Name: _____

Higher Unit 2 topic test

Date:

Time: 70 minutes

Total marks available: 66

Total marks achieved: _____

Questions

Q1.

(a) Factorise fully $6ab + 10ac$

.....

(2)

(b) Expand and simplify $(x - 5)(x + 7)$

.....

(2)

(c) Simplify $\frac{2m^2t^6}{m^4t^2}$

Give your answer in its simplest form.

.....

(2)

(d) Factorise $y^2 - 16$

.....

(1)

(e) Simplify $(h^2)^{-3}$

.....

(1)

(Total for Question is 8 marks)

Q2.

5 female giraffes have a mean weight of x kg.
7 male giraffes have a mean weight of y kg.

Write down an expression, in terms of x and y, for the mean weight of all 12 giraffes.

.....

(Total for Question is 2 marks)

Q3.

(a) Expand and simplify $(p + 9)(p – 4)$

.....

(2)

(b) Solve $\frac{5w - 8}{3} = 4w + 2$

$w =$ . . . . . .

(3)

(c) Factorise $x^2 – 49$

.....

(1)

(d) Simplify $(9x^8y^3)^{½}$

.....

(2)

(Total for Question is 8 marks)

Q4.

(a) Expand $3(x + 2)$

.....

(2)

(b) Factorise completely $12\ x^3y - 18\ xy^2$

.....

(2)

(c) Expand and simplify $(2x - 3)(x + 4)$

.....

(2)

(d) Simplify $5x^4y^3 \times 2x^3y^2$

.....

(2)

(Total for Question is 8 marks)

Q5.

$f = 3g + 7h$

(a) Work out the value of f when $g = -5$ and $h = 2$

$f =$ .....

(2)

(b) Factorise $3x + 6$

.....

(1)

(c) Expand and simplify $5(y - 2) + 2(y - 3)$

.....

(2)

(d) Simplify $m^5 \times m^3$

.....

(1)

(e) Simplify $\frac{p^6}{p^2}$

.....

(1)

(Total for question = 7 marks)

Q6.

Make p the subject of the formula $y = 3p^2 - 4$

. . . . . .

(Total for Question is 3 marks)

Q7.

Make t the subject of the formula

$$p = \frac{3 - 2t}{4 + t}$$

.....

(Total for Question is 4 marks)

Q8.

(a) Solve $2x + 3 = x - 4$

$x =$ . . . . . .

(2)

(b) Solve $4(x - 5) = 14$

$x =$ . . . . . .

(2)

(Total for Question is 4 marks)

Q9.

Dan has some marbles.
Ellie has twice as many marbles as Dan.
Frank has 15 marbles.

Dan, Ellie and Frank have a total of 63 marbles.

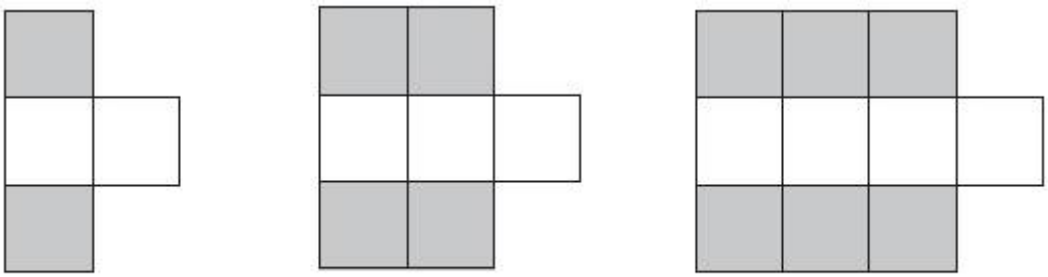
How many marbles does Dan have?

.....

(Total for Question is 3 marks)

Q10.

Here are some patterns made from white centimetre squares and grey centimetre squares.



Pattern 1 Pattern 2 Pattern 3

A Pattern has 20 grey squares.

(a) Work out how many white squares there are in this Pattern.

.....

(2)

(b) Find an expression, in terms of *n*, for the total number of centimetre squares in Pattern *n*.

.....

(2)

(Total for Question is 4 marks)

Q11.

Here are the first five terms of an arithmetic sequence.

3 5 7 9 11

Write down, in terms of *n*, an expression for the *n*th term of the sequence.

