



Coimisiún na Scrúduithe Stáit State Examinations Commission

LEAVING CERTIFICATE EXAMINATION, 2022

ENGINEERING – MATERIALS AND TECHNOLOGY

(Ordinary level – 150 marks)

THURSDAY 9 JUNE

MORNING 9:30 – 12:00

Answer any THREE questions.

All questions carry equal marks.

The 2022 examination papers were adjusted to compensate for disruptions to learning due to COVID-19.
This examination paper does not necessarily reflect the same structure and format as the examination papers of past or subsequent years.

Question 1.

(50 marks)

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

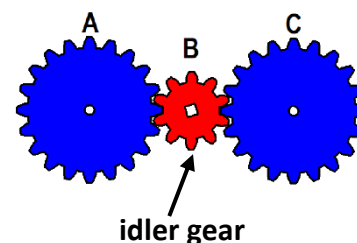
(a) Give **two** safety precautions to be observed when using a pillar drilling machine.



(b) State **one** disadvantage of a *non-permanent joint* in metal.

(c) State **two** benefits of renewable energy.

(d) Explain the function of the idler gear **B** in the gear train shown.



(e) Give **one** reason why it is important to keep engine parts lubricated.

(f) Give **one** benefit of using computer aided drawing (CAD) in Engineering.

(g) Explain the term *non-ferrous* **and** name **one non-ferrous** metal.



(h) State **one** reason why *aluminium* may be used when manufacturing satellites for use in space.

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



Vacuum former,



Pop rivet gun,



Tin snips.

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

Wireless control,

Micro:bit,

Sensor.

(k) Define the property *malleability* in metals **and** name **one** metal which is malleable.

(l) Describe **any one** of the following:

Conductor,

Engraving,

Prototype.

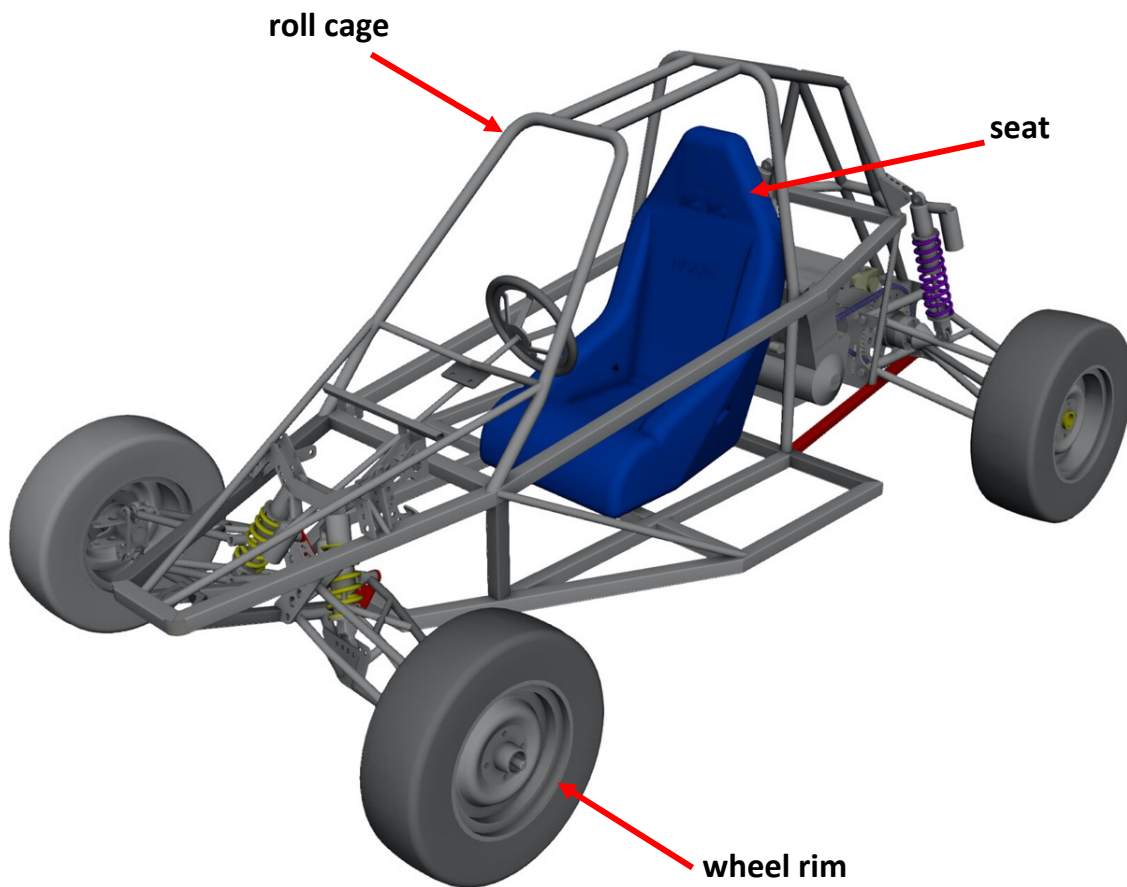
(m) List **two** safety precautions to be followed when soldering electronic components.



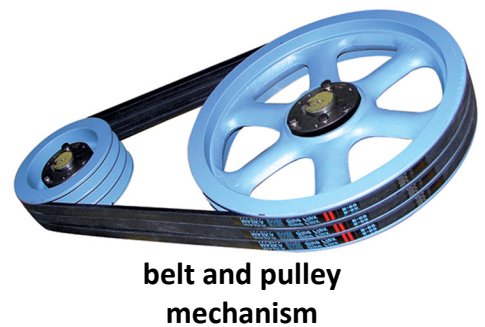
Question 2.

(50 marks)

- (a) In relation to metal production, explain **any three** of the following furnace terms:
Tapping hole, Charge, Refractory lining, Slag.
- (b) Describe, with the aid of a labelled diagram, the operation of **one** furnace you have studied.
- (c) You have been asked to manufacture the off-road dune buggy shown below.
- (i) Name a suitable material for **each** of the labelled parts on the off-road dune buggy.
- (ii) State **one** reason for **each** material you have selected.



- (d) As part of the drive system, the off-road dune buggy uses a *belt and pulley* mechanism, as shown.
- (i) State **one** advantage of using a belt and pulley mechanism in a drive system.
- (ii) State **one** disadvantage of using a belt and pulley mechanism in a drive system.



Question 3.

(50 marks)

- (a) The head of a steel axe is annealed, normalised, and tempered during manufacture.

Describe **any two** of the following processes:

- (i) Annealing;
- (ii) Normalising;
- (iii) Tempering.



- (b) In relation to the heat treatment of steel, explain **any two** of the following:

- (i) Quenching, (ii) Carbon content, (iii) Hardening temperature, (iv) Case hardening.

- (c) State **any two** items of Personal Protective Equipment (PPE) that should be used by the person using the hand-held angle grinder shown in the picture.



- (d) Explain **any two** of the following metal properties:

- (i) Brittleness, (ii) Melting point, (iii) Toughness, (iv) Elasticity.

OR

- (d) Give **one** example of the use of robotics in **any two** of the following:

- (i) medicine;
- (ii) gardening;
- (iii) manufacturing.



Question 4.

(50 marks)

- (a) (i) Explain the function of part **A** and the function of part **B** for the oxy-acetylene torch shown.



