Province of the

EASTERN CAPE

EDUCATION

DIRECTORATE SENIOR CURRICULUM MANAGEMENT (SEN-FET)

HOME SCHOOLING SELF-STUDY WORKSHEET ANSWER SHEET

SUBJECT	**AUTOMOTIVE**	**GRADE**	**10**	**DATE**	**JUNE 2020**
TOPIC	**FORCES**	**TERM 1 REVISION**	**(Please tick)**	**TERM 2 CONTENT**	**(√)**

QUESTION 1

1 (a) Define a force.

A force is an influence which changes or tends to change the state of rest or uniform motion of a body.

(b) With the aid of sketches, give the 3 types of forces as used in Automotive.

(i) Tensile force

(ii) Compressive force

(iii) Shear force

QUESTION 2

(a) Define a moment.

A moment of a force is the turning effect of a force.

(b) What is the unit of a moment?

The Unit of a Moment is Nm.

(c) **State the principle of moments**.

In order for a body to remain in a balanced state or equilibrium, the sum of Clockwise Moments should be equal to the Anti-Clockwise Moments.

QUESTION 3

(a) A moment is a turning effect and it depends on two things:
   i. ……
   ii. ……

(b) Given the three scenarios representing a spanner in the table below, calculate the moment in each of the three scenarios and indicate the type of moment as either Clockwise or Anti-clockwise.
   If given that:
   Scenario 1, A force of 10N is applied at 30cm from the pivot.

   Scenario 2, A force of 10N is applied at 15cm from the pivot.

