



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Cycle Final Examination 2023

Applied Technology

Common Level

Monday 19 June Morning 9:30 - 11:00

120 marks

Examination Number

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Day and Month of Birth

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For example, 3rd February is
entered as 0302

Centre Stamp

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Instructions

Answer all questions.

Write your answers in blue or black pen. You may use pencil for sketches only.

Write your answers in the spaces provided in this booklet. There is space for extra work at the end of the booklet. Label any such extra work clearly with the question number and part.

This examination booklet will be scanned and your work will be presented to an examiner on screen. Anything that you write outside of the answer areas may not be seen by the examiner.

Acknowledgements

P3/Q1(a)(i)	https://www.pinterest.ie/pin/369928556894333842/
P3/Q1(a)(ii)	https://www.nicepng.com/ourpic/u2q8y3t4e6e6y3o0_lego-blocks-png-lego-bricks-transparent-background/
P3/Q1(a)(iii)	https://hungarytoday.hu/lets-play-lego-nyiregyhaza-lego-plans-expansion-hungary-79073/
P3/Q1(a)(iv)	https://www.lego.com/en-gb/sustainability/environment/recycledmaterials/
P4/Q1(b)(i)	https://www.thebasicwoodworking.com/how-to-make-a-dollhouse-out-of-wood/
P5/Q1(c)(iii)	https://airbrushes.com/product_info.php?cPath=400_403_407_33&products_id=24210&osCsid=spp1hvol0fpl8nqelH3s91s3u8
P7/Q1(e)(iii)	https://www.yourtyres.co.uk/lkwsuchen.html
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P14/Q3(a)(iv)	https://www.robots.com/robots/fanuc-r-2000ib-185l
P16/Q3(c)(ii)	https://www.thebossshop.com.au/itm-pedestal-bench-drill-press-13mm-cap-5-speed-21

Question 1

Lego™ is one of the most successful toy manufacturing companies in the world.

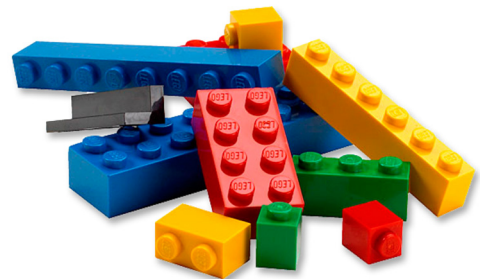
- (a) (i) Name **two** features of Lego products which make them popular toys.



1.
2.

- (ii) Lego bricks are made from ABS thermoplastic. Explain the term **thermoplastic**.

Thermoplastic:



- (iii) Many Lego products are manufactured using automated systems. State **one** advantage of the use of automation in this type of industry.

Advantage:



- (iv) Lego use a percentage of recycled plastic as raw material. State **one** reason why this is important.

Reason:



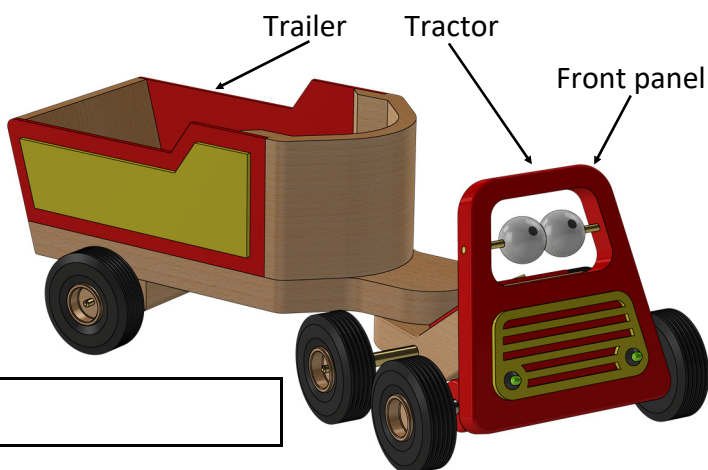
- (b) (i) State **two** advantages of using wood as a raw material for toy making.

1.
2.