- (ii) Name **any two** flames which are produced when using an oxy-acetylene torch.

- (iii) Explain the function of the gas regulator in oxy-acetylene welding.



- (b) Describe the purpose of **any three** of the following in **manual metal arc welding**:



- (i) Earth clamp, (ii) Welding helmet, (iii) Electrode holder, (iv) Welding curtain.

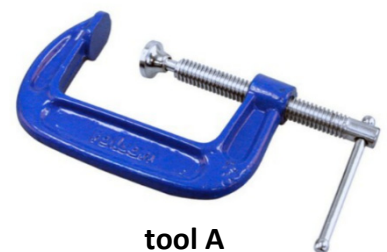
- (c) Answer **any three** of the following:

- (i) Name tool **A** shown **and** give **one** use for this tool.

- (ii) Explain why spot welding is **not** suitable for joining heavy gauge steel plate.

- (iii) In relation to soldering, explain the term *sweated joint* **and** give **one** example where a sweated joint might be used.

- (iv) Give **one** advantage of using thumb screws when assembling parts.



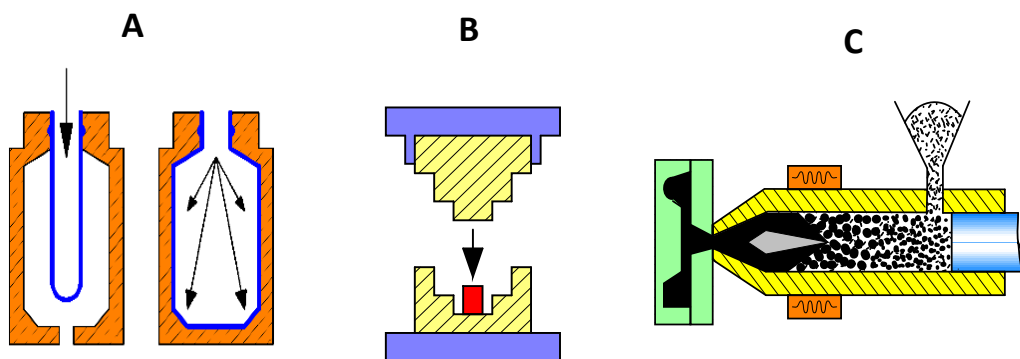
tool A



thumb screw

- (d) State **two** safety precautions to be observed when gas welding.

- (a) (i) Name **any two** of the plastic manufacturing processes shown at **A**, **B** and **C**.

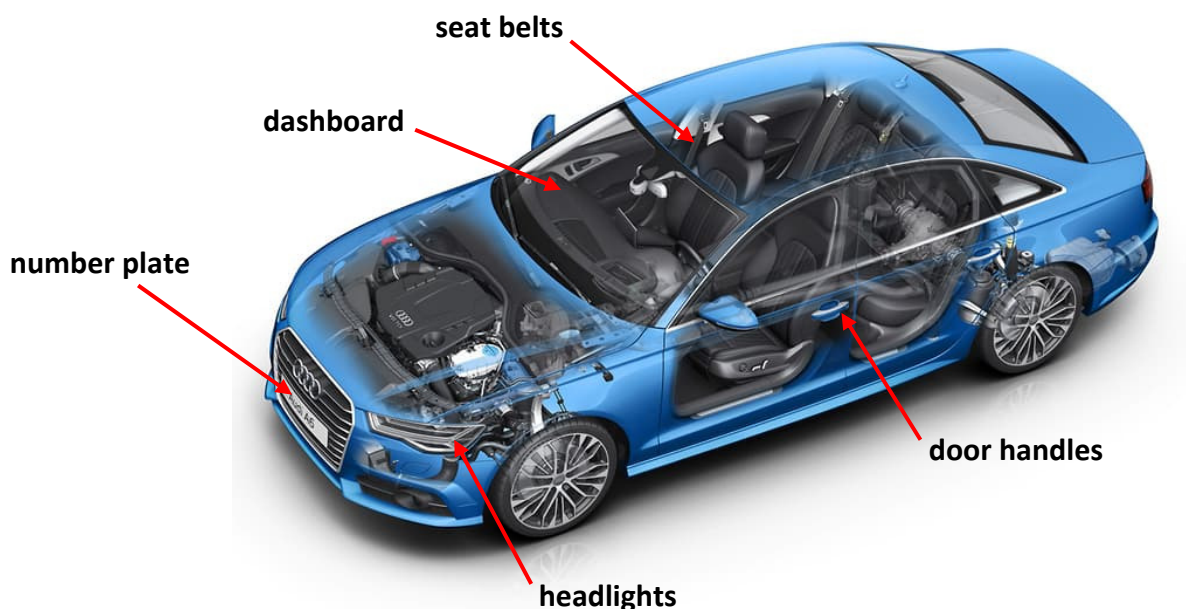


- (ii) Describe, with the aid of a labelled diagram, **any one** of the manufacturing processes named by you, at **5(a)(i)** above.

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

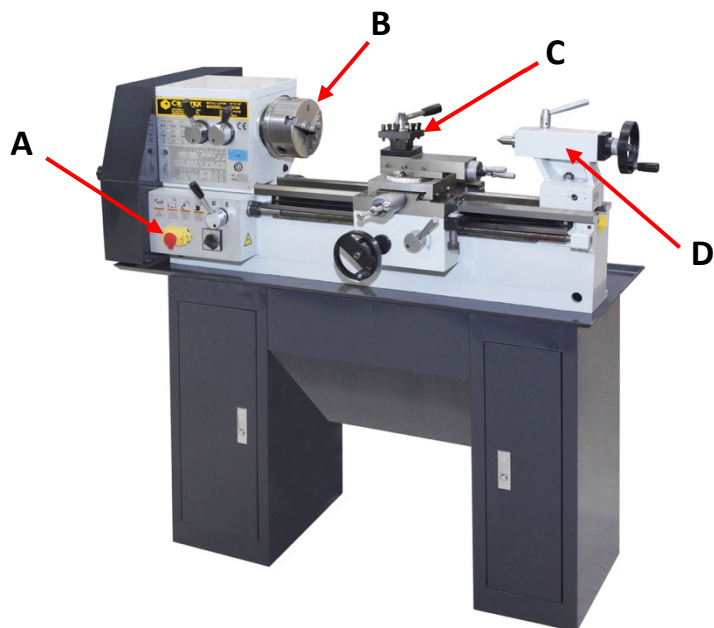
- (i) Thermosetting plastics;
- (ii) Thermoplastics;
- (iii) Fibreglass;
- (iv) Elastic memory.

- (c) Plastic is a common material found in cars. Select **any two** of the car parts labelled in the diagram and name a suitable plastic that could be used for their manufacture.



- (d) List **two** safety precautions to be observed when working with hot plastics.

- (a) Name **any three** of the labelled parts on the lathe below.

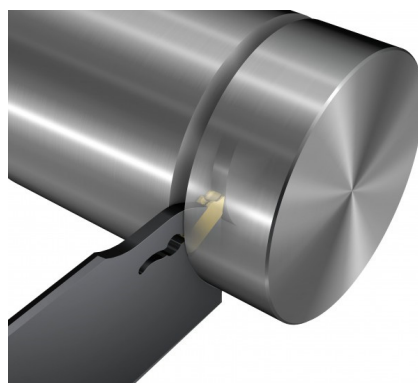


- (b) Explain **any three** of the following in relation to the machining of metals:

(i) Cutting fluid, (ii) Spindle speed, (iii) Depth of cut, (iv) Feed.

