

工程制图及计算机绘图精品课程系列教材

机械制图习题集

Exercise Workbook of Mechanical Drawing

主 编 程莲萍
副主编 李世芸 吴艳萍



科学出版社

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Exercise Workbook of Mechanical Drawing

主 编 程莲萍

Editor in Chief: Lianping Cheng

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科 学 出 版 社

北 京

内 容 简 介

本习题集与科学出版社出版的、由吴艳萍主编的《机械制图》教材配套使用。为了便于教学,本习题集的编排顺序与配套的教材体系完全一致。在内容编排上,采用中英文双语对照的编排形式,以方便双语教学。考虑到各类不同专业的要求,习题的数量和难度有一定的伸缩性,以便根据实际情况灵活选用。

本习题集共十章,另加七次图纸作业。主要内容有:制图的基本知识,正投影法基础,点、直线、平面的投影以及平面与平面立体相交,基本曲面立体的投影,组合体,轴测图,机件常用的表达方法,标准件、齿轮和弹簧,零件图,装配图。习题类型有补图、补线、选择、填空、改错、作图等。

本习题集可作为普通高等工科院校机械类和非机械类各专业“机械制图”课程(学时数为40~75)的配套用书,可供其他类型院校相关专业选用,也可作为从事机械制造的工程技术人员的参考资料。

Abstract

The workbook is supporting the use of the textbook "Mechanical Drawing" edited chiefly by Yanping Wu and published by China Science Press. In order to facilitate the teaching, the layout of this workbook follows the same format as its counterpart textbook. This workbook adopts an Chinese-English bilingual layout in order to facilitate bilingual education. Taking various subjects requirements into consideration, the amount and difficulty of the exercises have a certain degree of flexibility, so that users can choose freely according to the actual situation.

The workbook has ten chapters and seven assignments as well. The workbook contains the basic knowledge of drawing, basic orthographic projection theory, the projection of points, lines, planes and intersection of planes and solids, projection of curved solids, composite solids, axonometric projection, common representations for parts, standard parts, gears and springs, detail drawings, assembly drawings. Exercise types include adding missing details, choices, blanks filling, correction, drawing, etc.

The workbook is suitable as a textbook for students whose majors are various subjects related to mechanical engineering to learn the course Engineering Drawing (40 to 75 teaching hours) in the ordinary engineering universities and colleges. The workbook can also be used as a textbook for students of related subjects in other colleges and schools. It is also a very good reference book for mechanical and manufacturing engineers.

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前 言

本习题集与科学出版社出版的吴艳萍主编的《机械制图》教材配套使用，是在 2006 年出版的《机械制图习题集》(李锡蓉主编)的基础上，按照教育部制定的“画法几何及工程制图课程教学基本要求”，全面贯彻国家颁布的最新标准，同时考虑读者的反馈意见和建议修订而成。

为了方便教师和学生使用，使教与学相统一，学与练相促进，本习题集编排顺序与配套教材保持一致，具有以下特点：

- (1) 适于双语教学。在保证学生足够的作图空间的情况下，本习题集对所有的章节题目和主要内容增加了英文对照的编写形式，以便于双语教学。
- (2) 注重先进性。本习题集采用最新国标，按照“技术制图”及“机械制图”最新国家标准及与制图有关的其他标准对相关内容进行更新和补充。
- (3) 内容体系有所改进。建立以立体表达方式为主干，从体出发阐述正投影基本规律，将传统的点、线、面融入立体的投影中，对学生三维空间分析能力有很强的现实意义。
- (4) 内容编排适用性强。为了适用于机械类和非机械类各专业，本习题集以基本题为主、难度适中，难易搭配、重点突出，重点章节适当增加了题量。习题的数量和难度有一定的伸缩性，以便根据实际情况灵活选用。
- (5) 本习题集题型多样化，既有基本的作图题，也适当增加了选择题、判断题、改错题，有利于学生空间思维和创新能力的培养。还安排了七次图纸作业，所有作业都有详细的作业指导，既有利于学生顺利完成，又方便教师教学。

本习题集由程莲萍主编，李世芸、吴艳萍担任副主编，李莎编写第一章，吴艳萍编写第二、三、四、六、九、十章，李世芸编写第五章，顾红编写第七章，程莲萍编写第八章。

衷心感谢李世芸、吴艳萍、俞智昆对初稿进行细致审阅并提出了许多宝贵意见。本习题集在编写过程中，得到昆明理工大学教务处、昆明理工大学机电工程学院及工程制图教研室全体教师的大力支持和帮助，得到云南省精品课程“工程制图及计算机绘图”建设项目的资助，在此一并表示衷心的感谢。

在本习题集的编写过程中，参考了部分相同学科的教材及习题集等文献，在此谨向这些文献的作者致谢。

由于编者水平有限，本习题集难免存在缺点和不足，恳请读者批评指正。

编 者

2012 年 5 月

Preface

This workbook is used alongside the textbook "Mechanical Drawing" edited chiefly by Yanping Wu and revised on the basis of the early edition of "Exercise Workbook of Mechanical Drawing" edited by Xirong Li in 2006. This workbook has been written following the "Basic Requirements in Teaching Descriptive Geometry and Engineering Drawing Course" developed by the Ministry of Education and revised according to the national standards newly formulated or improved in past years and feedbacks and suggestions from readers.

In order to facilitate the use of teachers and students, the layout of this work book is consistent with its counterpart textbook, providing uniformity of teaching and learning as well as promoting interactive learning and exercises. It has the following characteristics:

- (1) Appropriate in bilingual education. It adopts an Chinese - English bilingual layout on the premise of ensuring enough drawing space for students to facilitate bilingual education.
- (2) Focus on advance. Adopt the latest released national standards. The relevant contents have been updated, changed and added according to the latest released national standards of the technical drawing and mechanical drawing and other standards related.
- (3) The system of contents is changed better. It described the orthographic projection theory from solids, integrate projections of the traditional points, lines, surfaces into projections of solids and has great practical significance for fostering students the ability of analysis in three dimensions.
- (4) The applicability of contents layout is strong. In order to used in mechanical or non mechanical profession, the workbook mainly adopts basic exercises, moderate difficulty, key points standing out, and the important sections appropriately increase the amount of exercises. The amount and difficulty of the exercises have a certain degree of flexibility, so that one can free choose according to the actual situation.
- (5) Exercise types of the workbook are diversity. Appropriately added question of choices, judgment, correction. It is conducive to foster students space imagination and creative ability. The workbook arranges seven assignments and all assignments have detailed instructions. It is conducive students to successfully complete the work, but also convenient for teachers to teach.

The chief editor of the edition in 2012 is Lianping Cheng; associate editors are ShiYun Li, Yanping Wu; Sha Li edits the first chapter; Yanping Wu edits the second, third, 4th, 6th, 9th, 10th chapters; Shiyun Li edits the 5th chapter; Hong Gu edits the 7th chapter; LianPing Cheng edits the 8th chapter.

Sincerely thanks to Professor Shiyun Li, associate professor Yanping Wu, associate professor Zhikun Yu to audit the first draft of the book and give a lot of valuable advices. We are also grateful to the Office of Academic Affairs of KMUST, Department of Mechanical and Electrical Engineering of KMUST, all teachers of Engineering Drawing Teaching and Research Office for supporting us. We finally thanks to Yunnan provincial fine course "Engineering Drawing and Computer Graphics" for granting.

In the process of preparing the workbook, we reference the other textbook and workbook of the same discipline. Therefore we gratefully announce our special acknowledgement.

