Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE EXAMINATION, 2019

ENGINEERING – MATERIALS AND TECHNOLOGY

(Ordinary level – 200 marks)

THURSDAY, 6th JUNE MORNING, 9:30 – 12:00

Answer **Question 1**, **Section A** and **Section B**, and **three** other questions.

Question 1. **(65 marks)**

SECTION A – 30 marks

Give **brief** answers to **any six** of the following:

(a) State **two** safety precautions that should be followed when using a bandsaw.

(b) List **one** use for the fiber optic inspection camera shown.

(c) State **two** properties associated with copper.

(d) Describe **one** way in which modern developments in technology have changed car manufacturing.

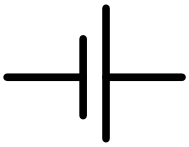
(e) Give an example of **each** of the following:

(i) A temporary joint; **(ii)** A permanent joint.

(f) Identify the mechanism shown opposite **and** give **one** appropriate use for it.

(g) State **one** application of vacuum forming.

(h) Name the electronic component represented by the symbol shown **and** suggest **one** suitable use of this component.



SECTION B – 35 marks

Answer **any three** of the following:

(i) Describe the main operating features of **any one** of the following:

Pop riveting gun

Shears

Tailstock.

(j) Explain **any two** of the following:

Hacking, Virtual reality, Mobile technology, Skype.

(k) Define the term *hazard* in relation to health and safety **and** give **one** example of a hazard.

(l) Explain **any two** of the following:

Countersink drill, Blind hole, Swarf, Reamer.

(m) Name the type of chuck shown **and** give a suitable application of it.

Question 2. **(45 marks)**

(a) Name the metals produced from **each** of the furnaces listed below:

(i) Blast furnace;

(ii) Basic oxygen furnace;

(iii) Electric arc furnace.

(b) Select **one** of the furnaces listed at **Q2(a)** above **and** with the aid of a suitable diagram, answer **each** of the following:

(i) Label the main parts of the furnace;

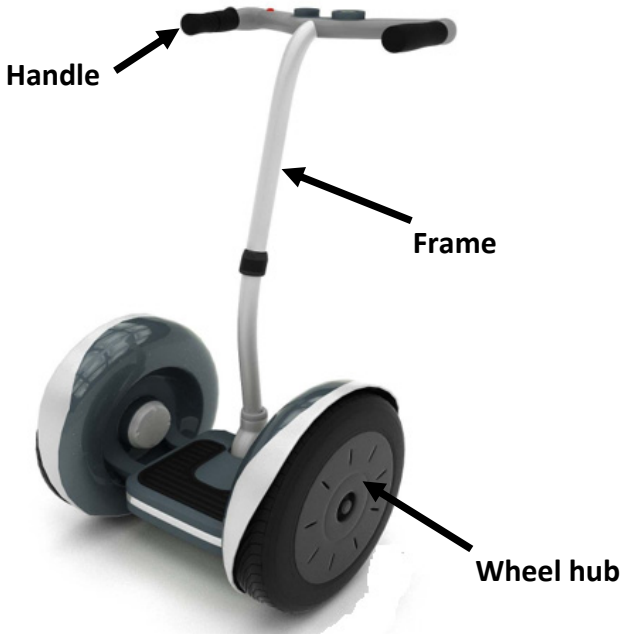
(ii) List the materials used in the charge;

(iii) Describe how the charge is heated.

(c) You have been asked to manufacture a personal transporter for use by tourists in a city.

(i) Name a suitable material for **each** of the parts labelled on the personal transporter shown below;

(ii) State **one** reason for the selection of **each** material.



(d) An alloy is made by combining two or more metals.

(i) Name **two** alloys;

(ii) List the metals used to make **one** of the alloys, named by you, in **2(d)(i)**.

Question 3. **(45 marks)**

(a) **(i)** Explain **two** heat treatment processes carried out at **cutting edge A** during the manufacture of the cold chisel shown.

(ii) State the mechanical property most associated with the **cutting edge** at **A**.

(iii) State the mechanical property most associated with the **head** of the cold chisel shown at **B**.

(b) Describe **each** of the following with regard to heat treatment:

(i) Quenching;

(ii) Work hardening.

(c) State **two** safety precautions to be observed when cooling hot metals.

(d) Explain **any two** of the following terms:

(i) Malleability, **(ii)** Tensile strength, **(iii)** Brittleness.

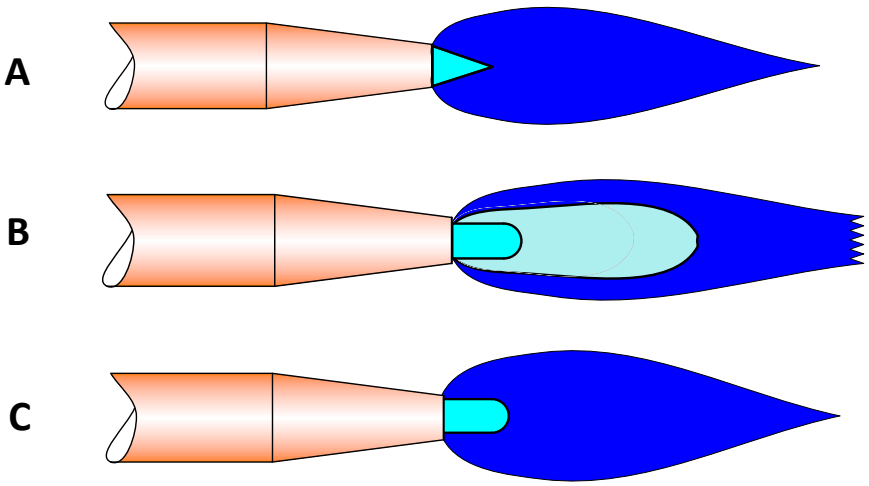
OR

(d) **(i)** State **two** engineering manufacturing processes where robots are used.

(ii) Give **two** advantages of robotics in manufacturing.

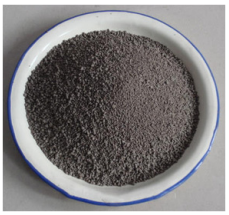
Question 4. **(45 marks)**

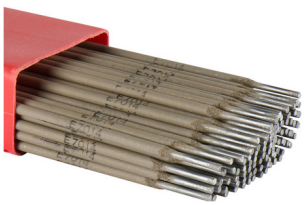
(a) **(i)** Name **each** of the flames shown at **A**, **B** and **C**.



(ii) State the proportions of oxygen and acetylene required for **each** of the flames shown at **A**, **B** and **C**.

(b) Give **one** suitable use for **any three** of the following:





(i) Earth clamp, **(ii)** Flashback arrestor, **(iii)** Flux, **(iv)** Electrode.

(c) Answer **any three** of the following:

(i) Name a suitable method used to join sheet steel.

(ii) Why is it important to test a circuit before soldering it together?

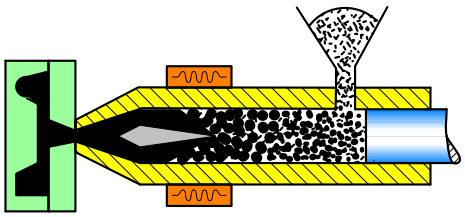
(iii) Explain the difference between an **M5** hole and a **Ø5** hole.

(iv) Explain why it is important to work in a well-ventilated area when using adhesives.

