

高等学校“十二五”规划教材

# 工程制图

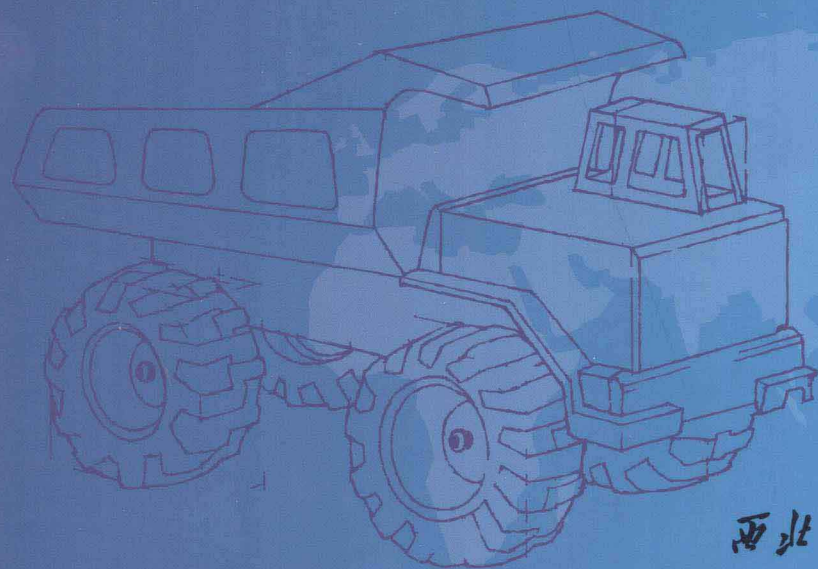
ENGINEERING DRAWING

(英汉对照)

WORKBOOK

# 习题集

刘金瑄 Terry E. Baxter (美) 主编



西北工业大学出版社

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**【Introduction】** In order to better serve the bilingual course “Engineering Drawing” in science schools, Chinese teachers cooperated with American teachers at Northern Arizona University to compose the *ENGINEERING DRAWING WORKBOOK* in both the Chinese and English languages. It adopts an English-to-Chinese thinking pattern while following recent national “Technique Drawing Standard” and “Mechanical Drawing Standard” and thus improves students’ ability to use technical English. The contents of *ENGINEERING DRAWING WORKBOOK* primarily include the basic knowledge of for drawing, as well as knowledge of projections, solids and surface intersections, composite objects, sketching, and the methods for representing components and parts. It also introduces standard and common parts as well as detail and assembly drawing, and changes in visual communications important to engineering drawing.

*ENGINEERING DRAWING WORKBOOK* is appropriate for use by non-mechanical engineering majors at universities, and can also be used for Adult colleges, continuing education and distance education. It can also serve as a reference book for Technicians.

**【内容简介】** 本书是为了配合高等院校工科基础课程“工程制图”的双语教学，与美国北亚利桑那大学教师合作编写而成的。在不改变我国工程制图现有课程体系并遵照我国技术制图、机械制图的最新标准的前提下，参考国外同类教材，采用从英语到汉语的思维模式，以便学生在学习的过程中，提高应用英语的能力。本习题集内容包括工程制图的基本知识、投影基础、立体的投影及交线、组合体、草图、机件的常用表达方式、标准件与常用件、零件图、装配图简介、可视化交流和工程设计。

本书作为高等院校工科非机械类专业教学用书，可供成人高校、继续教育、网络远程教育教学使用，也可供相关专业技术人员参考。

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# Preface

After China joined the WTO, the internationalization of higher education in China changed from being “with boundary” to being “without boundary”. The result was that universities in different countries began to develop standard curriculum systems so that they could achieve the successful articulation of credits and the recognition of degrees with Chinese universities. Xi'an University of Science and Technology also has been internationalizing higher education with one of its efforts being to join the Sino-American 1+2+1 Dual Degree Program operated by the China Center for International Educational Exchange.

This book, *ENGINEERING DRAWING*, was conceived while developing and improving on the process of bilingual teaching drawing classes, and during the research for “Engineering Drawing Comparison in China and in America and Innovation Practice”, which included the contributions of two faculty members from Northern Arizona University, Perry G. Wood and Terry E. Baxter. Engineering Drawing is considered an all-purpose textbook for bilingual teaching at Chinese universities.

*ENGINEERING DRAWING* not only follows the “Basic Requirements of Descriptive Geometry and Engineering Drawing Course” which was issued by the Engineering Drawing Course Teaching Committee and the recent national “Technique Drawing Standard” and “Mechanical Drawing Standard” ; but also combines the longtime experience of teaching engineering drawing and the development of engineering graphics.

*ENGINEERING DRAWING* contains the following features:

(1) A chapter on “Sketching” ( Chapter 5) has been added in order to improve students’ freehand drawing ability; and also adds a chapter on “Visual Communications and Engineering Design” (Chapter 10) that introduces developments that have occurred over time with engineering drawing in America from 2D to 3D to 4D into what is currently being referred to as BIM. This feature broadens students’ understanding of how drawings are used throughout design, extends their ability to work within the process of design and heightens their awareness of how the newer 3D based technology has become an important factor in the design and construction industry, and thus overall increases their competitive edge.

(2) The content of this text is presented in both English and Chinese where English has been used as the initial language of writing. The accompanying Chinese translation thus serves as a reference with the intended purpose of allowing students to improve their academic technical communication and language ability.

(3) A companion multi-media courseware, CAI, previously published provides numerous animated demos that vividly present the features of objects and increases the students’ interest in learning as well as their understanding.

