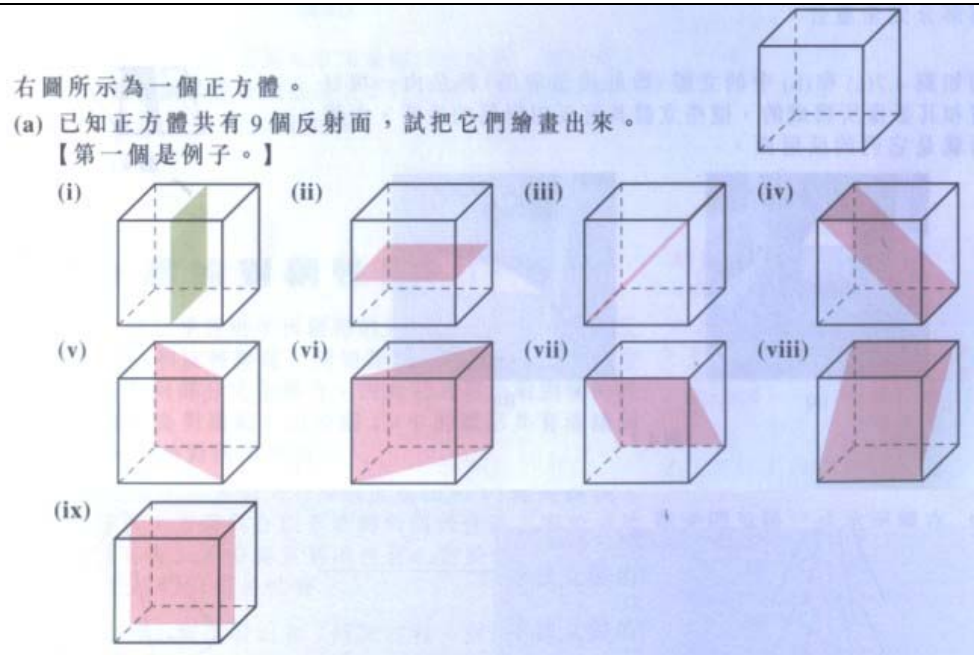
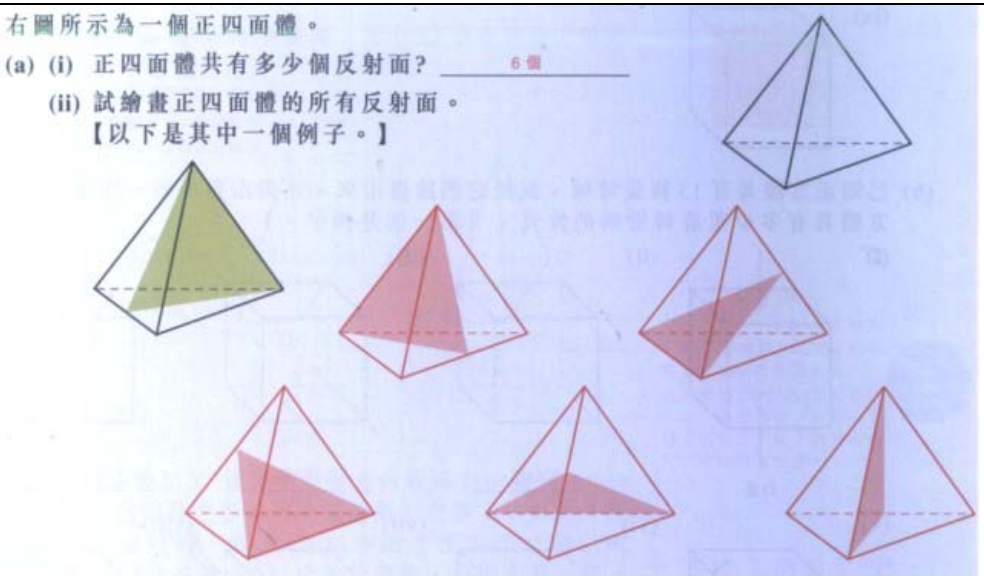
Note: 1. In Technical Drawing, there are First Angle Projection and Third Angle Projection Drawing.
First Angle Projection Drawing is used in China and Britain.

