High School
Mathematics Test 2015

Year 8

Further Algebraic Techniques

Non Calculator Section

Name_____

Skills and Knowledge Assessed:

- Create algebraic expressions and evaluate them by substituting a given value for each var
- Extend and apply the distributive law to the expansion of algebraic expressions (ACMNA
- 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. Calculators are **not** allowed.

1. Simplify $4m + 8am - 6am + 3m$.

☐ $m + 2am$ ☐ $7m - 2am$

☐ $7m + 2am$ ☐ $8am$

2. Simplify $9pq \times -5p^2q$

☐ $-45p^3q^2$ ☐ $-14p^3q^2$

☐ $14p^3q^2$ ☐ $45p^2q$

3. If $m = 8$, $g = 7$ and $r = 11$, what is the value of $m(g + 3r)$?

☐ 29 ☐ 48 ☐ 168 ☐ 320

4. Which product below gives an answer of $24a^2b$

☐ $12a \times 2b$ ☐ $6a^2 \times 4ab$

☐ $8ab \times 3a$ ☐ $24ab \times ab$

5. Expand $6(2m - 9)$.

☐ $12m - 54$ ☐ $12m - 3$ ☐ $2m - 3$ ☐ $8m - 54$

6. Expand $6(m - 8)$.

7. Expand $-8(2z - 7)$.

8. The table below is completed by substituting the x values given into $x - 2x^2$

x	–2	–1	1	2
$x - 2x^2$	–10	–3	A	B

What two values should replace A and B?

- ☐ $A = -3$ and $B = -6$
- ☐ $A = -1$ and $B = -6$
- ☐ $A = 3$ and $B = -6$
- ☐ $A = 3$ and $B = 10$

9. Expand $8a(6a - 2ab)$.

10. Expand $-5m^2(3am - 7n)$.

11. Which is not a factor of $36y^3b^2$?

- ☐ y^2b^2
- ☐ $12y^2$
- ☐ $9y^3b$
- ☐ $18yb^3$

12. Factorise $7m^2 - 21m$ completely.

- ☐ $7(m^2 - 21)$
- ☐ $7m(m - 3)$
- ☐ $m(7m - 3)$
- ☐ $7m^2(m - 3)$

13. Factorise $8c^2 - 24c$ completely.

14. Factorise $12p^2q - 36pq$ completely.

15. Expand and simplify $5d + 3e + 7(2e - d)$.

- ☐ $12d + 17e$
- ☐ $17e - 12d$
- ☐ $17e + 2d$
- ☐ $17e - 2d$

16. Expand and simplify $15x^2y + 2xy(2y - 3x) - 5xy^2$.

17. Factorise $24g^2h + 30gh^2$ completely.

- ☐ $6gh(4g + 5h)$
- ☐ $6g^2h(4 + 5h)$
- ☐ $6g^2h^2(4g + 5h)$
- ☐ $12gh(2g + 3h)$

18. Factorise $45pr^2 + 25p^2r^2$ completely.

19. Simplify $\dfrac{3p^2 - 9p}{3p}$.

- ☐ $p - 9$
- ☐ $p - 3$
- ☐ $p + 3$
- ☐ $3p - 1$

20. Complete the table of values below.

x	0	1	2	3
$3x + x^2$				

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Shading in the bubble for the correct answer from the four choices provided.

Show any working out on this test paper. Calculators are allowed.