- (c) A lathe process is shown opposite.

- (i) Name the lathe process shown.
- (ii) Describe how the lathe process shown is carried out.
- (iii) Name **any two** other processes that can be carried out on a lathe.



OR

- (c) Laser cutting is an important CNC (Computer Numerical Controlled) manufacturing process.

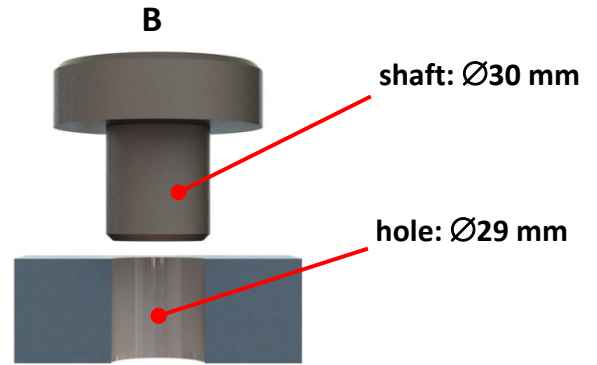
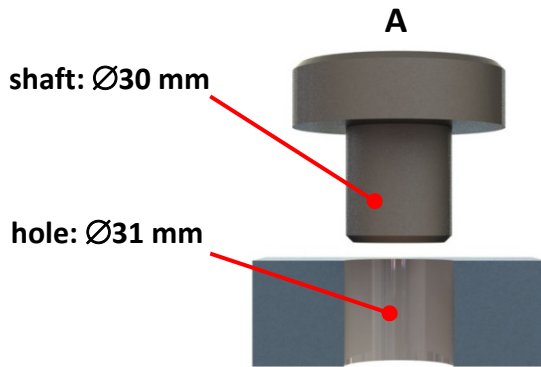
List **any three** advantages of using a laser cutter to cut out the shapes shown.



Question 7.

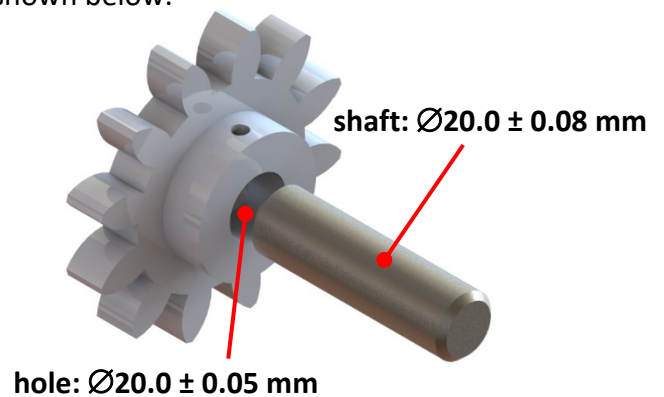
(50 marks)

- (a) Name the type of fit shown at **A** and the type of fit shown at **B**.

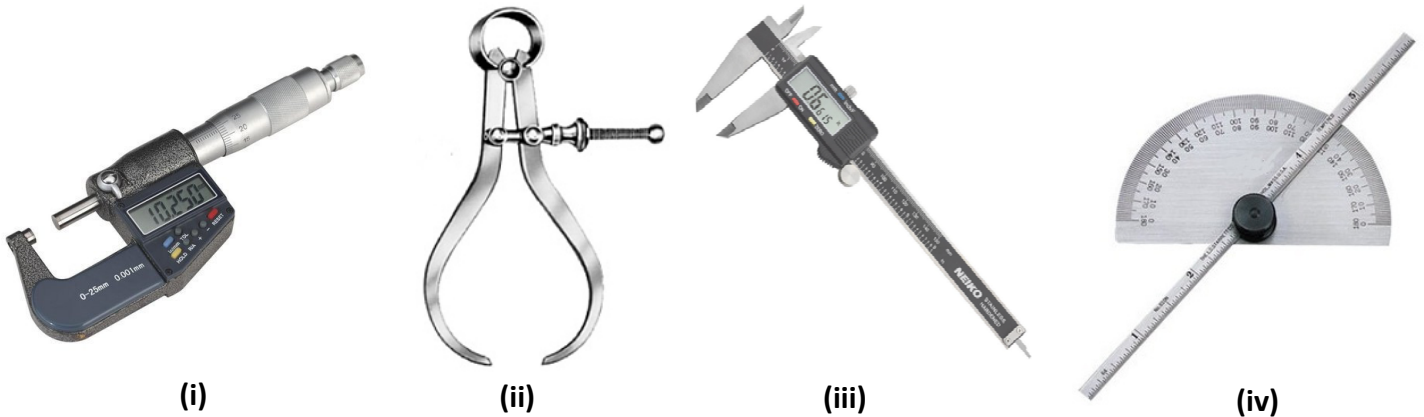


- (b) A hole and shaft are machined to the dimensions shown below.

- State the:
- (i) Nominal diameter of the hole;
 - (ii) Largest diameter of the shaft;
 - (iii) Largest diameter of the hole;
 - (iv) Tolerance of the shaft.



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



OR

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

- (i) Name a suitable electronic component that will emit light.
- (ii) Name a suitable electronic component used to adjust the speed of a 9V DC motor.
- (iii) Name a suitable electronic component used to start and stop the flow of current in a circuit.
- (iv) Name a suitable electronic component used to provide electrical energy to a circuit.



Leaving Certificate Examination, 2022

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 - 2022. M74A(L₂).
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 - 2022. M74A(L₁).
- (d) Put the examination paper - 2022. M74A(L₁) 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 **Mechanism** shown on the drawings to the shape and dimensions specified.

PART	MATERIAL	PROCESS
6	Clear Polycarbonate	Mark out and shape.
7	Aluminium	Mark out, drill and shape.
10	Brass	Mark out, drill and shape.
12	Aluminium	Mark out, drill, tap and shape.

Note: (i) Parts 1, 2, 3, 4, 5, 8, 9, 11 and 13 have been made prior to examination day.
Using the screws supplied assemble the mechanism, as detailed on the assembly drawing.
(ii) **Accuracy, finish and function are important.**



Scrúdú na hArdteistiméireachta, 2022

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 - 2022. M74A(L₂). 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 - 2022. M74A(L₁).
- (d) Cuir an scrúdpháipéar - 2022. M74A(L₁) 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** a thaispeántar sna líníochtaí sa chruth agus sna toisí a shonraítear.

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Nóta: (i) Rinneadh na páirteanna 1, 2, 3, 4, 5, 8, 9, 11 agus 13 roimh lá an scrúdaithe. Agus tú ag baint úsáide as na scríonna a sholáthraítear, cóimeáil an mheicníocht faoi mar atá sa líníocht chóimeála.