2. In the Second Edition, oblique projection has been deleted.

3. Names of some common solids:

柏拉圖立體	Platonic solids	錐體	pyramid	柱體	prism
正三角錐體	tetrahedron	四角錐體	pyramid with square base	圓柱體	cylinder
正立方體	cube	圓錐體	cone	長立方體	cuboid
正八面體	octahedron				
正十二面體	dodecahedron				
正二十面體	icosahedron				

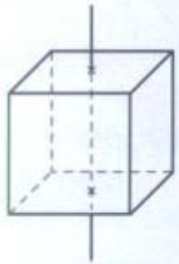
Appendix:

1. 9 reflectional symmetric planes of cube	
2. 6 reflectional symmetric planes of tetrahedron	

3. 13 axes of rotation of cube

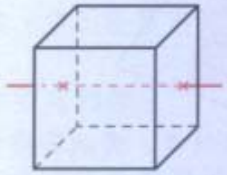
(b) 已知正方體共有 13 條旋轉軸，試把它們繪畫出來，並指出對於每一條旋轉軸，正方體具有多少重旋轉對稱的性質。【第一個是例子。】

(i)



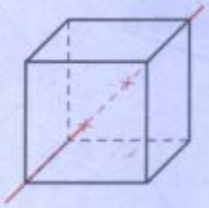
四重

(ii)



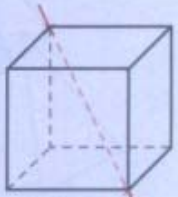
四重

(iii)



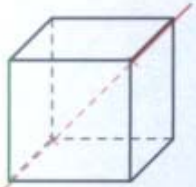
四重

(iv)



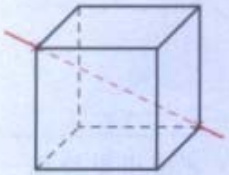
三重

(v)



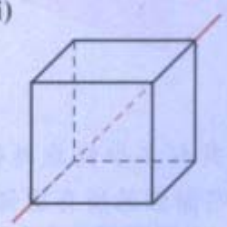
三重

(vi)



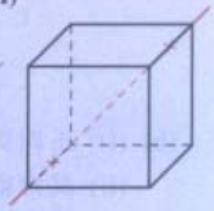
三重

(vii)



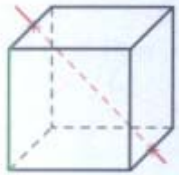
三重

(viii)



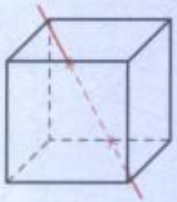
二重

(ix)



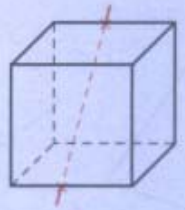
二重

(x)



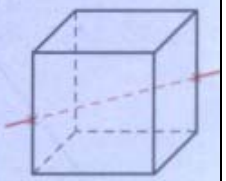
二重

(xi)



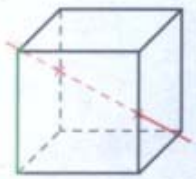
二重

(xii)

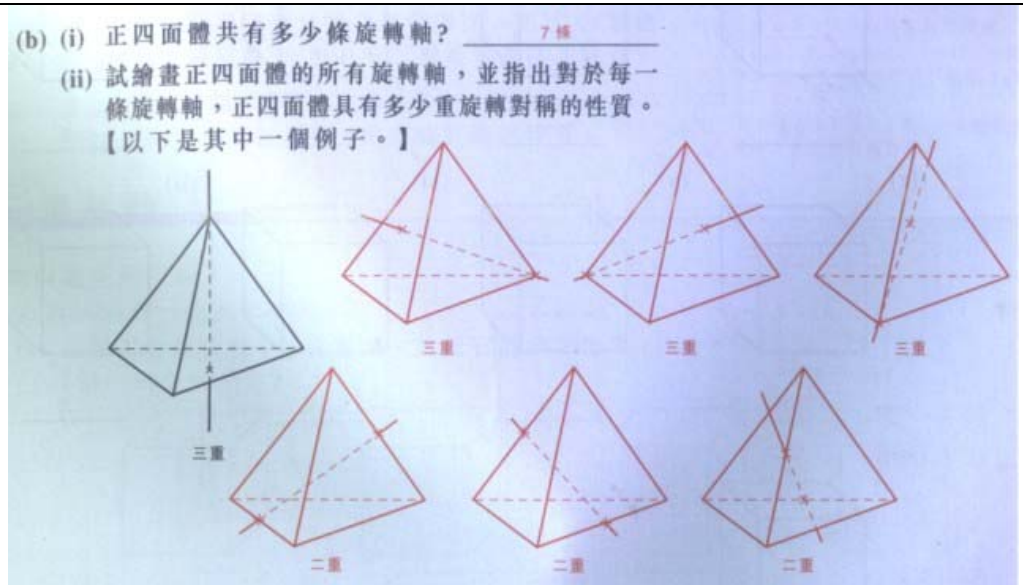


二重

(xiii)



