



education

Department of
Education
FREE STATE PROVINCE

CONTROL TEST

GRADE 10

TECHNICAL SCIENCES

MARCH 2020

MARKS: 75

TIME: 1½ HOURS

This paper consists of NINE pages and ONE data sheet.

INSTRUCTIONS AND INFORMATION

1. Write your name and other information in the appropriate spaces on the ANSWER BOOK.
2. This question paper consists of SEVEN questions. Answer ALL questions in the ANSWER BOOK.
3. Start EACH question on a NEW page in the ANSWER BOOK.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Leave one line between two sub-questions, for example between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable pocket calculator.
7. You may use appropriate mathematical instruments.
8. You are advised to use the attached DATA SHEETS.
9. Show ALL formulae and substitutions in ALL calculations.
10. Round off your FINAL numerical answers to a minimum of TWO decimal places where applicable.
11. Give brief motivations, discussions, et cetera where required.
12. Write neatly and legibly.

QUESTION 1: MATCHING-COLUMNS QUESTION

Choose the answer in COLUMN B that matches the information in COLUMN A. Write down ONLY THE LETTER (A–F) next to the question number (1.1–1.3) in your ANSWER BOOK.

	COLUMN A		COLUMN B
1.1	Number with unit and a direction	A	Location of an object relative to the origin
		B	Scalar quantity
1.2	Rate at which displacement changes.	C	Vector quantity
		D	Acceleration
1.3	Position	E	Velocity
		F	Distance

[3]

QUESTION 2: MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write down only the letter A, B, C or D next to the question number (2.1–2.4) in your ANSWER BOOK.

2.1 A Corona virus viewed under a microscope has a diameter of 0,000000125 m. The diameter written in scientific notation is ...

A $1,25 \times 10^{-7}$.

B $1,25 \times 10^{-6}$.

C $1,25 \times 10^6$.

D $1,25 \times 10^7$.

(2)

2.2 Two displacement vectors of magnitudes 20 cm and 80 cm, acting along a straight line, are added. Which one of the following is the only possible choice for the magnitude of the resultant displacement in cm?

A 0

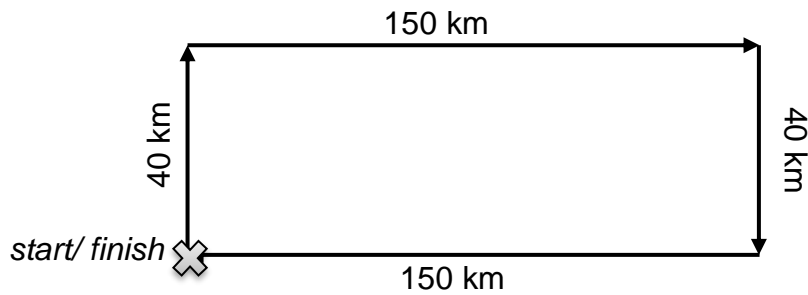
B 28

C 60

D 114

(2)

2.3 A learner follows the route indicated in the diagram below.



What is the total distance, in km, travelled by the learner when she arrives back at the starting point?

- A 0
 - B 190
 - C 230
 - D 380
- (2)

2.4 An object is moving at a constant velocity. Which statement is true?

- A It's speed increases.
 - B It experiences a zero acceleration.
 - C It experiences negative acceleration.
 - D It experiences positive acceleration.
- (2)
[8]

QUESTION 3

3.1 Convert the following numbers to the desired units:

3.1.1 4 m to dm (2)

3.1.2 3,2 μm to m (2)

3.1.3 200 cm^3 to litre (Hint: 10 cm^3 is the same as 10 mL.) (2)

3.2 Convert the following numbers, expressed in scientific notation, to normal notation:

3.2.1 $3,35 \times 10^5$ (2)

3.2.2 $1,29 \times 10^{-4}$ (2)

3.3 Make Δy the subject of the following formula:

$$v_f^2 = v_i^2 + 2g\Delta y$$

(2)
[12]

QUESTION 4

A concrete mixer is used to mix cement, sand, gravel and water to make concrete.

Assume that the concrete mixer has a cylindrical drum with a DIAMETER of 630 mm that rotates at a speed of 18 rpm (revolutions per minute).



4.1 Convert 18 rpm to rps (revolutions per second). (2)

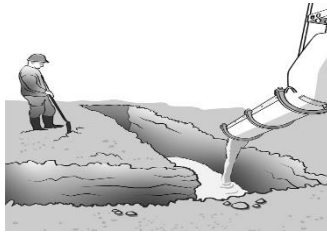
4.2 To convert the speed of the drum in rpm to speed in $\text{m}\cdot\text{s}^{-1}$ the following formula is used:

$$\text{speed} = 2\pi r\omega$$

r represents the radius of the drum in meter.
 ω represent the speed in revolutions per second.

Use this formula to calculate the speed of the drum in $\text{m}\cdot\text{s}^{-1}$. (3)

- 4.3 The concrete is poured into a trench at a rate of $1,4 \times 10^{-6} \text{ m}^3 \cdot \text{s}^{-1}$ to form the foundation of a building.



Calculate the time, in MINUTES, it will take to pour a volume of $5,4 \times 10^7 \text{ mm}^3$ concrete into the trench.

