

**THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATION COUNCIL
DIPLOMA IN SECONDARY EDUCATION EXAMINATION**

740

MATHEMATICS

Time: 3 Hours.

ANSWER

Year: 2010

Instructions

1. This paper consists of sections A, B and C.
2. Answer **all** questions from Section A and **two (2)** questions from each of section B and C.
3. Section A and B carry **30** marks, Section C carry 40 marks.
4. Mathematical tables and non-programmable calculators may be used
4. Cellular phones are **not** allowed inside the examination room.
5. Write your **Examination Number** on every page of your answer booklet

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SECTION A (40 Marks)

Answer all questions in this section.

1.(a) Using Figure 1, show that $\triangle ADB \cong \triangle ADC$.

From the figure, AD is common to both triangles ADB and ADC.

Angle ADB is a right angle and angle ADC is also a right angle, since AD is perpendicular to BC.

AB is marked equal to AC in the figure.

Therefore, the hypotenuse AB equals hypotenuse AC and one corresponding side AD is common.

By the RHS congruence criterion, $\triangle ADB \cong \triangle ADC$.

2.(a) If $\sin A = 3/5$ and $\cos B = 15/17$, where A is obtuse and B is acute, find the exact value of $\sin(A + B)$.

Since $\sin A = 3/5$ and A is obtuse,

$$\cos A = -\sqrt{1 - \sin^2 A}$$

$$\cos A = -\sqrt{1 - 9/25}$$

$$\cos A = -\sqrt{16/25}$$

$$\cos A = -4/5$$

Since $\cos B = 15/17$ and B is acute,

$$\sin B = \sqrt{1 - \cos^2 B}$$

$$\sin B = \sqrt{1 - 225/289}$$

$$\sin B = \sqrt{64/289}$$

$$\sin B = 8/17$$

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\sin(A + B) = (3/5)(15/17) + (-4/5)(8/17)$$

$$\sin(A + B) = 45/85 - 32/85$$

$$\sin(A + B) = 13/85$$

3.(a) The statement J is formed from the sentences P, G, M. Write J in its most simplified form and use it to draw an electric circuit to flow when T is true.

From the truth table, J is true whenever P is true, regardless of the values of G and M.

When P is false, J is false in all cases.

Therefore, the simplified form of J is $J = P$.

The electric circuit is represented by a single switch P.

Current flows when switch P is closed, that is when P is true.

4.(a) A box contains 100 copper plugs, 27 oversize and 16 undersize. A plug is taken, tested but not replaced. A second plug is also taken, tested but not replaced. Find the probability that both plugs fitted in the socket.

Number of plugs that fit

$$= 100 - 27 - 16$$

$$= 57$$

Probability first plug fits

$$= 57/100$$

Remaining fitting plugs

$$= 56$$

Remaining total plugs

$$= 99$$

Probability second plug fits

$$= 56/99$$

Probability both fit

$$= (57/100) \times (56/99)$$

$$= 3192/9900$$

$$= 532/1650$$

(b) The first plug was oversize and the second one was undersize.

Probability first plug oversize

$$= 27/100$$

Remaining undersize plugs

$$= 16$$

Remaining total plugs

$$= 99$$

Probability second plug undersize

$$= 16/99$$

Required probability

$$= (27/100) \times (16/99)$$

$$= 432/9900$$

$$= 72/1650$$

5.(a) Given that $3 \sin \theta - 4 \cos \theta = 2$. Find θ if $0^\circ \leq \theta \leq 360^\circ$.