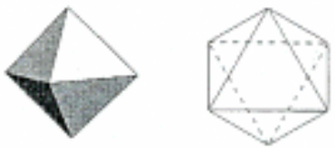
二重

4. 7 axes of rotation of tetrahedron	

Platonic solids (柏拉圖立體：正多面體)

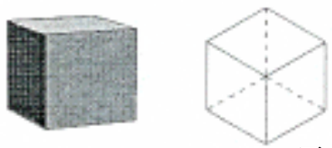
Tetrahedron
4 vertices. 6 edges. 4 faces.
1.2247 : 0.7071 : 0.4082

正四面體
正三角錐體



Octahedron
6 vertices. 12 edges. 8 faces.
1.4142 : 1 : 0.8165

正八面體

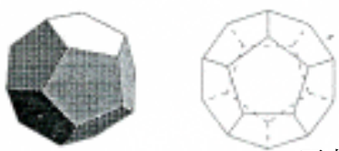


Cube
8 vertices. 12 edges. 6 faces.
1.7321 : 1.4142 : 1

正六面體
正立方體

Icosahedron
12 vertices. 30 edges. 20 faces.
1.9021 : 1.6180 : 1.5115

正二十面體

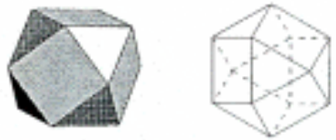


Dodecahedron
20 vertices. 30 edges. 12 faces.
2.8025 : 2.6180 : 2.2270

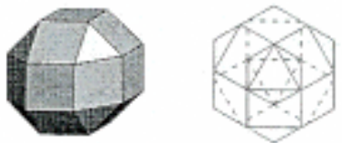
正十二面體

Archimedean solids (阿基米德立體)

Truncated Tetrahedron
12 vertices. 18 edges. 8 faces.
2.3457 : 2.1218 : (2.0418) : 1.2256