(4) A practice-oriented perspective binds the content with Engineering Drawing Workbook and thus accelerates the students’ learning with practical applications.

The Chief Editors of Engineering Drawing are Liu JinXuan, at Xi'an University of Science and Technology, and Terry E. Baxter, at Northern Arizona University. The

Associate Editors are Zhang Xiaochong, Liu Jia and Li Yong, all at Xi'an University of Science and Technology. Other contributors include Wei Chaowen, Jiang Baofeng, and Zhao Lingyan, also at Xi'an University of Science and Technology.

The publication of *ENGINEERING DRAWING* is sponsored by the Teaching Material Program at Xi'an University of Science and Technology. Finally, great appreciation is extended to Debra Edgerton at Northern Arizona University, who contributed illustrations and drawings in Chapter 5, and to the Xi'an University of Science and Technology students Yuan Qiang and Wang Zhengshuai, who helped transfer the drawing formats and completed some of the book's illustrations.

Because we know that it is difficult to create a book without any flaws, the readers and users of this book are encouraged to provide us with their comments and suggestions for corrections.

**The Editors**

2013.04

# 前 言

随着我国加入 WTO 以后的教育国际化进程的不断加快,高等教育国际化出现了由“有边界”向“无边界”过渡的新特征,各国高等教育中的课程体系、结构、学分和学位的相互承认等制度呈现出标准化、统一化趋势。

本书是在西安科技大学与中国国际教育交流中心“1+2+1 中美人才培养计划”本科生培养模式下,开展双语教学,并与美国北亚利桑那大学教授 Terry E. Baxter 以及 Perry G. Wood 合作“中美工程制图比较研究与创新实践”项目的比较研究过程中,通过对两校的制图课程进行比较而编写的适合我国大学生双语教学的通用教材。

本书依照高等学校工科制图课程教学指导委员会制定的“画法几何及工程制图课程教学基本要求”的规定,以及国家《技术制图》《机械制图》的最新标准,结合多年来积累的“工程制图”课程教学改革经验和近年工程图学发展特点编写而成。

本书具有下述特点:

(1) 加入了草图画法(第 5 章),以提高学生徒手绘图的能力;可视化交流和工程设计(第 10 章),介绍美国的制图课程从 2D→3D→4D→BIM 的发展过程,以拓展学生视野,培养学生的构型设计能力、计算机三维造型能力,提高学生参与国际竞争的能力。

(2) 本书知识阐述以英语为主线,采用从英语到汉语的思维模式,汉语翻译作为参考,目的是培养学生国际学术交流能力和语言能力。

(3) 前期出版了多媒体 CAI 课件,大量实物模型的动画演示,形象生动地展示了所反映物体的特征,增加了学生的学习兴趣以及对知识的理解力。

(4) 本书配有相应的习题集,用于帮助学生对所学知识进行巩固和提高。

本书由西安科技大学刘金瑄、美国北亚利桑那大学 Terry E. Baxter 任主编;张笑翀、刘佳、李勇任副主编,参加编写的人员还有尉朝闻、蒋宝锋、赵凌燕。

本书的出版获得了西安科技大学规划教材立项资助。另外,在本书的编写过程中,北亚利桑那大学教师 Debra Edgerton 绘制了第 5 章的部分插图,硕士研究生袁强、王正帅协助插图转换格式以及绘制了部分插图,在此表示诚挚的感谢。

由于时间仓促,书中难免有疏漏和不足之处,敬请广大读者批评指正。

编 者

2013 年 4 月



# Contents 目 录

Chapter 1	Basic Knowledge of Engineering Drawing 工程制图的基本知识 .....	1
Chapter 2	The Basic Knowledge of Projection 投影基础 .....	6
Chapter 3	Projections of Solids and Their Intersections 立体的投影及交线 .....	20
Chapter 4	Composite Objects 组合体 .....	30
Chapter 5	Sketching 草图 .....	40
Chapter 6	Methods of Representing Parts 机件的常用表达方法 .....	44
Chapter 7	Standard Parts and Common Parts 标准件与常用件 .....	57
Chapter 8	Detail Drawing 零件图 .....	64
Chapter 9	Introduction to Assembly Drawings 装配图简介 .....	67
Chapter 10	Visual Communications and Engineering Design 可视化交流和工程设计 .....	72

## Chapter 1 Basic Knowledge of Engineering Drawing 工程制图的基本知识

1.1 Write the letters, numbers and Chinese characters illustrated below by copying them in the spaces provided. 抄写下列数字、字母和汉字。

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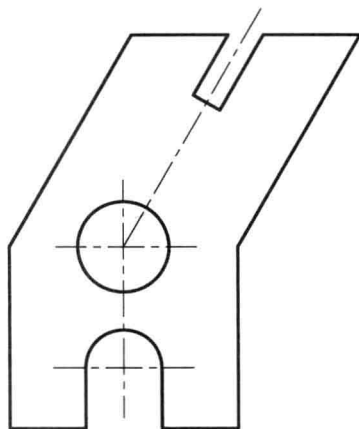
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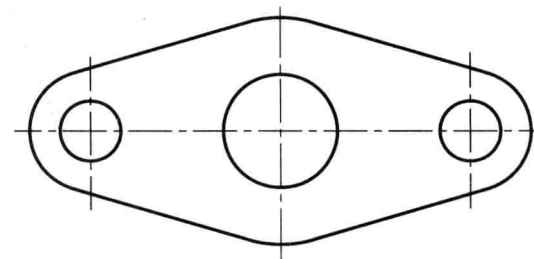


