

Progress assessment

The following materials refer to the course FME and are to be used for everyday, progress and final assessment.

1. Questions for tests and examination
2. Tasks for progress assessment and examination papers

1

1. Name types of products in mechanical engineering.
2. What is a life cycle of a product?
3. What parameters characterize quality of products?
4. What is manufacturability of a product design?
5. What parameters characterize accuracy of a part and of a machine?
6. How is continuous increase of machines accuracy explained?
7. What is the difference between manufacturing process and production process?
8. What does the process planning include?
9. What is an operation?
10. What is a processing step?
11. What are manufacturing means?
12. What is operation cycle per part?
13. What part of the operation cycle per part is called machining time?
14. What part of the operation cycle per part is called auxiliary time?
15. What is set-up time?
16. What is work sampling and workday timestudy?
17. Name the main methods of production and give their brief characteristics.
18. What is Takt time of products?
19. What is synchronization of operations?
20. What is the difference between flow and non-flow production?
21. What parameters are used to evaluate productivity?
22. What costs are included in the shop cost?
23. What is locating and clamping?
24. What is a datum, a set of datums, a locating point?
25. What is the six-point principle?
26. How are datums classified according to the number of the constrained degrees of freedom?
27. How are datums classified according to the nature?
28. What are the primary and auxiliary datums of a product?
29. What is a dimensional chain?
30. List the types of component dimensions of dimensional chains?
31. How are dimensional chains classified?
32. What are the direct and inverse tasks in calculation of dimensional chains?

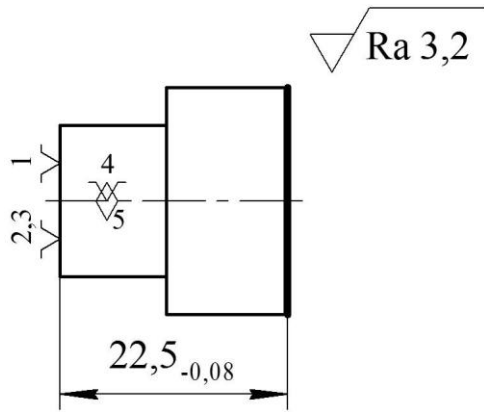
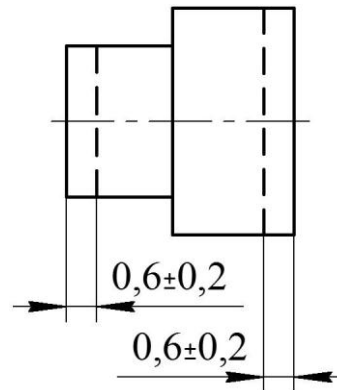
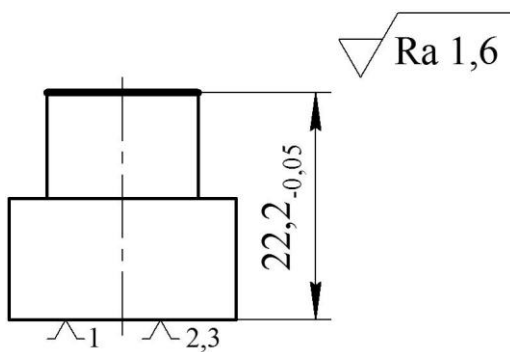
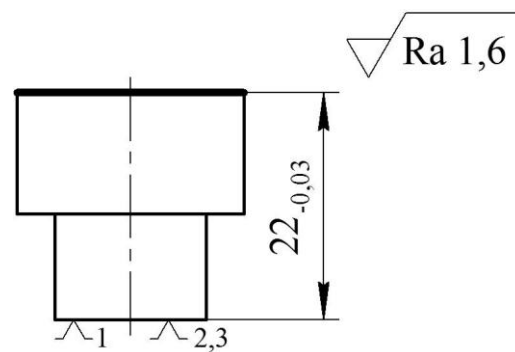
33. How is the resulting dimension tolerance allocated between the tolerances of the component dimensions (solution of the direct task)?
34. What is the difference between maximum-minimum method and statistical method of the direct task solving?
35. How are the planar dimensional chains with non-parallel dimensions solved?
36. What are the peculiarities of calculation of parallel-linked dimensional chains?
37. What is the essence of ensuring accuracy of the resulting dimension by the complete interchangeability method?
38. What is the essence of ensuring accuracy of the resulting dimension by the incomplete interchangeability method?
39. What is the essence of ensuring accuracy of the resulting dimension by the group interchangeability method?
40. What is the essence of ensuring accuracy of the resulting dimension by the fitting method?
41. What is the essence of ensuring accuracy of the resulting dimension by the adjustment method?
42. What dimensions are resulting in dimensional chains formed during the manufacture of parts?
43. How is the dimensional diagram of the manufacturing process constructed?
44. What is the essence of the tolerance analysis of the designed manufacturing process?
45. How can you enhance material properties of the cast and formed workpieces?
46. How does heat treatment (annealing, normalizing, hardening, tempering) change properties of steel workpieces?
47. How does chemical-heat treatment (carburizing, nitriding, carbonitriding) change properties of workpieces?
48. List the main parameters of the surface layer quality.
49. How does quality of the surface layer influence on performance of parts and their joints?
50. How do cutting parameters influence surface layer quality?
51. How do grinding parameters influence surface layer quality?
52. What is the purpose of cold working of parts?
53. How can work hardening and residual stresses be eliminated in surface layer of a part?
54. List the main causes of errors of workpiece machining.
55. Why precision machine tools should be used only for finishing operations?
56. How can you reduce machining errors caused by elastic deformations of the technological system due to cutting forces?
57. How can you reduce the machining errors caused by thermal deformations of the technological system?
58. How can you reduce machining errors caused by cutting tool wear?
59. How can you reduce machining errors caused by residual stresses?
60. How can you reduce machining errors caused by inaccuracy of sizing cutting tools?