Rewrite the expression

$$3 \sin \theta - 4 \cos \theta$$

$$\text{Let } R \sin(\theta - \alpha) = 3 \sin \theta - 4 \cos \theta$$

$$R = \sqrt{3^2 + 4^2}$$

$$R = \sqrt{25}$$

$$R = 5$$

$$\sin \alpha = 4/5$$

$$\cos \alpha = 3/5$$

So

$$5 \sin(\theta - \alpha) = 2$$

$$\sin(\theta - \alpha) = 2/5$$

$$\theta - \alpha = 23.58^\circ \text{ or } 180^\circ - 23.58^\circ$$

$$\theta = 23.58^\circ + \alpha \text{ or } \theta = 156.42^\circ + \alpha$$

$$\alpha = 53.13^\circ$$

$$\theta = 76.71^\circ \text{ or } \theta = 209.55^\circ$$

6.(a) Given that $y = A \sinh nx + B \cosh nx$. Show that $d^2y/dx^2 = n^2y$.

Differentiate y with respect to x

$$dy/dx = An \cosh nx + Bn \sinh nx$$

Differentiate again

$$d^2y/dx^2 = An^2 \sinh nx + Bn^2 \cosh nx$$

Factor n^2

$$d^2y/dx^2 = n^2(A \sinh nx + B \cosh nx)$$

Since $y = A \sinh nx + B \cosh nx$,

$$d^2y/dx^2 = n^2y$$

7.(a) Find dy/dx given that $y = (3x + 2)(2x - 1)$.

Expand the expression

$$y = 6x^2 - 3x + 4x - 2$$

$$y = 6x^2 + x - 2$$

Differentiate

$$dy/dx = 12x + 1$$

8.(a) ABC is a triangle in which $AB = AC$ and the bisectors of $\angle ABC$ and $\angle ACB$ meet at point P. Prove that $PB = PC$.

Since $AB = AC$, triangle ABC is isosceles.

Therefore, $\angle ABC = \angle ACB$.

The bisector of $\angle ABC$ divides it into two equal angles, and the bisector of $\angle ACB$ does the same.

Thus, triangles PBC formed on each side have equal corresponding angles and share side BP and CP symmetrically.

Hence $PB = PC$.

9.(a) A die is rolled five times. Find the probability of obtaining three sixes.

Probability of a six in one roll

$$= 1/6$$

Probability of a non-six

$$= 5/6$$

Number of ways of choosing three sixes out of five rolls

$$= {}^5C_3$$

Probability

$$= {}^5C_3 \times (1/6)^3 \times (5/6)^2$$

$${}^5C_3 = 10$$

Probability

$$= 10 \times (1/216) \times (25/36)$$

$$= 250/7776$$

$$= 125/3888$$

10.(a) Draw the plan and the front elevation of the following cylinder using the scale 1 cm : 10 cm.

Actual diameter of cylinder

$$= 40 \text{ cm}$$

Scaled diameter

$$= 40 \div 10$$

$$= 4 \text{ cm}$$

Actual height of cylinder

$$= 100 \text{ cm}$$

Scaled height

$$= 100 \div 10$$

$$= 10 \text{ cm}$$

The plan is a circle of diameter 4 cm.

The front elevation is a rectangle of width 4 cm and height 10 cm.

SECTION B (40 Marks)

Answer two questions from this section.

11.(a) Discuss the significance of the following concepts in the learning of Mathematics.

Students' prior experiences play a key role in mathematics learning because new concepts are best understood when they are linked to what learners already know. When teachers build on learners' previous knowledge, learners feel more confident and are able to connect abstract ideas to familiar situations, which improves understanding and retention.

Language is significant in mathematics learning because it is the medium through which concepts, instructions, and explanations are communicated. Clear and appropriate language helps learners understand mathematical ideas, follow procedures, and express their reasoning correctly, while poor language use can lead to misunderstanding even when the learner has the ability.

Symbols are essential in mathematics because they provide a concise and universal way of representing ideas and relationships. Proper understanding of symbols allows learners to read, interpret, and manipulate mathematical expressions efficiently, making complex problems easier to handle.

Pictures are important because they help learners visualize mathematical concepts that may be abstract. Diagrams, graphs, and drawings support understanding by showing relationships, patterns, and structures clearly, especially for visual learners.

12.(a) One of the demotivating factors in learning mathematics is the way teachers mark or assess mathematics learning. With examples support this statement.

