YEAR 11 | OLYMPIAD MATHEMATICS

STUDENT PAPER — original practice assessment

Name: _____ Date: _____

Suggested time: 60–75 minutes. Show reasoning, cite evidence where appropriate, and answer in complete sentences.

Section A — Number theory and patterns (24 marks)

1. Prove that the sum of any three consecutive integers is divisible by 3. (5)

2. Find the smallest positive integer divisible by 6, 8 and 15. Explain your method. (5)

3. How many positive divisors does 360 have? (6)

4. A two-digit number has digit sum 11. Reversing its digits increases the number by 27. Find it. (8)

Section B — Logical reasoning and proof (16 marks)

1. On a 5×5 grid of points, how many axis-aligned squares of any size can be formed? (8)

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2. Show that among any five integers, two have a difference divisible by 4. (8)

ANSWER KEY & TUTOR GUIDANCE

Olympiad Mathematics

The following pages contain suggested answers, marking points and tutor guidance. For open-ended tasks, answers are indicative rather than the only acceptable responses.

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TUTOR GUIDE — indicative responses and marking points

Section A — Number theory and patterns (24 marks)

1. $n+(n+1)+(n+2)=3(n+1)$, divisible by 3.

2. LCM$=2^3\times3\times5=120$.

3. $360=2^3\times3^2\times5$; $(3+1)(2+1)(1+1)=24$.

4. $10a+b$; $a+b=11$; $9(b-a)=27$ so $b-a=3$; $a=4, b=7$ => 47.

Section B — Logical reasoning and proof (16 marks)

1. For side length 1,2,3,4 point intervals: $4^2+3^2+2^2+1^2=30$.

2. Pigeonhole principle: four remainder classes modulo 4; five integers force two in same class; difference divisible by 4.

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