Due to various limitations, this workbook may contain mistakes and all criticism and corrections from all readers are welcome.

editors
May, 2012

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机械制图主练面剖技术要求说明平

系专业数量材料零结构件铸造其余

弹簧垫圈齿审核描绘侧投影切局部

长宽尺寸号备斜度俯仰上横截字案

轮滚动轴承钢塑拔模厚倒角油泵比例预淬力室新姓名班螺旋下中心

前后左右端栓法兰盘称格德勒通农化交钢手柄确理工学院圆弧连接

一 二 三 四 五 六 七 八 九 十 玻璃铆焊克过程钉阀盖减判断铅垂竖棱隔框

A B C D E F G H I J K L M N O P

a b c d e f g h i j k l m n o p q

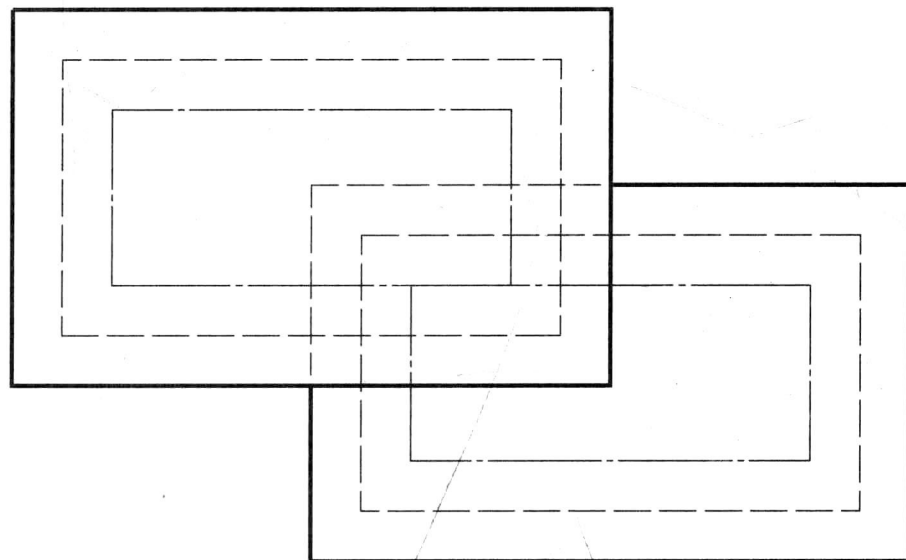
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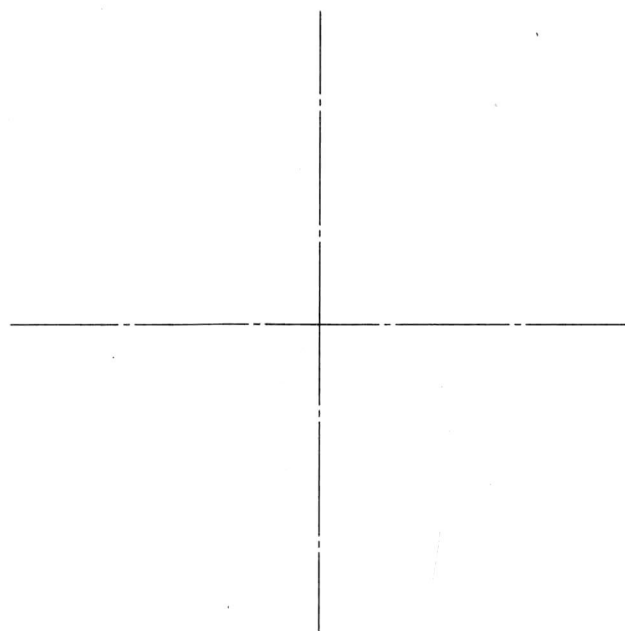
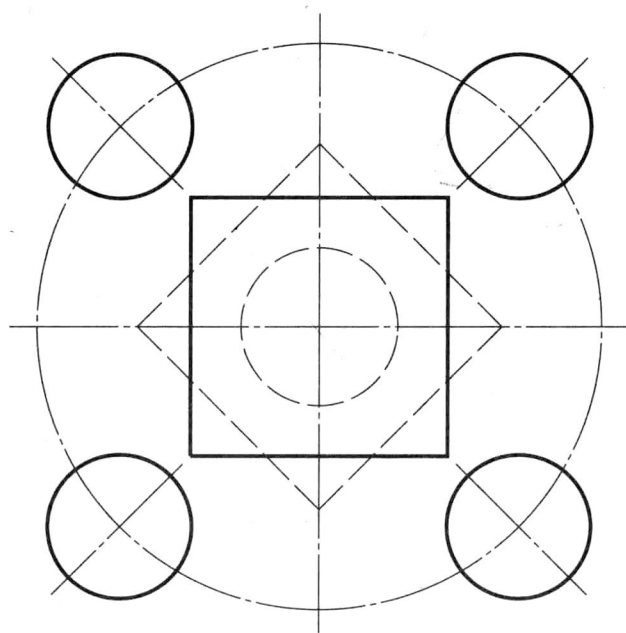
a b c d e f g h i j k l m n o p q

1 2 3 4 5 6 7 8 9 10 ϕ

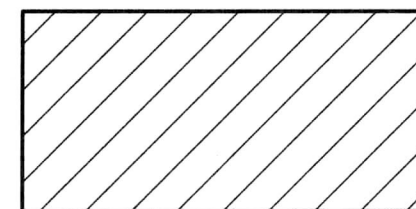
1. 按1:1抄绘所给图形, 尺寸从图中量取, 并圆整。(Draw following the example.)



2. 在指定位置按1:1抄绘所给图形, 尺寸从图中量取, 并圆整。(Draw following the example.)

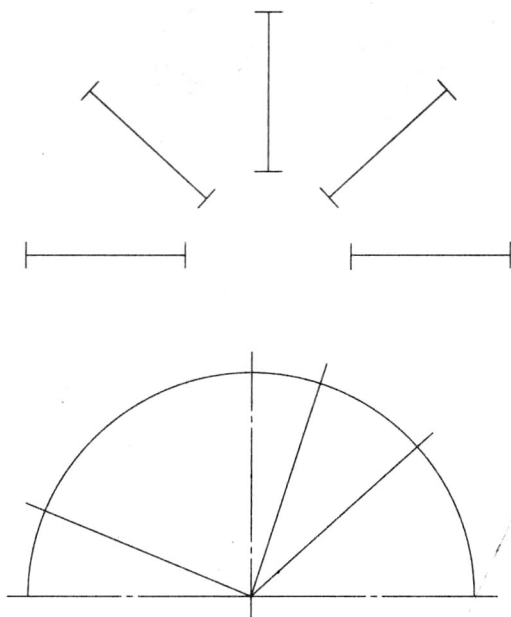


3. 按1:1抄绘所给图例。(Draw following the example.)



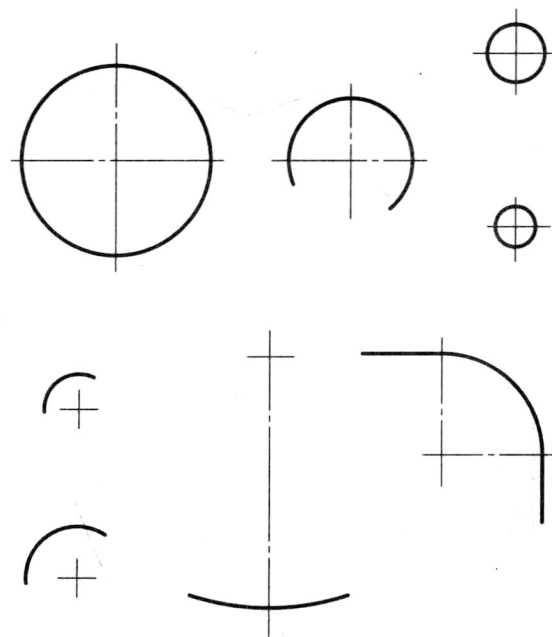
1. 标注出尺寸箭头、线性尺寸及角度尺寸。

(Mark arrows, linear and angular dimension.)



