Year 9 Mathematics Assessment Block One Higher GCSE.

Adding and subtracting integers

    i)   928,382 + 3,782 + 39 + 388,820 =

    ii)   93028 – 38881 =

Multiplying and dividing by 10, 100, 1000, …

Given that 8.4 × 47 = 394.8

Calculate

    i)   8.4 × 470 =   iv)   3.948 ÷ 840 =

    ii)   84 × 0.47 =   v)   840 × 4700 =

    iii)   3948 ÷ 4.7=

Multiplying Integers

    i)   45 × 87 =   iii)   (12345678 × 8) + 8 =

    ii)   9372816 × 281439=

Dividing Integers

    i)   252875÷7 =   ii)   91239 ÷ 17 =

Adding, Subtracting, Multiplying and Dividing Decimals

    i)   172.9201 + 12.8 + 9227.009 =   iv)   726.983 ÷ 12 =

    ii)   1002900.9287 – 90999.27 =   v)   827.88 ÷ 2.4 =

    iii)   3.52 × 3.7 =

Single digit directed numbers

    i)   (-5) + (-4) =   iv)   (-3) + 5 =

    ii)   7 – (-3) =   v)   (-8) + 9 =

    iii)   1 – 5 =   vi)   (-9) + (-9) =

Multiplying proper and improper fractions

    i) $\frac{4}{7} \times \frac{4}{9} =$ ii) $\frac{11}{3} \times \frac{4}{5} =$ iii) $\frac{123}{7} \times \frac{45}{6} =$

Dividing proper and improper fractions

    i) $\frac{4}{7} \div \frac{4}{9} =$ ii) $\frac{11}{3} \div \frac{4}{5} =$ iii) $\frac{123}{7} \div \frac{45}{6} =$

Adding Proper and Improper fractions

    i) $\frac{4}{5} + \frac{2}{5} =$ ii) $\frac{6}{7} + \frac{8}{9} =$ iii) $\frac{12}{5} + \frac{4}{9} =$

Subtracting proper and improper fractions

    i) $\frac{7}{12} - \frac{1}{4} =$ ii) $\frac{15}{11} - \frac{8}{9} =$ iii) $\frac{15}{4} - \frac{6}{5} =$

Converting improper fractions to mixed numbers including negatives

Change the following fractions into mixed numbers

i) $\dfrac{17}{4} =$

ii) $-\dfrac{28}{13} =$

Converting mixed numbers into improper fractions including negatives

Change the following mixed numbers into improper fractions.

i) $5\dfrac{4}{7} =$

ii) $-12\dfrac{3}{4} =$

iii) $7\dfrac{5}{8} =$

Multiplying and dividing mixed numbers

i) $4\dfrac{5}{6} \times 9\dfrac{2}{5} =$

v) $4\dfrac{5}{6} \div 9\dfrac{2}{5} =$

ii) $11\dfrac{5}{8} \times 5\dfrac{3}{7} =$

vi) $11\dfrac{5}{8} \div 5\dfrac{3}{7} =$

iii) $7\dfrac{5}{9} \times 2\dfrac{4}{5} =$

vii) $7\dfrac{5}{9} \div 2\dfrac{4}{5} =$

iv) $7\dfrac{5}{11} \times 8\dfrac{2}{5} =$

viii) $7\dfrac{5}{11} \div 8\dfrac{2}{5} =$

Addition and Subtraction of mixed numbers

i) $4\dfrac{5}{6} + 9\dfrac{2}{5} =$

v) $4\dfrac{5}{6} - 9\dfrac{2}{5} =$

ii) $11\dfrac{5}{8} - 5\dfrac{3}{7} =$

vi) $11\dfrac{5}{8} + 5\dfrac{3}{7} =$
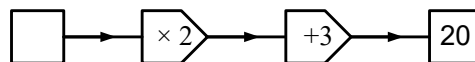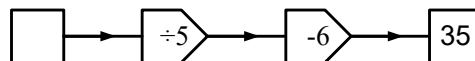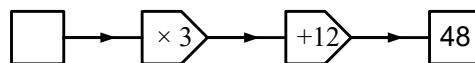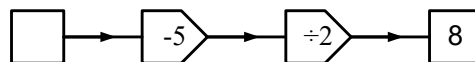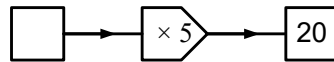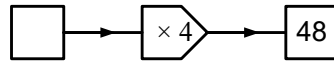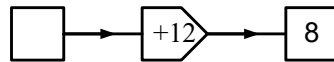
iii) $7\dfrac{5}{9} - 2\dfrac{4}{5} =$

