High School Mathematics Test 2013

Year 8

Further Algebraic Techniques
Products and Factors

Non Calculator Section

Name_____

Skills and Knowledge Assessed:

- Create algebraic expressions and evaluate them by substituting a given value for each variable (ACMNA176)
- Extend and apply the distributive law to the expansion of algebraic expressions (ACMNA190)
- Factorise algebraic expressions by identifying numerical factors (ACMNA191)
- Factorise algebraic expressions by identifying algebraic factors.
- Simplify algebraic expressions involving the four operations (ACMNA192)

Answer all questions in the spaces provided on this test paper by:
Writing the answer in the box provided.
or
Shading in the bubble for the correct answer from the four choices provided.
Show any working out on the test paper.

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1. $4p^2 + 12pq - 6p^2 - 8pq =$

   ☐ $4pq - 2p^2$ ☐ $4pq + 2p^2$ ☐ $2pq$ ☐ $6pq$

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2. Simplify $-3s \times 4w \times -2w$ completely.

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3. Simplify $\frac{24r^2s}{-8rst}$

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4. Which of the following is not a factor of $32xy^2$?

   ☐ $8x$ ☐ $2xy$ ☐ $4x^2$ ☐ $8y$

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5. When $w = 8, r = 2$ and $x = -4$ what is the value of $\frac{x^2}{wr}$?

   ☐ -1 ☐ 1 ☐ $-\frac{1}{2}$ ☐ $\frac{1}{2}$

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6. These are two incomplete entries in the table below, using the rule $a^2 - 4$.
Complete the table.

a	1	2	3	5
$a^2 - 4$		0	5	

7. The table below was obtained using a rule
T*he value of the term in the pattern is one more than twice the term number.*

Term Number	1	2	3	4
Term	3	5	7	9

What is the value of term number 80?

8. Which algebraic statement could be used to describe the relationship
"To get the term *T*, you multiply the term number (n) by 5 and take away 1."

☐ $T = 5 - 1n$ ☐ $T = 1n - 5$ ☐ $T = 1 - 5n$ ☐ $T = 5n - 1$

9. Expand $3(a + 9)$.

10. Expand $2m(3p - 4m)$.

11. When $-a(a - 4b)$ is expanded, the result is:

☐ $4ab - a^2$ ☐ $a^2 - 4ab$ ☐ $4ab - 2a$ ☐ $2a - 4ab$

12. Expand $3xy\left(4x - 5y^2\right)$.

13. When $5m - 10$ is factorised fully, the result is:

☐ $5(m - 10)$ ☐ $5(m + 10)$ ☐ $5(m + 2)$ ☐ $5(m - 2)$

14. Factorise fully: $8a + 24$.

15. Factorise fully: $k^2 - 2k$.

16. When $12pq - 15p^2$ is factorised fully, the result is:

☐ $3p(4 - 5p)$ ☐ $3p(4q - 5)$ ☐ $3p(4q - 5p)$ ☐ $3\left(4pq - 5p^2\right)$

17. Factorise fully: $4m^2 - 6mn$.

18. Factorise fully: $3ws + 6wr - 9wp$.

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Products and Factors

Calculator Allowed Short Answer Section

Name_____

Answer all questions in the spaces provided on this test paper by:
Writing the answer in the box provided.
or
Shading in the bubble for the correct answer from the four choices provided.
Show any working out on the test paper. Calculators are allowed.

1. The expression $12m \times 6n$ when simplified completely is

☐ $18mn$ ☐ $72mn$ ☐ $72m + n$ ☐ $72(m + n)$

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2. $24sp - 18w - 25sp - 22w =$

☐ $-40w - 49sp$ ☐ $-4w - sp$ ☐ $-4w - 49sp$ ☐ $-40w - sp$

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3. Which product is not equal to $24a^2bc$?

☐ $2a^2 \times 12bc$ ☐ $-8ab \times -3ac$ ☐ $6bc \times 4ab$ ☐ $8ab \times 3ac$

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4. When $j = 12$ and $k = -6$, what is the value of $\frac{6k}{j}$?

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5. Complete the table of values for the expression $3a + 2$

a	1	2	3	5	8
$3a + 2$	5	8	11		

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6. The first 4 terms in a pattern obtained using the rule $50 - 2n$ are shown in the table.
What would be the 20^{th} term if the table were continued?

n	1	2	3	4
$50 - 2n$	48	46	44	42

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7. A sailor's rule of thumb for cutting the correct length of rope to wrap around a post is: "*Allow 50 cm for each time you want to wrap the rope around and add another 20cm.*" How could this be written using algebra using l for the length and t for the number of times you want to wrap the rope around the post?