1.2 Label the dimensions for each of the plane figures below. The dimensions should match the actual size. 标注下列平面图形的尺寸。尺寸大小按实际量取。

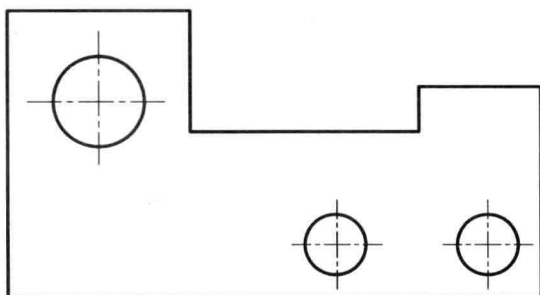
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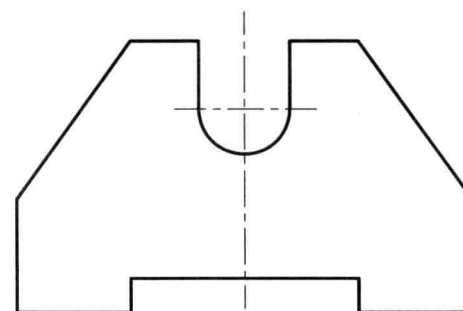
(2)



(3)



(4)



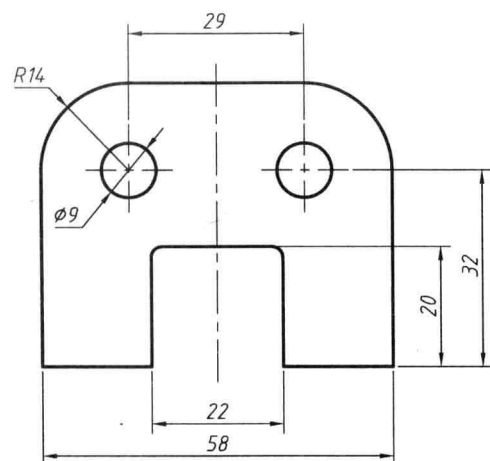
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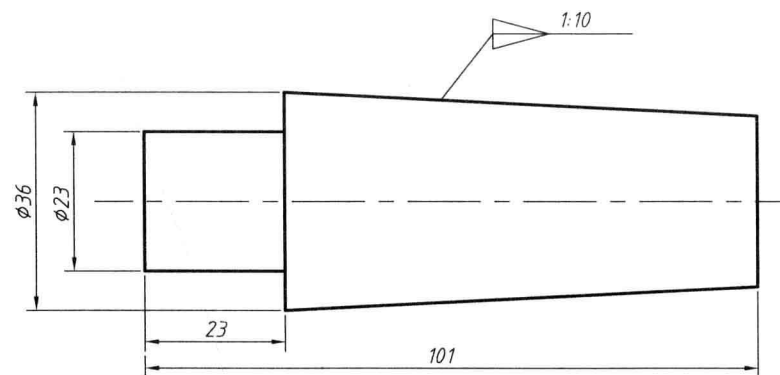
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1.3 Draw a copy of the figures and label all the dimensions. The scale is 1 : 1. 抄画下列平面图形并标注。比例为 1 : 1。

(1)



(2)



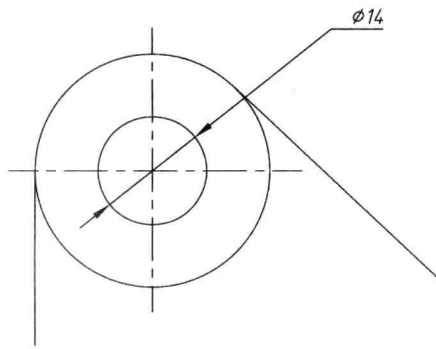
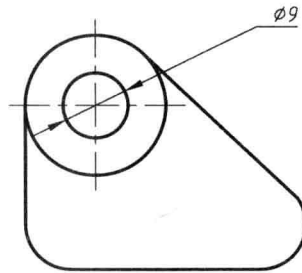
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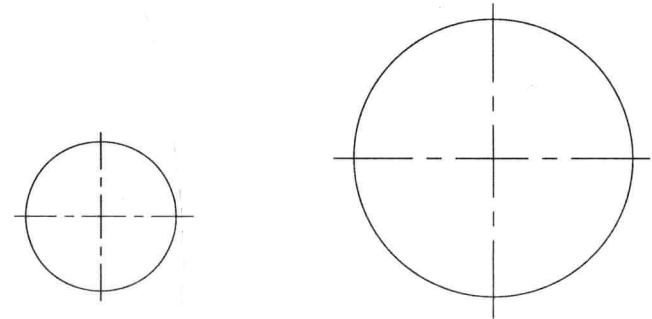
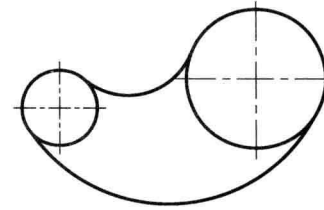
1.4 Construct the connecting arcs below using the given radii. 用给出的半径做出圆弧连接。

(1)



$R$

(2)