- (ii) A student design for a toy articulated truck (tractor and trailer) is shown. The tractor unit is powered using two gearbox motors and has two LEDs for headlights.

Name a suitable manufactured board from which to make the front panel.

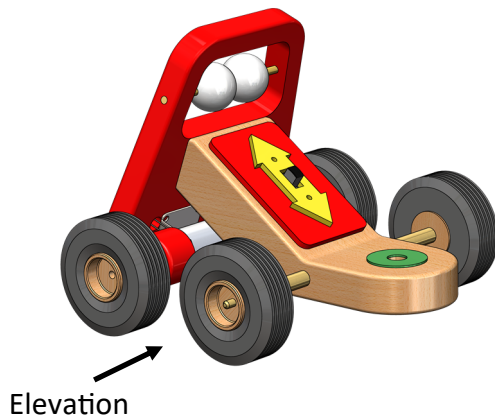


Manufactured board:

- (iii) Using notes and sketches, describe how you would make the front panel from a square piece of your selected material. Name any tools and machines used.

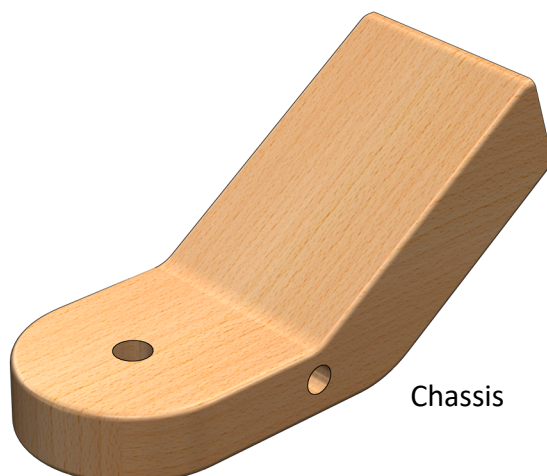


- (c) (i) In the space opposite sketch a well proportioned elevation of the tractor unit viewed in the direction of the arrow shown below.



- (ii) The chassis of the tractor unit was finished with a clear lacquer. Describe the process necessary to prepare the wood before applying the lacquer.

Answer:



- (iii) The lacquer is to be applied using an aerosol spray can. Explain why a spray booth should be used when carrying out this process. Name **one** other precaution which should be taken for this process.

Reason for using a spray booth:
One other precaution:



Spray Booth

(d) A view of one of the LED truck headlights is shown.

(i) What do the letters LED stand for?

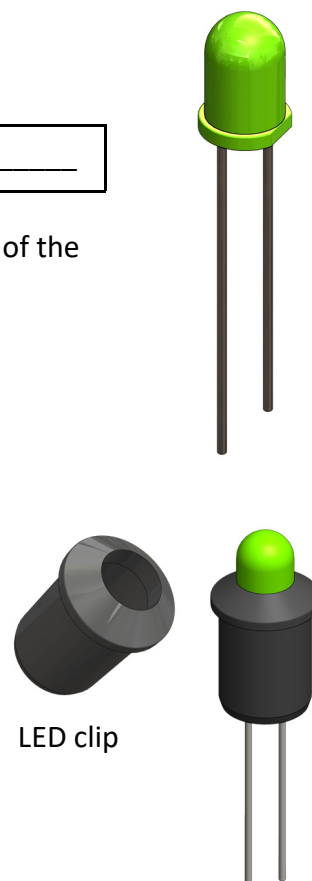
Answer:	L _____	E _____	D _____
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(ii) Place a tick (✓) in the appropriate box to indicate which leg of the LED is the anode (positive leg).