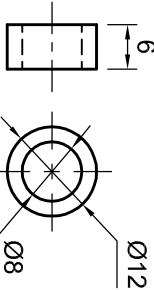
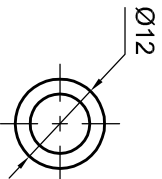
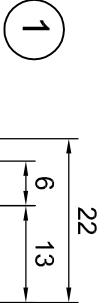
(ii) Tá tábhacht ag baint le cruinneas, le bailchríoch agus le hoibriú an triailphíosa.



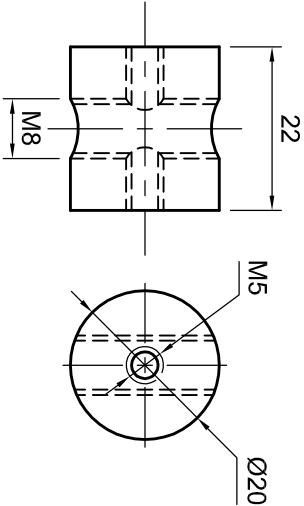
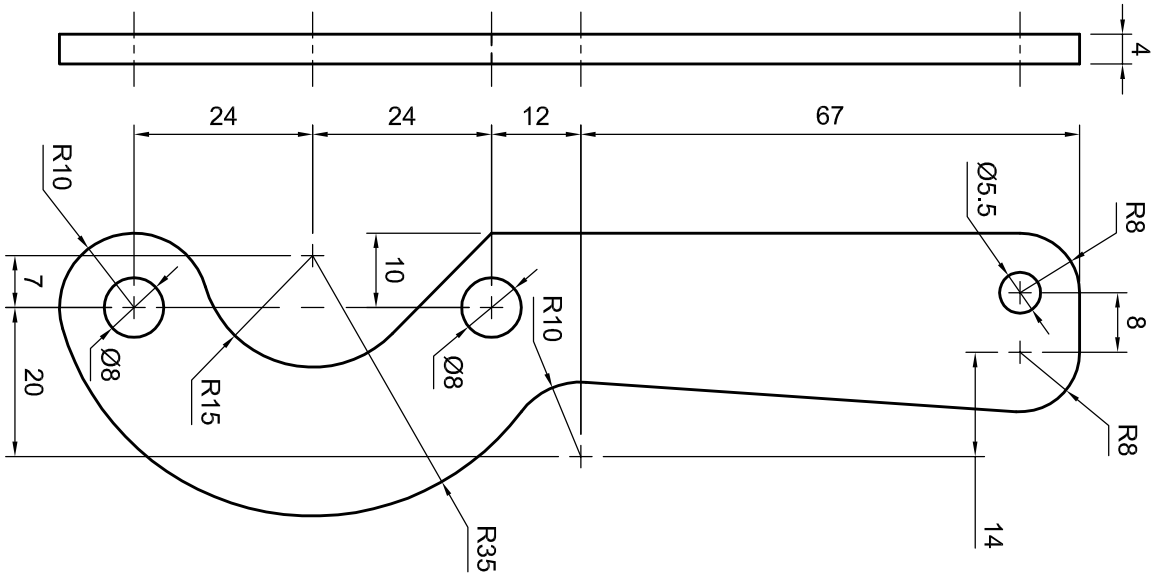
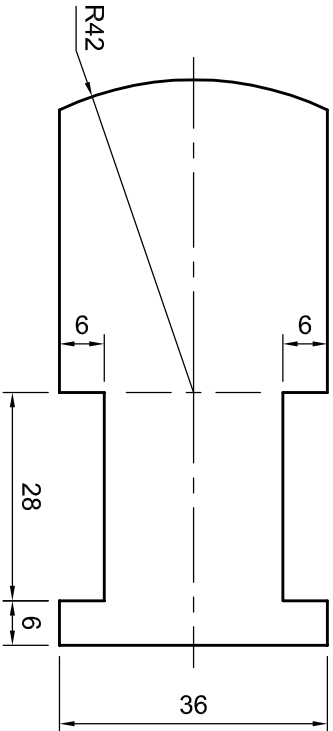
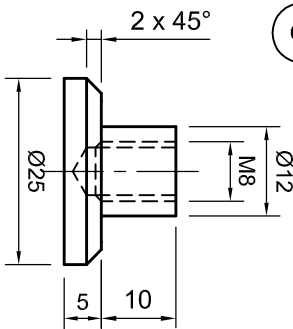
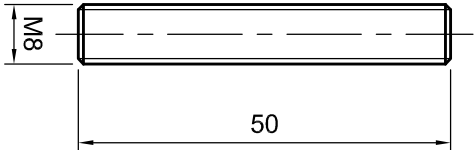
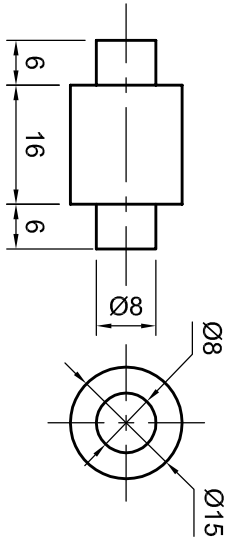
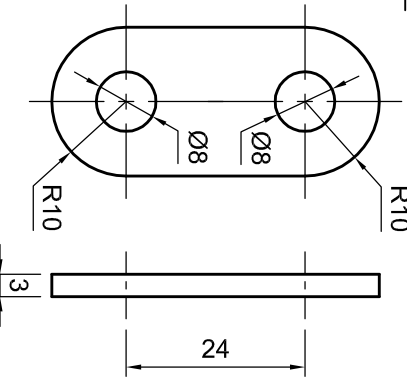
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Scriobh do Scrúduitheoir sa bhosca seo:

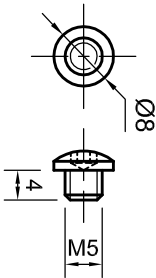
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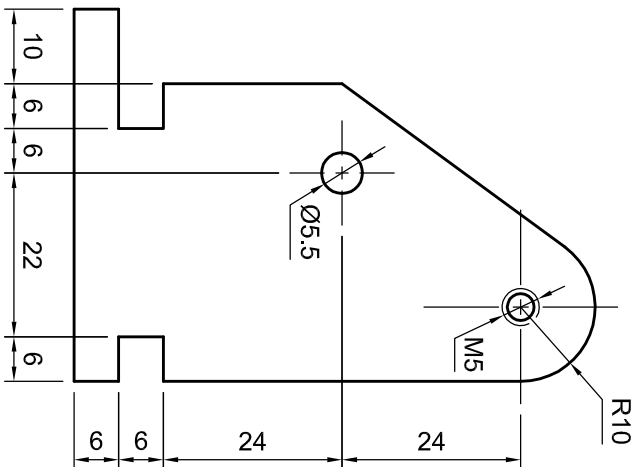
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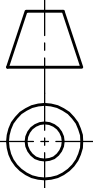
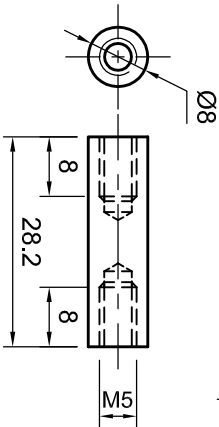
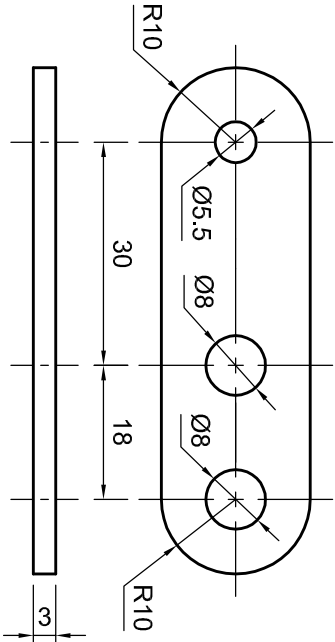
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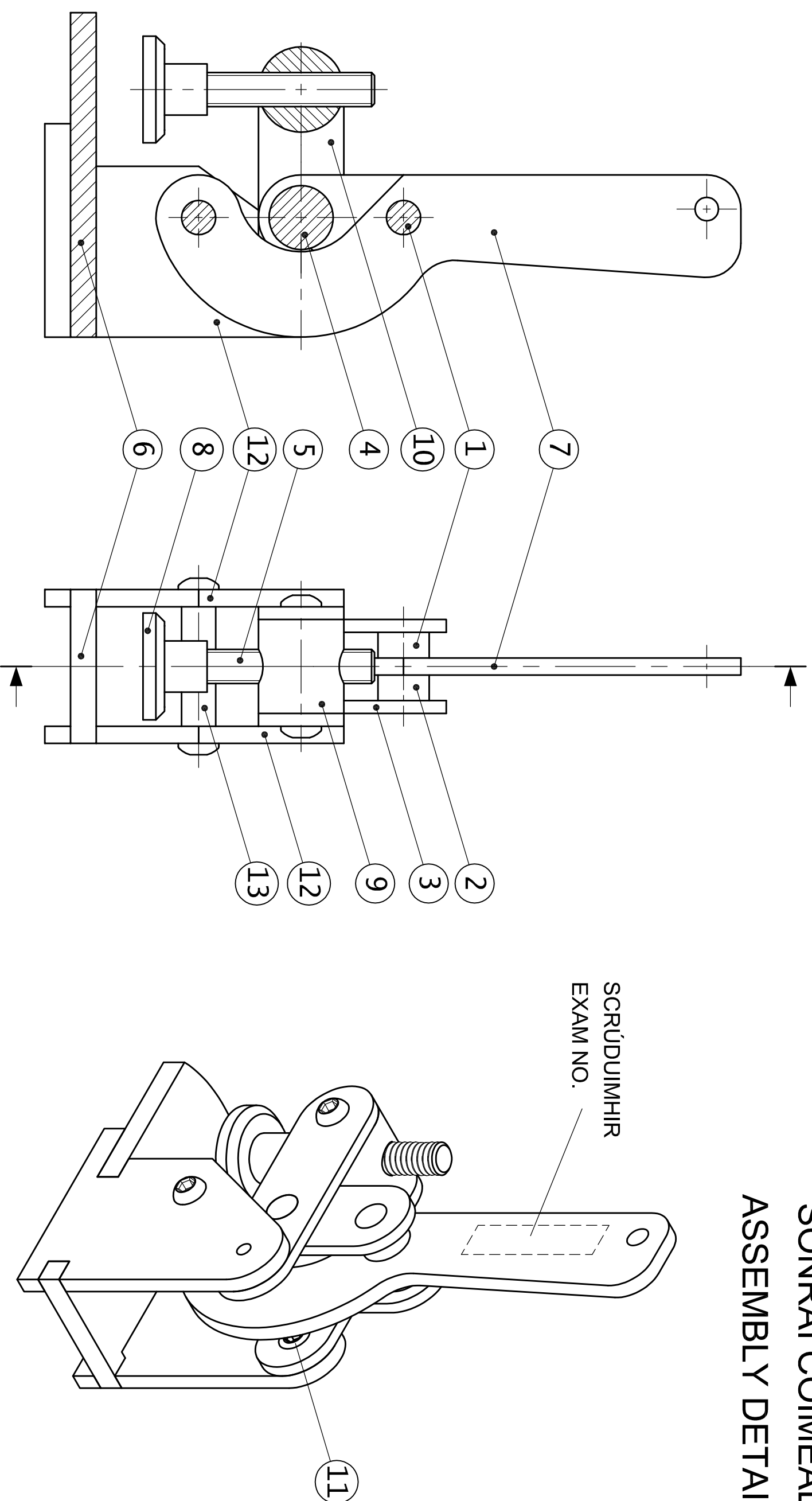
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SCRÚDÚ ARDTEISTIMÉIREACHTA - INNEALTÓIREACHT PRAITICIÚIL
LEAVING CERTIFICATE - ENGINEERING PRACTICAL

SONRAÍ CÒIMEÁLA
ASSEMBLY DETAILS



Cuir an scrúdpháipéar seo agus an triailphíosa isteach i gclúdach an iarthóra
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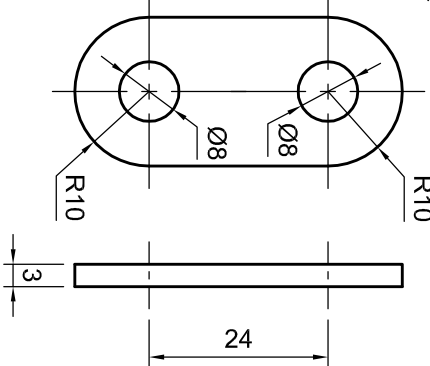
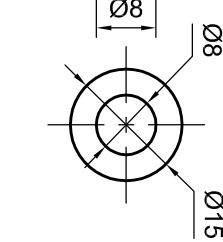
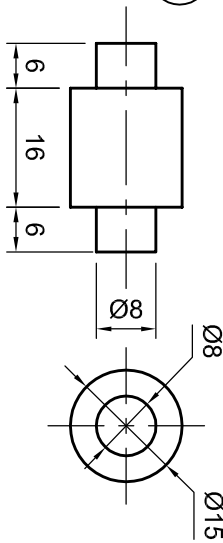
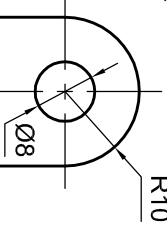
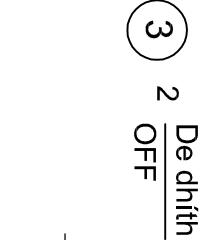
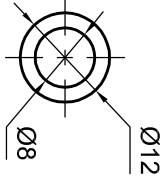
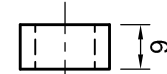
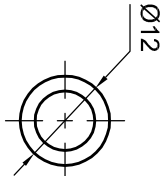
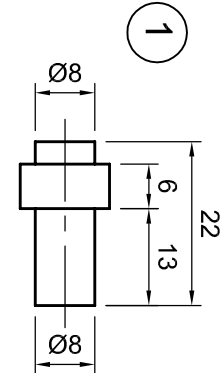
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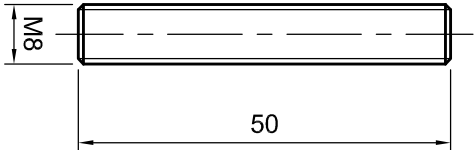
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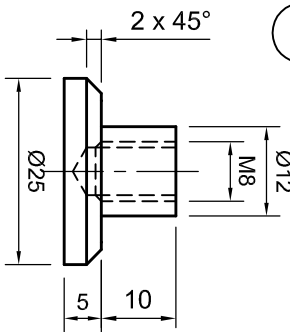
Write your Examination Number in this box:



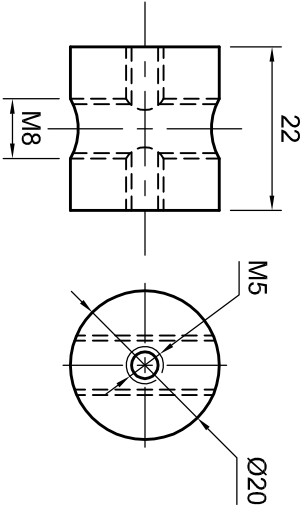
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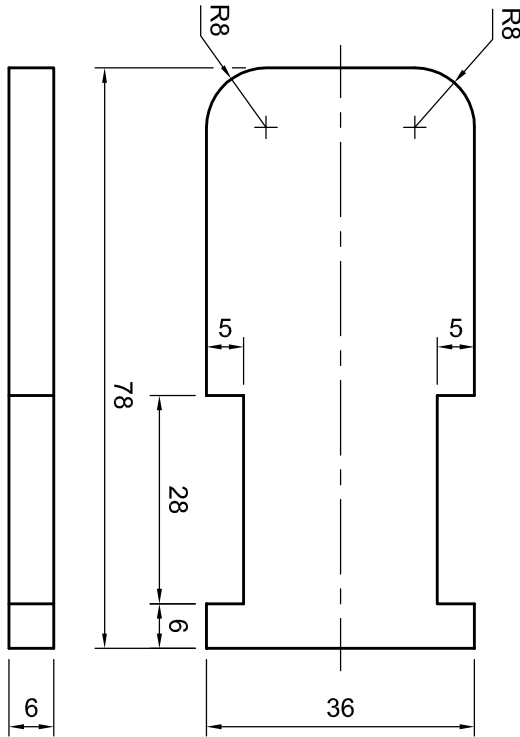
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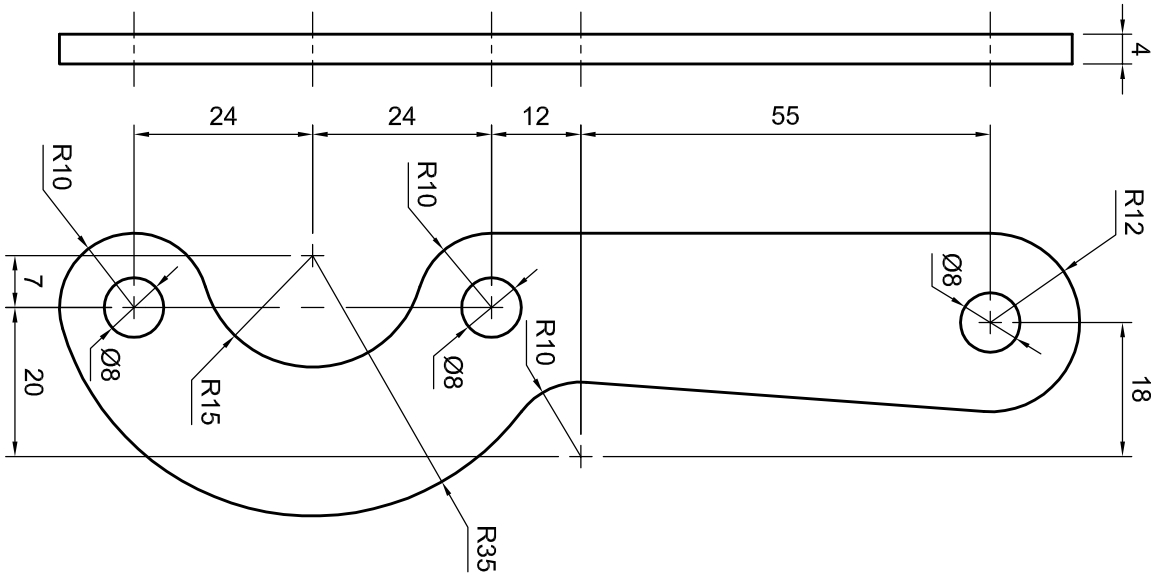
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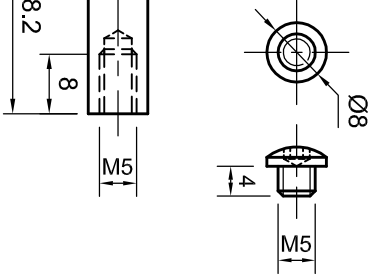


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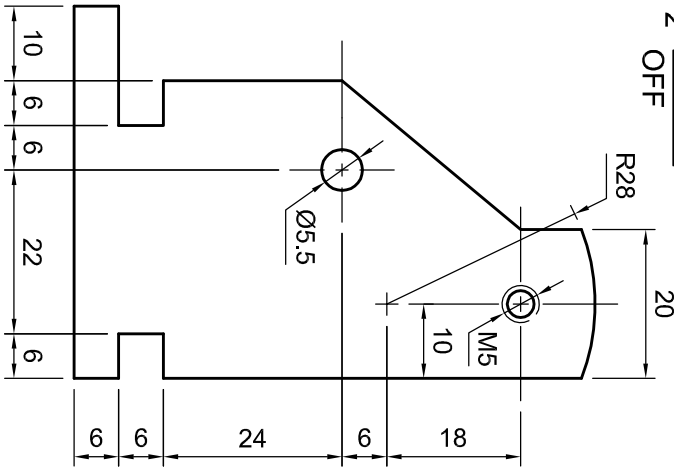
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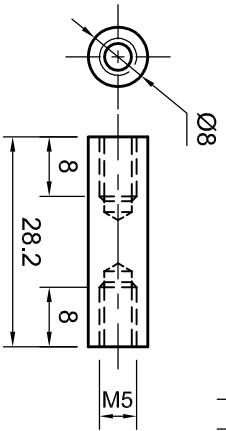


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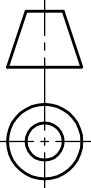
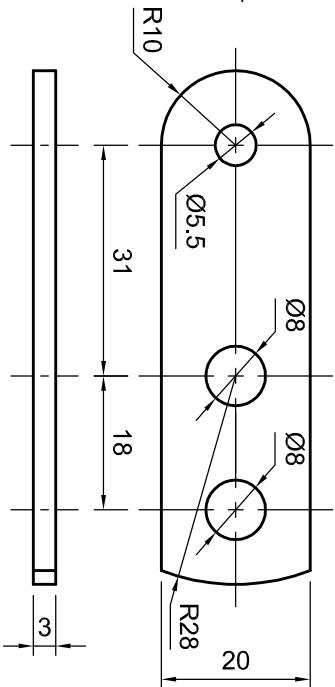