61. List components of error of workpiece mounting.
62. How can you reduce the error of workpiece mounting?
63. How does mounting error influence the accuracy of machining?
64. What is the nature of the installation pieces with alignment? When is it applied?
65. What is working setting size and how is it determined?
66. Why does the method of trial cuts provide higher accuracy compared to machining on pre-set machine tools?
67. What is the aim of setting a manufacturing system for machining a batch of workpieces?
68. What methods can be used for a manufacturing system setting?
69. How can you reduce machining time?
70. How does rigidity of technological system affect the possibility of combining the processing steps?
71. How can you reduce auxiliary time?
72. What are advantages of multiple-machining?
73. How can you reduce setup time?
74. What is the essence of group technology?
75. How can you reduce materials costs?
76. When multiple-machine manning is applicable and what advantages it provides?
77. What is the essence of process typification and what advantages it provides?
78. Give classification of manufacturing processes.
79. What is the sequence of development of a uniform manufacturing process?
80. How can a method of production be defined during the manufacturing process designing?
81. What are the requirements that the part design must comply with for manufacturability?
82. What dimensions should be specified on the part drawing, when some surfaces of the part are not exposed to machining?
83. What factors define form and production method of a workpiece?
84. What are the requirements that the workpiece design must comply with for manufacturability?
85. What is a complex workpiece?
86. What are the principles of manufacturing datums selection, explain their essence?
87. What is influenced by the selection of manufacturing datums for the first operation?
88. How are manufacturing datums for the first operation selected?
89. How are machining routes for individual surfaces of the part formed?
90. How are operations of the manufacturing process formed?
91. What considerations guide the selection of machine tools, fixtures and tools?
92. How can you calculate minimum allowances for machining?
93. How are tolerances of manufacturing dimensions allocated?
94. How does the mounting error influence on manufacturing dimensions?
95. What are the conditions for calculation of manufacturing dimensions?

96. What is the sequence of calculation of cutting parameters for roughing and finishing?
97. How can you evaluate cost-effectiveness of manufacturing process variants?
98. Give classification of assembling processes according to stages of the assembly process and level of mechanization and automation.
99. Name the basic forms of assembly organization and characterize them.
100. What is the sequence of design of an assembly process?
101. What does the manufacturing inspection of assembly drawings include?
102. What are the requirements that the part design must comply with for manufacturability during assembly?
103. How are assembly diagrams constructed?
104. How is content of the assembly operations defined?