vii) $1\dfrac{5}{9} + 2\dfrac{4}{7} =$

iv) $7\dfrac{5}{11} + 8\dfrac{2}{5} =$

viii) $7\dfrac{5}{11} - 3\dfrac{2}{5} =$

Understanding inverse operations– one and two step operations.

Find the missing inputs and outputs for the following function machines

$$\square \rightarrow \boxed{+12} \rightarrow \boxed{8}$$

$$\square \rightarrow \boxed{\times 4} \rightarrow \boxed{48}$$

$$\square \rightarrow \boxed{\div 5} \rightarrow \boxed{35}$$

$$\square \rightarrow \boxed{\times 5} \rightarrow \boxed{20}$$

$$\square \rightarrow \boxed{-5} \rightarrow \boxed{\div 2} \rightarrow \boxed{8}$$

$$\square \rightarrow \boxed{\times 3} \rightarrow \boxed{+12} \rightarrow \boxed{48}$$

$$\square \rightarrow \boxed{\div 5} \rightarrow \boxed{-6} \rightarrow \boxed{35}$$

$$\square \rightarrow \boxed{\times 2} \rightarrow \boxed{+3} \rightarrow \boxed{20}$$

Make t the subject in the following expressions

i) $s = 3t$

ii) $2s = 5t$

iii) $s = 5t - 3$

iv) $s = \frac{5t}{3} + 4$

Finding the inverse operation of more complex numerical expressions.

Make t the subject of the following equations, and hence, find the value of t.

i) $9^2 + 4t = 23$

ii) $3t + 17 = \sqrt{\frac{8 \times 32}{4}}$

iii)   Bob ran a taxi company called Bob's Cars. He charged a standing charge of £2.50 plus £0.80 per mile. A customer paid £12.10 for a trip in one of Bob's Cars. How long was the journey?

iv)   The load on a spring causes the spring to extend. If 500g is placed on a spring, the extension is 20cm. If 750g is placed on it, the extension is 30cm. If 1kg is placed on the spring, the extension is 40cm. How much load is placed on the spring if the extension is 45cm?

v)   The growth of a virus is modelled at $n = i + g^t$ where n is the number of virus particles, i is the intial number of particles that you started with, g is the growth rate and t is the time in hours.

   After finishing an experiment, the number of virus particles that a scientist measured in his Petri dish was 3,000,000. She knew the growth rate was 12 and the experiment had been running for 6 hours.

   How many particles were initially placed in the Petri dish?

Factors and Multiples

i)   Hayden generates a sequence from multiples of 12, ie 12, 24, 36, …
He generates another sequence from multiples of 18.
The common terms, ie the terms that appear in both sequences are used to form a third sequence. Hayden stops writing this sequence when he reaches 1000.
How many terms are there in the third sequence?

ii)   What are the multiples of 7 that lie between 100 and 150?

iii)   List the factor pairs of 24.

iv)   Find the list of common factors of 24 and 64.

v)   A perfect number is one where the sum of the factors is equal to twice the number itself. What is the lowest perfect number that is greater than 1?

Lowest Common Multiple and Highest Common Factor

i)   Find the common factors of 18 and 48.

ii)   Find the common factors of 25 and 90.

iii)   Find the lowest common multiple of 14 and 60.

iv)   Find the highest common factor between 30 and 45.

Prime numbers

i)   Write down the definition of a prime number.

ii)   List the prime numbers between 100 and 200.

iii)   Is 487 a prime number?

iv)   What is the 28th prime number?

Prime factor decomposition

i)   Write the number 120 as a product of its prime factors.

ii)   A number is written as a product of its prime factors in the following way: $2^3 \times 3^2 \times 7$. What is the number?

iii)   What is the highest prime factor that is shared by 114 and 200?

Using Prime Factors to find LCM and HCF.

i)   Find the LCM of 48 and 56.

ii)   Find the HCF of 35 and 184.

