



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T990(E)(M26)T

NATIONAL CERTIFICATE

MATHEMATICS N1

(16030121)

26 March 2018 (X-Paper)

09:00–12:00

REQUIREMENTS: ONE sheet of graph paper

Nonprogrammable scientific calculators may be used.

This question paper consists of 7 pages and a formula sheet of 2 pages.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
MATHEMATICS N1
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
 2. Read ALL the questions carefully.
 3. Number the answers according to the numbering system used in this question paper.
 4. Show ALL formulae and intermediate steps and simplify where possible.
 5. ALL final answers must be rounded off to THREE decimal places (unless indicated otherwise).
 6. Questions may be answered in any order, but subsections of questions must be kept together.
 7. Questions must be answered in blue or black ink. Writing in pencil will not be marked. Graphs can be drawn in pencil.
 8. Sketches and/or graphs must be large, neat and fully labelled.
 9. ONE GRAPH PAPER is required for QUESTION 5.1.3 and QUESTION 5.2.
 10. Write neatly and legibly.
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QUESTION 1

1.1 Simplify each of the following without using a calculator but by using exponential laws:

1.1.1 $(a^3)^2 \times a^4$ (2)

1.1.2 $\frac{x^3 \times x^5}{(x^4)^2} + 3x^0$ (4)

1.1.3 $(25)^{\frac{1}{2}} \times x^{a+b} \times 2x^{a-b}$ (3)

1.2 Simplify each of the following logarithms without using a calculator:

1.2.1 $\log_7 49 + \log_2 8$ (3)

1.2.2 $\log_2 2^m \times m \sqrt[3]{125} \log 100$ (3)
[15]

QUESTION 2

2.1 Subtract $-7x + x^2 + 1$ from $2x^2 - 3x + 5$. (3)

2.2 Divide $x^3 + 2 + 7x + 5x^2$ by $x - 3$. (3)

2.3 Determine the product and simplify:

$(3a - 5)(3a + 5)$ (2)
[8]

QUESTION 3

3.1 Factorise each of the following expressions fully:

3.1.1 $4a^3 - 8a^2b + 12a$ (2)

3.1.2 $x^4 + x^3 + 4x + 4$ (4)

3.2 Simplify the following:

$\frac{3x+6}{6} \div \frac{x^2+2x}{2}$ (4)

- 3.3 Determine the lowest common multiple (LCM) and the highest common factor (HCF) of the following algebraic terms by using prime factors:

$$\begin{aligned} &9a^2bc \\ &12a^4b^5c^4 \\ &15a^3b^3c^2 \end{aligned}$$

(7)
[17]

QUESTION 4

- 4.1 Solve for x :

4.1.1 $5x + 3 = 2x - 3$ (2)

4.1.2 $3(x - 2) - (x + 1) = 3$ (4)

- 4.2 The sum of FOUR consecutive even numbers is 76.

Find the numbers. (4)

- 4.3 Given: $v = lbh$

4.3.1 Make b the subject of the formula. (1)

4.3.2 If $v = 180 \text{ m}^3$; $l = 9 \text{ m}$ and $h = 5 \text{ m}$, find the value of b . (2)

- 4.4 A vehicle uses 1 litre of fuel to travel a distance of 13 km.

How much fuel will be needed to travel a distance of 494 km? (2)

[15]

QUESTION 5

- 5.1 Given: $2y - 8x + 4 = 0$

5.1.1 Write the equation in the form $y = mx + c$. (2)

5.1.2 Determine the gradient of the graph. (1)

5.1.3 Draw the graph by using a table, $x \in \{-2; -1; 0; 1; 2\}$.

[Use the GRAPH PAPER.] (5)

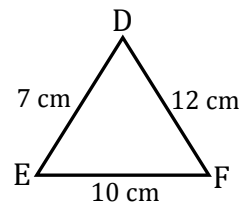
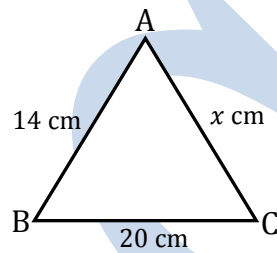
- 5.2 Draw the graph of $y = -\frac{4}{x}$ on the same system of axes used for QUESTION 5.1.3. Start by completing the table below.

x	-4	-2	-1	1	2	4
y						

(5)
[13]

QUESTION 6

6.1 Given: $\triangle ABC \sim \triangle DEF$



6.1.1 Complete the following:

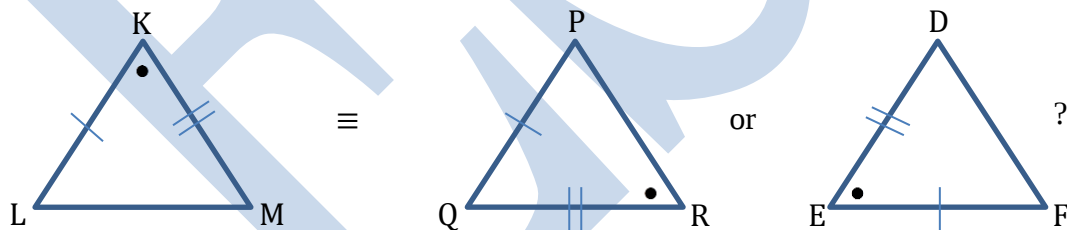
$$\frac{AB}{DE} = \frac{BC}{?} = \frac{AC}{?}$$

(1)

6.1.2 Calculate the value of x .

(2)