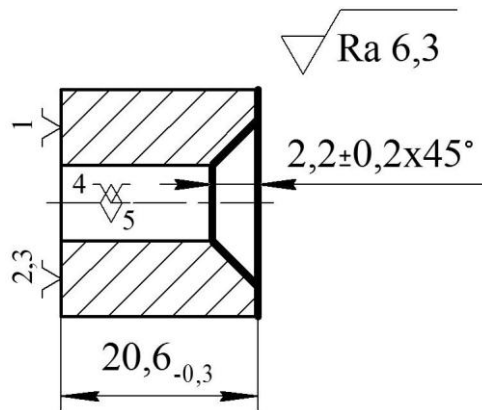
Task 1

The required thickness of the case hardened layer on the part ends should be at least 0.2 mm. Define, is it possible to ensure this requirement under the specified manufacturing conditions.

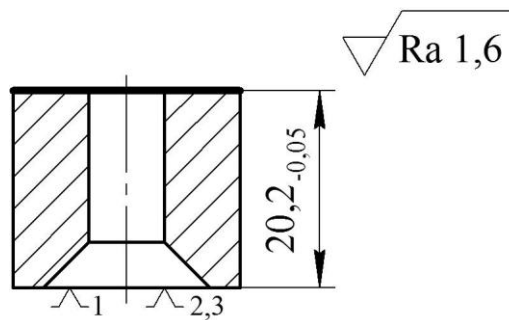
**1. Turning****2. Chemical heat treatment****3. Surface grinding****4. Surface grinding**

Task 2

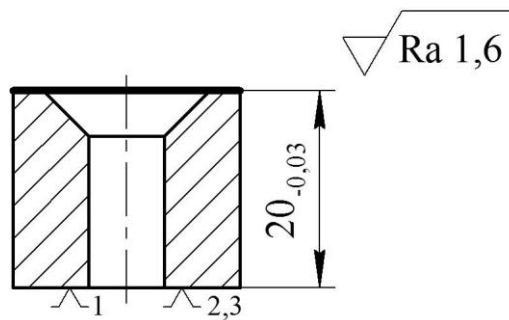
The required dimension of the chamfer, according to the drawing, is 2 ± 0.3 . Define, is it possible to ensure this dimension under the specified manufacturing conditions?



1. Turning



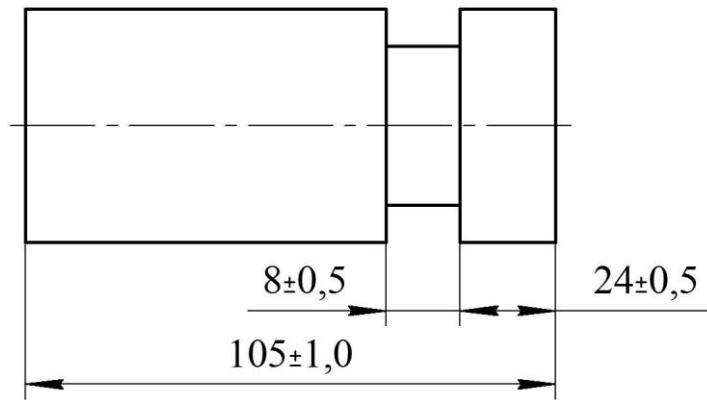
2. Surface grinding



3. Surface grinding

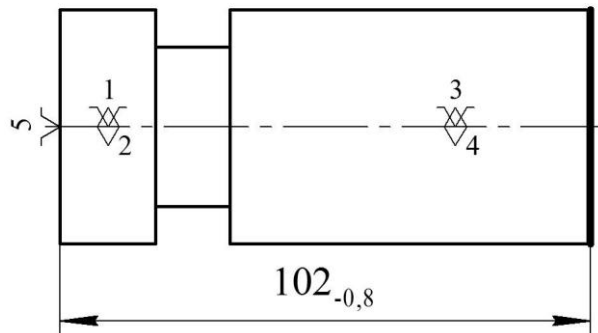
Task 3

According to the given manufacturing dimensions, define the limits of size of allowances for facing of ends 1 and 2.