Solve problems involving LCM and HCF.

i)   A red bus and a green bus were driven by two friends working from Batley Bus Depot. The red bus took 26 minutes to complete its route round Leeds and Wakefield. The green bus took 32 minutes to complete its journey round Bradford and Huddersfield.

If the buses both set off on their respective routes at 7:15am, at what time did they meet again?

ii)   Pencils come in packages of 18 and erasers come in packages of 15. Philip wants to buy exactly the same number of pencils and erasers without having any left-overs. What is the smallest number of packages of pencils and packages of erasers that he can buy?

iii)   Forty-eight girls and sixty-four boys are in the school choir. The choir master wants to arrange them so that there are an equal number of children in each row. Each row is either all boys or all girls. There are no rows of mixed gender. What is the maximum number of people on each row?

Listing outcomes of events.

i)   A computer store sells 5 different types of computer, 3 different types of mouse and 3 different types of keyboard. Julie wants to buy a computer, a mouse and a keyboard. From how many different combinations of equipment can Julie choose?

ii)   Sally plays a game in which she rolls two dice. One of the die is 6-sided whilst the other is 4-sided. List the combinations of throw that are possible.

Probability Sample Spaces.

i)   Draw a sample space to show the possible outcomes on two fair 6-sided dice and calculate the probability of throwing a double.

ii)   Two fair 6-sided dice are thrown and their totals are multiplied together. Draw a sample space diagram to show all the possible outcomes and use this to calculate the probability of scoring 18.

Understanding Integer Powers

i) $7^2 =$

ii) $7^0 =$

iii) $7^{-1} =$

iv) $8^3 =$

v) $7^{-2} =$

vi) $9^4 =$

vii) $a^2 = b^3$ Find values for a and b.

Understand the Laws of Indices

i) $3^2 \times 3^4 =$

ii) $x^4 \times x^7 =$

iii) $a^2 \times b^5 =$

iv) $3^2 \div 3^4 =$

v) $x^4 \div x^7 =$

vi) $a^2 \div b^5 =$

vii) $\frac{x^3}{x^2} =$

viii) $\left(\frac{3}{4}\right)^3 =$

ix) $\left(\frac{x}{2}\right)^2 =$

Recognising and Using Roots

i) $\sqrt{9} + \sqrt{16} =$

ii) $\sqrt{9 + 16} =$

iii) $\sqrt{9} \times \sqrt{16} =$

iv) $\sqrt{9 \times 16} =$

v) $\sqrt{144} + \sqrt{169} = a^2$ Find a.

vi)   Write the square numbers from 1 to 15.

vii)   Write the cube numbers from 1 to 5.

Roots Beyond Squared and Cubed and their Fractional Powers

i) $2^5 =$

ii) $3^4 =$

iii) $7^6 =$

iv) $81^{\frac{1}{2}} =$

v) $64^{1/3} =$

vi) $8^{1/3} =$

vii) $8^{2/3} =$

viii) $16^5 = 2^x$ Find x.

ix) $4^6 = y^{12}$ Find y.

x) $9^5 =$

xi) $102^0 =$

Estimate Powers and Roots of a Given Positive Number

i) $\sqrt{110} \approx$

ii) $\sqrt{1000} \approx$

iii) $\sqrt{600} \approx$

iv) $\sqrt{4500} \approx$

v) $\sqrt{88} \approx$

vi) $3.2^3 \approx$

vii) $4.8^2 \approx$

viii) $6.4^3 \approx$

ix) $0.8^3 \approx$

x) $25^3 \approx$

Calculations involving Roots

i) $3^2 + \sqrt{16} - \sqrt[3]{27}$

iii) $\frac{5^3 - \sqrt{49}}{\sqrt[3]{512}} =$

ii) $\frac{6^3 - \sqrt[3]{343}}{\sqrt{64}} =$

Calculations involving Index Laws

i) $(7^3 \times 7^2)^5 =$

iv) $(2^8 \times 4^3)^3 =$

ii) $(7^3 \div 7^2)^5 =$

v) $(5^3 \div 7^2)^5 =$

iii) $\frac{(7^3 \times 7^7)^3}{7} =$

vi) $(3^3 \times 3^2)^4 =$

Calculations with Fractional Indices

i) $\sqrt{64^{\frac{2}{3}}} =$

ii) $81^{\frac{1}{2}} \times 81^2 =$

iii) $\frac{729^{\frac{2}{3}}}{3} =$

Simplifying Surds

Write each of the following surds in its simplest form ie of the form $a\sqrt{b}$ where a and b are integers.