	Short Leg	Long Leg
Anode		

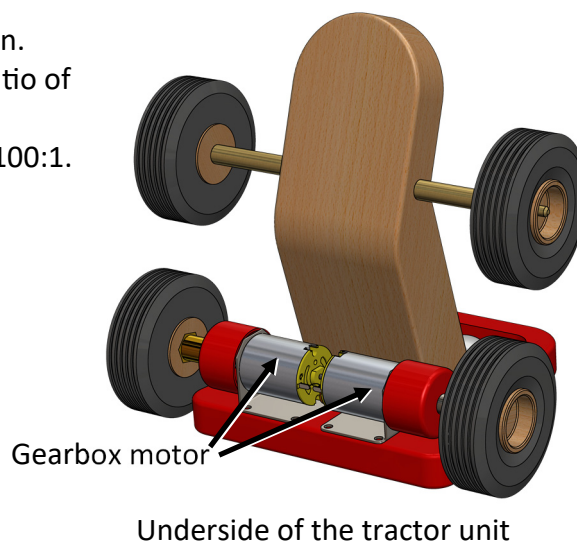
(iii) Explain why it is best practice to use an LED clip when inserting an LED into the front panel of the truck.

Answer:



(iv) The underside of the tractor unit is shown.
Two gearbox motors, each with a gear ratio of 100:1, power the tractor unit.
Explain what is meant by a gear ratio of 100:1.

Answer:

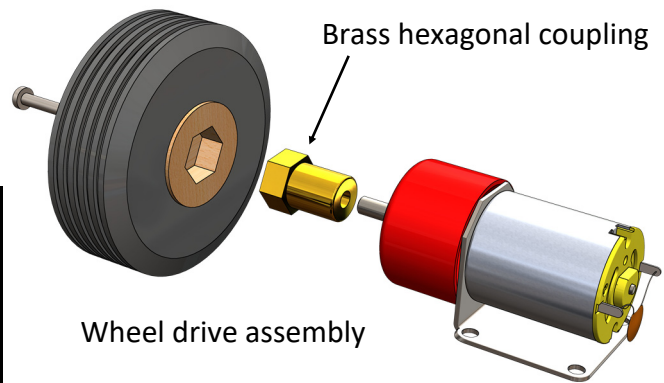


(v) Explain why DC motors, without gearboxes, would not be suitable to power the truck.

Answer:

- (e) (i) A brass hexagonal coupling is used to connect the gearbox shaft to the wheel.
Explain why a hexagonal profile is used for this purpose.

Answer:



- (ii) A plastic disc is used where the tractor and trailer units are connected.
Give **one** reason for using this plastic disc.

Reason:



- (iii) Wheels of commercial trucks use pneumatic tyres. Explain the term **pneumatic** and give **one** advantage of using pneumatic tyres.

Pneumatic:
Advantage:



- (iv) State **one** reason why trucks have a large number of wheels.

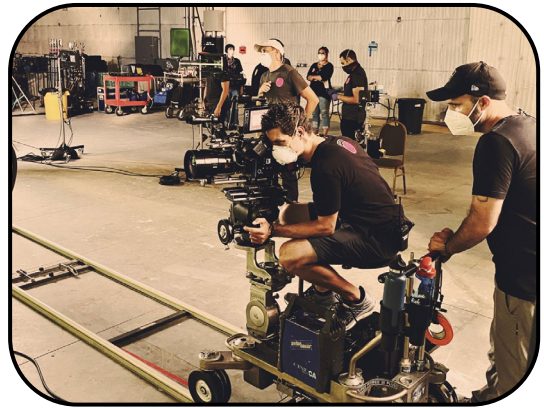
Reason:



Question 2

Modern movie production uses a wide variety of technologies in producing and distributing the film.

- (a) (i) Describe **two** ways in which digital technologies are used in the movie industry.



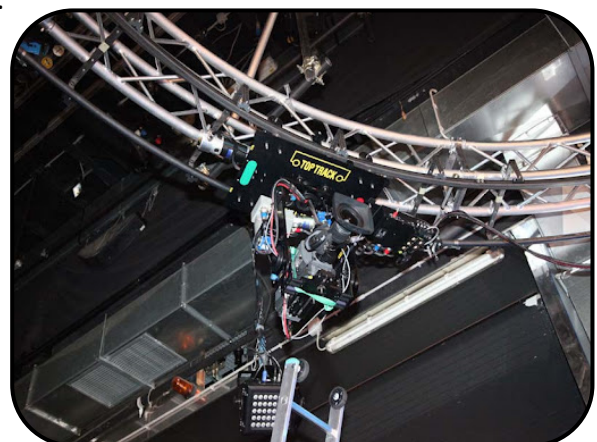
1.
2.