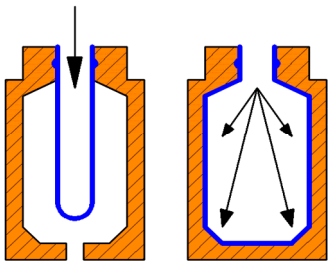
(d) State **two** safety precautions to be observed before starting a welding process.

Question 5. **(45 marks)**

A



B



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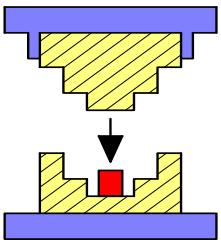


(a) **(i)** Name the **three** plastic manufacturing processes shown at **A**, **B** and **C**.

(ii) Describe with the aid of a labelled diagram **any one** of the manufacturing processes, named by you, at **5(a)(i)** above.

(b) In relation to plastic technology, describe **any two** of the following:

(i) Thermosetting plastic;

(ii) Elastic memory;

(iii) Thermoplastics.

(c) Select **any two** of the products shown below and name a suitable plastic material which can be used to make **each** of the products selected:

(i) Rear light cover for vehicles

(ii) Tool handles

(iii) Kitchen worktops.

(d) State **two** safety precautions to be observed when plastic dip coating.

Question 6. **(45 marks)**

(a) Name **any three** of the lathe parts shown.

(i)

(ii)

(iii)

(iv)

(b) Explain **any three** of the following in relation to machining:

(i) Cutting speed, **(ii)** Clearance angle, **(iii)** Tolerance, **(iv)** Cutting fluids.

(c) Dumbbell bars have a series of patterns, usually featuring diagonal lines going in opposite directions, to form a grip.

(i) Name a lathe process used to produce these patterns.

(ii) Describe this lathe process.

(iii) State **two** safety precautions to be observed during this lathe process.

OR

(c) A large number of copies of the chess piece shown below have to be machined.

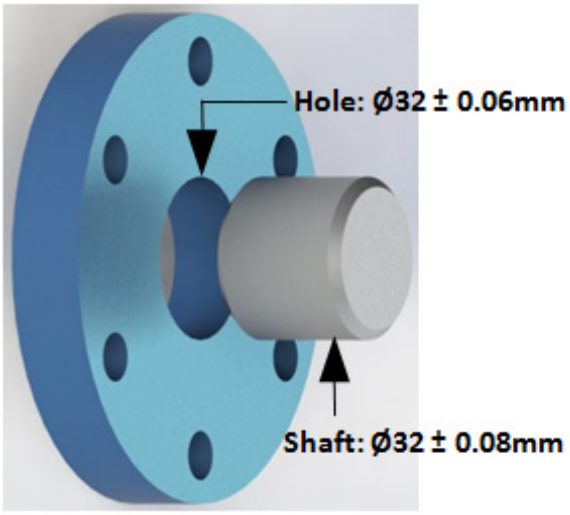
State **three** advantages of using a computer numerical control lathe (CNC lathe) rather than using a manual control lathe to produce these chess pieces.

Question 7. **(45 marks)**

(a) Describe **any two** of the following:

(i) Interference fit, **(ii)** Clearance fit, **(iii)** Upper limit.

(b) A hole and shaft assembly is manufactured to the dimensions shown.



State the: **(i)** Nominal diameter of the shaft;

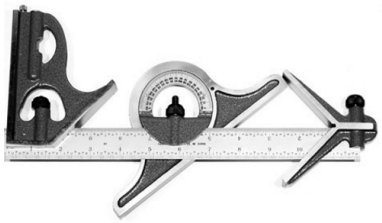
(ii) Largest diameter of the shaft;

(iii) Smallest diameter of the hole;

(iv) The tolerance of the hole.

(c) Name **any three** of the instruments shown and give **one** application of **each** instrument named.

(i)



(ii)

(iii)

(iv)

OR

(c) The electronic components below can be used in the manufacture of the Model Space Rover shown.

(i) Name **any three** of the electronic components shown below.

(ii) State the function of **each** component, named by you, in **7(c)(i)**.

A

B

C

D

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2019

Engineering - Practical

(150 marks)

Morning: 10:00 to 1:00 - Afternoon: 2:00 to 5:00

Please Read Carefully

Instructions

(a) The Examination Number must be clearly stamped or engraved, by the **teacher**, on the test-piece in the position indicated on the examination paper - 2019. M74A(L_2).
If the test-piece is not assembled, the Examination Number must be indicated on each separate part of the test-piece.

(b) Candidates are not permitted to communicate with or assist one another.

(c) Write your Examination Number in the box provided on the examination paper - 2019. M74A(L_1).

(d) Put the examination paper - 2019. M74A(L_1) and the test-piece into the candidate envelope supplied, and hand up the envelope to the Superintendent at the end of the examination.

From the materials supplied, make the **Lock Mechanism** shown on the drawings to the shape and dimensions specified.

PART	MATERIAL	PROCESS
3	Clear Polycarbonate	Mark out, drill, tap and shape.
5	Brass	Mark out, drill and shape.
6	Aluminium	Mark out, drill and shape.

Note: **(i)** Parts 4, 7, 8 and 9 have been made prior to examination day. Parts 1 and 2 has been part-prepared. Using the screws supplied assemble the mechanism, as detailed on the assembly drawing.

(ii) Accuracy, finish and function are important.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Scrúdú na hArdteistiméireachta, 2019

Innealtóireacht - Praiticiúil

(150 marc)

Maidin: 10:00 go dtí 1:00 - Tráthnóna: 2:00 go dtí 5:00

Léigh na Treoracha seo go cúramach le do thoil

Treoracha

(a) Ba chóir don **mhúinteoir** Scrúduimhir an Iarrthóra a stampáil nó a ghreanadh ar an triailphíosa san ionad a thaispeántar ar an scrúdpháipéar - 2019. M74A(L_2). Mura bhfuil an triailphíosa curtha le chéile, ní mór an Scrúduimhir a thaispeáint ar gach páirt ar leith den triailphíosa.

(b) Níl cead ag iarrthóirí a bheith i gcumarsáid le chéile ná cúnamh a thabhairt dá chéile.

(c) Scríobh do Scrúduimhir sa bhosca atá ann di ar an scrúdpháipéar - 2019. M74A(L_1).

(d) Cuir an scrúdpháipéar - 2019. M74A(L_1) agus an triailphíosa isteach i gclúdach an iarrthóra atá curtha ar fáil, agus tabhair an clúdach don Fheitheoir ag deireadh an scrúdaithe.

As na hábhair a sholáthraítear, déan an **Mheicníocht Ghlais** a thaispeántar sna líníochtaí sa chruth agus sna toisí a shonraítear.

PÁIRT	ÁBHAR	PRÓISEAS
3	Polacarbónáit thrédhearcach	A mharcáil amach, a dhruileáil, a tapa agus a dheilbhiú.
5	Prás	A mharcáil amach, a dhruileáil agus a dheilbhiú.
6	Alúmanam	A mharcáil amach, a dhruileáil agus a dheilbhiú.

Nóta: **(i)** Rinneadh na páirteanna 4, 7, 8 agus 9 roimh lá an scrúdaithe. Tá páirt 1 agus 2 páirtdéanta. Agus tú ag baint úsáide as na scriúnna a sholáthraítear, cóimeáil an mheicníocht faoi mar atá sa líníocht chóimeála.