Cuboctahedron
12 vertices. 24 edges. 14 faces.
2: 1.7321 : (1.6330) : 1.4142

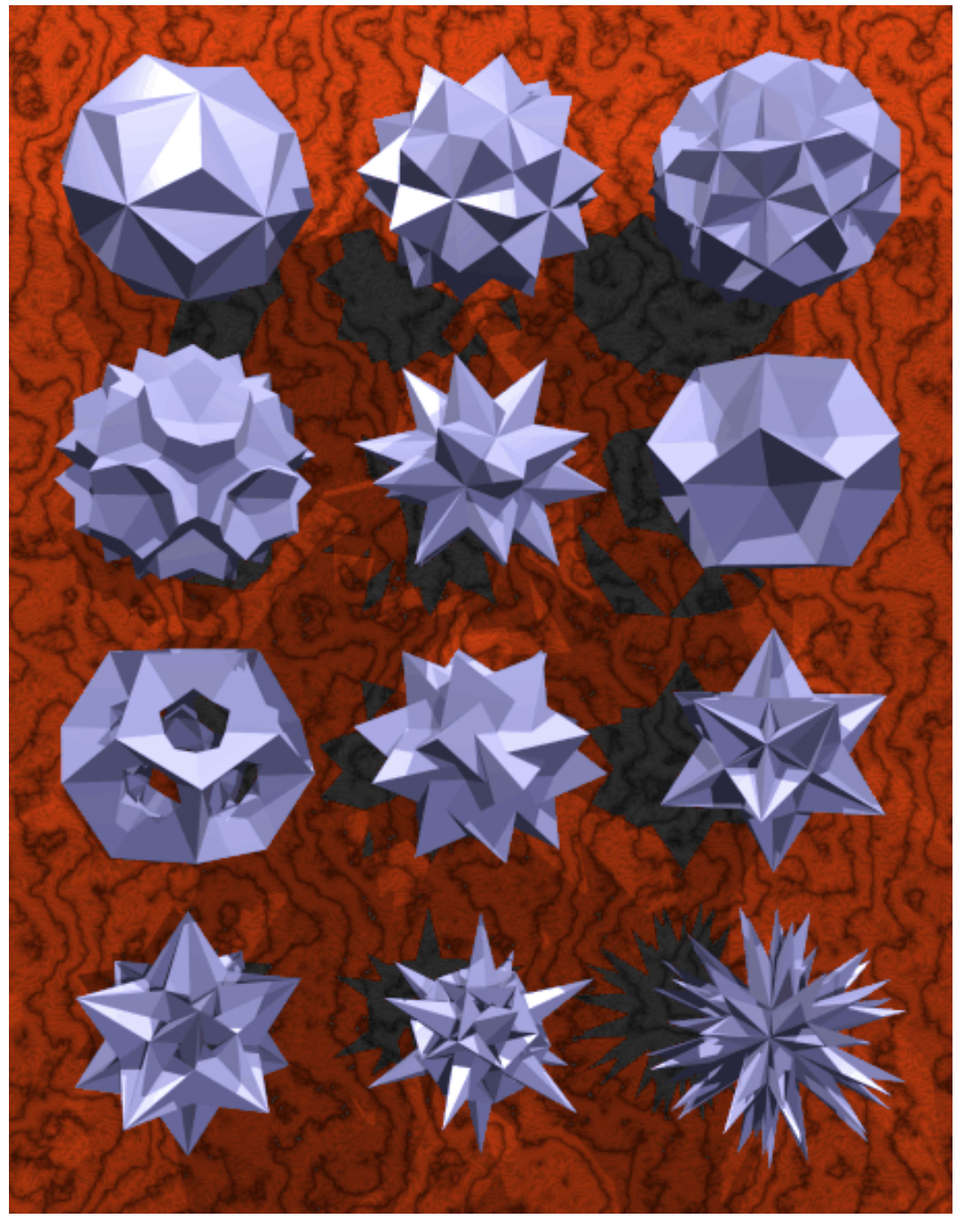


Rhombicuboctahedron
24 vertices. 48 edges. 26 faces.
2.7979 : 2.6131 : (2.5485) : 2.4142

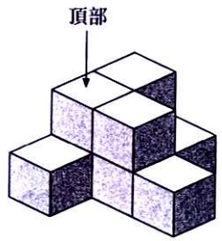
Truncated Octahedron
24 vertices. 36 edges. 14 faces.
3.1623 : 3 : (2.8284) : 2.4495

Truncated Cube
24 vertices. 36 edges. 14 faces.
3.5576 : 3.4142 : (3.3660) : 2.4142

Stellated solids (星形立體)

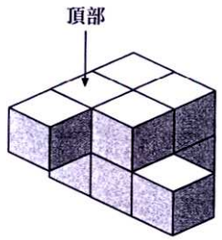


1.

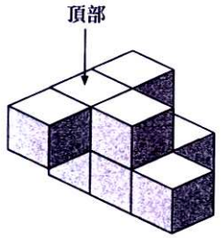


下列哪一個立體的俯視圖（top view）跟上圖中立體的俯視圖不相同？

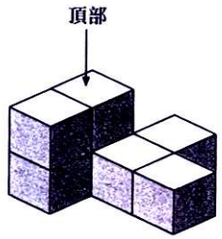
A.



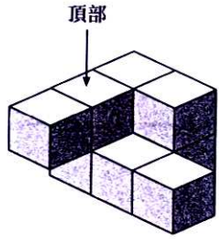
B.



C.



D.

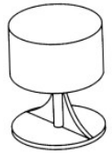


2. 下列那個立體可得到以下的正投影圖?

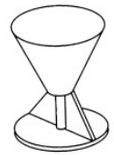
A.

B.

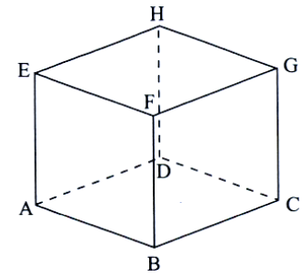
C.



D.