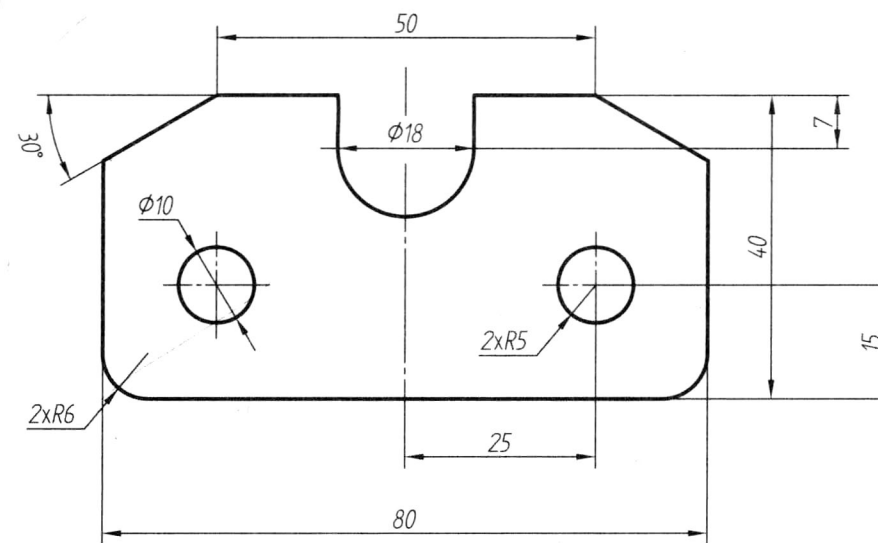
2. 标注直径或半径尺寸。

(Dimension diameters or radius.)



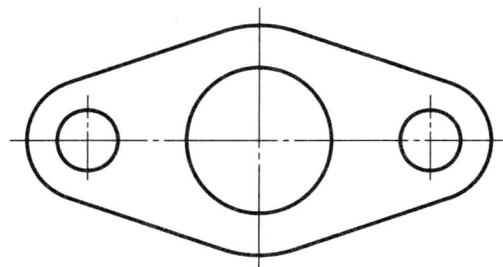
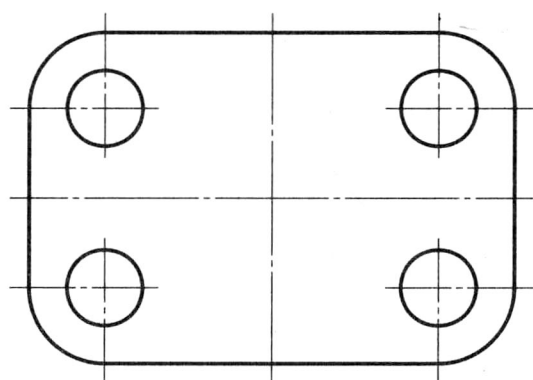
3. 指出图(1)中标注错误的尺寸, 在图(2)中标注完整正确的尺寸。

(Point out the error dimensions in Fig. 1, and correct in Fig. 2.)



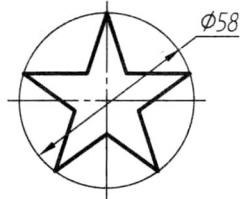
(1)

4. 标注平面图形的尺寸。 (Dimension 2D objects.)

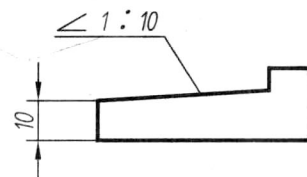


(2)

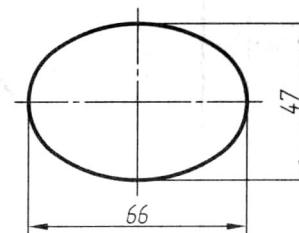
1. 用作正五边形的方法画五角星。(Draw a pentagram by the method of drawing the right pentagon.)



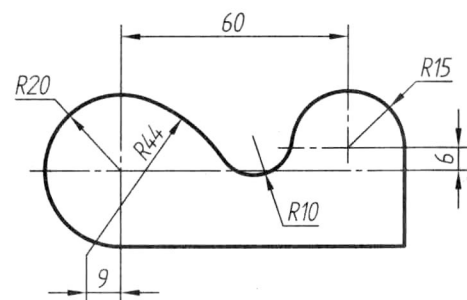
2. 作斜度。(Add the lines at given slope.)



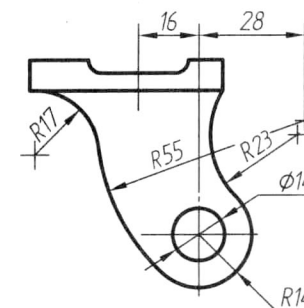
3. 用四心近似法画椭圆。(Draw ellipse by four-center approximate method.)



4. 作圆弧连接。(Draw tangent arcs.)



5. 作圆弧连接。(Draw tangent arcs.)



作业1 基本练习 (Basic Exercises)