$R_1$

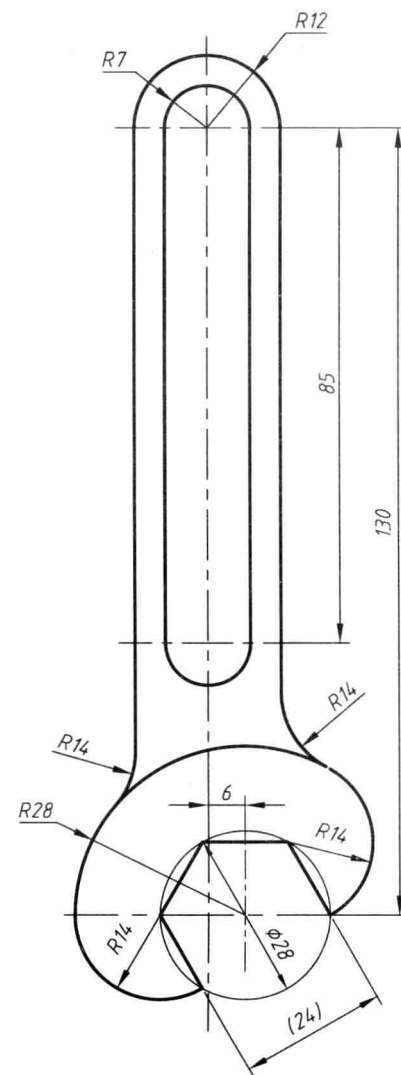
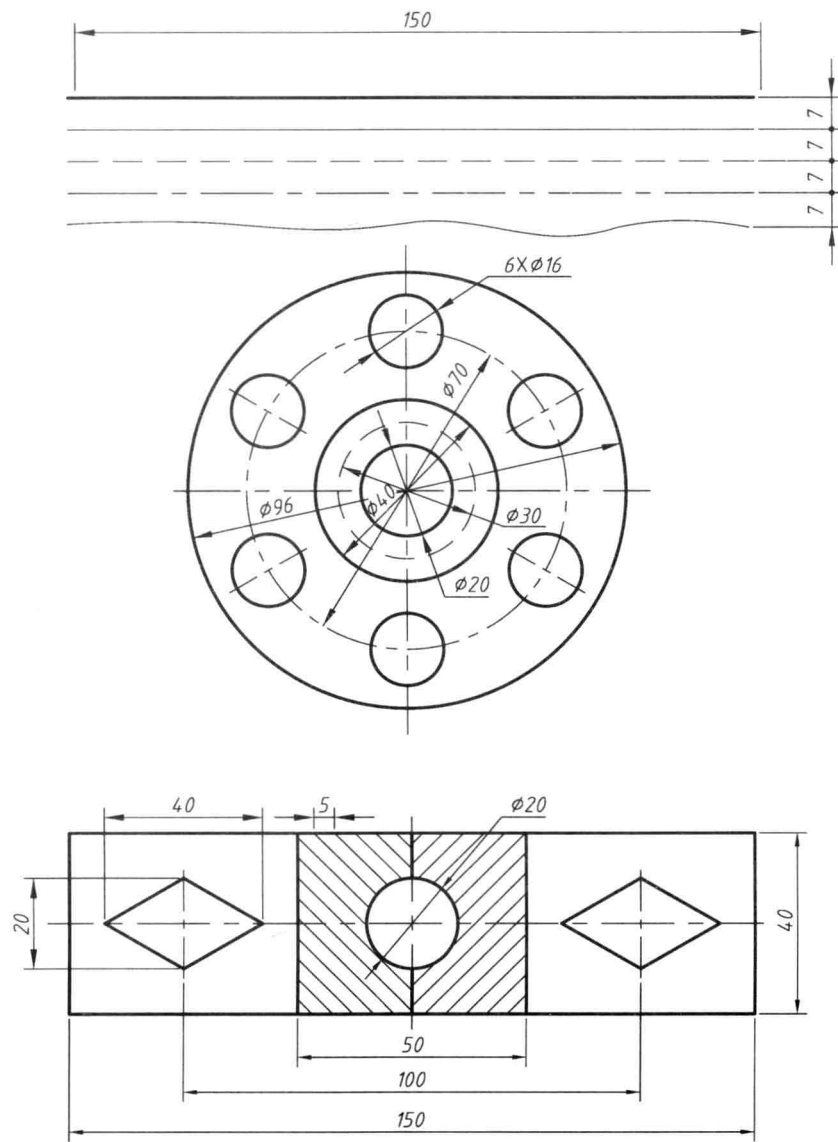
$R_2$

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1.5 Draw the figures on A3 paper and label the dimensions. The scale is 1 : 1. 在 A3 图纸上绘制下图并标注尺寸。比例为 1 : 1。