參看下圖，並解答 (3) 、 (4) 及 (5) 題。



3. 圖中所示爲一正方體 *ABCDEFGH*。下列哪項必爲錯誤？

A. *F* 在平面 *CDHG* 上的投影是 *G*。
B. 直線 *EG* 在平面 *ABCD* 上的投影是 *AC*。
C. 直線 *CE* 與平面 *ADHE* 的交角是$\angle CED$。
D. 平面 *CDE* 與 *ABCD* 的交角是$\angle ACE$。

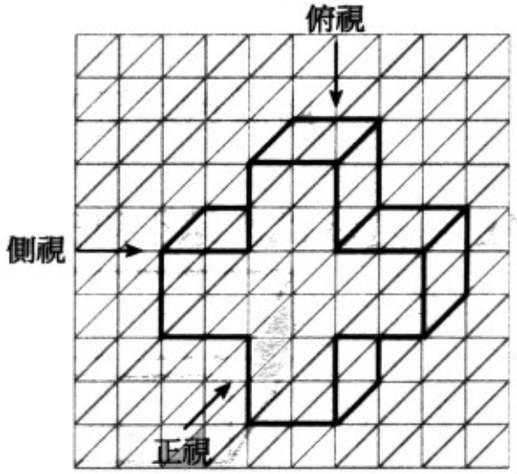
4. 綫段 *AE* 和綫段 *BE* 的相交角是

A. $\angle AEB$ B. $\angle AEF$
C. $\angle BAE$ D. $\angle EBA$

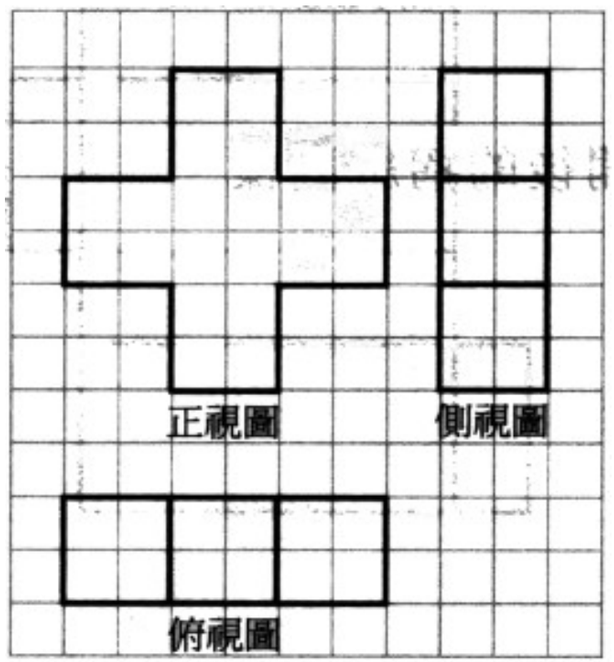
5. 圖中爲一正方體，下列那一個角<u>不是</u>以 *E* 爲頂點的直角?

A. $\angle FEH$ B. $\angle GEA$
C. $\angle GEC$ D. $\angle HEA$

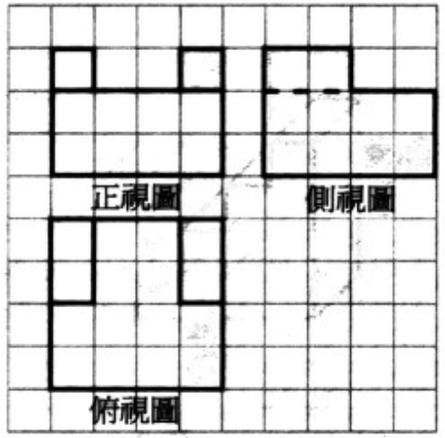
6. 在提供的方格紙 (quad paper) 內，繪畫下圖中立體的正投影圖 (orthographic projections)：正視圖、側視圖及俯視圖。