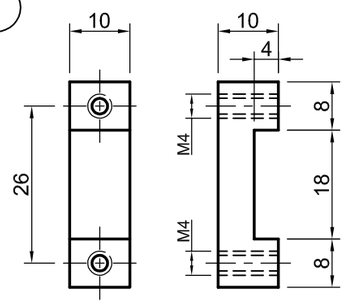
(ii) Tá tábhacht ag baint le cruinneas, le bailchríoch agus le hoibriú an triailphíosa.

Lá 1
Day 1

SCRÚDÚ ARDTEISTIMÉIREACHTA - INNEALTÓIREACHT PRAITICIÚIL
LEAVING CERTIFICATE - ENGINEERING PRACTICAL

2019. M74A(L 1)

1



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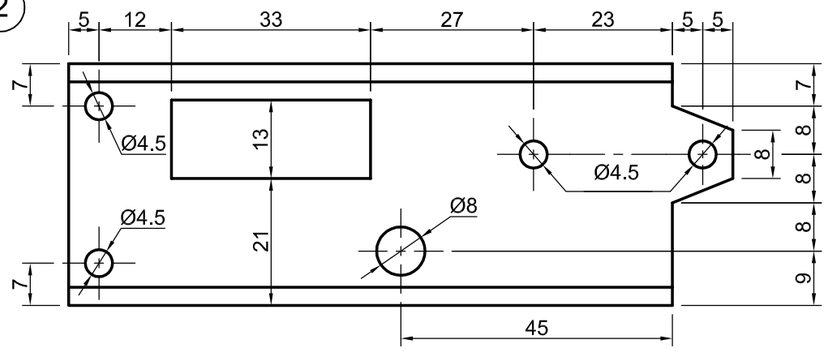

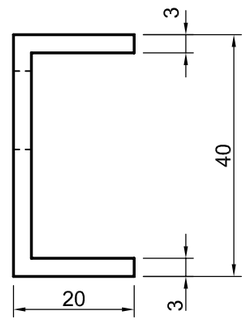

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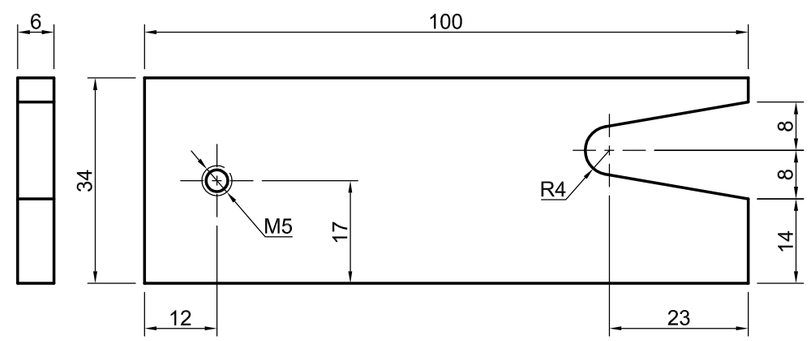

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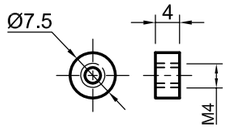

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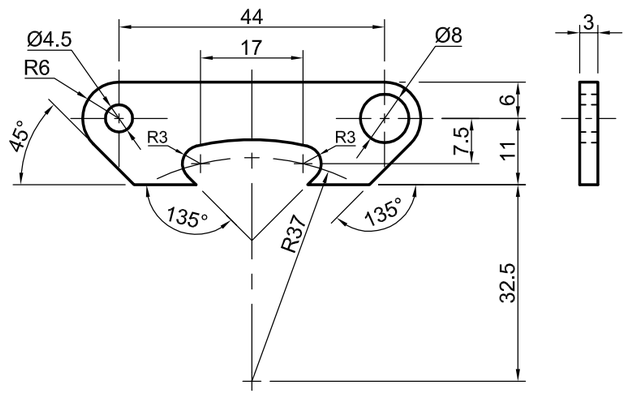

Cuir an scrúdpháipéar seo agus an triailphíosa isteach i gclúdach an iarrthóra atá curtha ar fáil, agus tabhair an clúdach don Fheitheoir ag deireadh an scrúdaithe.

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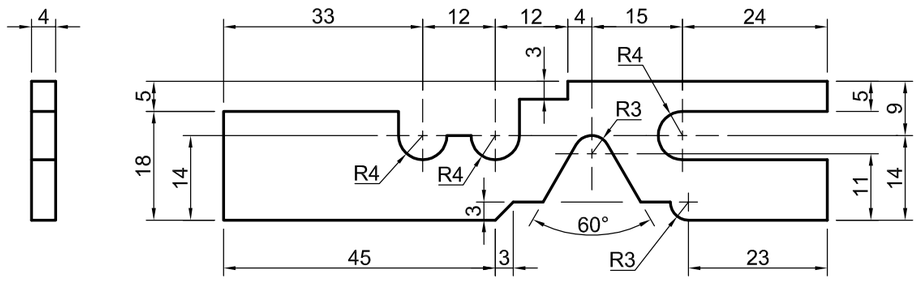
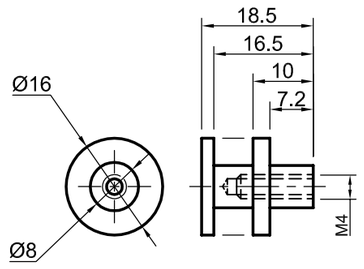
6

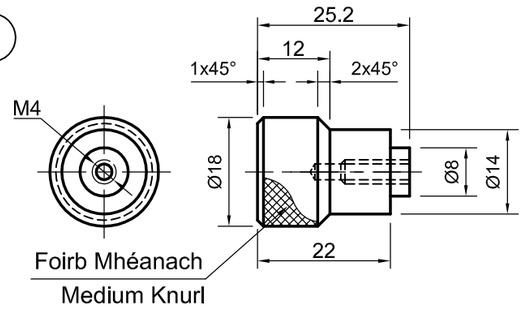


7



Scríobh do Scrúduimhir sa bhosca seo:
Write your Examination Number in this box:

8



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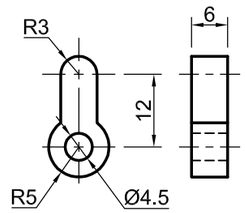
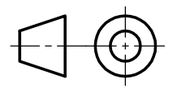