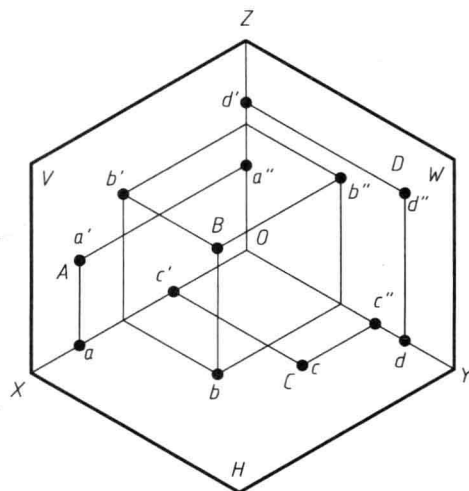
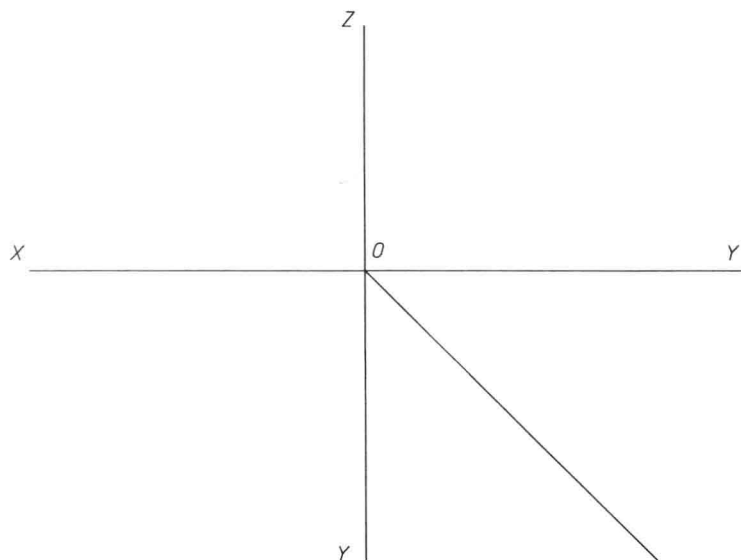
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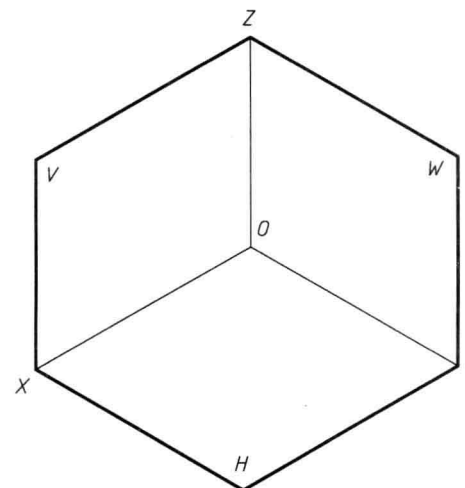
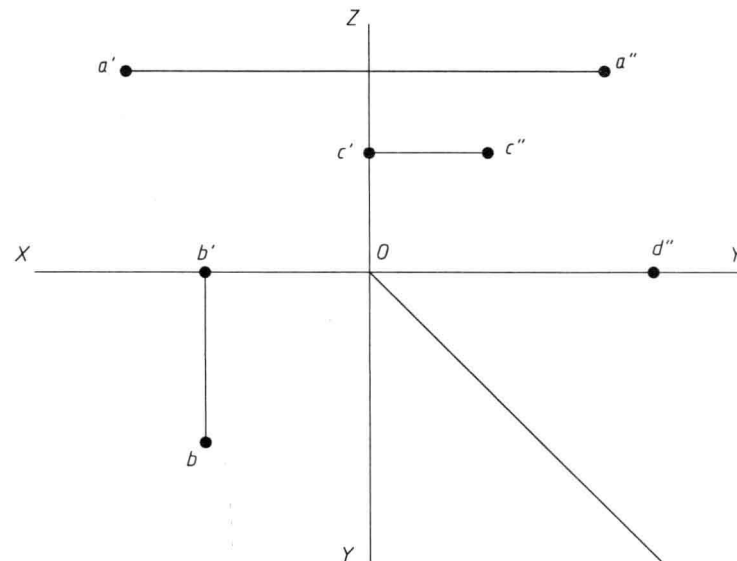
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## Chapter 2 The Basic Knowledge of Projection 投影基础

2.1 According to the spatial projections below, complete the projections of points  $A$ ,  $B$ ,  $C$  and  $D$ . 根据空间视图, 完成空间点 $A$ ,  $B$ ,  $C$ 和 $D$ 的投影。



2.2 Complete the third projection of points  $A$ ,  $B$ ,  $C$  and  $D$ , and then draw them in the spatial projection system. Notes: point  $D$  is located on the axis  $Y$ . 完成空间点 $A$ ,  $B$ ,  $C$ 和 $D$ 的投影, 并做出它们在空间投影体系中的投影。注: 点 $D$ 在 $Y$ 轴上。

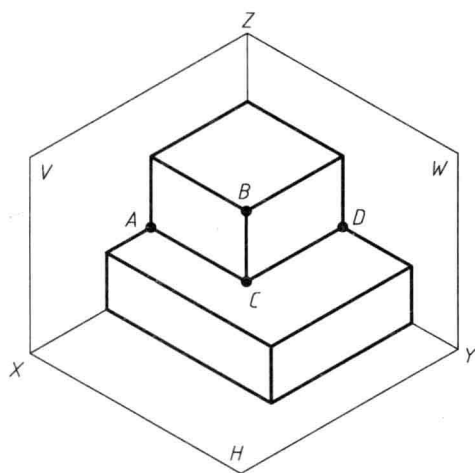
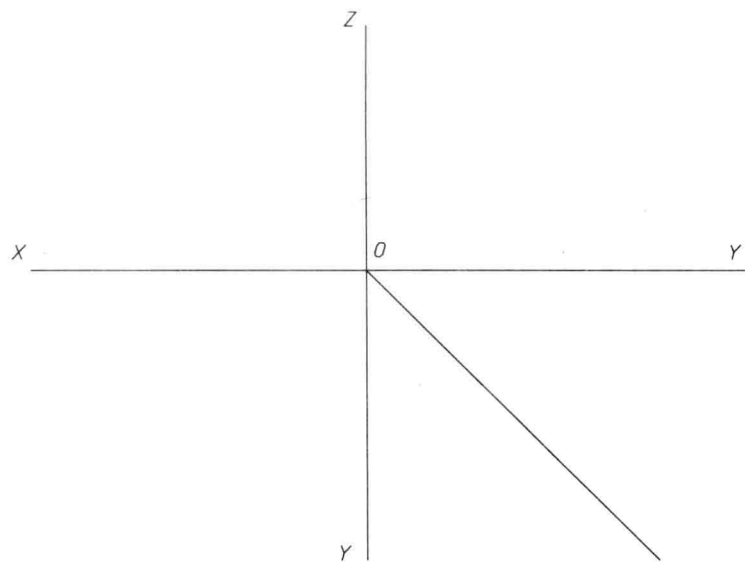