When teachers focus only on final answers and ignore correct methods, learners who understand procedures but make minor errors feel discouraged. For example, a learner who applies the correct formula but makes an arithmetic mistake may receive zero marks, which reduces motivation.

Harsh or unclear marking can also demotivate learners. If a teacher marks work without comments or explanations, learners do not understand their mistakes, leading to frustration and negative attitudes toward mathematics.

Frequent emphasis on summative tests without formative feedback can create fear and anxiety. For instance, continuous tests with no opportunity for correction may make learners associate mathematics with failure rather than learning.

(b) As a competent mathematics teacher, what will you do to improve the situation?

I would use marking schemes that award marks for correct steps and reasoning, not only final answers, so learners feel their effort is valued.

I would provide constructive feedback that clearly explains errors and suggests ways to improve, helping learners learn from their mistakes.

I would balance assessment methods by using quizzes, class activities, and assignments to support learning rather than relying only on high-stakes tests.

13.(a) The ability to link Mathematics with everyday life is a very important competence in learning Mathematics. How can you use Mathematics curriculum materials to ensure that your students develop this competence?

I would use textbooks and syllabi examples that relate mathematics concepts to real life situations such as budgeting, measuring land, or calculating time and distance, so learners see the usefulness of mathematics.

I would design activities from curriculum materials that involve problem solving based on daily experiences, such as shopping, transport, or farming, which helps learners apply mathematics practically.

I would encourage learners to interpret graphs, tables, and statistics from real data sources included in curriculum materials, strengthening the connection between mathematics and real life.

14.(a) Write short notes on the following learning activities.

Minds activities focus on thinking processes such as reasoning, analyzing, and problem solving. These activities develop understanding and logical thinking by engaging learners mentally with mathematical ideas.

Hands activities involve physical manipulation and practical work, such as using models, drawing diagrams, or measuring objects. They help learners learn by doing and make abstract concepts more concrete.

Hearts activities address attitudes, values, and motivation in learning mathematics. They encourage interest, confidence, and positive feelings toward mathematics, which support effective learning.

(b) Why is it important to use the three learning activities in (a) above?

Using all three activities ensures holistic learning by developing thinking skills, practical skills, and positive attitudes together.

It accommodates different learning styles, allowing all learners to participate meaningfully in mathematics lessons.

It improves understanding and retention because learners think, do, and feel positively about what they are learning.

SECTION C (20 Marks)

Answer two questions from this section.

15.(a) Enhancing logical thinking is one of the significance of learning Mathematics. Explain how the assessment of Mathematics can support this statement.

Mathematics assessment can support logical thinking by including questions that require reasoning, justification, and explanation of answers rather than simple recall.

Well-designed assessments that emphasize problem solving encourage learners to analyze situations, identify patterns, and apply logical steps to reach solutions.

Using open-ended questions in assessments allows learners to demonstrate logical reasoning and structured thinking processes.

16.(a) Explain the principles you will apply to promote the learning of Mathematics among your learners.

I would apply the principle of learner-centered teaching by actively involving learners in discussions, problem solving, and group work to enhance understanding.

I would use the principle of progression from simple to complex concepts so learners build confidence and understanding gradually.

I would apply the principle of relevance by linking mathematical concepts to real life situations to increase interest and motivation.

17.(a) Describe the importance of using computer knowledge in the teaching of Mathematics.

Computer knowledge allows teachers to use visual tools such as graphs, simulations, and animations that make abstract concepts easier to understand.

It enhances learner engagement through interactive software and digital resources that support active learning.

Computers also help in efficient assessment, data analysis, and presentation of mathematical information.

18.(a) Describe the main features of a marking scheme for a Mathematics test.

A marking scheme should clearly show the allocation of marks for each step and final answer to ensure fair and consistent marking.

It should include acceptable methods and alternative solutions to accommodate different correct approaches.

The scheme should be clear, detailed, and aligned with the learning objectives to guide teachers in accurate assessment.