Nóta: Ba chóir go rothódh Páirteanna 7 agus 8 go saorálach i bpoll Ø8 mm

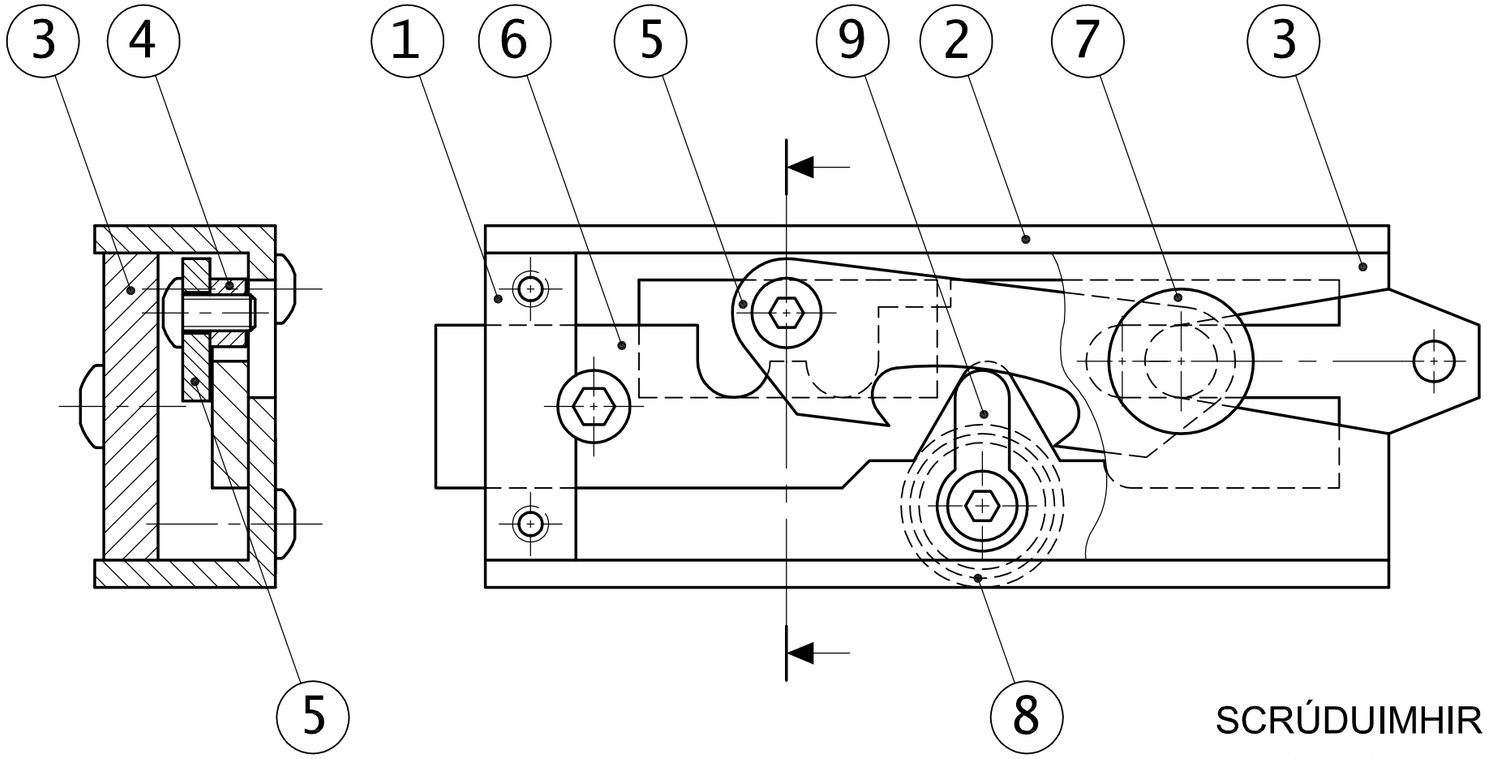
Note: Parts 7 and 8 should rotate freely in a Ø8 mm hole



THALL OVER

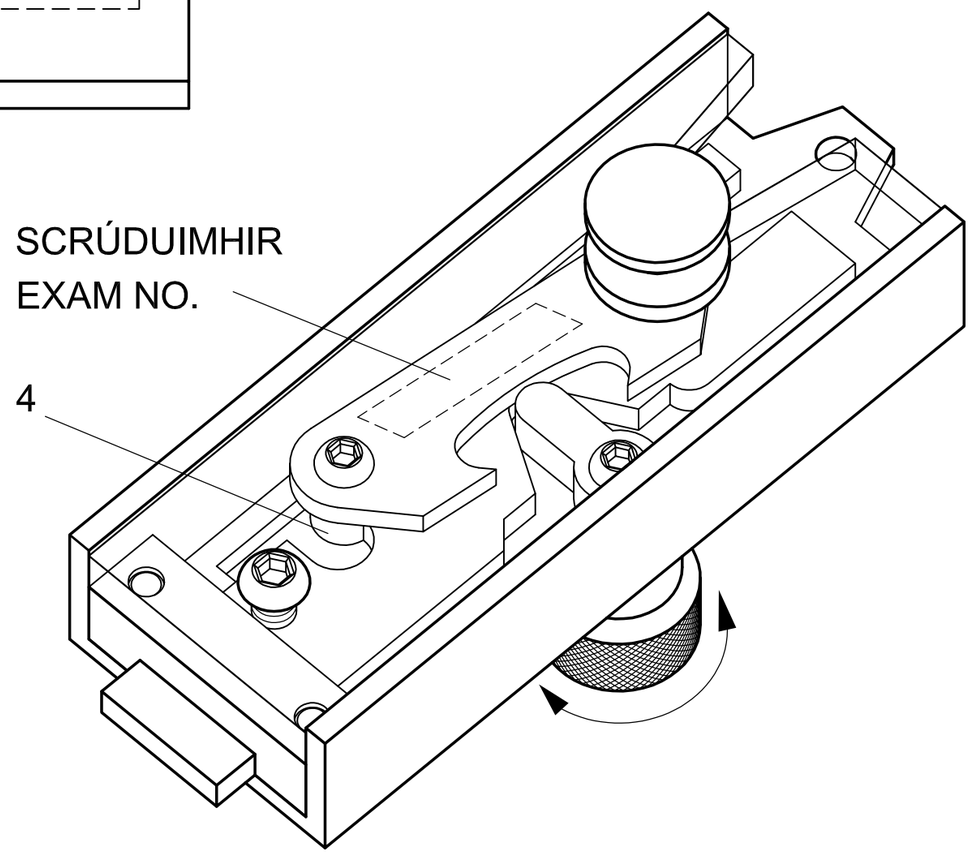
Coimisiún na Scrúduithe Stáit
State Examinations Commission

SCRÚDÚ ARDTEISTIMÉIREACHTA - INNEALTÓIREACHT PRAITICIÚIL
LEAVING CERTIFICATE - ENGINEERING PRACTICAL



SONRAÍ CÓIMEÁLA

ASSEMBLY DETAILS



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(b) Níl cead ag iarrthóirí a bheith i gcumarsáid le chéile ná cúnamh a thabhairt dá chéile.

(c) Scríobh do Scrúduimhir sa bhosca atá ann di ar an scrúdpháipéar - 2019. M74A(L_1).

(d) Cuir an scrúdpháipéar - 2019. M74A(L_1) agus an triailphíosa isteach i gclúdach an iarrthóra atá curtha ar fáil, agus tabhair an clúdach don Fheitheoir ag deireadh an scrúdaithe.

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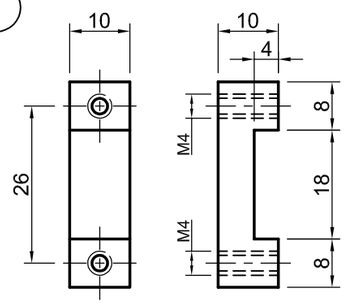
(ii) Tá tábhacht ag baint le cruinneas, le bailchríoch agus le hoibriú an triailphíosa.