- (ii) *Camera dollies* are used in movie production to provide a smooth movement over an uneven surface.
Suggest **one** design feature of a camera dolly which makes this possible.



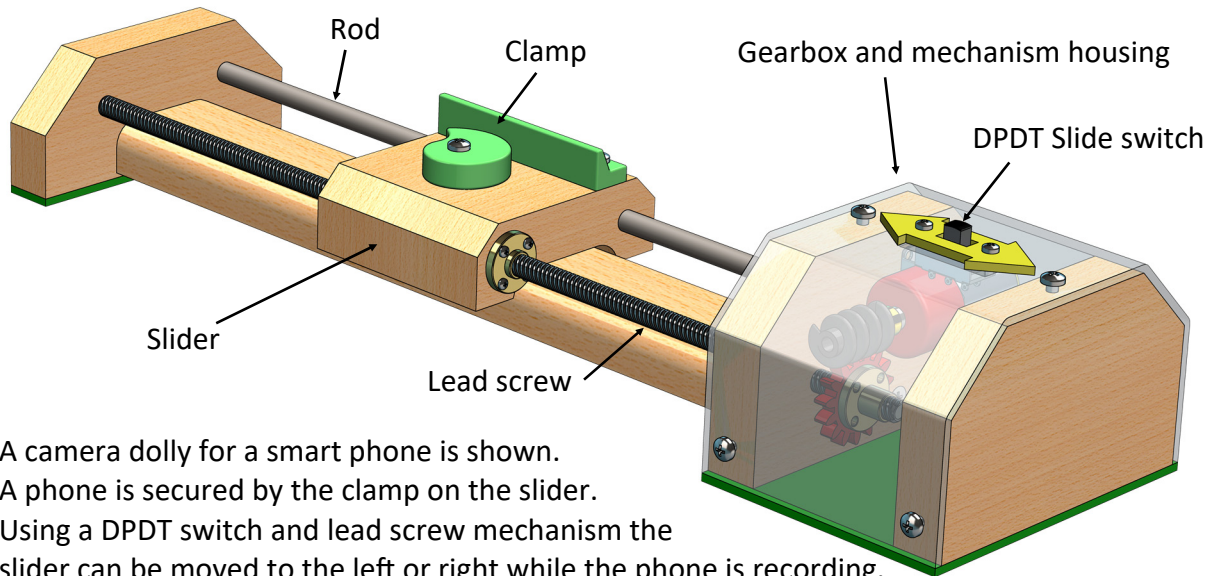
- (iii) The image shows a ceiling mounted dolly. The track is a triangulated-truss type structure.
Why is the truss triangulated?

Answer:



Overhead trussed camera dolly

(b)

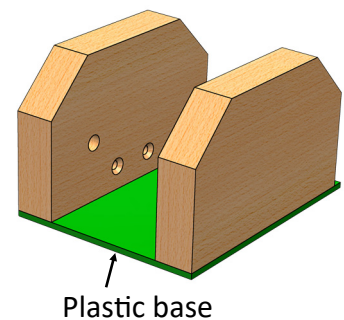


A camera dolly for a smart phone is shown.
A phone is secured by the clamp on the slider.
Using a DPDT switch and lead screw mechanism the slider can be moved to the left or right while the phone is recording.

- (i) Name a suitable hardwood for the wooden parts of the dolly and state **one** property of your chosen hardwood.

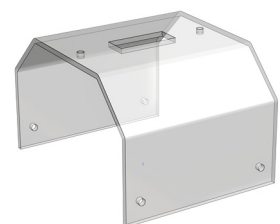
Hardwood:	Property:
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- (ii) In the space below, explain using notes and sketches, how the plastic base of the gearbox housing could be attached to the two wooden sides.