一、目的

- 1. 熟悉主要线型的规格，掌握图框及标题栏的画法。
- 2. 熟悉尺规绘图的过程，学习正确使用绘图工具和仪器的方法。
- 3. 了解并遵守国标的有关规定。

二、内容与要求

- 1. 图名：基本练习。
- 2. 选下图绘制在一张A3图纸中。
- 3. A3图纸横放，按图中所给尺寸1:1绘制。

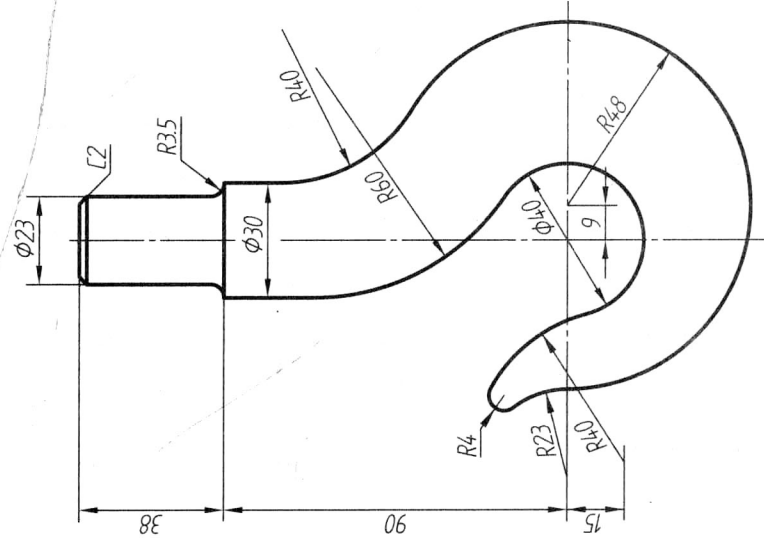
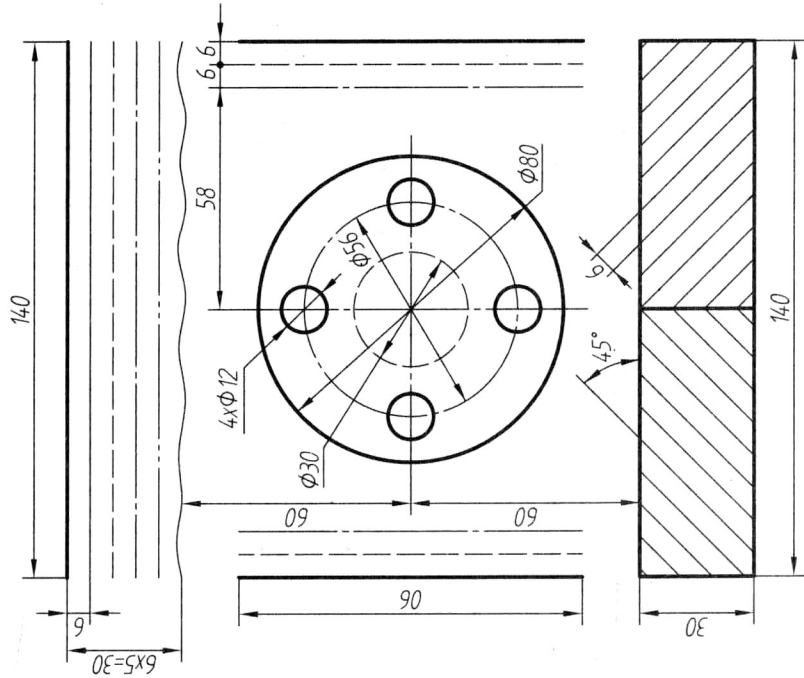
三、绘图步骤

- 1. 分析图形。
- 2. 画底稿 (用H或2H铅笔)。
 - (1) 画图框、标题栏。
 - (2) 布图，画图形的基准线、对称线及圆的中心线等。
 - (3) 按图例中所注的尺寸，开始作图。
 - (4) 画尺寸界线、尺寸线。
- 3. 检查底稿，擦去多余图线。
- 4. 加深图形。(用B或2B铅笔)
- 5. 标注尺寸，填写标题栏。
- 6. 校对，修饰图面。

四、注意事项

- 1. 布置图形时，应考虑标注尺寸的位置。
- 2. 画底稿时，作图线应轻而准确，并应找出连接弧的圆心及切点。
- 3. 加深时按“先粗后细、先曲后直、先水平后垂直、倾斜”的顺序进行，尽量做到同类图线规格一致。粗线型线宽 d ，细线型线宽 $d/2$ ；细虚线长度 $12d$ ，间隙 $3d$ ；细点画线长 $24d$ ，间隙及中间小短划共 $6d$ 。
- 4. 箭头宽 d ，箭头长度 $\geq 6d$ ，图中箭头应大小一致。
- 5. 字体工整。标题栏内的字体要符合GB/T 14691--1993《技术制图 字体》的规定。日期签署可用年月日形式如：20120918。
- 6. 光滑连接。
- 7. 图面整洁。

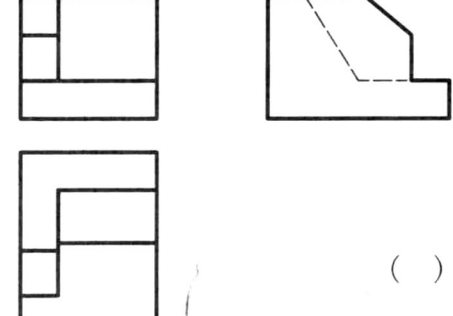
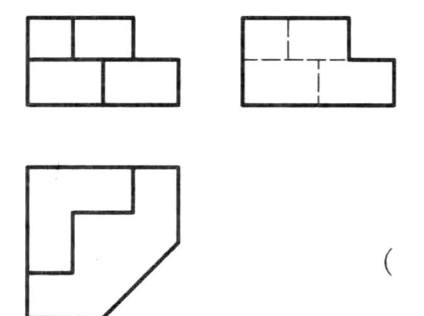
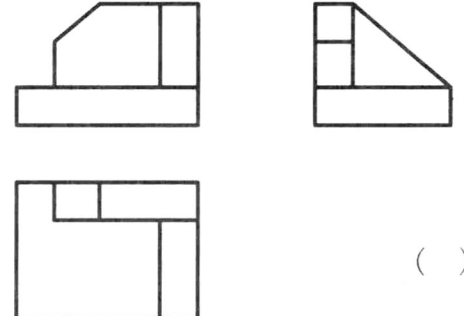
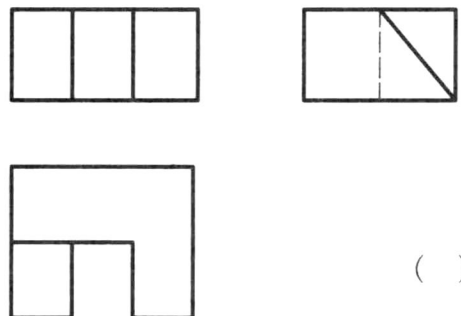
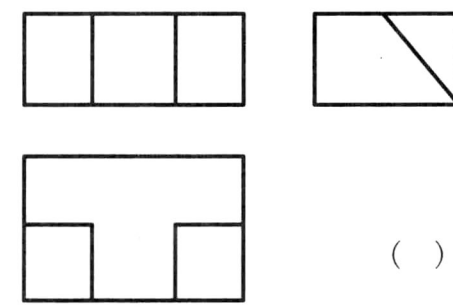
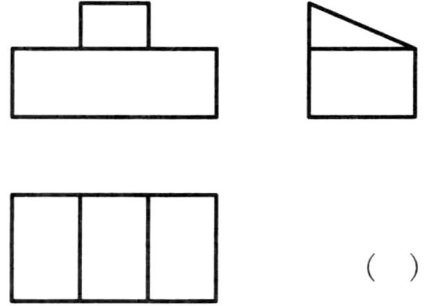
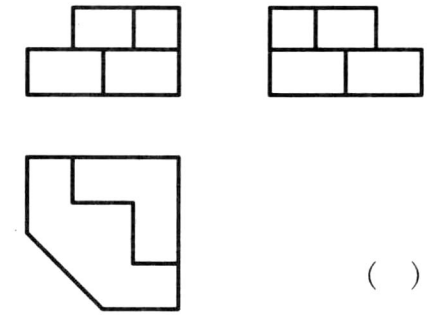
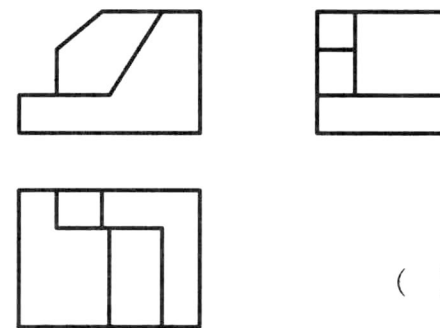
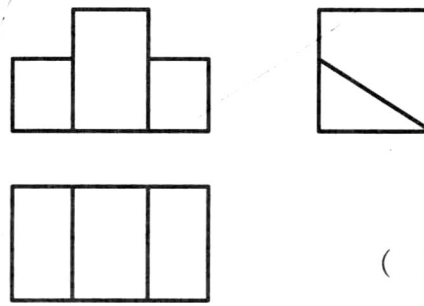
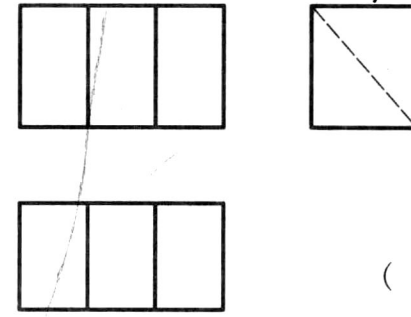
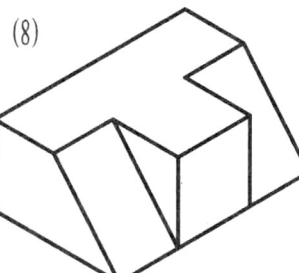
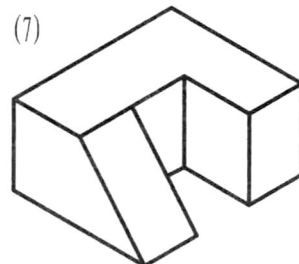
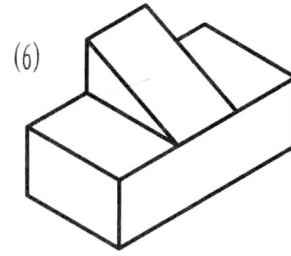
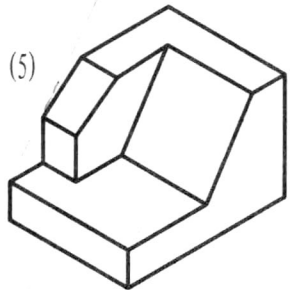
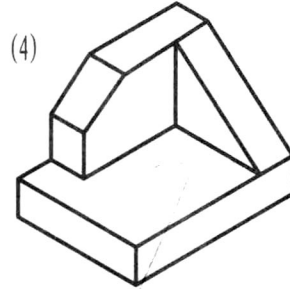
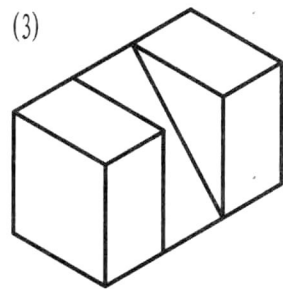
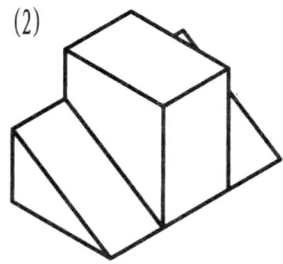
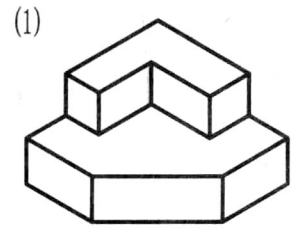
(The purpose, contents and requirements, drawing steps and notices of basic exercises.)