i) $\sqrt{32} =$ v) $\sqrt{900} =$ ix) $\sqrt{88} =$

ii) $\sqrt{64} =$ vi) $\sqrt{600} =$ x) $\sqrt{250} =$

iii) $\sqrt{128} =$ vii) $\sqrt{48} =$ xi) $\sqrt{3800} =$

iv) $\sqrt{243} =$ viii) $\sqrt{150} =$

Calculating with Surds

i) Simplify fully $\sqrt{50} \times \sqrt{2}$.

ii) Show that $(\sqrt{30} + 3)(\sqrt{3} - 10)$ can be simplified into the form $a\sqrt{3}$ where a is an integer.

iii) Simplify fully $\frac{\sqrt{12} \times \sqrt{3}}{\sqrt{6}} =$

iv) $(a + 4)(5 + \sqrt{16}) = 36 + 9\sqrt{12}$. Find the value of a.

Standard Form

i) Write 48,200,000 in standard form.

ii) Write 4.7×10^6 in ordinary form.

iii) Write 0.00653 in standard form.

iv) Write 1.9×10^{-3} in ordinary form.

v) Billy says that 11.8×10^{-2} is 0.118 written in standard form. Is he correct? How do you know?

vi) Put the following numbers into order from lowest to highest.

$$2.43 \times 10^3 \qquad 244 \qquad 24.5 \times 10^2 \qquad 0.246 \times 10^4$$

Multiplying and Dividing in Standard Form

Give all answers in standard form.

i) $(4 \times 10^3) \times (2 \times 10^5) =$

vii) $(8.93 \times 10^3) \times (7.98 \times 10^{-8}) =$

ii) $(3 \times 10^7) \times (9 \times 10^{12}) =$

viii) $(4.921 \times 10^1) \times (6.938 \times 10^7) =$

iii) $(7 \times 10^{-4}) \times (9 \times 10^8) =$

ix) $(7.78 \times 10^2) \times (6.99 \times 10^{-7}) =$

iv) $(5.3 \times 10^{-8}) \times (6 \times 10^{-5}) =$

x) $(7.507 \times 10^8) \times (8.062 \times 10^5) =$

v) $(4.9 \times 10^4) \times (8.3 \times 10^4) =$

xi) $(9.99 \times 10^3) \times (7.9 \times 10^{-4}) =$

vi) $(8.9 \times 10^{-7}) \times (7.4 \times 10^7) =$

xii) $(1.4 \times 10^{-4}) \times (9.88 \times 10^{-7}) =$

Adding and Subtracting Numbers in Standard Form

i) $(4 \times 10^3) + (2 \times 10^5) =$

ii) $(3 \times 10^{14}) + (9 \times 10^{12}) =$

iii) $(7 \times 10^{-4}) - (9 \times 10^{-3}) =$

iv) $(5.3 \times 10^{-8}) - (6 \times 10^{-7}) =$

v) $(4.9 \times 10^4) + (8.3 \times 10^4) =$

vi) $(8.9 \times 10^{-7}) + (7.4 \times 10^{-5}) =$

vii) $(8.93 \times 10^3) - (7.98 \times 10^2) =$

viii) $(4.921 \times 10^{-1}) - (6.938 \times 10^2) =$

ix) $(7.78 \times 10^2) + (6.99 \times 10^{-2}) =$

x) $(7.507 \times 10^8) + (8.062 \times 10^7) =$

xi) $(9.99 \times 10^3) - (7.9 \times 10^4) =$

xii) $(1.4 \times 10^{-5}) + (9.88 \times 10^{-7}) =$

Understanding and Using Inequality Notation

Round the following numbers to the nearest 10. Then write 17<20 or equivalent.