6.2



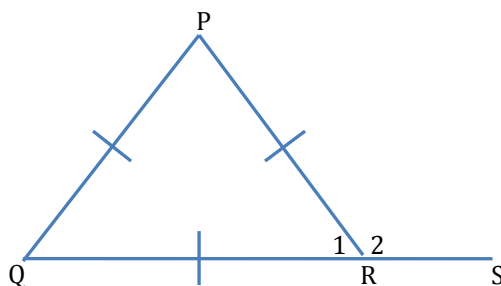
Complete the following and give a reason for the answer:

$$\triangle KLM \equiv \triangle \text{_____} (\quad)$$

(2)

6.3 In the figure below $\triangle PQR$ is given. $PQ = QR = PR$.

Calculate the size of $\hat{R}_1$ and $\hat{R}_2$. Give reasons for the answers.



(4)

[9]

QUESTION 7

7.1 If $\sin \theta = \frac{4}{5}$ and $0^\circ \leq \theta \leq 90^\circ$:

7.1.1 Draw the rectangular triangle in the given quadrant. Clearly indicate θ and the lengths of ALL sides.

[Calculate the unknown side by using the theorem of Pythagoras.] (4)

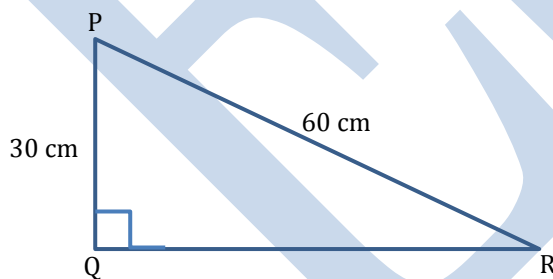
Determine the values of each of the following expressions:

7.1.2 $\cos \theta$ (1)

7.1.3 $\tan \theta$ (1)

7.2 In $\triangle PQR$, $\hat{Q} = 90^\circ$, $PR = 60$ cm and $PQ = 30$ cm.

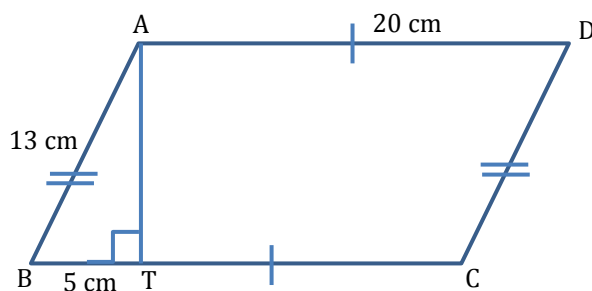
Calculate QR.



(3)
[9]

QUESTION 8

8.1 In parallelogram ABCD, $AB = 13$ cm; $AD = 20$ cm; $BT = 5$ cm, $AD = BC$
 $AB = DC$ and $AT \perp BC$.

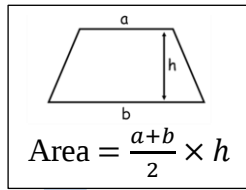


8.1.1 Calculate the length of AT. (3)

8.1.2 Determine the circumference of figure ADCT. (2)

8.1.3 Calculate the area of the trapezium ADCT.

Use the formula given below:



(3)

8.2 Decrease 320 kg by 15%.

(2)

8.3 An item costs R700 before adding VAT.

If VAT is 14%, calculate the total cost (including VAT) of this item.

(4)

[14]

TOTAL: 100

FORMULA SHEET

Rectangle:

$$\text{Perimeter} = 2(l + b)$$

$$\text{Area} = l \times b$$

Square:

$$\text{Perimeter} = 4a$$

$$\text{Area} = a^2$$

Triangle:

$$\text{Perimeter} = a + b + c$$

$$\text{Area} = \frac{1}{2}b \times h$$

Rectangular prism:

$$\text{Volume} = l \times b \times h$$

Right triangular prism:

$$\text{Volume} = \frac{1}{2}b \times h \times l$$

Cube:

$$\text{Volume} = a^3$$

Right pyramid:

$$\text{Volume} = \frac{1}{3}(\text{base area} \times h)$$

Ellipse:

$$\text{Area} = \frac{\pi}{4}(\text{major axis} \times \text{minor axis})$$

Circle:

$$\text{Circumference} = \pi D \text{ or } 2\pi r$$

$$\text{Area} = \frac{\pi D^2}{4} \text{ or } \pi r^2$$

Cylinder:

$$\text{Volume} = \frac{\pi D^2}{4} \times h \text{ or } \pi r^2 h$$

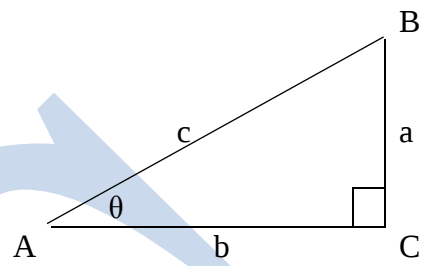
Cone:

$$\text{Volume} = \frac{\pi D^2}{4} \times \frac{h}{3} \text{ or } \frac{\pi r^2 h}{3}$$

Annulus:

$$A = \pi(R^2 - r^2)$$

The right-angled triangle:



The theorem of Pythagoras:

$$c^2 = a^2 + b^2$$

Ratios of angle θ :

$$\sin \theta = \frac{a}{c}$$

$$\cos \theta = \frac{b}{c}$$

$$\tan \theta = \frac{a}{b}$$