Lá 2
Day 2

SCRÚDÚ ARDTEISTIMÉIREACHTA - INNEALTÓIREACHT PRAITICIÚIL
LEAVING CERTIFICATE - ENGINEERING PRACTICAL

2019. M74A(L 1)

1



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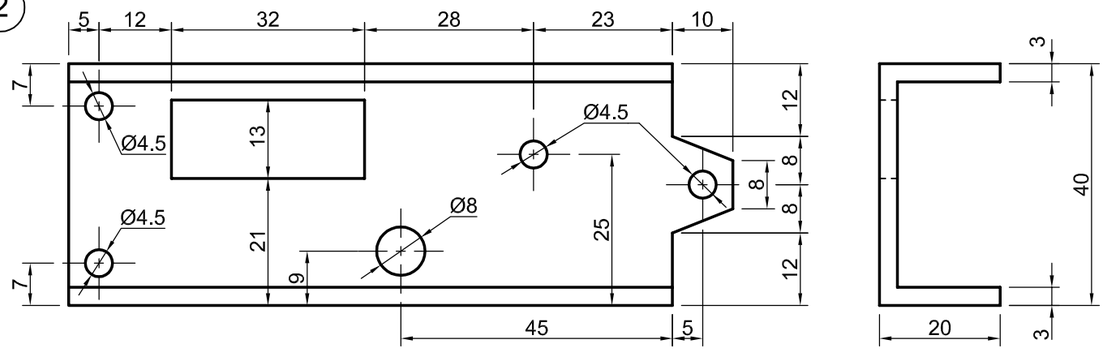

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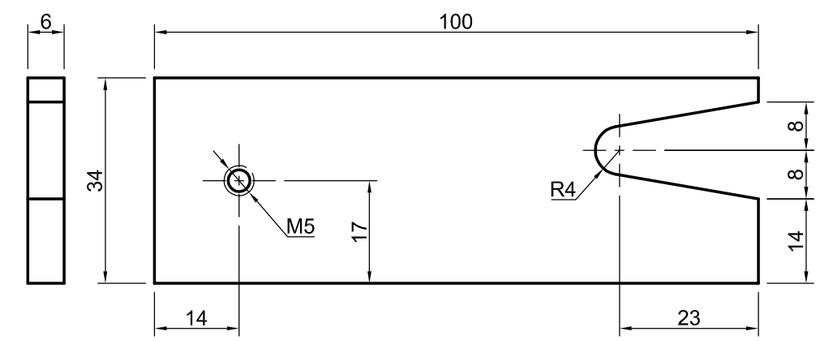

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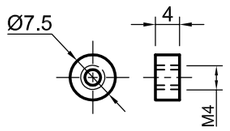

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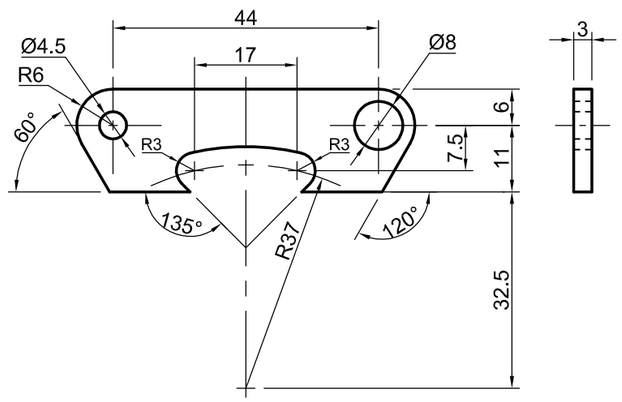

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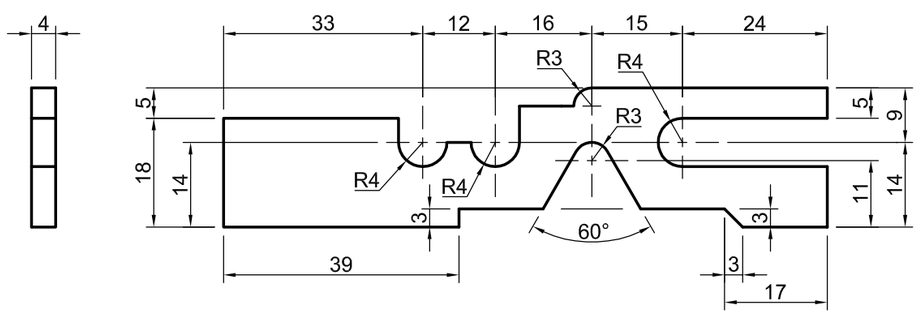

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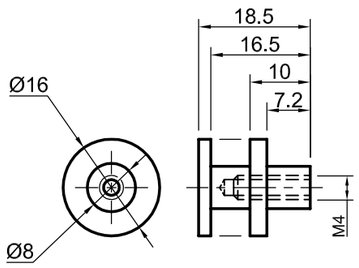

Scríobh do Scrúduimhir sa bhosca seo:
Write your Examination Number in this box:

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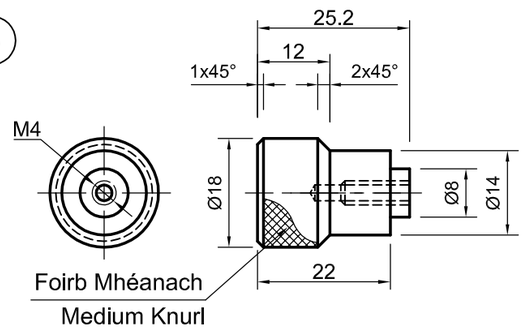

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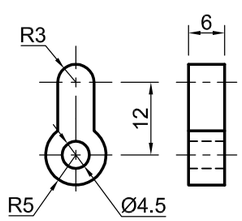
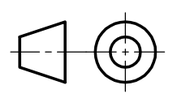