.....

(Total for Question is 2 marks)

Q12.

Here are the first five terms of an arithmetic sequence.

2 6 10 14 18

(a) Write down an expression, in terms of n, for the nth term of this sequence.

.....

(2)

(b) Is 86 a term in the sequence?
You must give a reason for your answer.

(1)

(Total for question = 3 marks)

Q13.

Here are the first six terms of a Fibonacci sequence.

1 1 2 3 5 8

The rule to continue a Fibonacci sequence is,

the next term in the sequence is the sum of the two previous terms.

(a) Find the 9th term of this sequence.

.....

(1)

The first three terms of a different Fibonacci sequence are

a b $a + b$

(b) Show that the 6th term of this sequence is $3a + 5b$

(2)

Given that the 3rd term is 7 and the 6th term is 29,

(c) find the value of a and the value of b.

.....

(3)

(Total for question = 6 marks)

Q14.

Here are the first five terms of an arithmetic sequence.

1 5 9 13 17

(a) Write down an expression, in terms of n, for the nth term of this sequence.

.....

(2)

The nth term of a different number sequence is $3n^2 + 7$

(b) Find the 10th term of this sequence.

.....

(2)

(Total for Question is 4 marks)

Examiner's Report

Q1.

Part (a) was done well. Most candidates were able to extract at least one of the factors of the given expression, but a surprising number of candidates omitted to include the right hand bracket of the linear factor. In part (b), most candidates were able to expand the brackets to obtain 4 correct terms which most were then able to simplify correctly. Expansion of the constant term was an obstacle for some candidates. Common errors here were +2, −45 and −12. A popular incorrect answer involving the simplification of the term in x was $x^2 - 2x - 35$.

In part (c), the majority of candidates were able score at least 1 mark for simplifying the algebraic fraction. A popular form for the answer was $2m^{-2}t^4$, ie not expressed as a fraction.

In part (d), the majority of candidates were able to use the difference of two squares to factorise the quadratic expression. Common incorrect answers here were $y(y - 16)$, $(y - 4)^2$, $(y - 8)(y - 8)$ and $(y - 8)(y + 2)$. In part (e), most candidates were able to use the laws of indices to simplify the given expression. A common incorrect answer here was h^{-1}.

Q2.

This question was well attempted but only the most able candidates gained full marks. Many candidates scored M1 for $5x$ or $7y$ though these expressions were often found in a jumble of algebraic expressions.

Common incorrect responses included just $5x+7y$, $\frac{(x+y)}{12}$ and $\frac{5x+7y}{2}$

Weaker candidates used ⅕ and ⅐ with no letters, described a process, made up numbers to use or wrote $12xy$.

Q3.

Candidates were generally quite successful in part (a). Most candidates appeared to know a method for expanding two sets of brackets with many achieving at least one mark. Methods seen included FOIL and the use of a grid. Common errors included ignoring the signs of the terms ($–4p$ was often given as $4p$) and adding the final two terms instead of multiplying. Simplifying the four-term expression sometimes resulted in errors, e.g. $–4p + 9p$ being simplified to $13p$ or $–5p$ or to just 5.

Part (b) was not answered so well. Most candidates realised that they needed to multiply both sides of the equation by 3 but many weren't sure how to carry this out. $15w – 24 = 12w + 6$ was seen often and the RHS was sometimes given as $4w + 6$ or $12w + 2$. Some candidates were able to rearrange their four-term equation correctly but many made errors when attempting to do this. Some candidates who got as far as $14 = –7w$ were unsure of how to deal with the minus sign.

Candidates who recognised the expression in part (c) as the difference of two squares almost invariably found the correct answer but there were many who gave the answer as either $(x + 7)^2$ or $(x – 7)^2$. Others tried to find a common factor and $x(x – 49)$ was a common incorrect answer.

Part (d) was answered less well although a good number of candidates did successfully apply the laws of indices to get either a fully correct answer or to gain one mark for having two correct terms within a product. Many candidates did not know that the power of 1/2 indicates square root and $9^{½}$ was commonly given as '4.5' or left as '9'.

Q4.

Multiplying the first term in the bracket only and leaving the second unchanged, ie $3x + 2$, was the most common incorrect answer and $3x + 5$ was often seen. A few did not score the final accuracy mark by continuing to 'simplify' their final answer, writing $3x + 6 = 9x$. Very few answers reflected no understanding of the algebra involved.

