



education

Department of
Education
FREE STATE PROVINCE

FORMAL EXPERIMENT

GRADE 10

TECHNICAL SCIENCES

SEPTEMBER 2017

MARKS: 30

TIME: 1 HOUR

This paper consists of FIVE pages.

Name of learner:

Grade:

INSTRUCTIONS AND INFORMATION

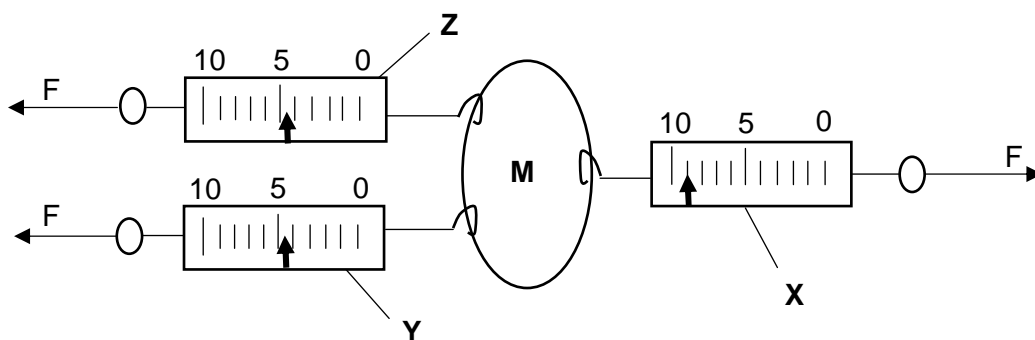
1. Write your name and grade in the appropriate spaces on the FRONT PAGE of this question paper.
2. Answer ALL questions in the spaces provided in THIS QUESTION PAPER.
3. Non-programmable pocket calculators may be used.
4. Appropriate mathematical instruments may be used.
5. Show the formulae and substitutions in ALL calculations.
6. Round off your final numerical answers to a minimum of TWO decimal places where necessary.
7. Give brief motivations, discussions, et cetera where required.
8. Formulae you might need is as follows:

$$\tau = F \times d \perp$$

$$w = mg$$

QUESTION 1

You are investigating the effect of three FORCES that have the same line of action. To do this, three similar pieces of apparatus, **X**, **Y** and **Z**, calibrated in newton, are used. **X**, **Y** and **Z** are connected to a ring **M** and forces are applied to **X**, **Y** and **Z** as indicated. Ring **M** is in EQUILIBRIUM.



- 1.1 Give the name of apparatus **Z**. (1)

- 1.2 By inspecting the readings on **Y** and **Z**, what is the magnitude of the TOTAL force, in N, that was exerted to the left on ring **M**? (2)

- 1.3 What is the scientific term for the TOTAL force referred to in question 1.2? (2)

- 1.4 Represent the vector sum of the readings on **Z** and **Y** graphically.



(3)

- 1.5 By inspecting the reading on **X**, what is the magnitude of the force, in N, that was exerted to the right on ring **M** to keep it in equilibrium? (1)

- 1.6 How do the forces referred to in questions 1.2 and 1.5 compare? (2)

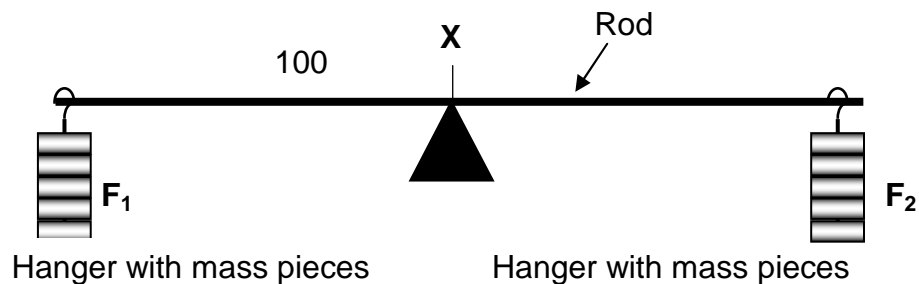
- 1.7 What is the scientific term for the force that was registered on **X**? (1)

- 1.8 What conclusion can be drawn about the three forces registered on **X**, **Y** and **Z**? (3)

[15]

QUESTION 2

During a class demonstration to verify the law of moments, the apparatus in the diagram below was used. Force F_1 and the distance between the fulcrum (at **X**) and F_1 were KEPT CONSTANT. To balance the rod, different forces were used for F_2 at different distances from the fulcrum.



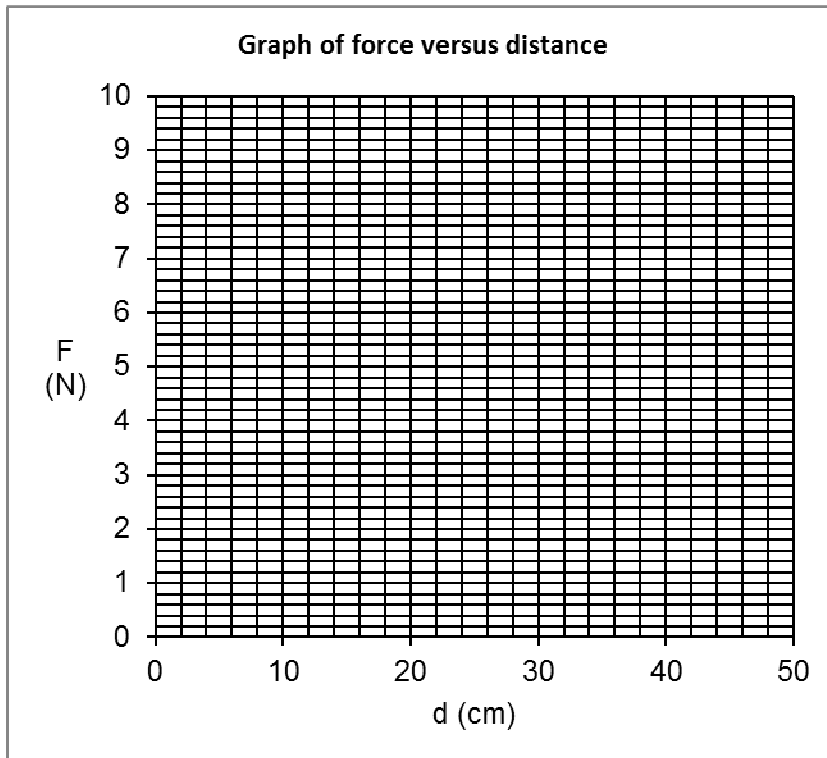
The following results were obtained.

F_1 (N)	Distance between X and F_1 (cm)	F_2 (N)	Distance between X and F_2 (cm)
0,98	100	9,80	10
		7,84	12,50
		3,92	25,00
		1,96	50,00

- 2.1 Calculate the magnitude of the force moment due to F_1 in BASIC SI units. (4)

- 2.2 During one of the trials, F_2 is at a distance of 16,67 cm from **X**. Calculate the magnitude of F_2 in order to balance the rod. (3)

- 2.3 Use the data in the table for F_2 and the distance between **X** and F_2 to draw a graph of force against distance on the graph paper below. Draw the best-fit line or curve for your data. (5)



- 2.4 Which variable in the graph was considered the independent variable? (1)

- 2.5 What conclusion can be made from this graph? (2)

[15]
GRAND TOTAL: 30