Nóta: Ba chóir go rothódh Páirteanna 7 agus 8 go saorálach i bpoll Ø8 mm

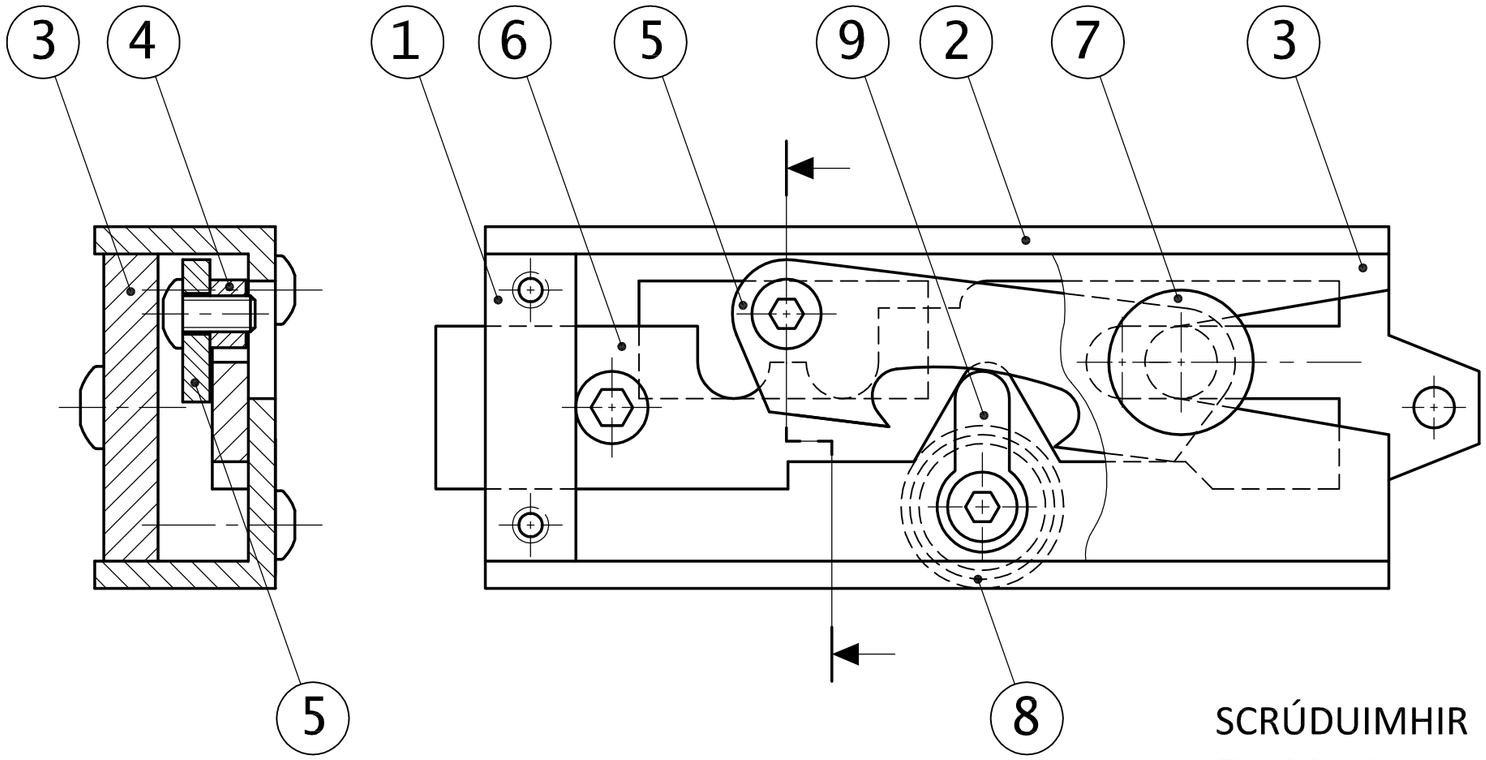
Note: Parts 7 and 8 should rotate freely in a Ø8 mm hole



THALL OVER

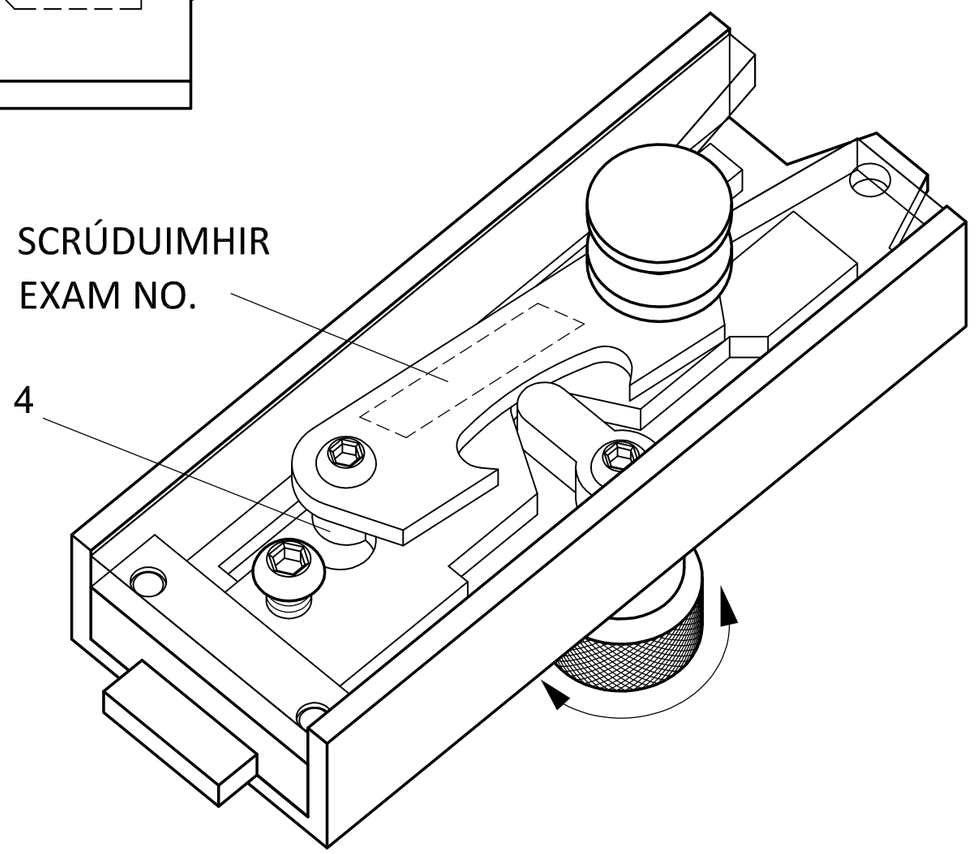
Coimisiún na Scrúduithe Stáit
State Examinations Commission

SCRÚDÚ ARDTEISTIMÉIREACHTA - INNEALTÓIREACHT PRAITICIÚIL
LEAVING CERTIFICATE - ENGINEERING PRACTICAL



SONRAÍ CÓIMEÁLA

ASSEMBLY DETAILS



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Put this examination paper and the test-piece into the candidate envelope supplied, and hand up the envelope to the Superintendent at the end of the examination.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2019

Engineering - Practical

(150 marks)

Morning: 10:00 to 1:00 - Afternoon: 2:00 to 5:00

Please Read Carefully

Instructions

(a) The Examination Number must be clearly stamped or engraved, by the **teacher**, on the test-piece in the position indicated on the examination paper - 2019. M74A(L_2).
If the test-piece is not assembled, the Examination Number must be indicated on each separate part of the test-piece.

(b) Candidates are not permitted to communicate with or assist one another.

(c) Write your Examination Number in the box provided on the examination paper - 2019. M74A(L_1).

(d) Put the examination paper - 2019. M74A(L_1) and the test-piece into the candidate envelope supplied, and hand up the envelope to the Superintendent at the end of the examination.

From the materials supplied, make the **Lock Mechanism** shown on the drawings to the shape and dimensions specified.

PART	MATERIAL	PROCESS
3	Clear Polycarbonate	Mark out, drill, tap and shape.
5	Brass	Mark out, drill and shape.
6	Aluminium	Mark out, drill and shape.

Note: **(i)** Parts 4, 7, 8 and 9 have been made prior to examination day. Parts 1 and 2 has been part-prepared. Using the screws supplied assemble the mechanism, as detailed on the assembly drawing.

(ii) Accuracy, finish and function are important.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Scrúdú na hArdteistiméireachta, 2019

Innealtóireacht - Praiticiúil

(150 marc)

Maidin: 10:00 go dtí 1:00 - Tráthnóna: 2:00 go dtí 5:00

Léigh na Treoracha seo go cúramach le do thoil

Treoracha

(a) Ba chóir don **mhúinteoir** Scrúduimhir an Iarrthóra a stampáil nó a ghreanadh ar an triailphíosa san ionad a thaispeántar ar an scrúdpháipéar - 2019. M74A(L_2). Mura bhfuil an triailphíosa curtha le chéile, ní mór an Scrúduimhir a thaispeáint ar gach páirt ar leith den triailphíosa.

