

Gammes du soir (evening drills), Chapter 01B: Algebraic expressions and notable identities

Year 10

5 questions each evening, answers at the bottom of the box: I mark my own work, my underlying mistake goes into the error log

Evening of S0

1. [chapter 01] Calculate: $\frac{7}{12} - \frac{1}{3}$.

2. [chapter 00] Write 108 as a product of prime factors.

3. [module M1] In “if an integer is divisible by 12, then it is divisible by 3”, name the hypothesis and the conclusion.

4. [Year 9 fluency skill] Calculate: $-4 + 3 \times 5$.

5. [chapter 01B] Give the main operation and the nature of $(3x - 2)(x + 5) + 7$, then of $-2(4x - 1)$.

Answers: 1. $\frac{5}{12}$; 2. $108 = 2^2 \times 3^3$; 3. Hypothesis: “divisible by 12”; conclusion: “divisible by 3”; 4. 11; 5. Addition, so a sum; multiplication, so a product.

Evening of S1

1. [chapter 01A] One triangle has two angles of 42° and 68° ; another has 70° and 42° . Are they similar?

2. [chapter 01] Write as a single power and then as a fraction: $3^4 \times 3^{-6}$.

3. [module M1] Is the converse of “multiple of 10 $\Rightarrow$ even” true? Give a counterexample.

4. [Year 9 fluency skill] Seven notebooks cost 10,50 €. How much do four notebooks cost?

5. [chapter 01B] Expand and simplify: $(2x - 3)(x + 4)$.

Answers: 1. Yes: the third angles are 70° and 68° . 2. $3^{-2} = \frac{1}{9}$. 3. No: 6 is even without being a multiple of 10. 4. 6 €. 5. $2x^2 + 8x - 3x - 12 = 2x^2 + 5x - 12$.

Evening of S2

1. [chapter 01] Write 0,000 78 in standard form.

2. [chapter 00] Is 187 prime? Justify.

3. [module M1] Write the negation of “ $x < -2$ ”.

4. [Year 9 fluency skill] Calculate: $(-3)^2 - 4 \times (-2)$.

5. [chapter 01B] Expand and simplify: $3x(x - 2) - (x + 1)(2x - 5)$.

Answers: 1. $7,8 \times 10^{-4}$. 2. No: $187 = 11 \times 17$. 3. $x \geq -2$. 4. 17. 5. $3x^2 - 2x - 5$.

Evening of S3

1. [chapter 01A] Two corresponding sides measure 6 cm and 9 cm. What length corresponds to a side of 8 cm?

2. [chapter 00] Calculate $\text{HCF}(84; 126)$.

3. [module M1] If $n = 5k$ with k an integer, what conclusion can be written about n ?

4. [Year 9 fluency skill] Simplify: $5x - 3 + 2x + 8$.

5. [chapter 01B] Expand: $(2x + 3)^2$.

Answers: 1. Scale factor 1,5, so $8 \times 1,5 = 12$ cm. 2. 42. 3. n is a multiple of 5. 4. $7x + 5$. 5. $4x^2 + 12x + 9$.

Evening of S4

1. [chapter 01] Calculate: $\frac{7}{15} \div \frac{14}{25}$.

2. [chapter 01A] A shape with area 32 cm^2 is enlarged by scale factor 1,5. What is its new area?

3. [module M1] Give a counterexample to “the square of every integer is even”.

4. [Year 9 fluency skill] A right-angled triangle has legs of 9 cm and 12 cm. Calculate the hypotenuse.

5. [chapter 01B] Expand: $(5x - 2)^2$ and then $(3x + 4)(3x - 4)$.

Answers: 1. $\frac{7}{3}$. 2. $32 \times 1,5^2 = 72 \text{ cm}^2$. 3. $1^2 = 1$ is odd. 4. $\sqrt{9^2 + 12^2} = 15$ cm. 5. $25x^2 - 20x + 4$; $9x^2 - 16$.

Evening of S5

- [chapter 00] Write 198 as a product of prime factors.
- [chapter 01] Calculate and give the answer in standard form: $(4 \times 10^5)(2 \times 10^{-3})$.
- [module M1] In a proof, what role does a counterexample play?
- [chapter 01A] The areas of two similar shapes are 49 cm^2 and 100 cm^2 . What is the enlargement scale factor?
- [chapter 01B] Calculate cleverly: 1003×997 .

