G3 MATHEMATICS HOLIDAY REVISION

Week 0

Foundation diagnostic

Student worksheet

Upper Secondary - Sec 3 and Sec 4

18 original questions

Show your working. Choose a method, keep track of restrictions and check that your answer fits the question.

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STUDENT WORKSHEET

Week 0 · Foundation diagnostic

READINESS CHECKS

Q1

[2 marks]

Simplify $(3x^4y^{-2})(2x^{-1}y^5)$ using positive indices. State restrictions.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

READINESS CHECKS

Q2

[2 marks]

Rewrite $8^{2/3}$ as an integer. Explain the denominator of the index.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

READINESS CHECKS

Q3

[2 marks]

Factorise completely $12u^2 - 27v^2$.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

CORE REPAIR

Q4

[4 marks]

Simplify $(15a^3b^{-2})/(8c) \div (25a^{-1}b)/(12c^2)$ using positive indices. State restrictions.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

CORE REPAIR

Q5

[3 marks]

Given $2^{x+1} \times 4^{x-2} = 32$, solve for x. Show common bases and check.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

CORE REPAIR

Q6

[3 marks]

Rectangle sides are $3x^2y$ and $2xy^{-1}$, with $x>0, y>0$. Find area and perimeter.

Explain why perimeter terms cannot combine.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

CORE REPAIR

Q7

[3 marks]

For positive m,n, factorise $18m^3n - 8mn^3$ completely. Hence solve $18m^3n - 8mn^3 = 0$ for n in terms of m.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

CORE REPAIR

Q8

[3 marks]

Simplify 3/(2x−1) − 7/(x+1) as one fraction. State excluded values.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

MULTISTEP PRACTICE

Q9

[4 marks]

Simplify $[(12x^2y^{-1})/(5z)] \div [(18x^{-1}y^2)/(25z^2)]$ using positive indices. State restrictions, then evaluate at $x=-1, y=2, z=3$.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

MULTISTEP PRACTICE

Q10

[4 marks]

Solve $3^{2x-1} = 27^{x-2} \times 9^2$. Explain why common-base comparison is reversible.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

MULTISTEP PRACTICE

Q11

[4 marks]

$A=2^r3^s$ and $B=2^t3^u$, with r,s,t,u non-negative integers and A/B an integer. Give necessary and sufficient conditions for A/B to be (i) a positive integer square, (ii) a positive integer cube. Explain.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

MULTISTEP PRACTICE

Q12

[4 marks]

$A=(x+2)^2-(x-2)^2$. Simplify by expansion and by an identity; explain cancellation, then find x when $A=40$.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

MULTISTEP PRACTICE

Q13

[4 marks]

$N=2^3\times3^2\times5$. Find least positive k,j so Nk is a perfect square and Nj a perfect cube. Explain exponent adjustments.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

SPOT THE MISTAKE

Q14

[3 marks]

A student writes $x^{-2}-x^{-3}=x$. Find the correct simplification and domain.

Identify the mistaken exponent operation.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

SPOT THE MISTAKE

Q15

[3 marks]

A student expands $(2r-3)^2$ as $4r^2+9$. Correct it and explain the missing term.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

SPOT THE MISTAKE

Q16

[3 marks]

A student simplifies x(x+4)/(x+4) to x+4. Give correct simplification and restriction. Explain what factor is cancelled.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

STRETCH

Q17

[5 marks]

Find the least positive n such that 72n is both a perfect square and a perfect cube. Justify the prime-exponent conditions.

WORKING SPACE

STUDENT WORKSHEET

Week 0 · Foundation diagnostic

STRETCH

Q18

[4 marks]

Solve $2^{x+1}=8^{2-x}$. Explain why common-base comparison works and whether any real x is excluded.

WORKING SPACE