(b) Níl cead ag iarrthóirí a bheith i gcumarsáid le chéile ná cúnamh a thabhairt dá chéile.

(c) Scríobh do Scrúduimhir sa bhosca atá ann di ar an scrúdpháipéar - 2019. M74A(L_1).

(d) Cuir an scrúdpháipéar - 2019. M74A(L_1) agus an triailphíosa isteach i gclúdach an iarrthóra atá curtha ar fáil, agus tabhair an clúdach don Fheitheoir ag deireadh an scrúdaithe.

As na hábhair a sholáthraítear, déan an **Mheicníocht Ghlais** a thaispeántar sna líníochtaí sa chruth agus sna toisí a shonraítear.

PÁIRT	ÁBHAR	PRÓISEAS
3	Polacarbónáit thrédhearcach	A mharcáil amach, a dhruileáil, a tapa agus a dheilbhiú.
5	Prás	A mharcáil amach, a dhruileáil agus a dheilbhiú.
6	Alúmanam	A mharcáil amach, a dhruileáil agus a dheilbhiú.

Nóta: **(i)** Rinneadh na páirteanna 4, 7, 8 agus 9 roimh lá an scrúdaithe. Tá páirt 1 agus 2 páirtdéanta. Agus tú ag baint úsáide as na scriúnna a sholáthraítear, cóimeáil an mheicníocht faoi mar atá sa líníocht chóimeála.

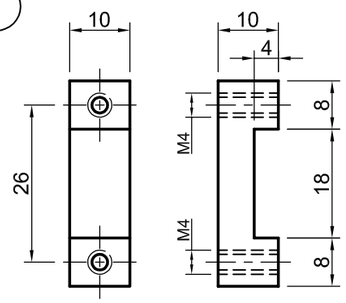
(ii) Tá tábhacht ag baint le cruinneas, le bailchríoch agus le hoibriú an triailphíosa.

Lá 3
Day 3

SCRÚDÚ ARDTEISTIMÉIREACHTA - INNEALTÓIREACHT PRAITICIÚIL
LEAVING CERTIFICATE - ENGINEERING PRACTICAL

2019. M74A(L 1)

1



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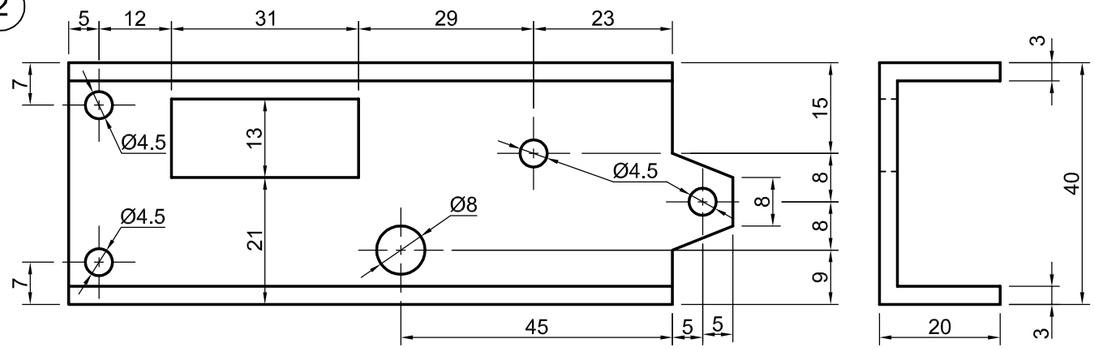

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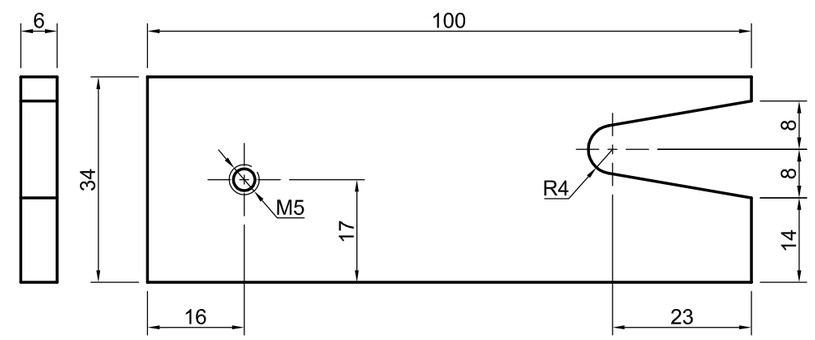

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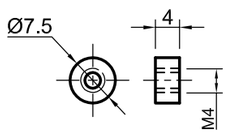

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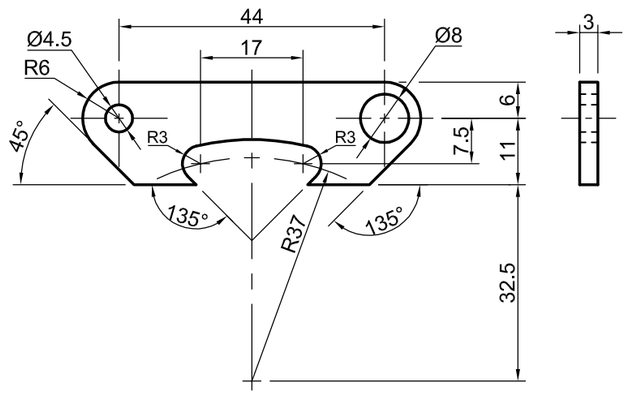

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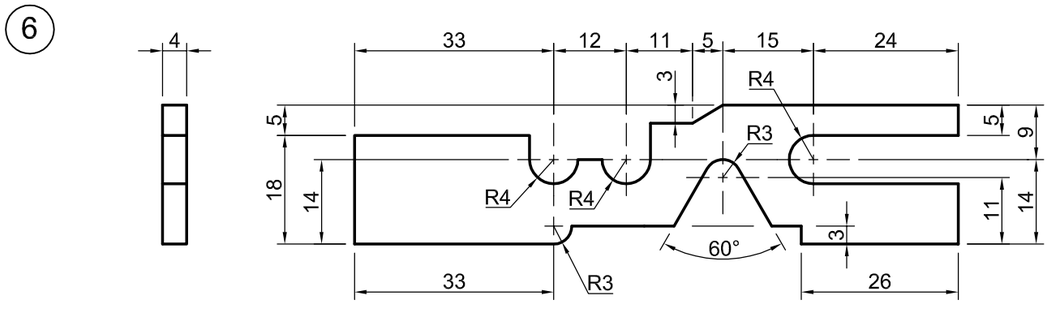

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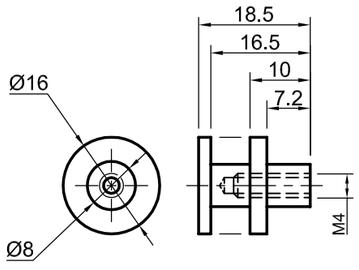

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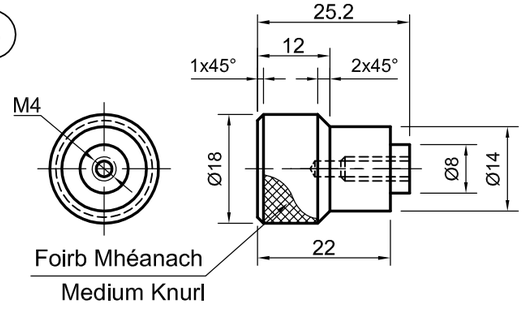