- (iii) The cover of the motor housing is classed as a **shell structure**.
List **two** other examples of a shell structure in everyday use.

1.	2.
----	----



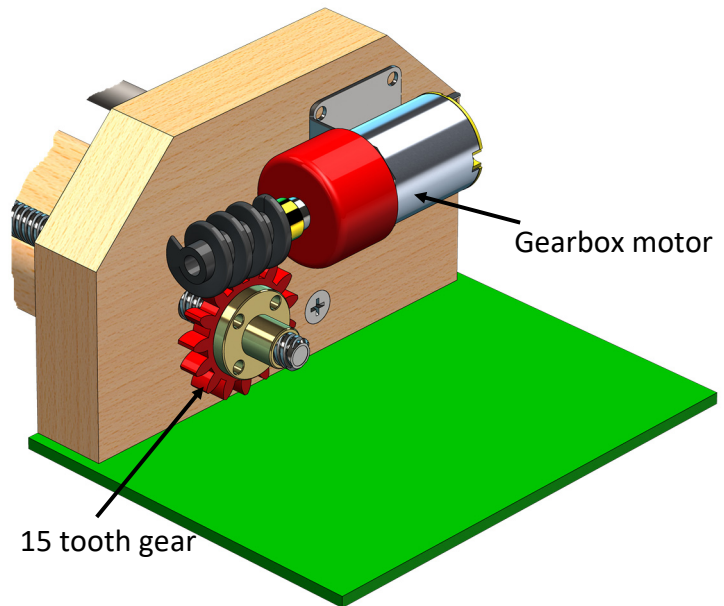
- (c) The dolly movement is produced by a gearbox motor which drives the mechanism shown.

(i) Name this mechanism.

Name:

(ii) State **one** advantage of using this mechanism for the dolly.

Advantage:



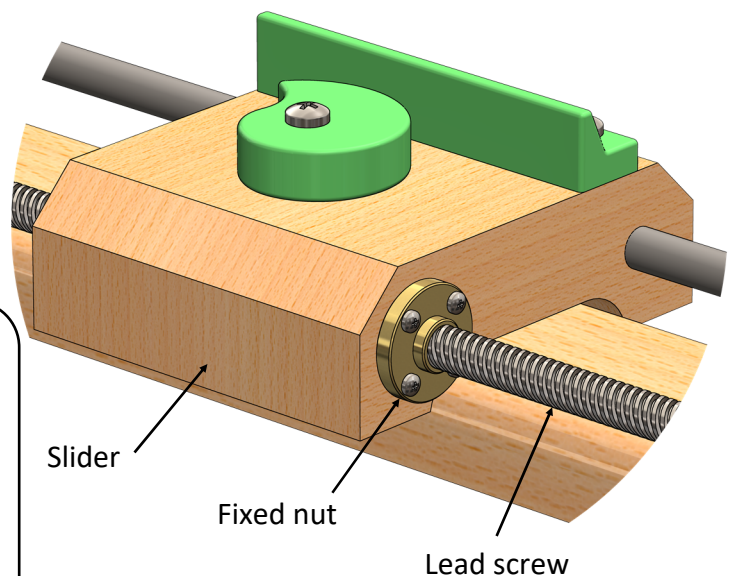
(iii) The output shaft of the gearbox rotates at 450 RPM.
Calculate the rotational speed of the 15 toothed gear.

Calculation:

Answer:

(iv) Every rotation of the lead screw moves the slider a distance of 8 mm.
Using your answer from the previous question, calculate the linear speed of the slider in millimetres per second.