Answers: 1. $198 = 2 \times 3^2 \times 11$. 2. 8×10^2 . 3. It is enough to disprove a universal statement. 4. $k_2 = \frac{64}{100} = \frac{16}{25}$, so $k = \frac{4}{5}$. 5. $166666 = 6 - 00000001 = 3 - 000000001 + 3 - 0000000001 + 3 - 00000000001$.

Evening of S6

- [chapter 01] Calculate: $\frac{5}{8} + \frac{7}{12}$.
- [chapter 00] Calculate HCF(168; 210).
- [module M1] If $n = 2k + 1$ with k an integer, what definition allows us to conclude?
- [Year 9 fluency skill] Solve: $3x + 5 = 20$.
- [chapter 01B] Factorise fully: $15x^2 - 20x$.

Answers: 1. $\frac{24}{15} + \frac{14}{12} = \frac{24}{20} = \frac{3}{5}$. 2. 42. 3. It is the definition of an odd integer. 4. $x = 5$. 5. $5x(3x - 4)$.

Evening of S7

- [chapter 01A] A solid with volume 15 cm^3 is enlarged by scale factor 2. What is its new volume?
- [chapter 01] Calculate: $\frac{(5^3)^2}{5^4}$.
- [module M1] Is the converse of “multiple of 8 $\Rightarrow$ even” true? Give a counterexample.
- [Year 9 fluency skill] Increase 80 by 15%.
- [chapter 01B] Factorise: $25x^2 - 49$ and then $x^2 + 6x + 9$.

Answers: 1. $15 \times 2^3 = 120 \text{ cm}^3$. 2. $5^6 - 4 = 5^2 = 25$. 3. No: 6 is even without being a multiple of 8. 4. $80 \times 1.15 = 92$. 5. $(5x + 3)^2$.

Evening of S8

- [chapter 00] Is 1001 prime? Justify.
- [chapter 01] Compare $6,2 \times 10^{-5}$ and $5,9 \times 10^{-4}$.
- [module M1] Why is checking a statement on a hundred examples not enough to prove it for all integers?
- [chapter 01A] Two similar shapes have scale factor 2,5. By what factor are their areas multiplied?
- [chapter 01B] Prove that the sum of three consecutive integers is a multiple of 3.

Answers: 1. No: $1001 = 7 \times 11 \times 13$. 2. $5,9 \times 10^{-4}$ is greater (exponent $-4 > -5$). 3. They only cover a hundred cases; infinitely many cases remain. 4. By 2,5. 5. For n an integer: $n + (n + 1) + (n + 2) = 3n + 3 = 3(n + 1)$, with $n + 1$ an integer.

Evening of S9

- [chapter 01] Calculate: $\left(\frac{3}{5}\right)^2$.
- [chapter 00] Is 391 prime? Justify.
- [module M1] What must be produced to disprove a universal statement?
- [chapter 01A] On a map at scale 1/500, a length measures 2,4 cm. What real length does it represent?
- [chapter 01B] Show that $(2n + 3)^2 - (2n + 1)^2$ is a multiple of 8 for every integer n .

Answers: 1. $\frac{9}{25}$. 2. No: $391 = 17 \times 23$. 3. A single counter-example: $2,4 \times 500 = 1200 \text{ cm} = 12 \text{ m}$. 4. Difference of squares: $(4n + 4) \times 2 = 8(n + 1)$, with $n + 1$ an integer.

Evening of S10: eve of the test

- [chapter 01] Calculate and write in standard form: $\frac{3 \times 10^{-2}}{6 \times 10^3}$.
- [chapter 00] Write $\frac{96}{144}$ as a fraction in lowest terms using the HCF.
- [module M1] What is the difference between a checked example and a proof?
- [chapter 01A] Two triangles have sides 3, 5, 7 and 4,5, 7,5, 10,5. Are they similar?
- [chapter 01B] For $I = (4x - 1)^2 - 9$, give an expanded form and a factorised form.

Answers: 1. $0,5 \times 10^{-5} = 5 \times 10^{-6}$. 2. HCF(96; 144) = 48, so $\frac{96}{144} = \frac{2}{3}$. 3. An example establishes one case; a proof covers all intended cases. 4. Yes: all three ratios equal 1,5. 5. $16x^2 - 8x - 8 = (4x + 2)(4x - 4) = 8(2x + 1)(x - 1)$.

Evening of S11: the test is over

Well-earned rest: no evening drills tonight: just read through the error log, that's all.

Golden rule: I answer first, I turn the sheet over afterwards; never the other way round. Testing myself is how I remember.