(4)
[9]

QUESTION 5

- 5.1 John completes the following TWO actions:

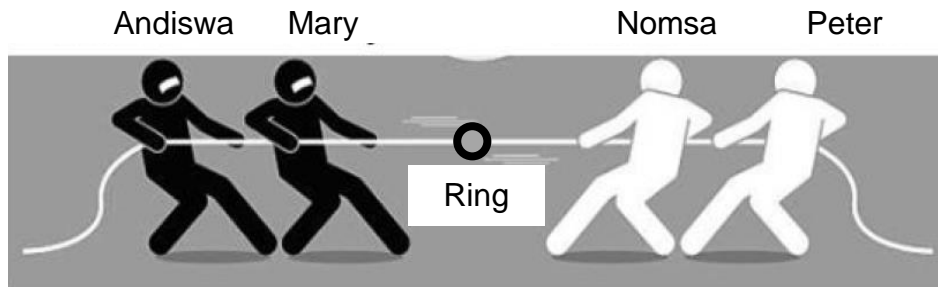
A: He runs for 4 km on a treadmill in a gym.

B: He runs 3 km to the right of the gym to reach his home.



- 5.1.1 Which one of the two actions, **A** or **B**, describes a scalar quantity? (1)
- 5.1.2 Give a reason for your answer to question 5.1.1. (1)
- 5.1.3 Name TWO examples found in everyday life of scalar quantities. (2)

- 5.2 Four grade 10 learners, Andiswa, Mary, Nomsa and Peter, compete in a tug of war competition. Two ropes are used, and they are tied to a ring as shown below.



The learners exert the following forces on the ring with the help of the ropes:

- Andiswa: 12 N to the left
- Mary: 7 N to the left
- Nomsa: 8 N to the right
- Peter: 9 N to the right

5.2.1 Define the term *resultant* vector. (2)

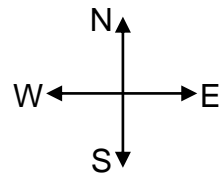
5.2.2 Calculate the resultant force acting on the ring. (3)

5.2.3 Determine the resultant force acting on the ring; this time graphically by using the tail-to head method. Use a scale where 1 cm represents 2 N. (4)

5.2.4 One of the teams needs a third person to exert a force on the rope TO PREVENT THE RING FROM MOVING. What is the magnitude and direction of this force? (2)
[15]

QUESTION 6

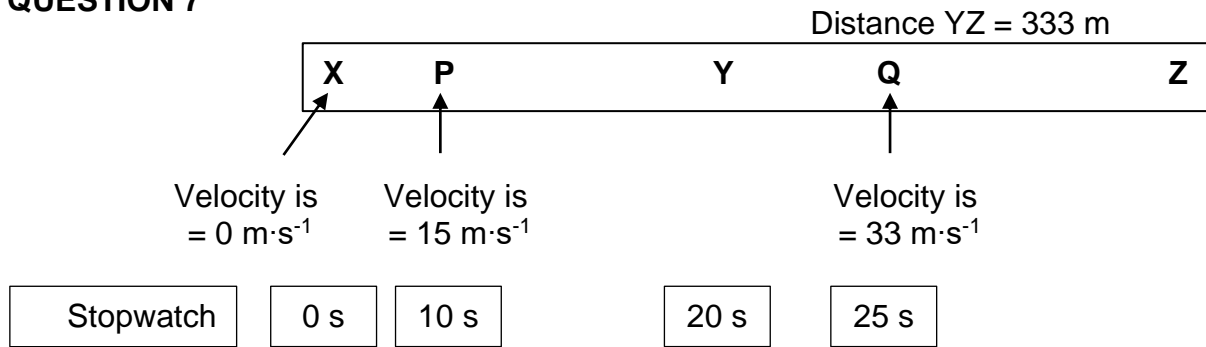
An athlete runs 100 m from point **A** to point **B** in 30 s and then 100 m to point **C** in 20 s. He then turns around immediately and runs back to **B** in 15 s where he stops. **A**, **B** and **C** are lying on the west-east axis of the compass directions.



A	100 m	B	100 m	C
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- 6.1 Differentiate between *distance* and *displacement*. (4)
 - 6.2 Calculate the TOTAL DISTANCE covered by the athlete when he has reached point **B** for the SECOND time. (2)
 - 6.3 Calculate the DISPLACEMENT of the athlete when he has reached point **B** for the SECOND time. Give the direction in terms of the compass directions. (2)
 - 6.4 Calculate the VELOCITY of the athlete for the whole motion. (4)
 - 6.5 Calculate the SPEED of the athlete for the whole motion. (3)
- [15]**

QUESTION 7



A motor mechanic is testing a car's performance. In the car is a stopwatch to show the time when the car reaches each one of points **P**, **Y** and **Q**. The velocity of the car at each one of points **X**, **P** and **Q** is also indicated. Example: 10 s after the car has started from REST from point **X** it reaches point **P** with a velocity of $15 \text{ m}\cdot\text{s}^{-1}$.

7.1 Define the term *acceleration*. (2)

7.2 Analyse the information in the diagram and calculate the:

7.2.1 Magnitude of the acceleration of the car from **P** to **Q**. (4)

7.2.2 Distance from **X** to **Y**. (4)

7.2.3 Time it takes to move from **Y** to **Z**. (3)

[13]

GRAND TOTAL: 75

**DATA FOR TECHNICAL SCIENCES GRADE 10
MARCH CONTROL TEST
GEGEWENS VIR TEGNIESE WETENSKAPPE GRAAD 10
MAART KONTROLETOETS**

TABLE 1: FORMULAE / TABEL 1: FORMULES

$rate = \frac{volume}{time}$	$tempo = \frac{volume}{tyd}$
$speed = \frac{distance}{time}$	$spoed = \frac{afstand}{tyd}$
$velocity = \frac{displacement}{time}$	$snelheid = \frac{verplasing}{tyd}$
$acceleration = \frac{change\ in\ velocity}{time}$	$versnelling = \frac{verandering\ in\ snelheid}{tyd}$