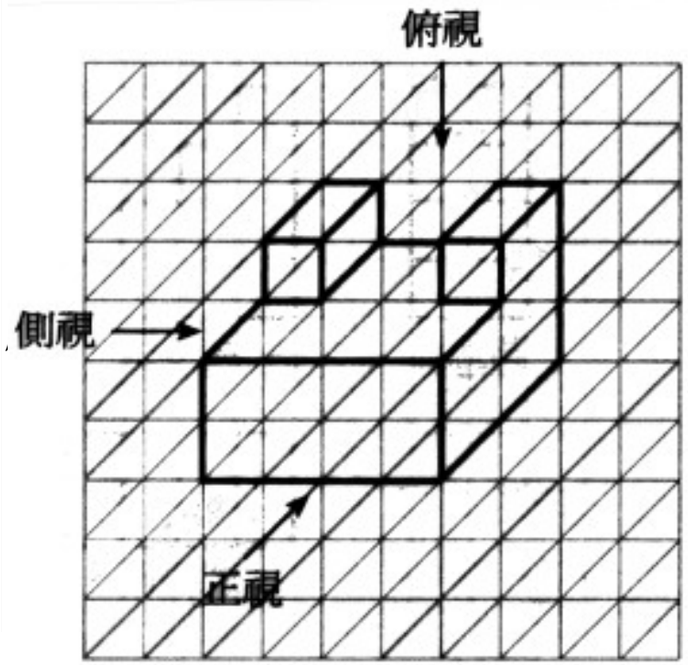
(3 分)



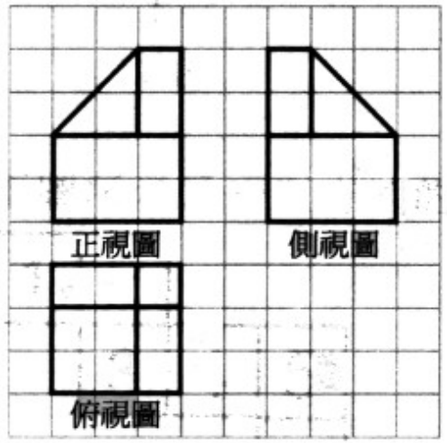
7. 根據下圖中正投影圖的資料，在提供的斜網格 (oblique graph paper) 內，繪畫斜角投影圖 (oblique projection) 。



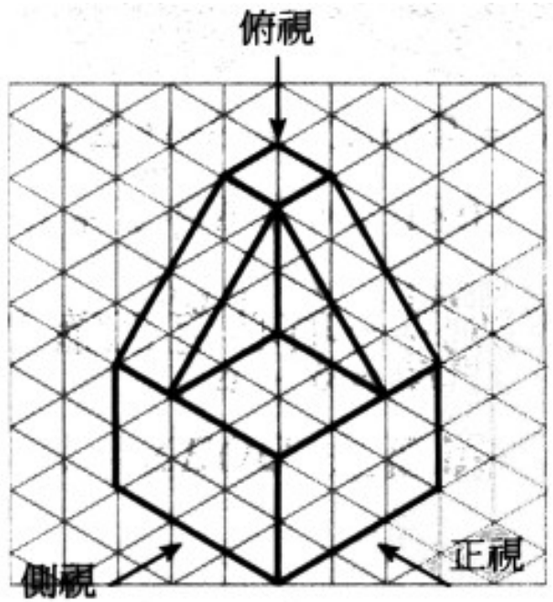
(5 分)



8. 根據下圖中正投影圖的資料，在提供的等距方格 (isometric graph paper) 內，繪畫均角投影圖 (isometric projection) 。



(6 分)



Chapter 04 Investigation of 3-dimensional Figures Quiz 04-2

F.3____ Name:_____ (_____) Marks: _____ / 18

1. Which of the following letter has a different order of rotational symmetry with the others?

   A. D
   B. H
   C. I
   D. S

2. Which of the following letters has no axis of symmetry?

   A. D
   B. H
   C. I
   D. S

3. How many planes of reflection does a right pyramid with a square base have?

   A. 2
   B. 4
   C. 5
   D. 6

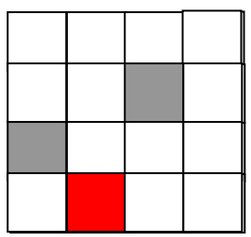
4. How many axis of rotation does a prism with a regular octagon base have?

   A. 4
   B. 5
   C. 8
   D. 9

5. 若一個立體對於某一條軸具有五重旋轉對稱（rotational symmetry of order 5 OR 5-fold rotational symmetry）的性質，該立體要沿該旋轉軸（axis of rotation）旋轉最少多少度才可與原來立體重合?