In part (b) most students found some common factors and divided well. Candidates need to ensure that they find the highest common factor, particularly for the number part of each term. They need to look at the terms left in the bracket to see if anything is still a factor. Candidates should be encouraged to check their answer by expanding as answers such as $6xy(2x^2 – 3xy)$ were occasionally seen.

In part (c) This question was well answered with a majority of candidates familiar with the need to find four terms and many also correctly dealing with the signs and simplification of the answer. 43% of candidates could expand and simplify correctly with a further 24% able to provide 4 correct terms (ignoring the signs) or 3 correct terms with the correct signs. The most common errors were incorrect signs, incorrect product of $2x$ and x, an incorrect simplification of $–3x + 8x$ or a constant term of +1

In part (d) it was pleasing to see that nearly 60% of the candidates obtained the correct answer with a further 12% scoring one mark for obtaining 2 correct parts of the expression $10x^7y^5$. The most common error was to add the coefficients with $7\ x^7y^5$ frequently seen. Others left multiplication signs in their answer or occasionally an addition sign.

Q5.

In part (a) the most common error was to assume $3g$ meant $3+g$, surprising on a Higher paper. Negative numbers caused problems for some. In contrast part (b) was usually well answered.

Brackets were usually multiplied out correctly in part (c), with most errors caused by incorrect simplification, usually leading to $7y+16$ and $7y+4$ because of an inability to process $-10-6$.

In parts (d) and (e) it was disappointing to find a significant minority who either multiplied or divided the indices (rather than adding and subtracting).

Q6.

Many candidates showed poor understanding of the order of the steps required and misplaced signs or lost terms caused errors. The most common first step appeared to be showing an intention to add 4 to both sides. There were some candidates that tried dividing through by 3, however this was far less successful.

Most candidates realised they had to find a square root somewhere, but frequently this was done too early in the process, before an equation of the form $p^2=$ had been formed.

A significant minority found the square root of the numerator only, but of concern are those candidates whose presentation of the answer was ambiguous: it was not clear whether the square root was intended to go over the entire fraction or not; some missed off the "$p=$" from their final answer. Full marks could not be awarded in these cases. The use of flow diagrams rarely led to any marks.

Q7.

This question was poorly completed, with few candidates managing to gain more than one mark for an intention to multiply through by $4 + t$. Often the bracket was missing and $p(4 + t)$ became $4p + t$. Candidates did appear to realise that they needed to find 't = something' but lacked the ability to achieve this. Of those who did successfully isolate the term sin t, only the most able went on to factorise correctly.

Q8.

In part (a), many candidates used incorrect signs when attempting to collect the x's on one side and the numbers on the other, $3x$ and -1 were common. This was a standard question and candidates at this level should be performing much better; this is a topic in algebra that needs more practice.

Part (b) was very well done by the majority. The most common route was to expand the brackets. Some of those that divided by 4 first made errors.

Q9.

The majority of candidates scored full marks. Some formed an algebraic equation but others just subtracted 15 from the total of 63 and then divided by 3. The most common error was to divide by 2 instead of by 3. Some candidates showed fully correct working but then identified Ellie's total, 32, as the answer, so losing the final mark. Some candidates experimented with combinations of numbers which often gave the correct result.

Q10.

This question was done quite well. In part (a), most candidates were able to work out the number of white tiles in the Pattern. A common approach here was for candidates to draw a diagram to help them count the numbers of grey tiles and white tiles. Those candidates listing the numbers of grey tiles and white tiles in a table were less successful as they often made errors in extending the list beyond the tiles given in the paper. A common error here was to double both the numbers of grey tiles and the numbers of white tiles, eg (6 grey, 4 white) in the diagram was extended to (12 grey, 8 white) in their list (instead of 7 white). In part (b), most candidates were able to write down an expression for the total number of tiles. Some candidates gave their final answer in the form $2n + n + 1$, ie unsimplified. Common incorrect answers here $2n + 1$, $n + 3$ and $4n+1$.

Q11.

Most students recognised that the numbers went up by 2 each time and many were able to access the first mark by writing $2n$. The most common incorrect responses were $2n - 1$ and also $3n + 2$. Some students did understand that the correct expression was $2n +1$ but wrote their answer as $n = 2n + 1$, losing the accuracy mark.