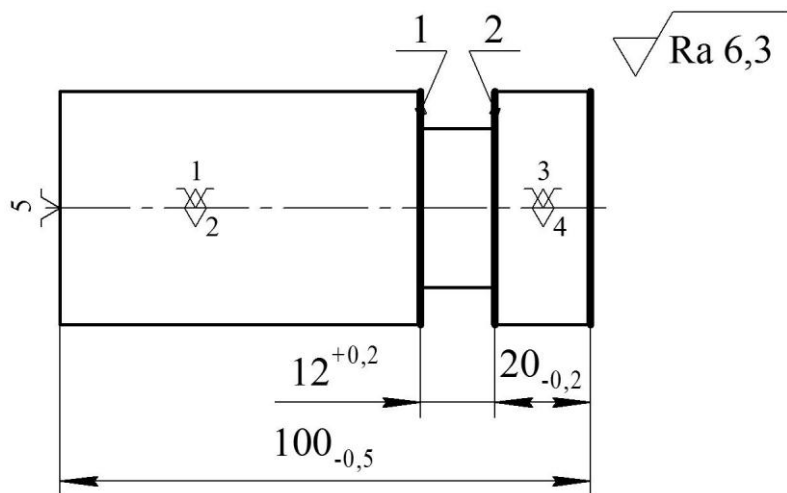


0. Casting

$\sqrt{\text{Ra } 6,3}$



1. Turning

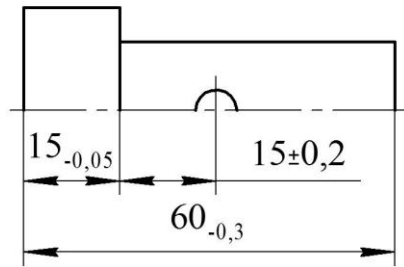


2. Turning

Task 4

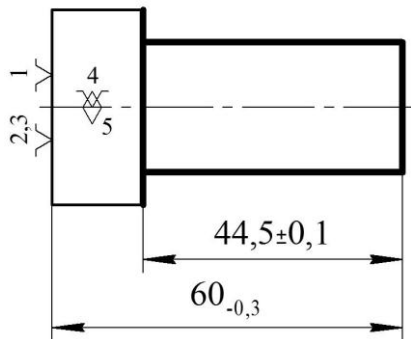
According to the given manufacturing dimensions, define, whether is it possible to ensure functional dimensions?

$\sqrt{\text{Ra } 6,3} (\checkmark)$



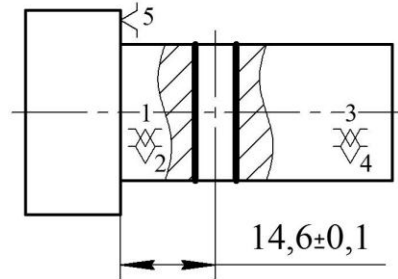
Sketch of the part

$\sqrt{\text{Ra } 6,3}$



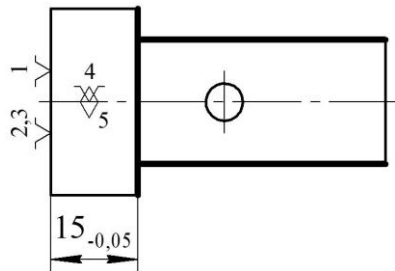
1. Turning

$\sqrt{\text{Ra } 1,6}$



2. Drilling

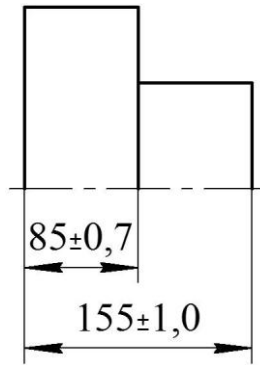
$\sqrt{\text{Ra } 1,6}$



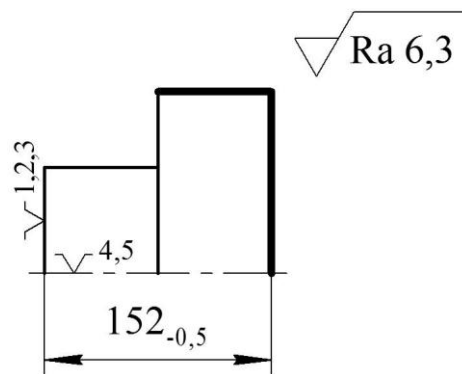
3. Cylindrical grinding

Task 5

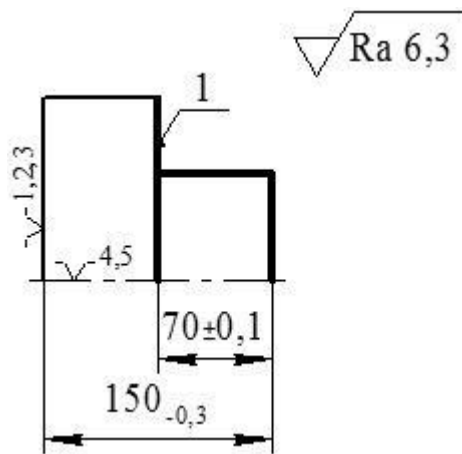
According to the given manufacturing dimensions, define the limits of size of allowance for facing of end 1.