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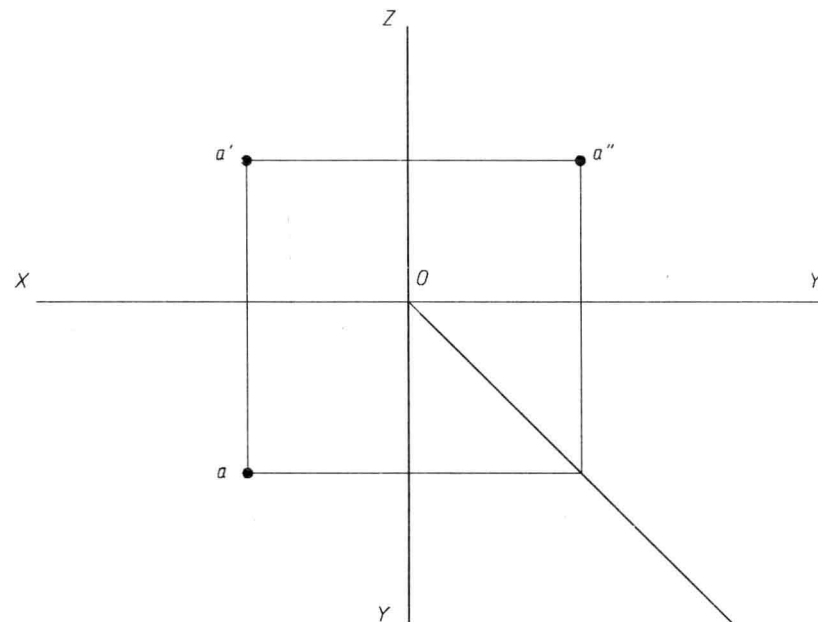
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2.3 According to the spatial projections below, complete the three projections of each point  $A$ ,  $B$ ,  $C$  and  $D$ . 依据空间视图，完成点 $A$ ,  $B$ ,  $C$ 和点 $D$ 的三个投影。

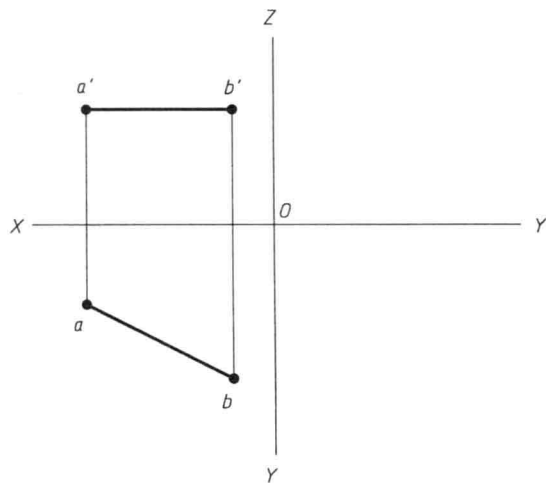


2.4 Point  $B$  is 10 to the left of point  $A$ , 5 in front of point  $A$  and 10 above point  $A$ . Point  $C$  is 10 to the right of point  $B$ , at the same height as point  $B$ , and as far forward as point  $A$ . 点 $B$ 在点 $A$ 的左侧10, 前方5, 上方10处。点 $C$ 在点 $B$ 的右侧10, 并与点 $B$ 同高, 和点 $A$ 位置一样前。完成点 $B$ 和点 $C$ 的三个投影。



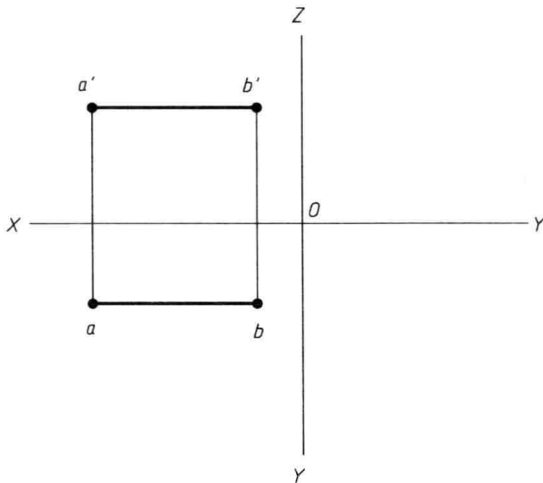
2.5 Complete the third projection of the given lines. Indicate the relative position of a line in comparison to its projection plane. 完成所给直线的第三个投影，并判断直线和投影面的相对位置。

(1)



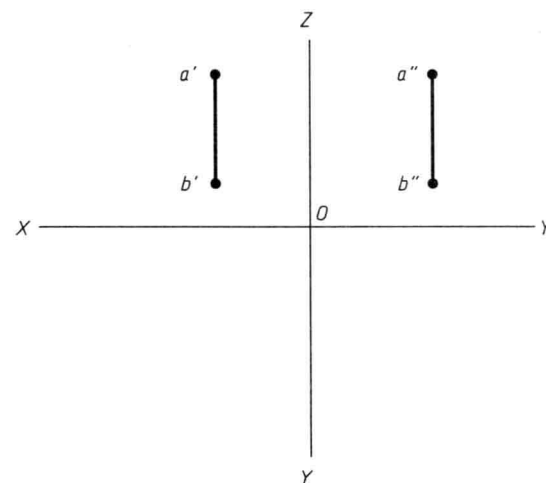
Line AB is a \_\_\_\_\_ line.