Q12.

Many were able to give the correct answer of 4n-2 in part (a), with 4n or 2n+4 being the most common incorrect answers.

Irrespective of the quality of response in part (a), many went on to provide a perfectly reasonable explanation in part (b), many by continuing the sequence up to 86. Incomplete answers referred just to the fact that they were even numbers, or had to include 2,6,4,8.

Q13.

No Examiner's Report available for this question

Q14.

Part (a) was well attempted by most candidates with many scoring full marks. In most cases those who didn't score full marks either wrote an expression containing 4*n* scoring B1 or wrote *n* + 4 scoring B0. There were very few responses seen with other coefficients of *n*.

Part (b) was well attempted by most candidates though more candidates were successful in part (a). The most common incorrect response was 907, however, those candidates who presented full working out and initially wrote $3 \times 10^2 + 7$ followed by $30^2 + 7$ did earn at least M1, unfortunately in most cases candidates wrote $3 \times 10 = 30$, $30^2 = 900$, $900 + 7 = 907$. Candidates who tried to generate all the terms of the sequence were usually unsuccessful.

Mark Scheme

Q1.

PAPER: 5MB2H 01					
Question		Working	Answer	Mark	Notes
	(a)		$2a(3b + 5c)$	2	B2 cao (B1 for $a(6b + 10c)$ or $2(3ab + 5ac)$ or $2a$(linear term in b and c))
	(b)		$x^2+2x-35$	2	M1 for 3 terms out of 4 correct including signs or all 4 terms correct ignoring signs A1 cao
	(c)		$\frac{2t^4}{m^2}$	2	B2 for $2m^{-2}t^4$ oe (B1 $\frac{2t^4}{m^n}, n \neq 2$ oe or $\frac{2t^k}{m^2}, k \neq 4$ oe or $m^{-2}t^4$ oe)
	(d)		$(y-4)(y+4)$	1	B1 cao
	(e)		h^{-6}	1	B1 for h^{-6} or $\frac{1}{h^6}$

Q2.

Question		Working	Answer	Mark	Notes
		$(5 \times x + 7 \times y) \div 12$	$\frac{5x+7y}{12}$	2	M1 for $5 \times x$ or $7 \times y$ oe seen A1 for $\frac{5x+7y}{12}$ oe (ignore kg units)

Q3.

Question	Working	Answer	Mark	Notes
(a)	$p^2 - 4p + 9p - 36$	$p^2 + 5p - 36$	2	M1 for all 4 terms correct (condone incorrect signs) or 3 out of 4 terms correct with correct signs A1 cao
(b)	$5w - 8 = 3(4w + 2)$ $5w - 8 = 12w + 6$ $-8 - 6 = 12w - 5w$ $-14 = 7w$	-2	3	M1 for attempting to multiply both sides by 3 as a first step (this can be implied by equations of the form $5w - 8 = 12w + ?$ or $5w - 8 = ?w + 6$ i.e. the LHS must be correct M1 for isolating terms in w and the number terms correctly from $aw + b = cw + d$ A1 cao **OR** M1 for $\frac{5w}{3} - \frac{8}{3} = 4w + 2$ M1 for isolating terms in w and the number terms correctly A1 cao
(c)		$(x + 7)(x - 7)$	1	B1 cao
(d)		$3x^4 y^{3/2}$	2	B2 for $3x^4y^{3/2}$ or $3x^4 y^{1.5}$ or $3x^4y^{1\frac{1}{2}}$ (B1 for any two terms correct in a product eg. $3x^4y^{?}$)

Q4.

Question	Working	Answer	Mark	Notes
(a)		$3x + 6$	2	M1 for attempted expansion of the bracket eg $3\times x$ and 3×2 seen or $3x + k$ or $kx + 6$ A1 for $3x + 6$
(b)		$6xy(2x^2 - 3y)$	2	M1 or $6xy$ (two terms involving x and/or y) or correct partial factorisation by taking out two from 6 (or 3 or 2) or x or y A1 cao
(c)	$2x^2 + 8x - 3x - 12$	$2x^2 + 5x - 12$	2	M1 for 3 out of 4 correct terms with correct signs, or all 4 terms ignoring signs A1 cao
(d)		$10\ x^7\ y^5$	2	B2 for $10\ x^7\ y^5$ (B1 for product of two of 5×2 oe, x^{4+3}, y^{3+2} ignore $\times$ signs)

Q5.