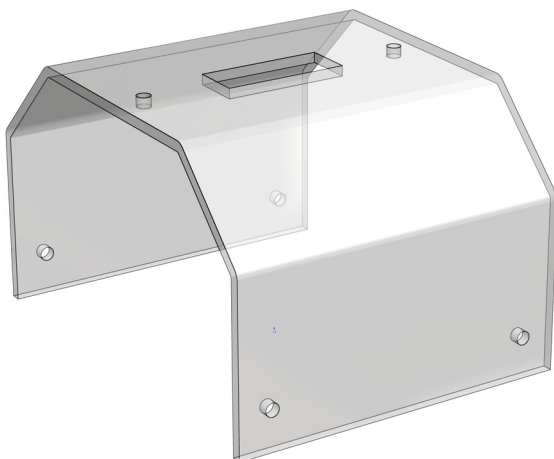
Calculation:



Answer:

- (d) (i)** In the space provided, draw the development of the housing cover shown in 3D below.

Show the position of all bend lines, holes, and the rectangular slot for the slide switch.



- (ii)** Name a suitable transparent material for this cover and give a reason for your choice.

Material:
Reason:

Development

- (iii)** Name the machine used to bend this cover and describe the process of making one of the bends.

Machine name:
Bending Process:

- (e) (i) Describe, using the named parts of the slider, how the smart phone is held in place.

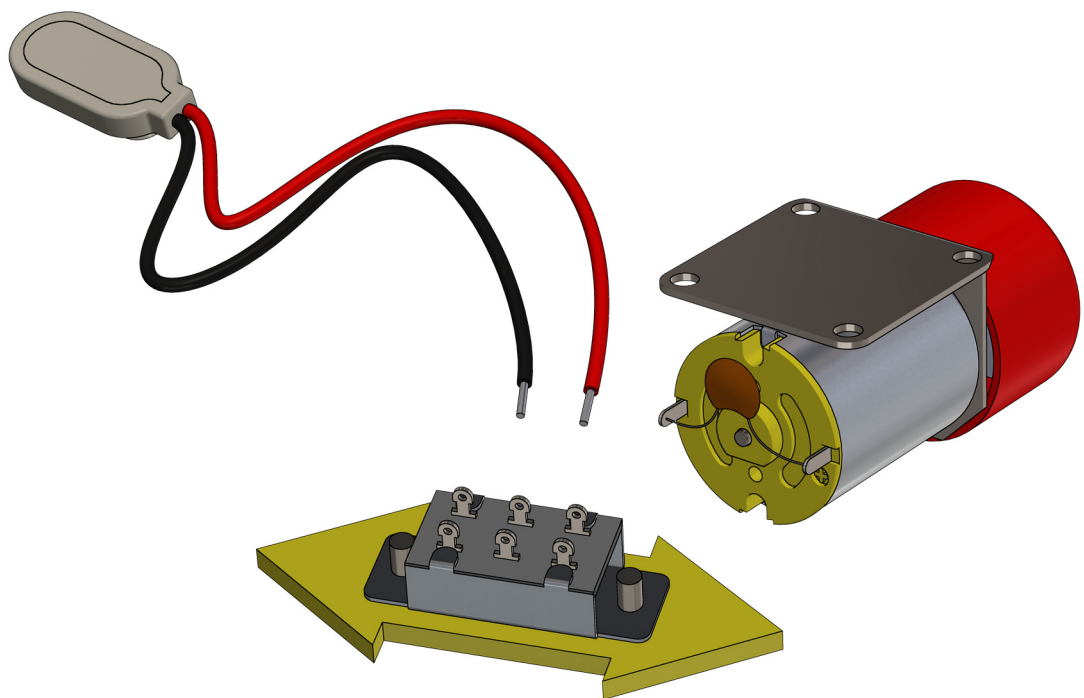
Answer:

- (ii) Name a manufacturing process which could be used to make both the cam and the fence from plastic.

Name of process:

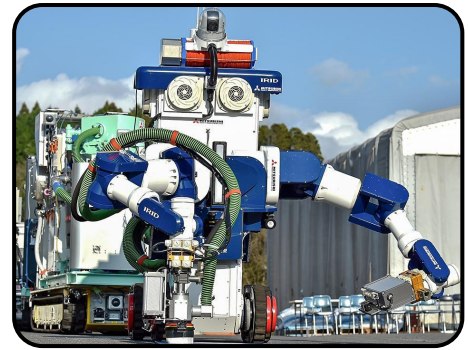


- (iii) The incomplete control circuit for the camera dolly is shown below. The circuit must control forward motion, backward motion, and motor-off functions. Complete this circuit by sketching in the connecting wires of the three components.