   Scenario 3, A force of 10N is applied at 60cm from the pivot

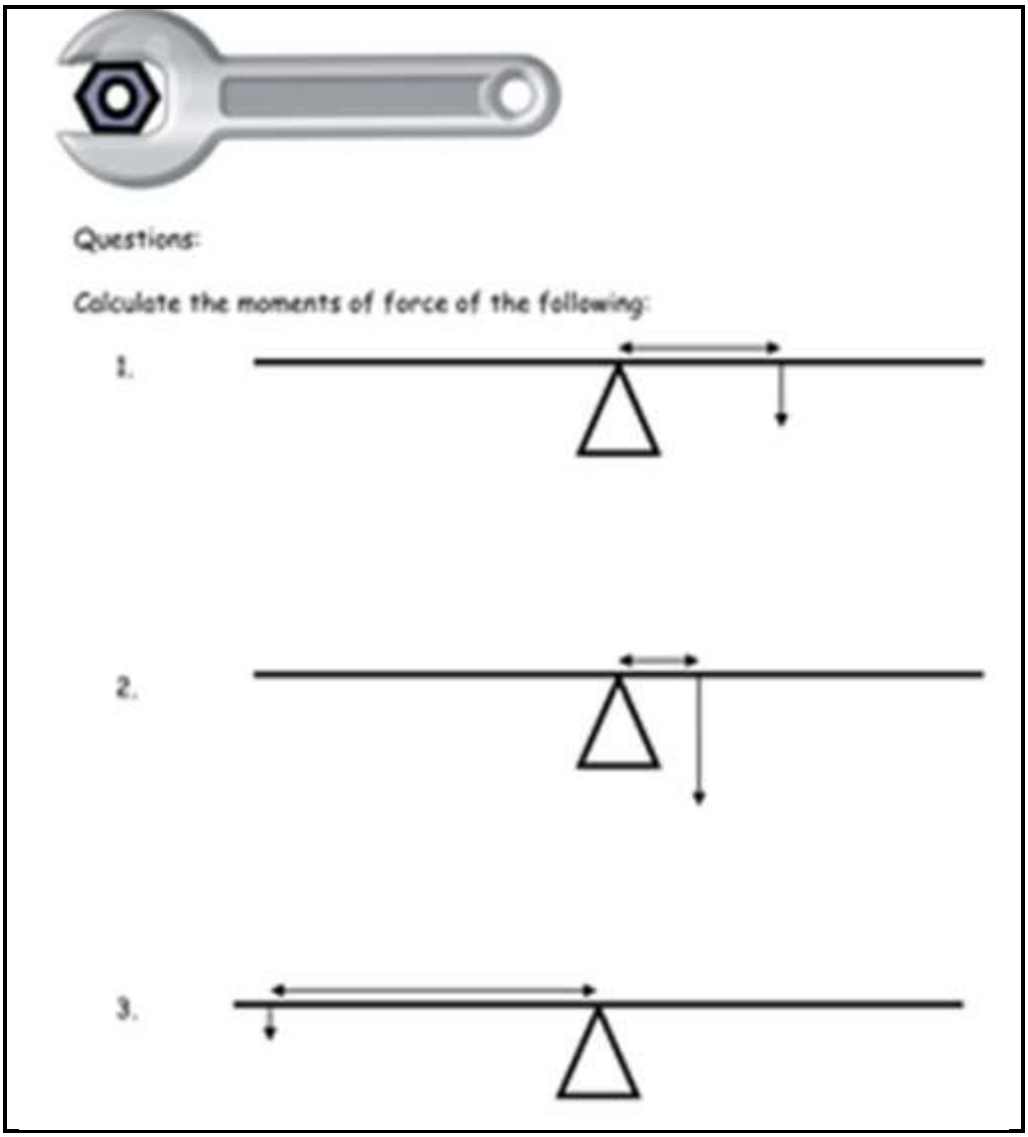

Table 1

SOLUTION TO QUESTION 3

3 (a) i. Force

ii. Distance

(b) 1. Moment = Force x Distance

= 10N x (30 ÷ 100) m

= **3 Nm**

Clockwise moment

2. Moment = Force x Distance

= 10N x (15 ÷ 100) m

= **1.5 Nm**

Clockwise moment

3. Moment = Force x Distance

= 10N x (60 ÷ 100) m

= **6 Nm**

Anti - clockwise moment

QUESTION 4

Determine both the Clockwise moment and Anti – clockwise moment given Figure 1 below. Comment on whether the body will remain in a balanced state.

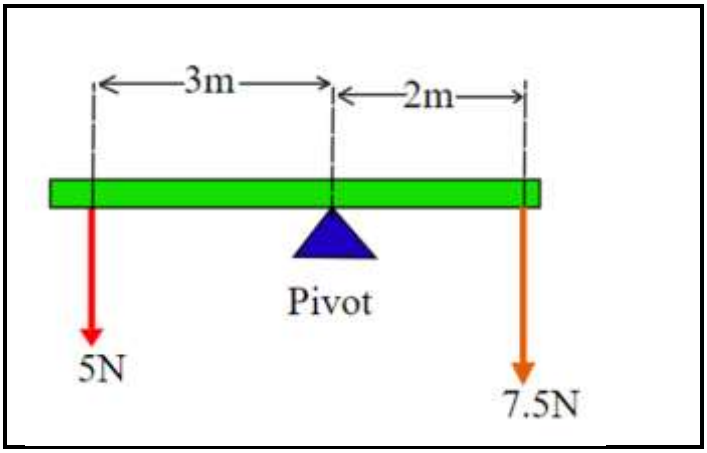

Figure 1

SOLUTION TO FIGURE 1 ABOVE

Calculating the two moments:
First, the Clockwise moment, M_c:
$M_c = F \times d$

= 7.5 x 2
= 15 Nm

Second, the Anticlockwise moment, M_A:
$M_A = F \times d$

= 5 x 3
= 15 Nm

Since the moments are equal, then according to the Principle of Moments, the object must balance.

QUESTION 5

Find the value of F_2, if the lever in Figure 2 below has to be in a state of equilibrium.

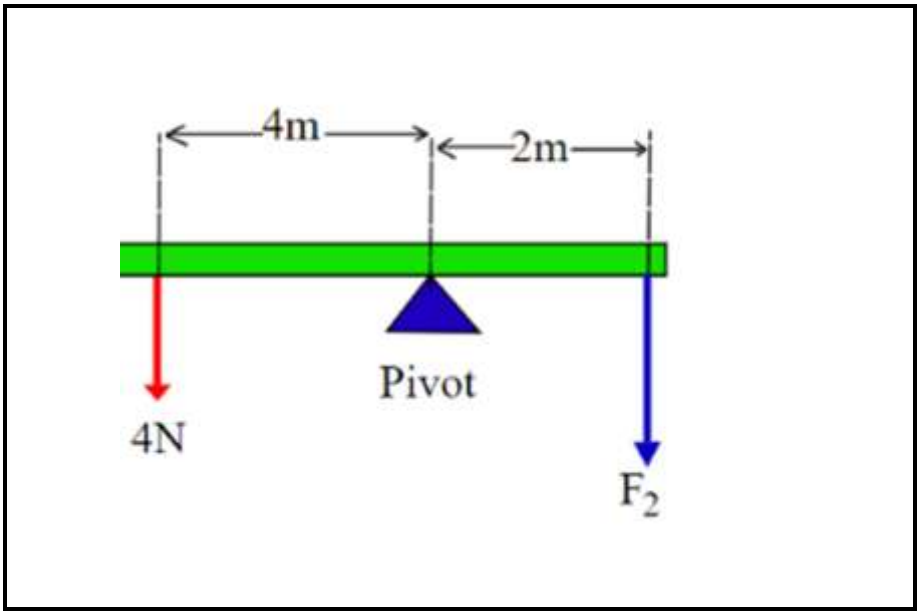

Figure 2

SOLUTION TO FIGURE 2 ABOVE:

Given all of the values to calculate the anticlockwise moment, then:

Clockwise Moment (M_C) = Anti-clockwise Moment (M_A)
$M_A = F \times d$

$= 4 \times 4$
$= 16$ Nm

Now, for the clockwise moment there is a missing force value, F_2, thus:
$M_c = F_2 \times d$
Now put in the value of M_c, which is equal to M_A, for the object to balance, so its clockwise moment equals its anticlockwise moment. Hence:

Since the object balances, the total clockwise moment equals the total anticlockwise moment, so $M_c = 16$ Nm.

$16 = F_2 \times 2$
$F_2 = 16 / 2$
$= 8$ N

(Do a quick check; 4 x 4 = 16 Nm on the left of the pivot. And then 2 x 8 = 16 Nm on the right of the pivot.)