(2)



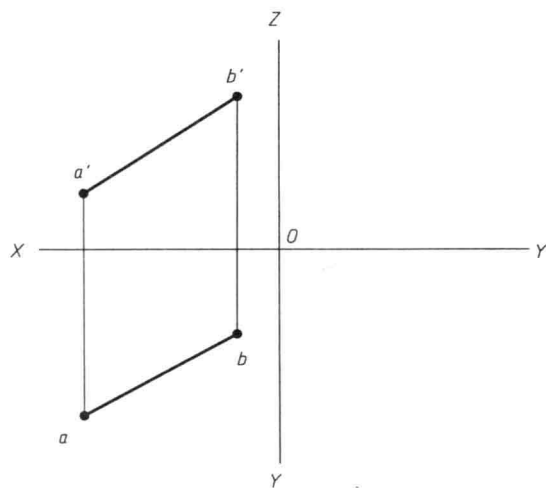
Line AB is a \_\_\_\_\_ line.

(3)



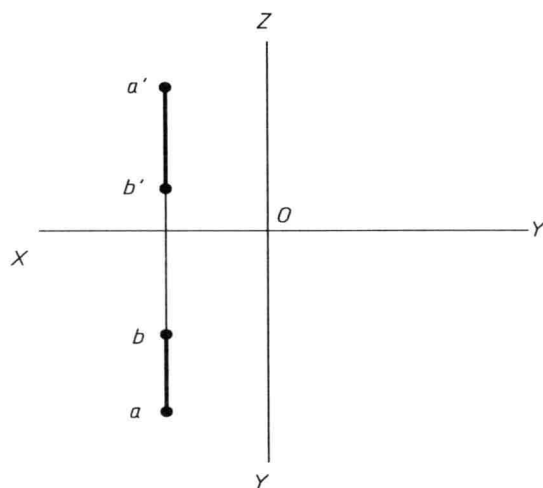
Line AB is a \_\_\_\_\_ line.

(4)



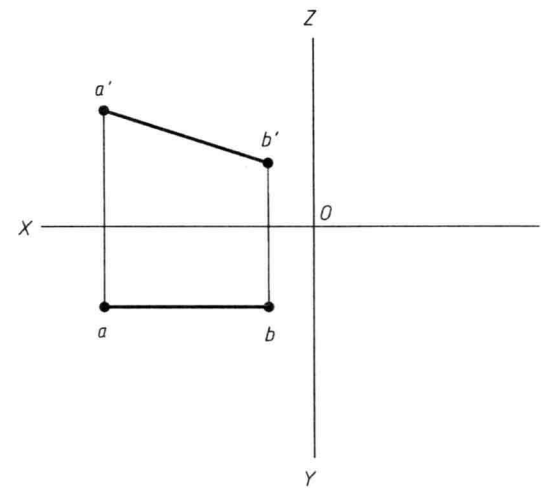
Line AB is a \_\_\_\_\_ line.

(5)



Line AB is a \_\_\_\_\_ line.

(6)



Line AB is a \_\_\_\_\_ line.

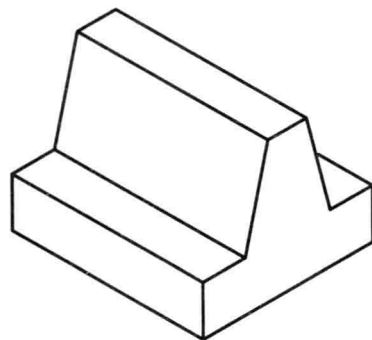
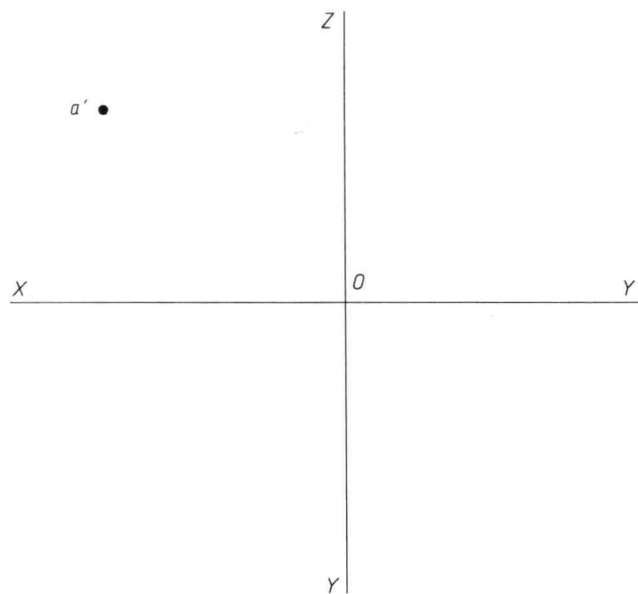
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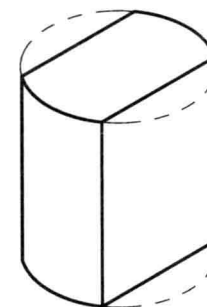
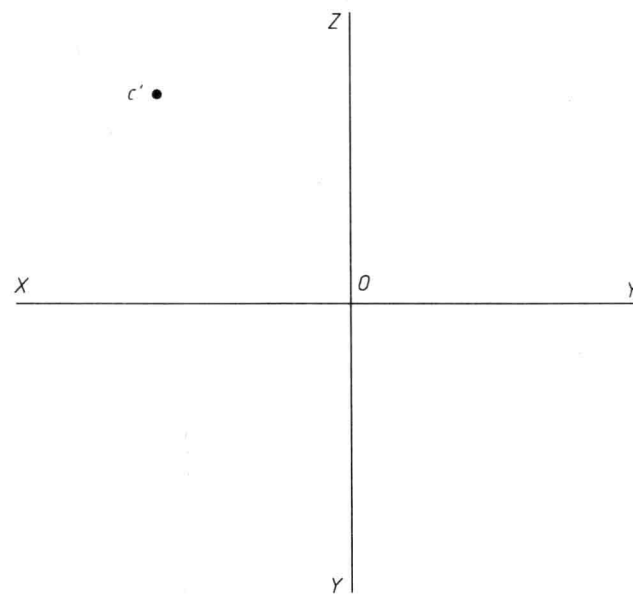
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2.6 Line  $AB$  is a frontal line and point  $A$  is to the upper left of point  $B$ ,  $AB=20$ ,  $\alpha=60^\circ$ . Complete the three projections of line  $AB$ . Mark  $AB$  on the object. 直线 $AB$ 是正平线, 点 $A$ 在点 $B$ 的左上角,  $AB=20$ ,  $\alpha=60^\circ$ 。做出直线 $AB$ 的三个投影, 并在物体上标出 $AB$ 。