Question 3

- (a) In 2011, a tsunami (tidal wave) caused severe damage to the Fukushima nuclear power plant in Japan. Since then a number of robotic machines have been used as part of the clean-up operation in the nuclear plant.



- (i) Give **two** reasons why robots are particularly suited to these clean-up operations.

1.
2.

- (ii) Autonomous vehicles are viewed by many as the future of transport. Explain what is meant by the term **autonomous vehicle** and give **one** example.

Autonomous vehicle:
Example:

- (iii) The image shows a robotic exoskeleton which can be used to assist a person with reduced mobility to walk.
Describe **two** other technological devices that make life easier for a person with a disability.

1.
2.



Robotic exoskeleton

- (iv) Robots are becoming more commonplace in manufacturing industries. Outline **one** positive and **one** negative consequence of this increase in the use of robots.

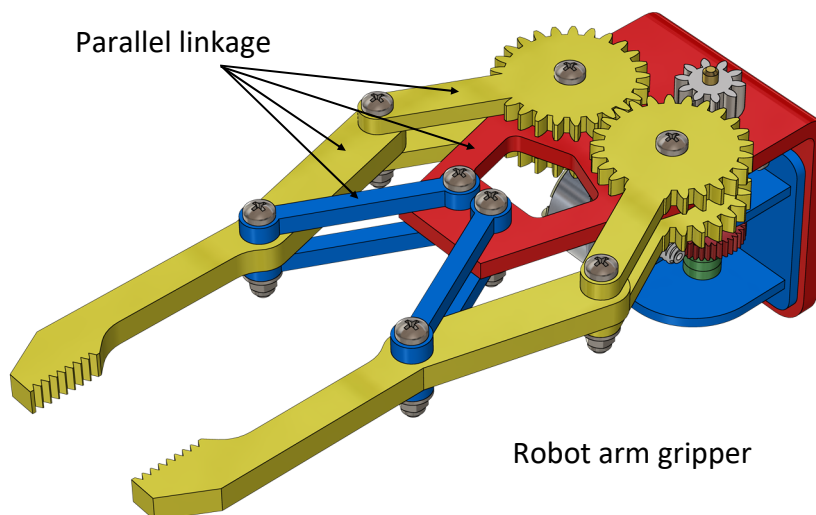
Positive consequence:
Negative consequence:



Assembly line robot

- (b) A gripper for a robot arm is shown. The gripper opens and closes mechanically using a parallel linkage mechanism driven by a number of gears.

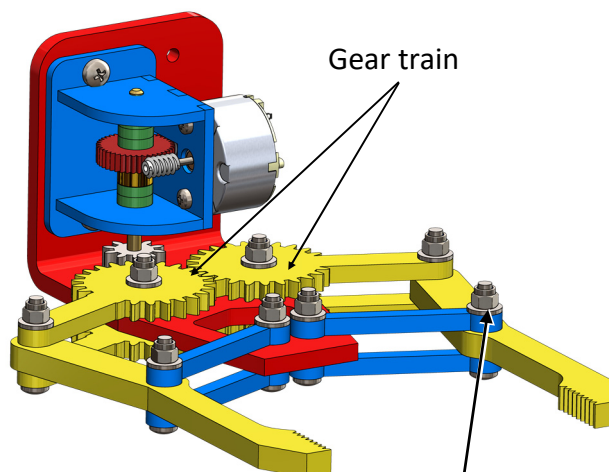
- (i) Name **one** other device or machine that uses a parallel linkage and state its function.



Name:
Function:

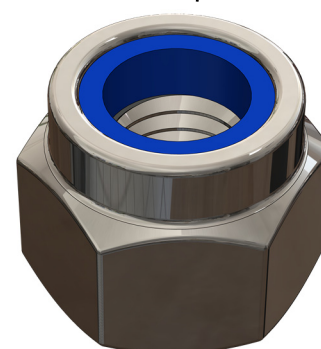
- (ii) The gear train shown was selected as a drive mechanism for the gripper. Give **two** reasons for selecting this type of drive mechanism.