- ☐ $l = 20t + 50$
- ☐ $l = 50t + 20$
- ☐ $t = 50l + 20$
- ☐ $t = 20l + 50$

8. Expand $5(m + 8)$.

9. When $2z(3z - 5q)$ is expanded, the result is

☐ $6z - 10qz$ ☐ $6z^2 - 10qz$ ☐ $6z^2 - 5q$ ☐ $12z - 10qz$

10. Expand $2e(5g - 6e)$.

11. Expand $-7d(2am - 5dn)$.

12. When $-5s^2t(4su - 5rt^2)$ is expanded, the result is

- ☐ $-20s^3tu - 25rs^2t^3$
- ☐ $-20s^3tu + 25rs^2t^3$
- ☐ $-20s^2tu - 25rs^2t^2$
- ☐ $-20s^2tu + 25rs^2t^2$

13. Expand $7p(2am - 3ad - 5un)$.

14. When $12t - 6sk$ is factorised fully, the result is:

☐ $6(t - sk)$ ☐ $6(2t - sk)$ ☐ $12(t - 2sk)$ ☐ $3(4t - sk)$

15. Factorise fully: $14gk - 21k^2$.

16. When $10p^2 - 15sp$ is factorised fully, the result is:

☐ $10p(p - 3s)$ ☐ $10p(p - 15s)$ ☐ $5p(2p - 3s)$ ☐ $5p^2(2 - 3s)$

17. Factorise fully: $32a^2b^2 - 24ab^3$.

18. Factorise fully: $30p^2q + 18pr - 24sp$.

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Calculator Allowed
Longer Answer Section

Name_____

Write all working and answers in the spaces provided on this test paper.

Marks

1. Expand and simplify the following expressions

(a) $2m(2m - 4) - 3(m + 5)$ **2**

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……..

(b) $3a(a + 2b - 4bc) - 5b(2a - 5ac + 7b)$ **2**

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……..

2. Simplify these expressions by first factorising:

(a) $\dfrac{2x - 4}{5x - 10}$ **2**

……..

……..

(b) $\dfrac{2a^2 - 4ab}{6a - 12b}$ **2**

……..

……..

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ANSWERS

Non Calculator Section

1.	$4pq - 2p^2$
2.	$24sw^2$
3.	$-\frac{3r}{t}$
4.	$4x^2$
5.	1
6.	<table><tr><td>1</td><td>2</td><td>3</td><td>5</td></tr><tr><td>**–3**</td><td>0</td><td>5</td><td>**21**</td></tr></table> ½ mark each.
7.	161
8.	$T = 5n - 1$

9.	$3a + 27$
10.	$6mp - 8m^2$
11.	$4ab - a^2$
12.	$12x^2y - 15xy^3$
13.	$5(m - 2)$
14.	$8(a + 3)$
15.	$k(k - 2)$
16.	$3p(4q - 5p)$
17.	$2m(2m - 3n)$
18.	$3w(s + 2r - 3p)$

Calculator Allowed Section

1.	$72mn$
2.	$-40w - sp$
3.	$6bc \times 4ab$
4.	-3
5.	<table><tr><td>5</td><td>8</td></tr><tr><td>**17**</td><td>**26**</td></tr></table> ½ mark each
6.	10
7.	$l = 50t + 20$
8.	$5m + 40$
9.	$6z^2 - 10qz$

10.	$10eg - 12e^2$
11.	$-14dam + 35d^2n$
12.	$-20s^3tu + 25rs^2t^3$
13.	$14pam - 21pad - 35pun$
14.	$6(2t - sk)$
15.	$7k(2g - 3k)$
16.	$5p(2p - 3s)$
17.	$8ab^2(4a - 3b)$
18.	$6p(5pq + 3r - 4s)$

Calculator Allowed Longer Answer Section		
1.	(a) $2m(2m-4)-3(m+5) = 4m^2-8m-3m-15$ $= 4m^2-11m-15$	2
	(b) $3a(a+2b-4bc)-5b(2a-5ac+7b) = 3a^2+6ab-12abc-10ab+25abc-35b^2$ $= 3a^2-4ab+13abc-35b^2$	2
2.	(a) $\frac{2x-4}{5x-10} = \frac{2(x-2)}{5(x-2)} = \frac{2}{5}$	
	(b) $\frac{2a^2-4ab}{6a-12b} = \frac{2a(a-2b)}{6(a-2b)}$ $= \frac{2a}{6}$ $= \frac{a}{3}$	