设计	(日期)	(材料)	(校名)
板板			基本练习
审核		比例	(图样代号)
班级	学号	共 张	第 张

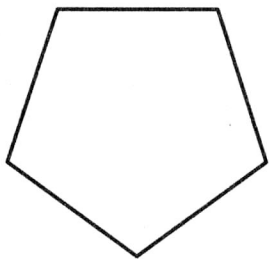
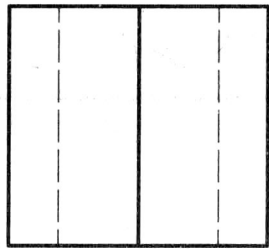
1. 根据立体图找出对应的三面投影图，将对应的立体图号码填写在三面投影图的括号内。

(Place the number of the appropriate component in the bracket beside each three-projection drawing.)



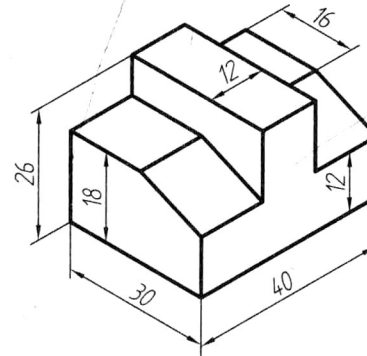
1. 画出正五棱柱的侧面投影。

(Draw the profile projection of the regular pentagonal prism.)

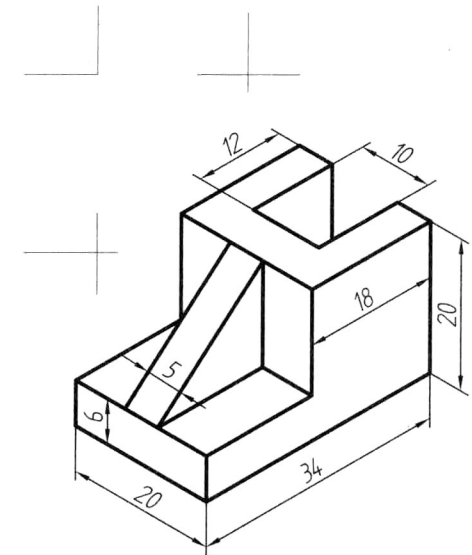


3. 根据立体图和给出的尺寸, 1:1 画出立体的三面投影。(Draw three-projection drawings according to pictorial drawing and dimensions.)

(1)

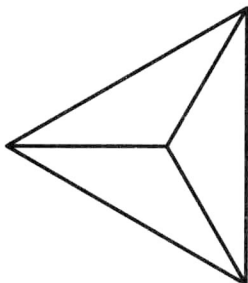
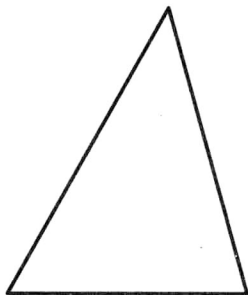


(2)

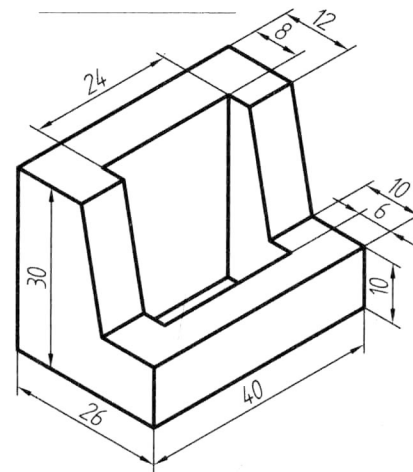


2. 画出三棱锥的侧面投影。

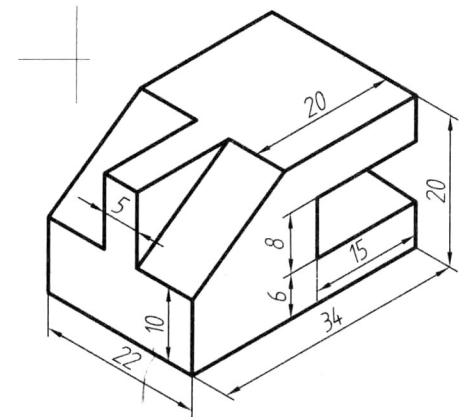
(Draw the profile projection of the triangular pyramid.)