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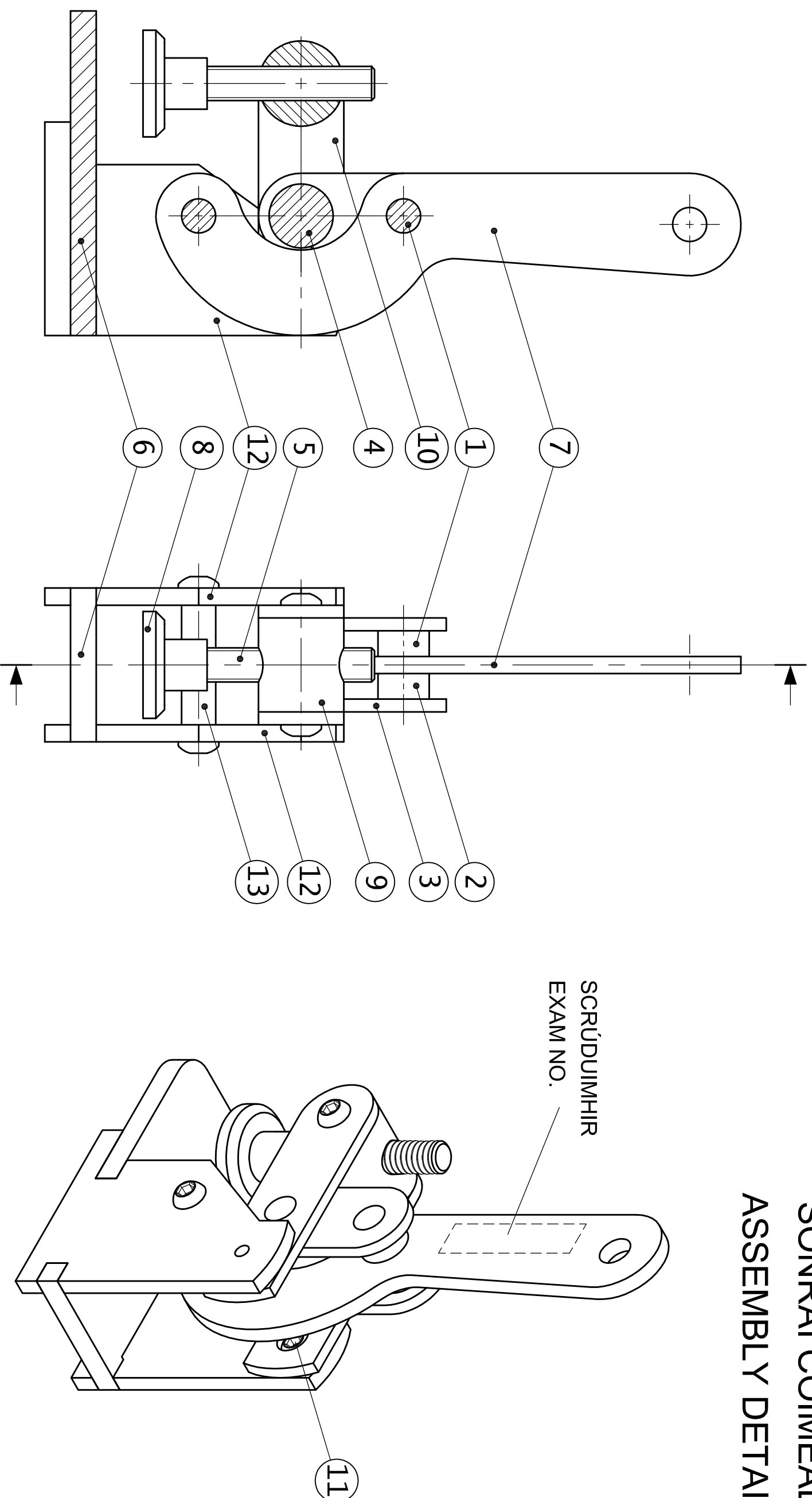
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THALL
OVER

SCRÚDÚ ARDTEISTIMÉIREACHTA - INNEALTÓIREACHT PRAITICIÚIL
LEAVING CERTIFICATE - ENGINEERING PRACTICAL

SONRAÍ CÒIMEÁLA
ASSEMBLY DETAILS



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



Leaving Certificate Examination, 2022

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 - 2022. M74A(L₂).
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 - 2022. M74A(L₁).
- (d) Put the examination paper - 2022. M74A(L₁) 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 **Mechanism** shown on the drawings to the shape and dimensions specified.

PART	MATERIAL	PROCESS
6	Clear Polycarbonate	Mark out and shape.
7	Aluminium	Mark out, drill and shape.
10	Brass	Mark out, drill and shape.
12	Aluminium	Mark out, drill, tap and shape.

Note: (i) Parts 1, 2, 3, 4, 5, 8, 9, 11 and 13 have been made prior to examination day.
Using the screws supplied assemble the mechanism, as detailed on the assembly drawing.

(ii) **Accuracy, finish and function are important.**



Scrúdú na hArdteistiméireachta, 2022

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 - 2022. M74A(L₂). 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 - 2022. M74A(L₁).
- (d) Cuir an scrúdpháipéar - 2022. M74A(L₁) 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** a thaispeántar sna líníochtaí sa chruth agus sna toisí a shonraítear.

PÁIRT	ÁBHAR	PRÓISEAS
6	Polacarbónáit thrédhearcach	A mharcáil amach agus a dheilbhiú.
7	Alúmanam	A mharcáil amach, a dhruileáil agus a dheilbhiú.
10	Prás	A mharcáil amach, a dhruileáil agus a dheilbhiú.
12	Alúmanam	A mharcáil amach, a dhruileáil, a tapa agus a dheilbhiú.

Nóta: (i) Rinneadh na páirteanna 1, 2, 3, 4, 5, 8, 9, 11 agus 13 roimh lá an scrúdaithe. Agus tú ag baint úsáide as na scríonna 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.