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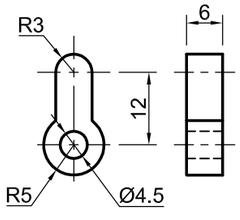

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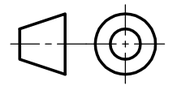


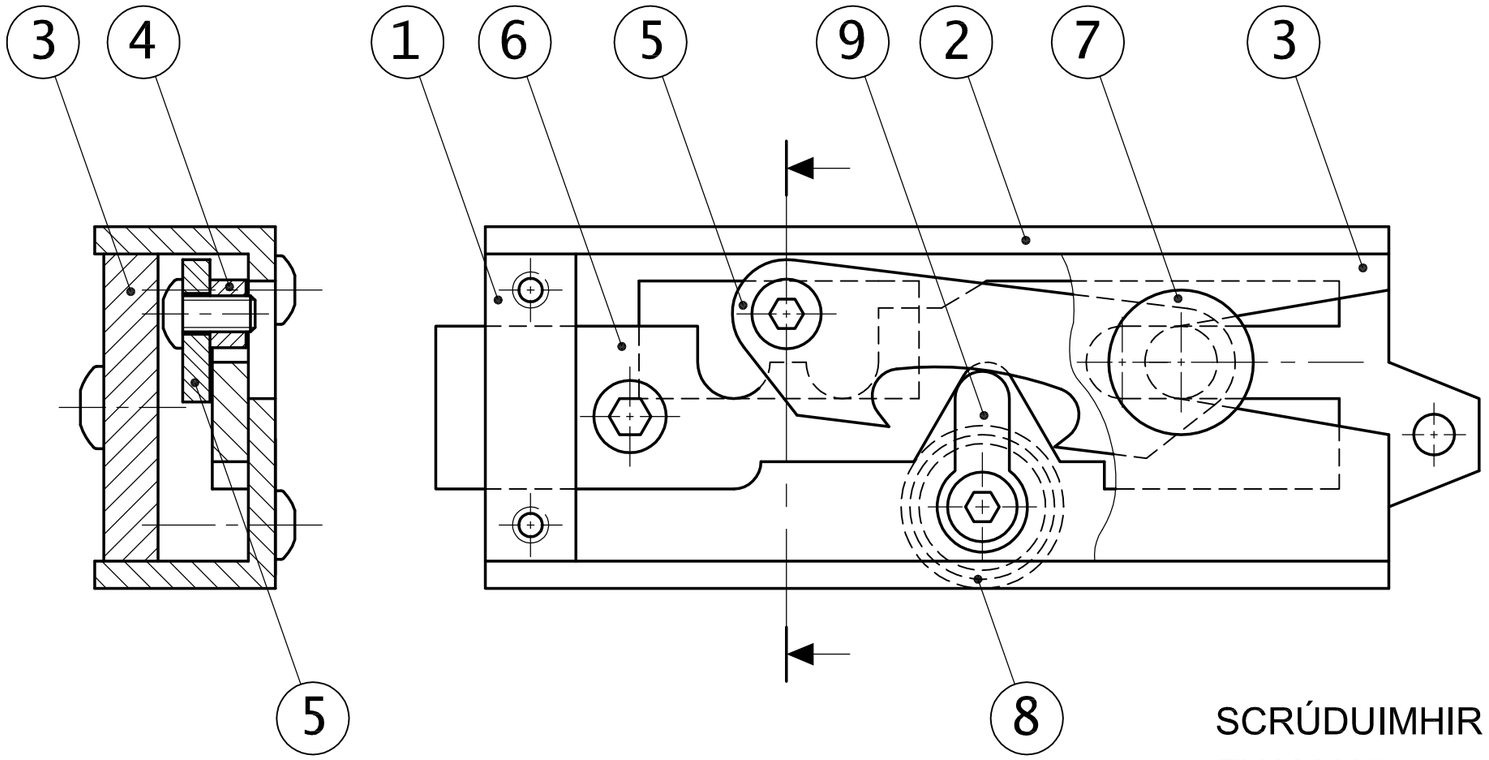
THALL OVER

Lá 3
Day 3

Coimisiún na Scrúduithe Stáit
State Examinations Commission

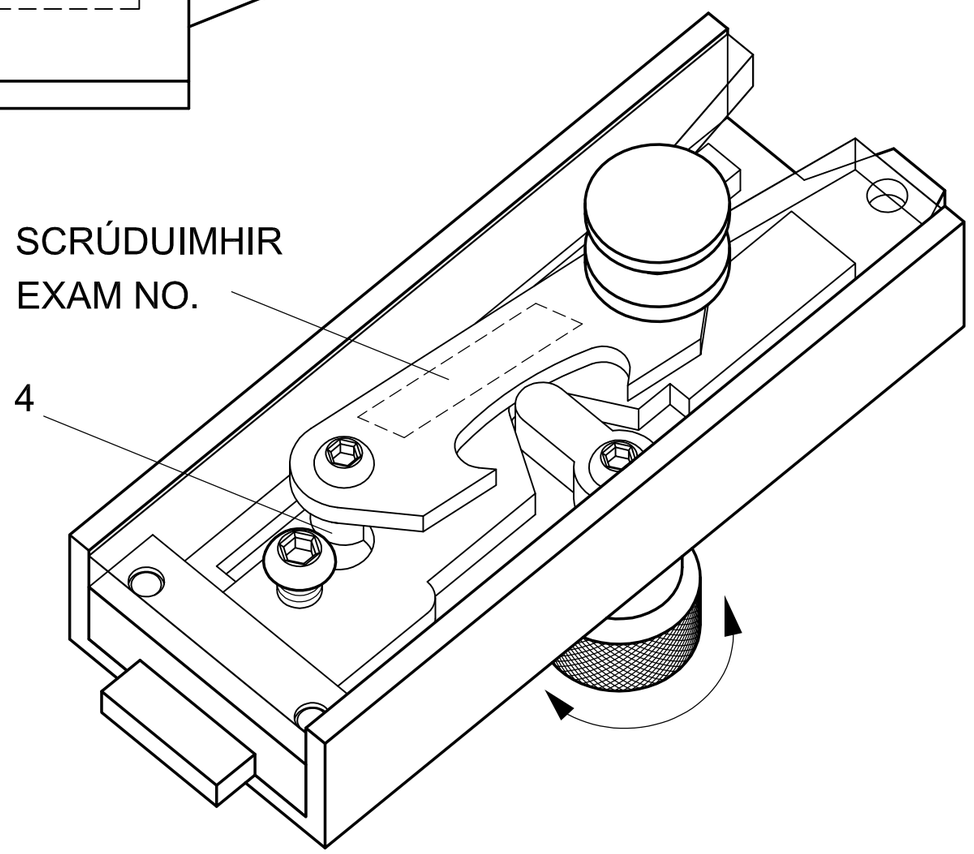
2019. M74A(L_2)

SCRÚDÚ ARDTEISTIMÉIREACHTA - INNEALTÓIREACHT PRAITICIÚIL
LEAVING CERTIFICATE - ENGINEERING PRACTICAL



SONRAÍ CÓIMEÁLA

ASSEMBLY DETAILS



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