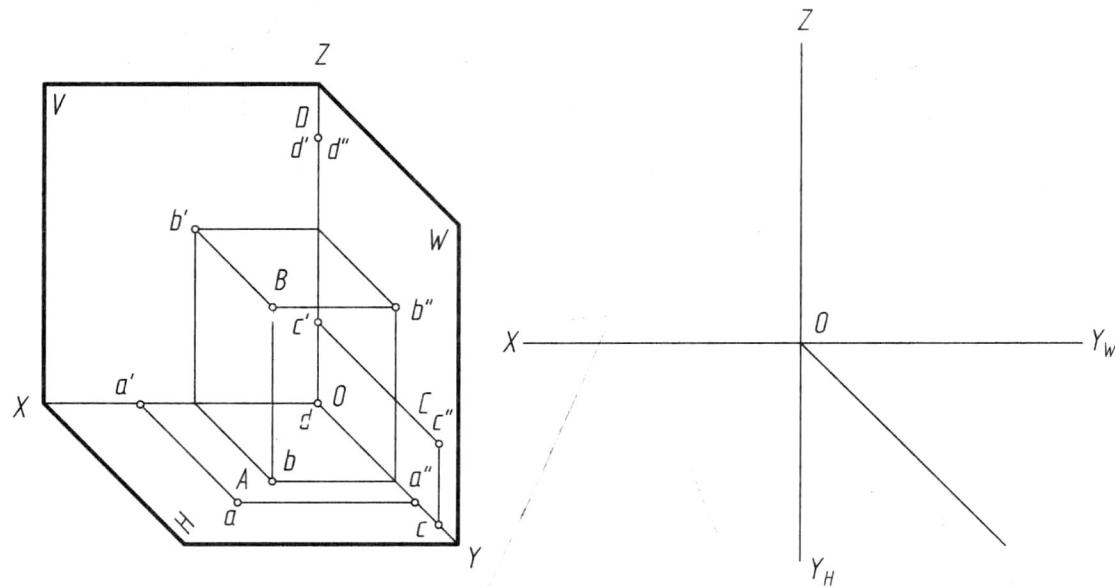
(3)



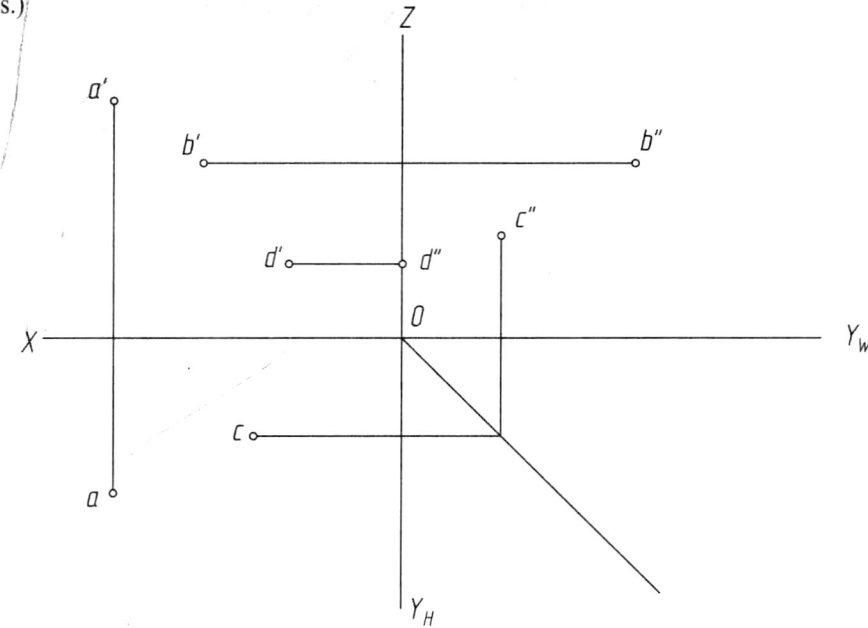
(4)



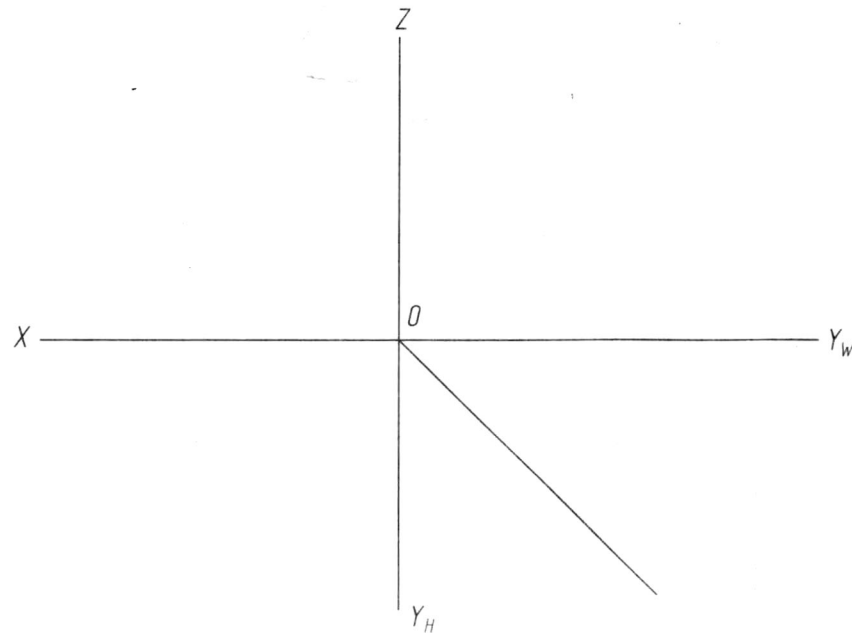
1. 根据立体图画诸点的三面投影。(Draw three projections of points according to the pictorial drawing.)



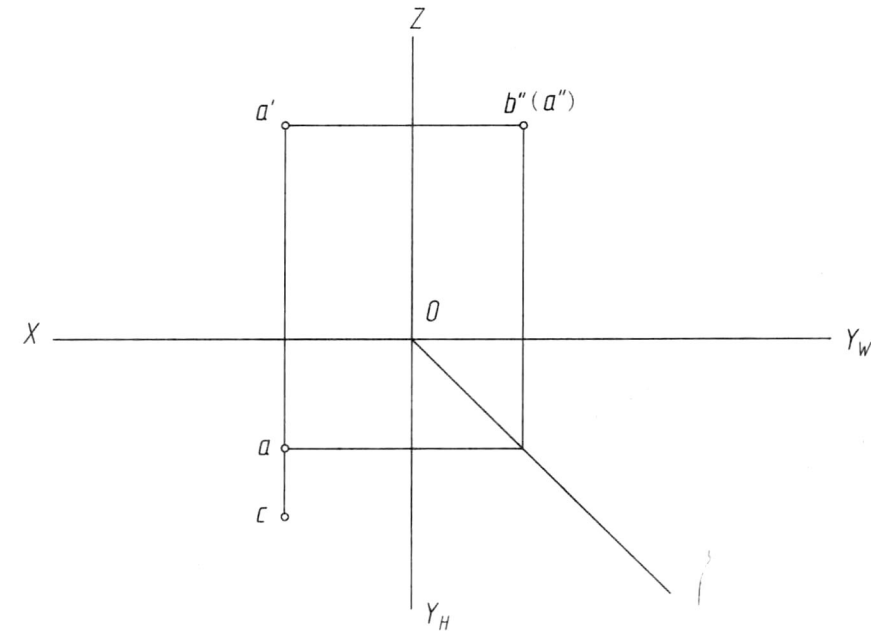
2. 根据点的两面投影作出诸点的第三面投影。(Draw the third projection of points according to two projections.)



3. 作出诸点的三面投影: 点A(20, 15, 20); 点B距离投影面W、V、H分别为20, 10, 15; 点C在A点之左10, A之前10, A之上10; 点D在A之下12, 与投影面V、H等距离, 与投影面W的距离是与H面距离的3倍。(Draw three projections of points given.)