i)   298

ii)   381

iii)   990

iv)   773

v)   9183

vi)   1783

vii)   1066

viii)   1945

ix)   1901

x)   1977

xi)   5028

xii)   2089

xiii)   200190

xiv)   183911

xv)   88492

xvi)   18929

Rounding and Estimating in Real Life Problems

i)   Gary went shopping. He had £80 in his pocket. He bought 8 items that cost £8.85 each. Before he went to the checkout, he saw a bunch of flowers that he wanted to buy for his girlfriend. The flowers cost £12.70. Estimate whether he should put the flowers in his basket? Show your working out.

ii)   Mark and Joanne went for a walk. They had to be back at home for 6pm. The walk was 12.827 miles and the pair could walk at 2.86mph If they started their walk at 1:30pm, would they be home on time?

iii)   My car does 41.827 miles to the gallon. There are 4.54609 litres in one gallon. Fuel at my local garage costs £1.33 per litre. Estimate how much it will cost for me to travel 350 miles. Is your estimate above or below the likely actual cost?

Rounding and Estimating in Numerical and Mathematical Problems.

i)   A ball has a radius of 12.7cm rounded to 3 significant figures. What is the smallest and largest possible radius of the ball? Express this as a possible range of errors.

ii)   What is the range of errors for the surface area of the ball given that the surface area of a sphere $= 4\pi r^2$ where r is the radius?

iii)   What is the range of errors for the volume of the ball given that the volume of a sphere is calculated by $\frac{4}{3}\pi r^3$ where r is the radius?

iv)   Estimate $\frac{7.892 \times 10^6}{4.008 \times 10^2}$. Show your working.

v)   Estimate $\frac{5.009 \times 8.938}{22.531}$. Show your working.

vi)   Estimate $\frac{20.817 \times 4.9381}{9.8289} + \frac{30.182 \times 3.7982}{6.218}$. Show your working.

Rounding to Significant Figures

Round the following numbers to 2 significant figures.

i)   28491   ii)   47827   iii)   18919

iv)   8377.39   vi)   0.008472   viii)   0.00111
v)   0.9381   vii)   0.000378

Write the following numbers in standard notation rounded to two significant figures.

i)   382.9191
ii)   84923842
iii)   3.9101
iv)   0.000381827
v)   0.384732
vi)   0.000738181
vii)   34343.98493
viii)   483.92992

Significant Figures vs Decimal Places

Complete the table below.

Ordinary Form	To Two Significant Figures	To Two Decimal Places
78.92817	79	78.93
3782.4829		
0.029184		
0.00183		
0.27817		
893.9175		
910785.2918		

Rounding in Practical Problems
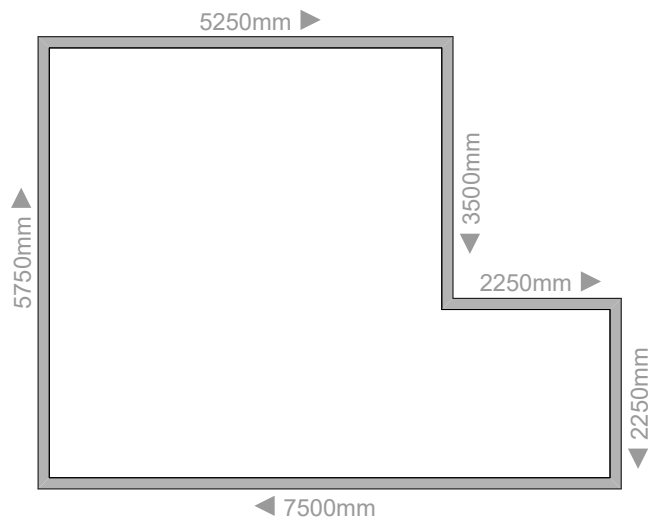
i)   Valery had a room which she wished to decorate. The walls were 2.4m high. A plan of the room is shown above. A tin of pain cost £27.95 and covers 18m^2. Estimate the cost of painting the room. Show your working.

ii)   Carpet is sold at £31.47 m^{-2}. Carpet fitting is free if you purchase underlay from the carpet manufacturers. Underlay is charged at £6.79 m^{-2}. Alternatively, Valery can buy some underlay or her room for £45 and pay for the fitting of underlay and carpet at £85. Estimate the cost of laying the carpet. For which option should Valery go? Manufacturers underlay and free fitting or pay for both underlay and fitting.