Reason 1:
Reason 2:



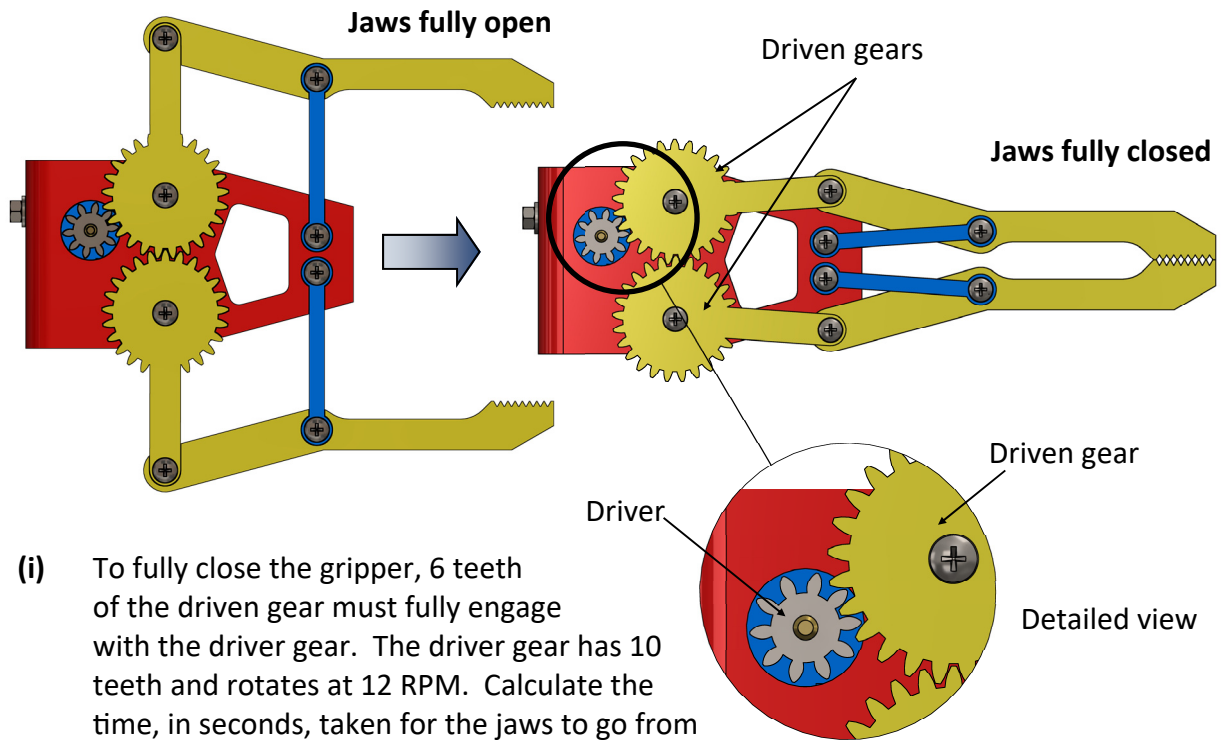
- (iii) The locking nut shown ('nyloc nut'), is used in the assembly of the gripper mechanism. Give a reason for its use.

Reason:



Enlarged view of locking nut

(c)



- (i) To fully close the gripper, 6 teeth of the driven gear must fully engage with the driver gear. The driver gear has 10 teeth and rotates at 12 RPM. Calculate the time, in seconds, taken for the jaws to go from the fully open to the fully closed position.

Calculation:

Answer:

- (ii) A drilling machine (bench drill) is used when manufacturing the gripper arms.
State **two** safety precautions which should be observed when using a drilling machine.



Precaution 1:

Precaution 2:

[illegible]

[illegible]

Additional writing space.
Label all work clearly with the question number and part.

Do not write on this page

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Applied Technology

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