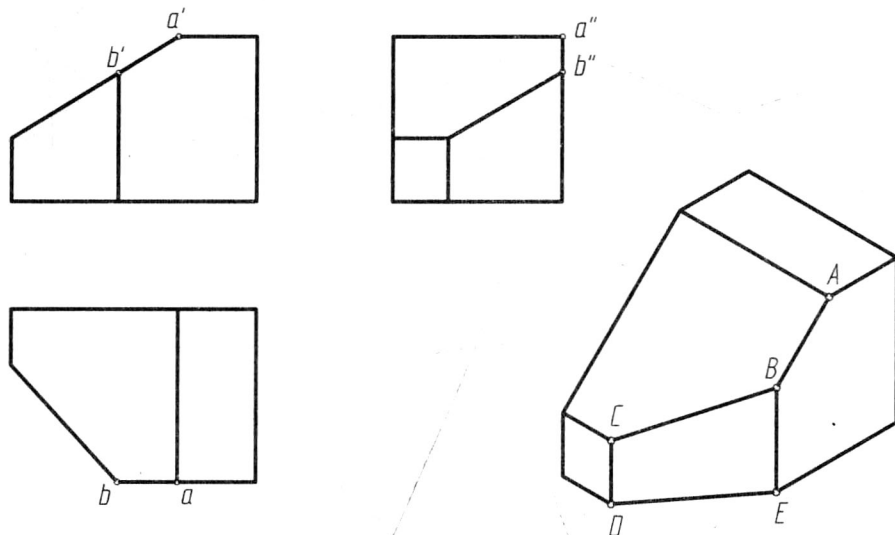


4. 已知点B距离点A为10; 点C与点A是对V面的重影点; 点D在B点正下方15。补全诸点的三面投影, 并注明可见性。(Draw three projections of points given and distinguish the visibility.)



1. 根据立体图标出各直线的三面投影, 并填写直线相对投影面的位置。

(Mark the position of lines in the three projections of component and fill in the blanks.)

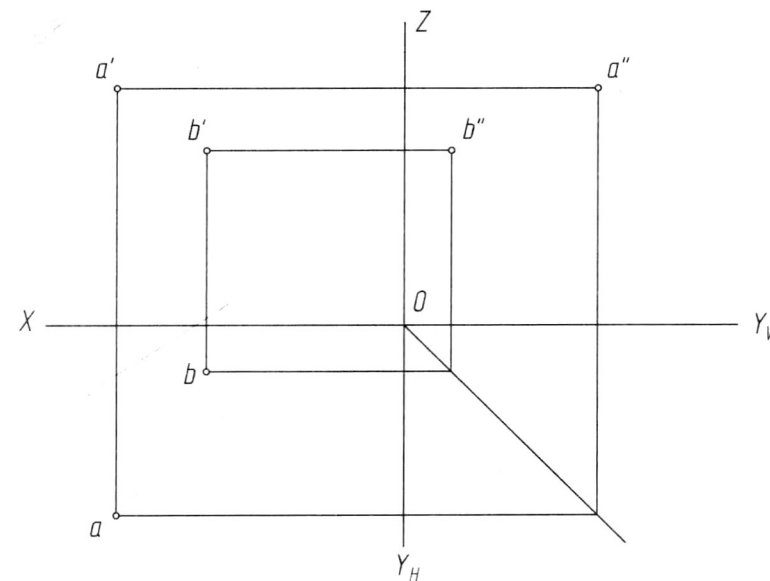


AB是_____线; BC是_____线; BE是_____线; DE是_____线。

2. 作下列直线的三面投影:

(1) 水平线AC, 从点A向右、向后, $\beta=30^\circ$, $AC=30\text{mm}$; (2) 侧垂线BD, 从点B向右, $BD=20\text{mm}$ 。

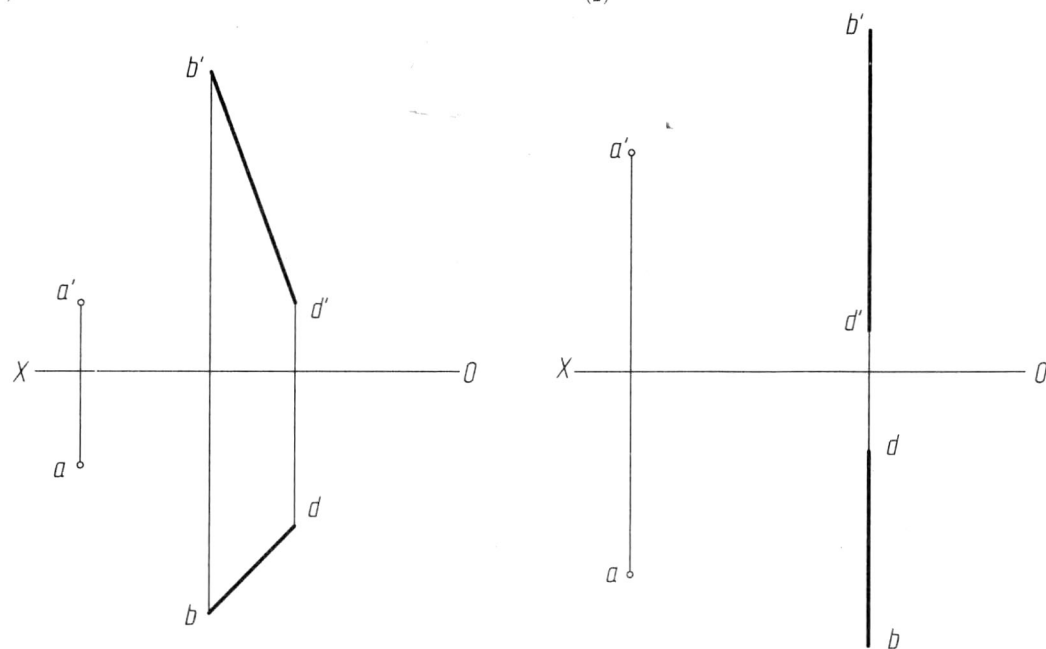
(Draw three projections of horizontal line AC and W-perpendicular line BD.)



3. 由点A作AC, 与直线BD相交, 交点C距H面20mm。 (Draw two projections of the line AC.)

(1)

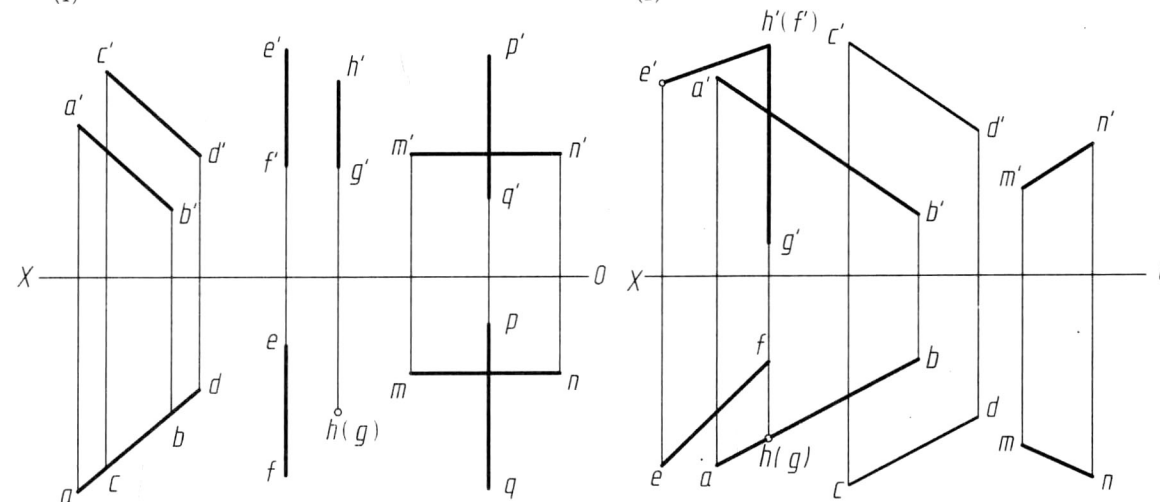
(2)



4. 判断并填写两直线的相对位置 (平行、相交、交叉)。 (Judge the relative position of lines.)