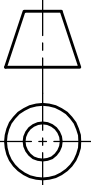
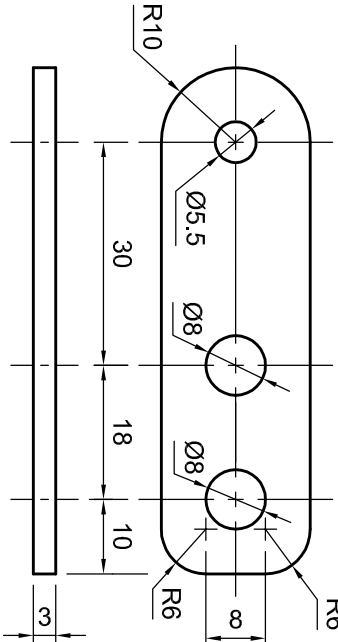
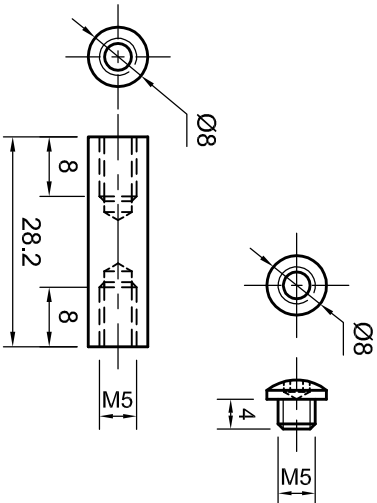
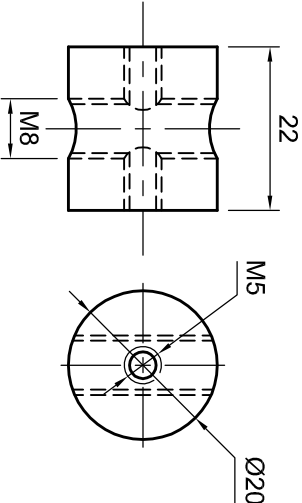
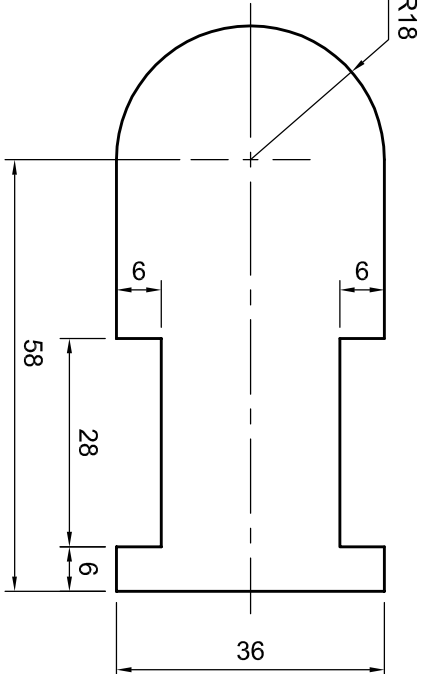
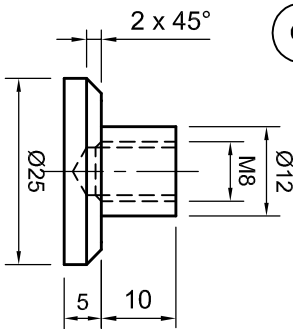
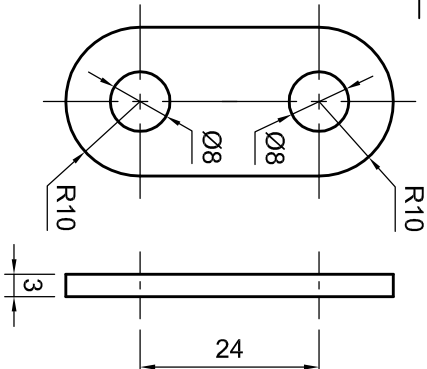
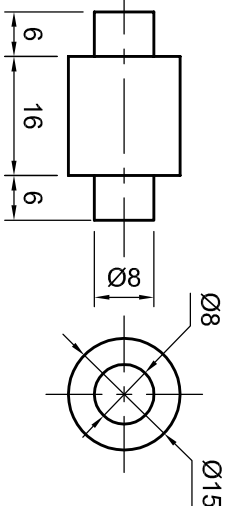
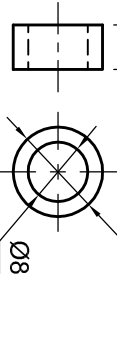
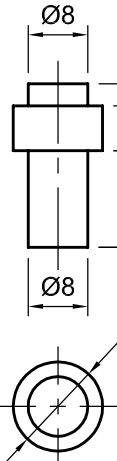
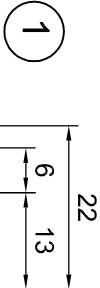


Cuir an scrúdpháipéar seo agus an triailphíosa isteach i gclúdach an iarthóra atá curtha ar fáil, agus tabhair an clúdach don Fheidhteoir ag deireadh an scrúdaithe.

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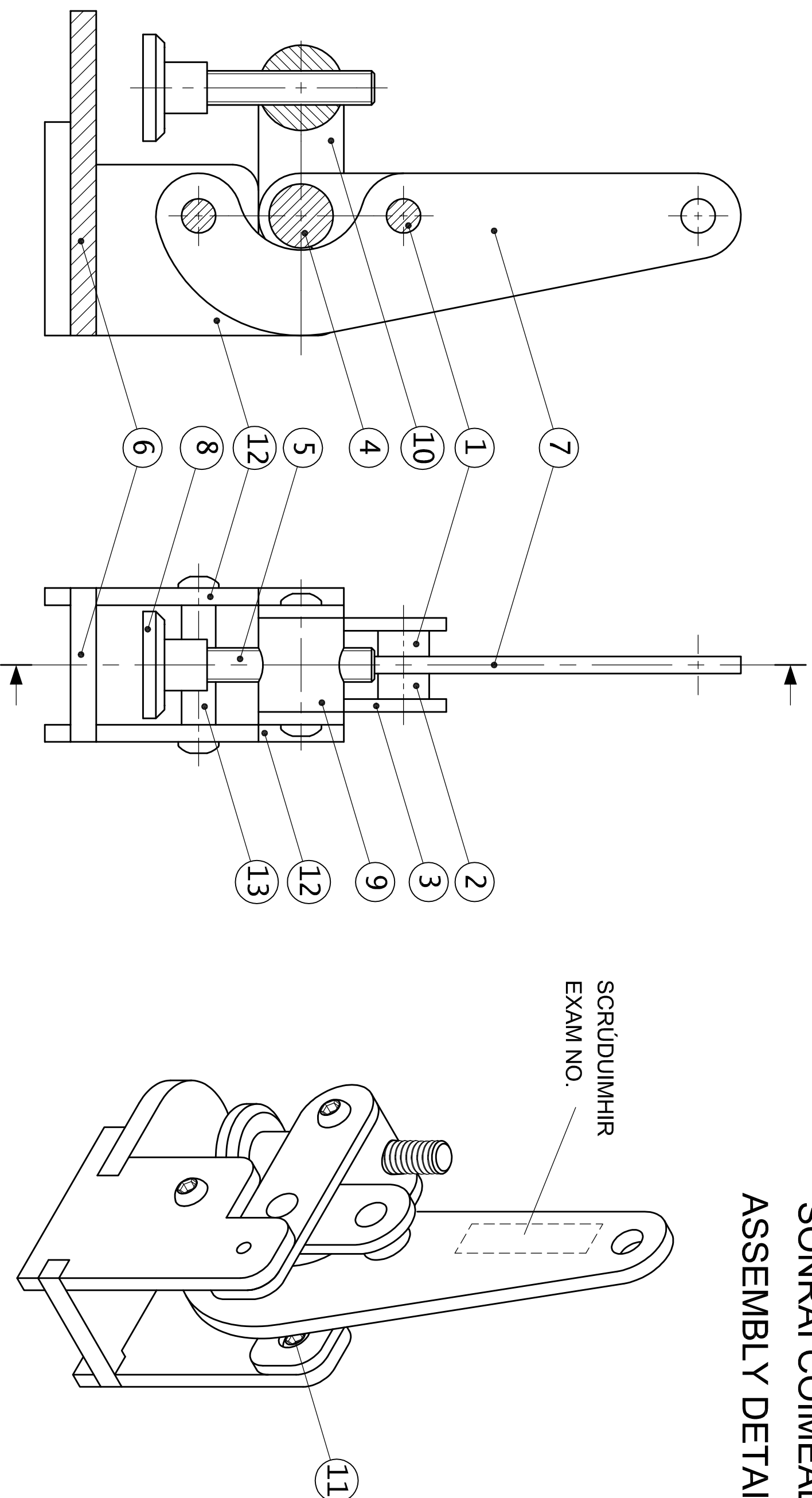
Scríobh do Scrúduitheoir sa bhosca seo:

Write your Examination Number in this box:



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