

SCHOOL: Your school name

SENIOR THREE MATHEMATICS
END OF TERM EXAMINATION · FREE SAMPLE
MARKING SCHEME (TEACHER'S COPY)

Academic year: 20..... – 20.....

Date:/...../20.....

Duration: 2 hours

Total marks: 37

Content covered: Unit 4: Algebraic fractions · Unit 5: Simultaneous linear inequalities · Unit 6: Linear and quadratic functions · Unit 7: Compound interest, reverse percentage and compound proportional change · Unit 9: Circle and related theorems · Unit 10: Collinear points and orthogonal vectors in 2D · Unit 13: Interpretation of statistical graphs · Unit 14: Probability with Venn diagrams

INSTRUCTIONS

1. A full paper has THREE sections and 100 marks: A 55 marks (all questions), B 30 marks (any three of four), C 15 marks (one of two).
2. This free sample shows one extract of each section.
3. Silent non-programmable calculators may be used.
4. Write your answers in the answer booklet provided.
5. Show all your working clearly.

SECTION A (extract of 55 marks)

Attempt ALL questions.

1. Solve $\frac{3}{x-1} = \frac{2}{x+1}$. (3 marks)

Model answer: $3(x+1) = 2(x-1)$, $3x+3 = 2x-2$, $x = -5$. It does not make a denominator zero, so $x = -5$.

Marking: Method: 2 marks for the working (see the steps above) · final answer: 1 mark. Accept any correct method.

2. Show that $A(1,2)$, $B(3,6)$, $C(4,8)$ are collinear. (3 marks)

Model answer: $\vec{AB} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$, $\vec{AC} = \begin{pmatrix} 3 \\ 6 \end{pmatrix} = \frac{3}{2} \vec{AB}$. They are parallel with a common point A, so the points are collinear.

Marking: Method: 2 marks for the working (see the steps above) · final answer: 1 mark. Accept any correct method.

3. A and B are mutually exclusive with $P(A) = 0.3$ and $P(B) = 0.45$. Find $P(A \cup B)$ and $P(\text{neither})$. (3 marks)

Model answer: $P(A \cap B) = 0$, so $P(A \cup B) = 0.75$.
 $P(\text{neither}) = 1 - 0.75 = 0.25$.

Marking: Method: 2 marks for the working (see the steps above) · final answer: 1 mark. Accept any correct method.

Common mistake: Mutually exclusive means the circles do not overlap.

4. After a 12% pay rise, a salary is 168 000 FRW. What was it before? (3 marks)

Answer: 150 000 FRW

Model answer: $168\,000 \div 1.12$.

Marking: Method: 2 marks for the working (see the steps above) · final answer: 1 mark. Accept any correct method.

SECTION B (extract of 30 marks)

Attempt any THREE questions.

5. (10 marks)

- (a) An arc of length 11 cm lies on a circle of radius 7 cm. Find the angle at the centre ($\pi = \frac{22}{7}$). (3 marks)

Answer: 90°

Model answer: Step 1. Arc = $\frac{\theta}{360^\circ} \times 2\pi r = \frac{\theta}{360^\circ} \times 44$.

Step 2. $\frac{\theta}{360^\circ} \times 44 = 11 \Rightarrow \theta = 90^\circ$.

Marking: Method: 2 marks for the working (see the steps above) · final answer: 1 mark.
Accept any correct method.

(b) Find k if $\begin{pmatrix} k \\ 2 \end{pmatrix} \parallel \begin{pmatrix} 3 \\ 6 \end{pmatrix}$. (3 marks)

Answer: 1

Model answer: $6k - 6 = 0$.

Marking: Method: 2 marks for the working (see the steps above) · final answer: 1 mark.
Accept any correct method.

(c) $|\vec{u}| = 3$, $|\vec{v}| = 4$ and $\vec{u} \perp \vec{v}$. Find $|\vec{u} + \vec{v}|$. (4 marks)

Answer: 5

Model answer: Step 1. $|\vec{u} + \vec{v}|^2 = |\vec{u}|^2 + 2\vec{u} \cdot \vec{v} + |\vec{v}|^2 = 9 + 0 + 16$.

Step 2. $|\vec{u} + \vec{v}| = \sqrt{25} = 5$.

Marking: Method: 3 marks for the working (see the steps above) · final answer: 1 mark.
Accept any correct method.

SECTION C (extract of 15 marks)

Attempt only ONE question.

6. Simultaneous linear inequalities (15 marks)

A farmer plants x ha of maize and y ha of beans. She has at most 10 ha, needs at least 2 ha of beans, and wants at least twice as much maize as beans.

(a) When is the boundary line drawn dashed? (1 mark)

Model answer: For strict inequalities $<$ or $>$.

Marking: Remember level: 1 mark for a complete, correct answer; part marks for correct working.

(b) Why do we test a point such as $(0, 0)$? (2 marks)

Model answer: To decide which side of the line satisfies the inequality.

Marking: Understand level: 2 marks for a complete, correct answer; part marks for correct working.

(c) Write the three inequalities. (3 marks)

Model answer: $x + y \leq 10$, $y \geq 2$, $x \geq 2y$.

Marking: Apply level: 3 marks for a complete, correct answer; part marks for correct working.

(d) Find the vertices of the region. (3 marks)

Model answer: $(4, 2)$, $(8, 2)$ and $\left(\frac{20}{3}, \frac{10}{3}\right)$.

Marking: Analyse level: 3 marks for a complete, correct answer; part marks for correct working.

(e) Is the plan "5 ha maize, 4 ha beans" allowed? (3 marks)

Model answer: No: $5 \geq 8$ is false.

Marking: Evaluate level: 3 marks for a complete, correct answer; part marks for correct working.

(f) Profit is 50 000 FRW/ha for maize and 80 000 FRW/ha for beans. Which vertex gives the most profit? (3 marks)

Model answer: $(4, 2)$: 360 000; $(8, 2)$: 560 000; $\left(\frac{20}{3}, \frac{10}{3}\right)$: 600 000 FRW, the best.

Marking: Create level: 3 marks for a complete, correct answer; part marks for correct working.

END