2.7 Line  $CD$  is a normal line of plane  $H$ , and  $CD=20$ . Complete the three projections of line  $CD$  and mark it on the object. 直线 $CD$ 是正垂线,  $CD=20$ 。做出直线 $CD$ 的三个投影, 然后在物体上标出直线 $CD$ 。



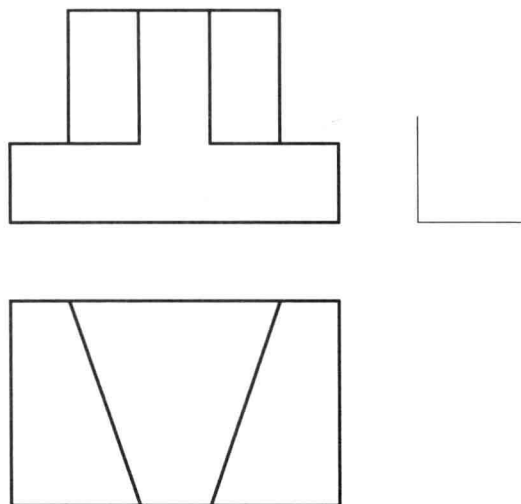
Class 班级:

Name 姓名:

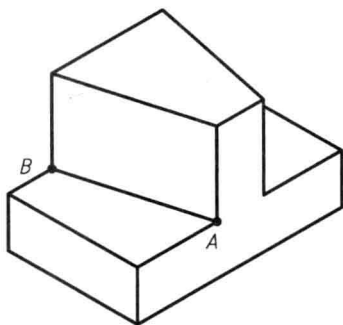
ID number 学号:

2.8 Complete the left view of the object, and label line  $AB$  on the three views.

Indicate the spatial position of line  $AB$ . 做出物体的左视图，在三视图上标出直线  $AB$ 。并判断直线  $AB$  的空间位置。

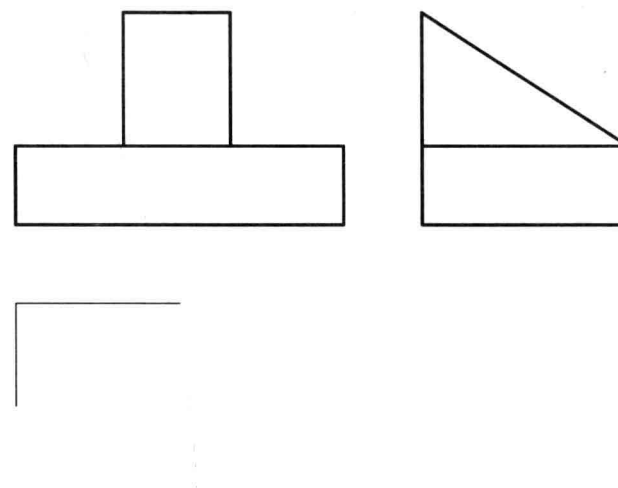


Line  $AB$  is a \_\_\_\_\_ line.

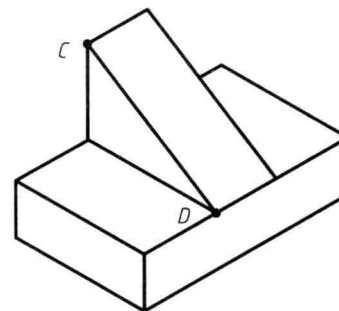


2.9 Complete the top view of the object, and label line  $CD$  on the three views.

Indicate the spatial position of line  $CD$ . 画出物体的俯视图，在三视图中标出直线  $CD$  的三个投影，并判断直线  $CD$  的空间位置。



Line  $CD$  is a \_\_\_\_\_ line.



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