0. Workpiece



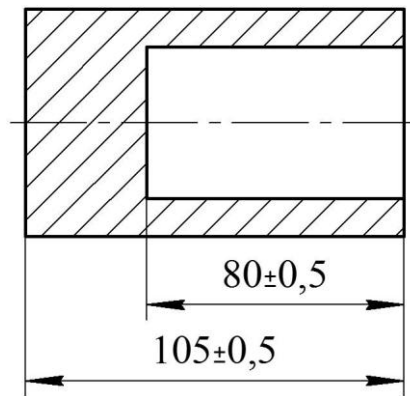
1. Turning



2. Turning

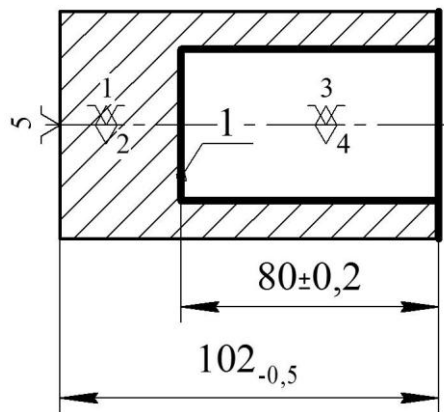
Task 6

Define the limits of size of allowances for facing of ends 1 and 2.



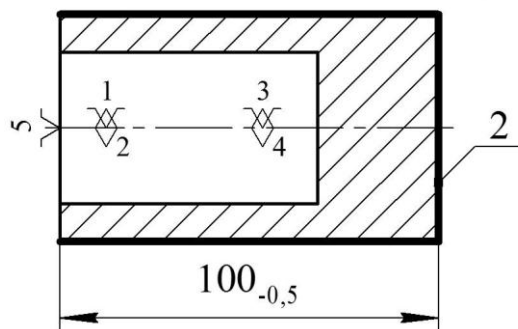
0. Workpiece

∇ Ra 6,3



1. Turning

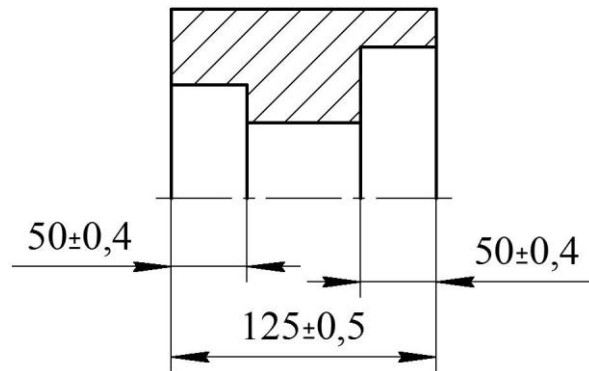
∇ Ra 6,3



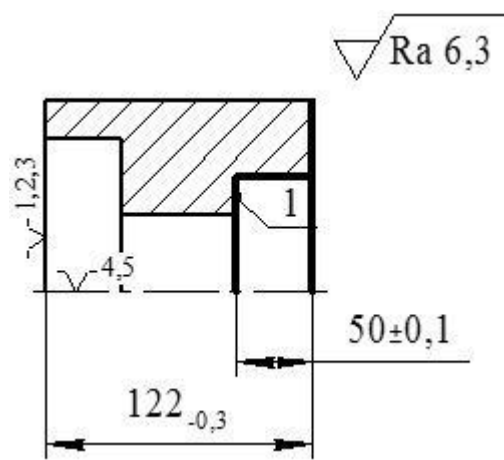
2. Turning

Task 7

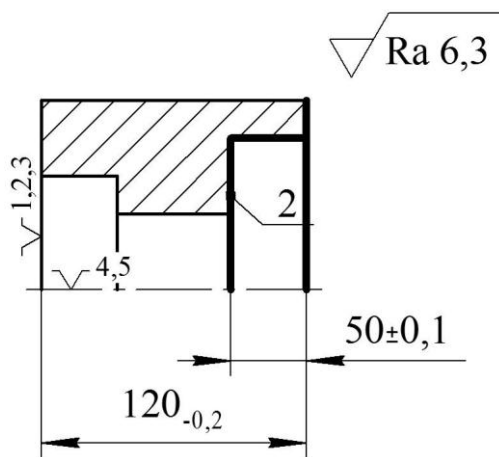
According to the given manufacturing dimensions, define the limits of size of allowances for facing of ends 1 and 2.