(1)

(2)



AB、CD是_____线; EF、GH是_____线;

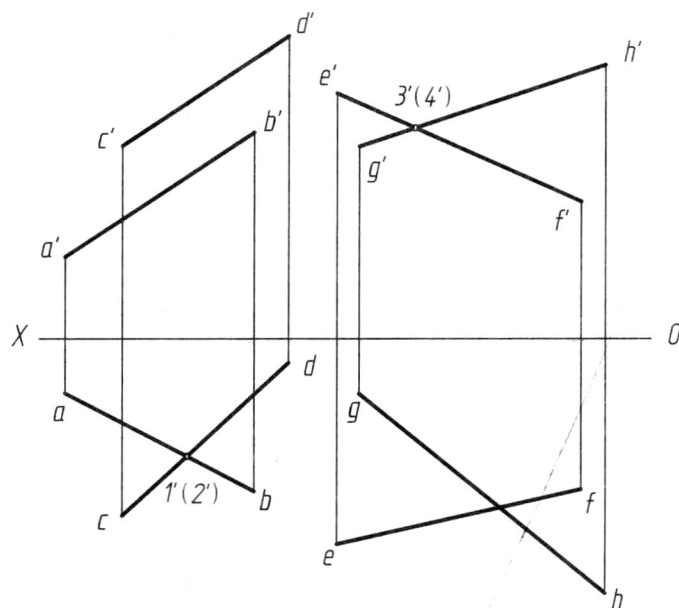
MN、PQ是_____线。

AB、CD是_____线; CD、MN是_____线;

AB、GH是_____线; EF、GH是_____线。

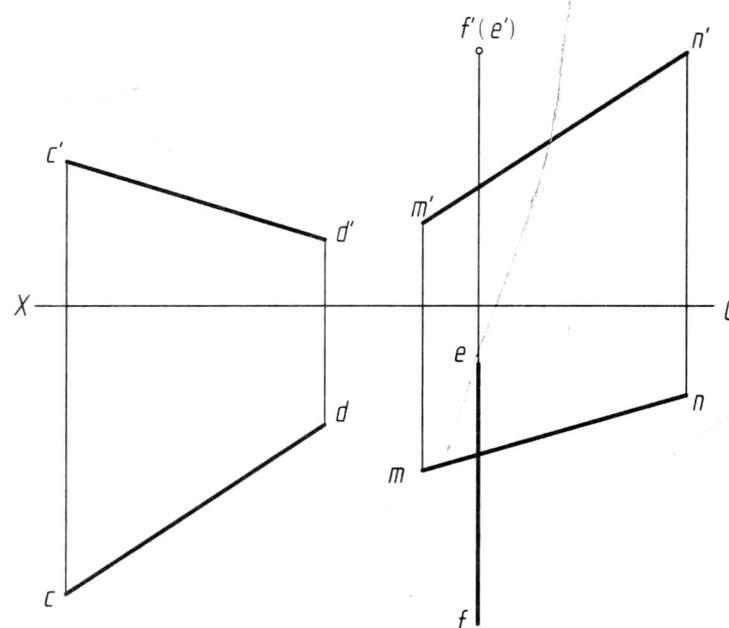
1. 注出两交叉直线重影点的投影。

(Mark the projections of coincident points.)



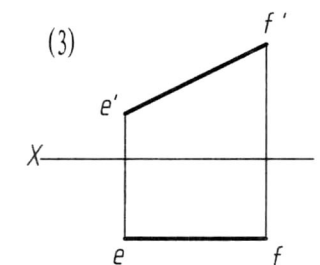
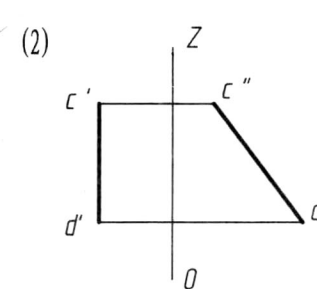
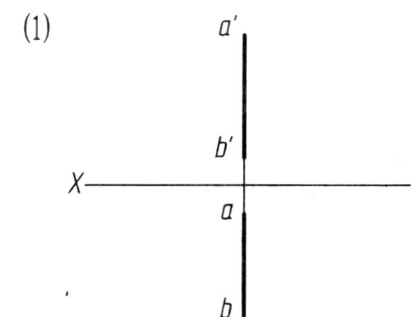
2. 作直线AB与直线CD平行, 且与EF、MN两直线相交。

(Draw two projections of line AB which is paralleling with CD and intersecting with EF, MN.)

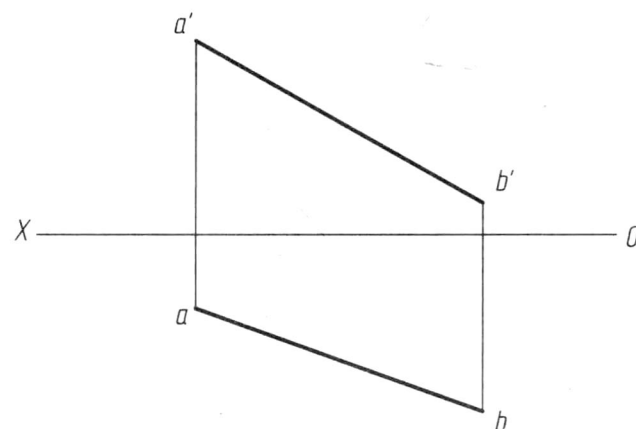


3. 求各线段实长。(若有不需要作图的题, 指明实长即可)

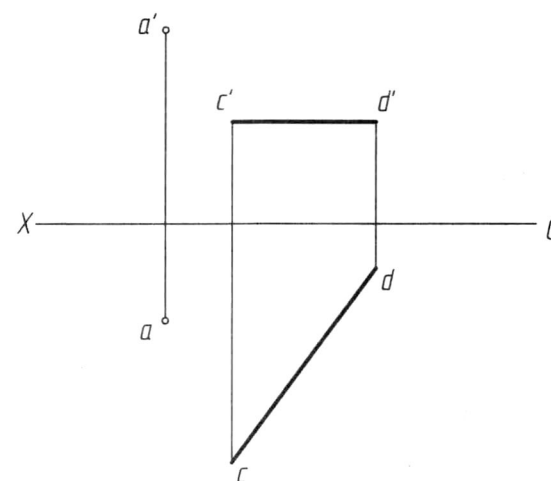
(Solve the true length of line segments.)



4. 用直角三角形法求直线AB的实长及其对H面、V面的倾角。(Use right triangle method to solve true length and oblique angle of line AB.)



5. 由点A作直线CD的垂线AB, 作出垂足B, 并求出A点与直线CD间的真实距离。(Draw two projections of line AB and gain real distance between point A and line CD.)



6. 已知菱形ABCD的对角线BD的投影和另一对角线端点A的水平投影a, 完成菱形的两面投影。(Draw two projections of diamond ABCD.)