PAPER: 1MA0_2H				
Question	Working	Answer	Mark	Notes
(a)		-1	2	M1 for $3 \times -5 + 7 \times 2$ A1 cao
(b)		$3(x + 2)$	1	B1 cao
(c)		$7y - 16$	2	M1 for intention to expand a bracket eg $5y - 10$ or $2y - 6$ A1 cao
(d)		m^8	1	B1 cao
(e)		p^4	1	B1 cao

Q6.

		Working	Answer	Mark	Notes
		$3p^2 = y + 4$ $p^2 = y + 4/3$	$p = \sqrt{\frac{y+4}{3}}$	3	M1 for clear intention to add 4 to both sides or divide all terms by 3(with at least 3 terms) M1 for clear intention to find the square root from p^2 = (expression in y) A1 for $p = \sqrt{\frac{y+4}{3}}$ oe (accept ± a correct root)

Q7.

Question		Working	Answer	Mark	Notes
			$t = \frac{3-4p}{p+2}$	4	M1 for intention to multiply both sides by $4+t$ eg $p\times4+t=3-2t$ M1 for intention to correctly move their t terms to one side, and correctly move their other terms to the other side eg $p\times4+t-4p+2t=3-2t+2t-4p$ M1 for intention to factorise eg $t(p\pm 2)$ A1 for $t = \frac{3-4p}{p+2}$ oe

Q8.

		Working	Answer	Mark	Notes
	(a)		−7	2	M1 for an attempt to get xs on one side or number terms on one side A1 cao
	(b)		8.5	2	M1 for an attempt to divide each side by 4 or an attempt to expand the bracket eg $4 \times x - 4\times5$ A1 for 8.5 oe

Q9.

		Working	Answer	Mark	Notes
		$x + 2x + 15 = 63$ $3x = 48$	16	3	M1 for $x + 2x + 15 = 63$ M1 for attempt to subtract 15 from each side of their equation A1 cao OR M1 for 63 – 15 (= 48) M1 for '48' ÷ 3 A1 cao OR M2 for 16 and 32 seen (M1 for a strategy using at least two pairs with the ratio 1 : 2) A1 cao

Q10.

PAPER: 5MB2H_01					
Question		Working	Answer	Mark	Notes
	(a)		11	2	M1 for $20 \div 2$ or 10 or list/table with 4 pairs of at least 5 pairs correct A1 cao
	(b)		$3n + 1$	2	B2 for $3n + 1$ oe (B1 for $3n + k$, $k \neq 1$ or absent)

Q11.

PAPER: 5MB2H_01					
Question		Working	Answer	Mark	Notes
			$2n + 1$	2	M1 for $2n$ or $2n + k$ where $k \neq 1$ A1 for $2n + 1$

Q12.

PAPER: 1MA0_2H					
Question		Working	Answer	Mark	Notes
	(a)		$4n-2$	2	B2 for $4n-2$ oe (B1 for $4n+k$, $k \neq -2$ or k is absent, or $n=4n-2$)
	*(b)		Yes + reason	1	C1 ft from (a) for decision and explanation, e.g. equating 86 with nth term **and** "Yes, its the 22nd term" or continuing the sequence up to 86 **and** "Yes, 86 is in the sequence" oe

Q13.

Paper 1MA1: 3H			
Question	Working	Answer	Notes
(a)	8, 13, 21,	34	B1 cao
(b)	$a, b, a+b, a+2b, 2a+3b$	Shown	M1 Method to show by adding pairs of successive terms $a+2b, 2a+3b$ shown C1
(c)	$3a+5b=29$ $a+b=7$ $3a+3b=21$ $b=4, a=3$	$a=3$ $b=4$	P1 Process to set up two equations P1 Process to solve equations A1

Q14.

		Working	Answer	Mark	Notes
	(a)		$4n-3$	2	B2 for $4n-3$ oe (B1 for $4n+k$, $k \neq -3$ or $n=4n-3$)
	(b)		307	2	M1 for substitution of 10 into $3n^2+7$ ($=3\times10^2+7$) A1 cao