



Subject: Grade 9 Technology

Topic: Technology: Term 2 - Exam 1

Total: 125 Marks

1. 840mm | 840 | 840 mm

3 marks

Explanation:

There are four steps in this staircase.

$$4 \times 210\text{mm} = \mathbf{840\text{mm}}$$

2. 690 | 690mm

2 marks

Explanation:

If each tread is 230mm and there are 3 treads:

$$230\text{mm} \times 3 = \mathbf{690\text{mm}}$$

3. pawl

3 marks

Explanation:

This is an image of a ratchet and pawl mechanism.

A = axle of the ratchet

B = pawl

C = the teeth of the ratchet

4. pneumatic | hydraulic | force

6 marks

Explanation:

- A **pneumatic** system is filled with **compressed air** to make a mechanic system move or do work.
- A hydraulic system is filled with **pressurised fluid** or liquid such as transmission oil.
- Both systems are used to transmit an **input force** to do work. Hydraulic systems usually give mechanical advantages to move heavy loads.

5. false

2 marks

Explanation:

The parts labelled E and F in this image are **valves**. The control valves in a hydraulic system regulate the flow of hydraulic fluid.

The pistons are at A and D.



6. C: D = Input piston
G = Fluid Reservoir
A = Output piston

4 marks

Explanation:

The correct labels are:

D = Input piston - the input force is applied at C

G = Fluid Reservoir - this stores the hydraulic fluid for the system

A = Output piston - this is the larger piston which does the work

7. fluid | oil | liquid

3 marks

Explanation:

The yellow in this image represents the **hydraulic fluid** in the system.

This fluid is a **liquid** and is often called hydraulic **oil**.

8. single | 3D | construction | design

8 marks

Explanation:

- This drawing uses a **single vanishing point** perspective drawing technique. A double vanishing point would use two points on either side of the object in line with a horizon.
 - This will help the designer to create a **3D drawing**. The three dimensions of the drawing are height, width, and **depth**.
 - The lines drawn from the object to the vanishing point are called **construction lines**. The construction lines should be very soft and can be erased once the outline is completed.
 - This type of drawing is done during the **design phase of the design process**. All drawings are done in the design phase and referred to during the make phase.
-

9. false

2 marks

Explanation:

This image is a **2D** image. It is not 3D as it is a flat drawing showing only **two dimensions** of length and height. There is no depth.

10. hydraulic

3 marks

Explanation:

This image shows an example of an earthmoving machine. This machine makes use of a **hydraulic system** to operate the digger arm at the back and the excavator at the front.

11. false

2 marks

Explanation:

Shading and shadows are added to a drawing to make it appear **three-dimensional**. Adding shading helps to make an image look more **realistic**. It is important to consider the possible **light sources** to ensure all shadows fall in the logical directions.

12. dimensions | dimensioning | measurements

3 marks

Explanation:

Once an orthographic projection with all necessary details is completed, **dimensions** must be added to turn it into a **working drawing**. Measurements must be taken, and numeric values must be written next to each line.

13. C: Single wheel fixed pulley

4 marks

Explanation:

This is an example of a **single-wheel fixed** pulley.

- There is only **one** sheave wheel.
 - The wheel's axle is **attached** to a fixed point.
 - The wheel cannot move and the rope moves through the wheel.
-

14. fixed | axle | equal to | direction

8 marks

Explanation:

- This is a **single-wheel fixed pulley**. There is only one wheel used and a single rope.
 - The **axle** of the wheel is attached to a permanent point. The wheel must be able to turn, but its axle is fixed to a point.
 - This type of pulley will provide a **mechanical advantage that is equal to 1**. The force is not multiplied.
 - This pulley changes the **direction** of the force applied. A person can pull down on a rope or cable to lift an object up.
-

15. smaller | greater | greater | smaller

8 marks

Explanation:

To achieve force multiplication in a hydraulic press:

- The **smaller input force** has to move through a **greater distance**. This means that the small piston, which is the one the operator pushes, moves much further.
- The **larger output force** moves through a **smaller distance**. There is a much greater force at the output which enables it to crush/ press materials that we would not be able to do without the press.

16. D: 12,5N

4 marks

Explanation:

$$F_1 \times d_1 = F_2 \times d_2$$

$$F_1 \times 300\text{mm} = 375\text{N} \times 10\text{mm}$$

$$F_1 = \frac{3750\text{Nmm}}{300\text{mm}}$$

$$F_1 = 12,5\text{N}$$

17. pneumatic | air | compressed

6 marks

Explanation:

- Passenger train doors and bus doors make use of **pneumatic systems** to control the opening and closing of the doors. These systems allow precise control of the doors.
- These doors are activated by a button being pushed which activates an electrical system. **Air** is then drawn into the system and **compressed** which then controls the precise movement of the doors.
- A hissing sound can be heard when the bus and train doors are activated. This is the air being released from the system.