0. Workpiece



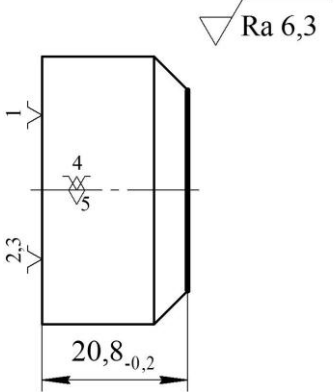
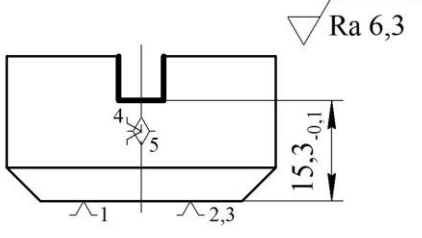
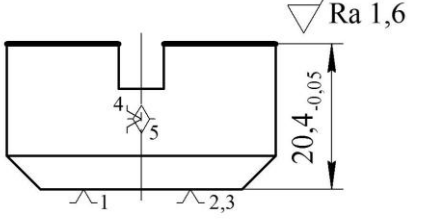
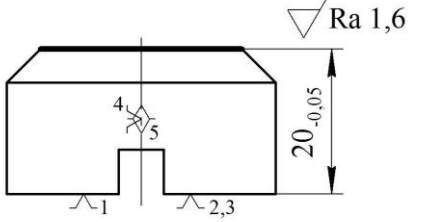
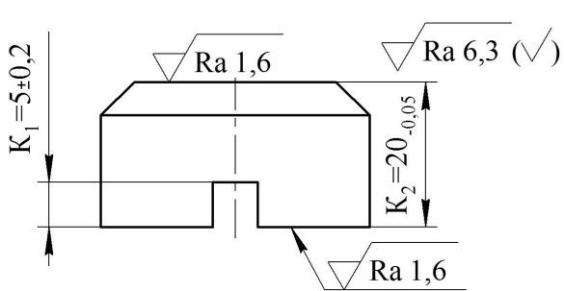
1. Turning



2. Turning

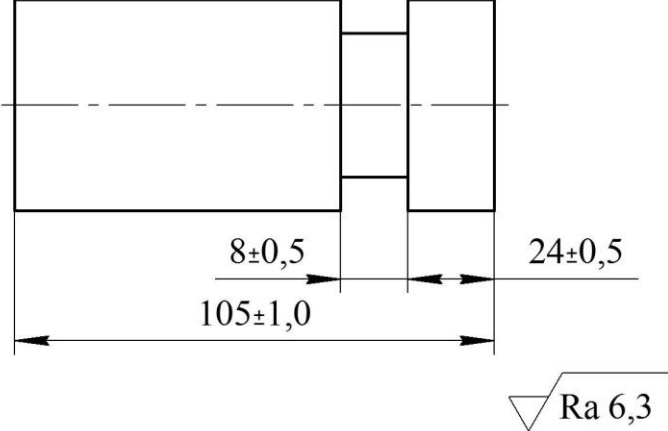
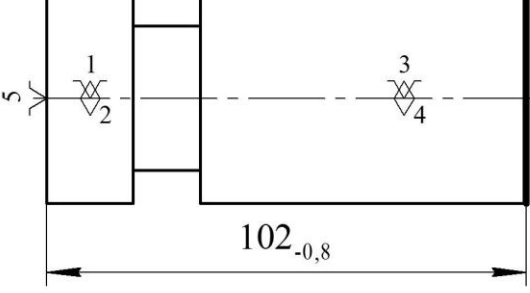
Task 8

According to the given manufacturing dimensions, define whether is it possible to ensure the functional dimension K_1 ?

<p>1. Turning</p>	
<p>2. Milling</p>	
<p>3. Surface grinding</p>	
<p>4. Surface grinding</p>	
<p>Sketch of the part</p>	

Task 9

According to the given manufacturing dimensions, define the limits of size of allowances for facing of ends 1 and 2.

0. Casting	
1. Turning	
2. Turning	