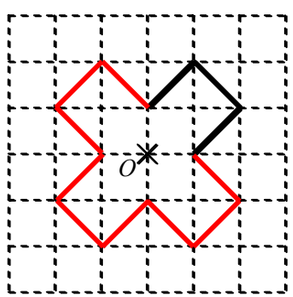
   A. 60^o
   B. 72^o
   C. 90^o
   D. 180^o

6. 在下圖中塗多一個小方格，使整幅圖只有一條對稱軸 (axis of symmetry)。



(1 mark)

7.(a) Finish the figure, so that it has rotational symmetry of order 4 about *O*.

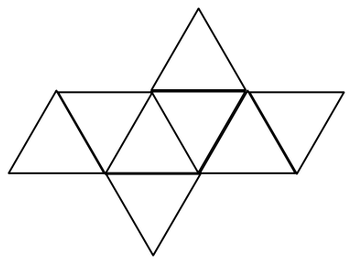


(b) How many axis of symmetry it has?

4

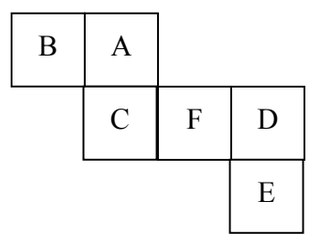
_____(3 marks)

8. The following net consists of 8 congruent equilateral triangles. Give the name of the solid it can be formed.



The solid is a octahedron (正八面體).(1 mark)

9. The following net consists of 6 congruent squares.



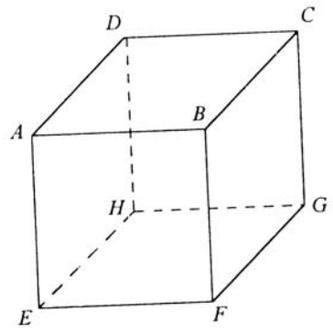
(a) The net can form a cube (正立方體).

(b) For that solid, the letter opposite to *B* is

F

_____.(2 marks)

The figure shows a cube. Use it to answer the Questions (10)-(12).



10. Which of the following is/are equal to $\angle AGE$?

① $\angle AGF$
② $\angle BDF$
③ $\angle DEG$

A. ①only
B. ②only
C. ③only
D. ①and ②only
E. ②and ③only

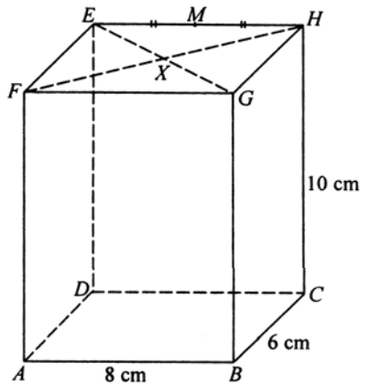
11. The angle between the lines EA and FA is

A. $\angle EAF$
B. $\angle EAB$
C. $\angle FEA$
D. $\angle AFE$

12. Which of the following is NOT right angle at A?

A. $\angle BAD$
B. $\angle CAE$
C. $\angle CAG$
D. $\angle DAE$

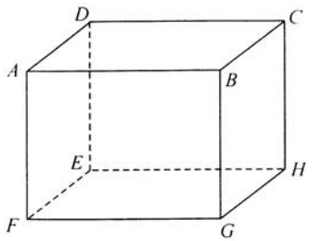
13. In the figure, $ABCDEFGH$ is a rectangular block.



EG and FH meet at X. M is the mid-point of EH. Which of the following makes the greatest angle with the plane $ABCD$?

A. AG
B. AH
C. AM
D. AX

14. The figure shows a cuboid.

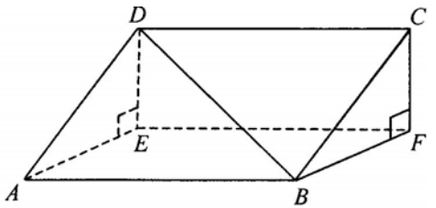


Which of the following are right angles?

① $\angle CAF$
② $\angle DHG$
③ $\angle AGC$

A. ① and ② only
B. ① and ③ only
C. ② and ③ only
D. ①, ② and ③

15. The figure shows a right prism $ABCDEF$ with a right-angled triangle as the cross-section. The angle between BD and the plane $CDEF$ is



A. $\angle BDE$
B. $\angle BDF$
C. $\angle DBE$
D. $\angle DBF$