18. scale

3 marks

Explanation:

A **scale** refers to the **size relationship** given on a working drawing.

A scale of 1:10 means that 1mm on the **drawing** represents 10mm on the **actual** object. Using a scale enables designers to draw a large object on a piece of paper.

19. front | side | top right | top

8 marks

Explanation:

When drawing the 1st angle orthographic projection, a vertical cross shape is drawn in the middle of the page to create 4 blocks to draw.

- The first view drawn is the **front view** which is drawn in the **top left block**. You must start drawing close to the corner of the cross, leaving at least 5mm.
- The **side view** is then constructed in the **top right block**. This can be either the left or the right side view.
- The **top view is drawn below the front view**. This view is constructed using construction lines from the other two views.
- The **bottom right** block is used only for construction lines. The 45° line is drawn in this block and used to assist with constructing the top view.

Explanation:

- During the design process, you need to consider whether the product is comfortable and practical for a person to use. These are the **ergonomics** of the design. These are the human factors of a design.
- These take factors such as the **size and comfort** of the product into consideration. Factors such as colour and texture are part of aesthetics, not ergonomics.
- The computer mouse in this image must fit into the user's hand and work with the body's natural **movements** to minimise discomfort and injury. The mouse pad in this image also has a gel pad to support the wrist.
- These same factors will be considered when designing an excavator's seat and steering wheel. Both ergonomic factors and aesthetic factors must be considered when designing any product.

Explanation:

The **worm** gear is connected to the motor and is the **input** gear. The worm gear is the **driver** gear which turns the wheel gear. The wheel gear is the output or driven gear.

Explanation:

- When designing these steps, it will be necessary to create a **2D orthographic drawing** of this ramp and staircase. The front, side and top views will all need to be drawn in 2D.
- If the steps are drawn in front of the ramp, then a **hidden detail line** will need to be drawn to show the position of the ramp. This is a broken or dashed line.

Explanation:

After you have been given a design brief, you need to follow the five steps of the Design Process. The first step is **INVESTIGATION** and doing research.

24. up | faster | speed | force

8 marks

Explanation:

- If the input gear is larger than the output gear this is called **gearing up**. There are more teeth on the driver gear.
- The smaller driven gear will **rotate faster** than the driver gear.
- There is a **speed advantage**. The smaller driver gear will turn more times for each turn of the large driver gear.
- There is a trade-off as this **reduces the force output** by the smaller gear. **When gearing up, the speed increases, but the force decreases.**

25. fixed | fixed pulley

3 marks

Explanation:

- The **fixed** pulley system has an $MA = 1$.
- There is only **one load-bearing rope** in the fixed system.
- It is a **single-wheel fixed pulley system**.
- The other pulley systems will all have an $MA > 1$.
- The increasing number of wheels and ropes will increase the mechanical advantage.

26. mm | millimetres | millimetre

3 marks

Explanation:

All measurements on technical drawings are in **millimetres**. The SI unit is written as **mm**. The unit is not written on the drawing as it is a convention, and everyone therefore knows it is in millimetres.

27. isometric projection | isometric projections

3 marks

Explanation:

A 3D technical drawing of the staircase and ramp at 30° is called an **isometric projection**.

28. true

2 marks

Explanation:

The four main types of gears studied in Technology in grades 8 and 9 are:

- **Bevel** gears - the gears intersect at a 90°.
- **Worm** gears - also called worm and wheel gears.
- **Rack and pinion** gears - linear motion is changed into rotary motion.
- **Spur** gears - round gears connect in a gear train.

29. A: 0,5

4 marks

Explanation:

To calculate the mechanical advantage we use this formula:

$$MA = \frac{\text{load}}{\text{effort}}$$

$$MA = \frac{\text{the number of teeth on the **driven** gear}}{\text{the number of teeth on the **driver** gear}}$$

$$MA = \frac{30}{60}$$

$$MA = 0,5$$

- This means that the Mechanical Advantage is less than 1.
- There is no force multiplication.
- Note: The **idler gear has no impact on the MA** - the only function is to change the direction of the follower.

30. idler

3 marks

Explanation:

The middle gear is the **idler gear**. The function of this gear is to change the direction of the gear which follows after the idler. In a train of 3 gears like this one, the driver gear (A) and driven gear (C) will both rotate in the same direction.

Total: 125 Marks