1. Simplify $15p + 7w - 18p - 17w$.

- ☐ $-33p - 24w$
- ☐ $-3p - 24w$
- ☐ $-3p - 10w$
- ☐ $3p - 10w$

2. Simplify $\dfrac{-12x^3y^2}{4x^2y}$.

- ☐ $-3x^2y^2$
- ☐ $-3x^2y$
- ☐ $-3xy^2$
- ☐ $-3xy$

3. If $r = 11$, what is the value of $\dfrac{r^2 - 2r + 1}{r - 1}$?

- ☐ 10
- ☐ 11.1
- ☐ 12.2
- ☐ 13.2

4. Write two algebraic terms which have a product of $6m^2n$.

$$\square \times \square = 6m^2n$$

5. Expand $12a(7 - 14b)$.

☐ $19a^2 - 26ab$ ☐ $84a - 26ab$ ☐ $84a - 168ab$ ☐ $84a^2 - 168b$

6. Expand $15(q - 20)$.

7. Expand $-7(3z + 7)$.

8. Complete the table below by substituting the x values given into $3x + 4$

x	-2	-1	1	2
$3x + 4$	-2	1		

9. Expand $-12a(6a - 15b^2)$.

10. Expand $-5m^2(3am - 7n)$.

11. Expand $8(2y - 6x + 10)$.

☐ $10y - 48x + 80$ ☐ $10y - 14x + 80$

☐ $16y - 48x - 80$ ☐ $16y - 48x + 80$

12. Factorise $15xy - 30y^2$ completely.

☐ $15y(x - 2y)$ ☐ $2y(x - 15y)$ ☐ $15y(1 - 2y)$ ☐ $15(x - 2y)$

13. Factorise $24a^2 - 48ac$ completely.

14. Factorise $8t^2u^2 - 12tu^3 + 16t^3u^2$ completely.

15. Expand and simplify $15ab + 3a^2 - 7a(a - b)$.

☐ $8ab - 4a^2$ ☐ $8ab - 10a^2$ ☐ $22ab - 4a^2$ ☐ $22ab - 10a^2$

16. Expand and simplify $15y^2 + 3y(y^2 + 2y + 1) - 3y$.

17. Factorise $-32d^2e^3 - 48d^2e$ completely.

☐ $-8d^2e(e^2 + 3)$ ☐ $-16d^2e(2e^2 + 3)$

☐ $-16d^2(2e^2 + 3e)$ ☐ $-16de(2d^2e^2 + 3d)$

18. Factorise $63g^2h - 18gh$ completely.

19. Simplify $\dfrac{16a^2 - 12ab}{4a}$.

☐ $\dfrac{2a - 3b}{2}$ ☐ $\dfrac{a - b}{a}$

☐ $4a - 6b$ ☐ $4a - 3b$

20. Simplify $\dfrac{50y^3 + 30y^2 - 40y}{5y}$.

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ANSWERS

No.	WORKING	ANSWER
1.	$4m + 8am - 6am + 3m = 4m + 3m + 8am - 6am$ $= 7m + 2am$	3rd answer
2.	$9pq \times -5p^2q = 9 \times (-5) \times p \times p^2 \times q \times q$ $= -45p^3q^2$	1st answer
3.	If $m = 8$, $g = 7$ and $r = 11$, $m(g + 3r) = 8 \times (7 + 3 \times 11)$ $= 8 \times (7 + 33)$ $= 8 \times 40$ $= 320$	4th answer
4.	$12a \times 2b = 24ab \neq 24a^2b$ $6a^2 \times 4ab = 24a^3b \neq 24a^2b$ $8ab \times 3a = 24a^2b$ $24ab \times ab = 24a^2b^2 \neq 24a^2b$	3rd answer
5.	$6(2m - 9) = 6 \times 2m - 6 \times 9 = 12m - 54$	1st answer
6.	$6(m - 8) = 6 \times m - 6 \times 8$ $= 6m - 48$	$6m - 48$
7.	$-8(2z - 7) = -8 \times 2z - (-8) \times 7$ $= -16z + 56$	$-16z + 56$

8.	<table><tr><th>x</th><th>1</th><th>2</th></tr><tr><td>$x - 2x^2$</td><td>$A = 1 - 2 \times (1)^2$ $= 1 - 2 \times 1$ $= 1 - 2$ $= -1$</td><td>$B = 2 - 2 \times (2)^2$ $= 2 - 2 \times 4$ $= 2 - 8$ $= -6$</td></tr></table>	2nd answer
9.	$8a(6a - 2ab). = 8a \times 6a - 8a \times 2ab$ $= 48a^2 - 16a^2b$	$48a^2 - 16a^2b$
10.	$-5m^2(3am - 7n) = -5m^2 \times 3am - (-5m^2) \times 7n$ $= -15am^3 + 35m^2n$	$-15am^3 + 35m^2n$
11.	The factors of $36y^3b^2$ include $12y^2$, $9y^3b$ and y^2b^2, but not $18yb^3$ as the b^3 term is greater than the b^2 term in $36y^3b^2$	4th answer
12.	$7m^2 - 21m = 7m(m - 3)$	2nd answer
13.	$8c^2 - 24c = 8c(c - 3)$	$8c(c - 3)$
14.	$12p^2q - 36pq = 12pq(p - 3)$	$12pq(p - 3)$
15.	$5d + 3e + 7(2e - d) = 5d + 3e + 14e - 7d$ $= -2d + 17e$ $= 17e - 2d$	4th answer
16.	$15x^2y + 2xy(2y - 3x) - 5xy^2 = 15x^2y + 4xy^2 - 6x^2y - 5xy^2$ $= 9x^2y - xy^2$	$9x^2y - xy^2$
17.	$24g^2h + 30gh^2 = 6gh(4g + 5h)$	1st answer
18.	$45pr^2 + 25p^2r^2 = 5pr^2(9 + 5p)$	$5pr^2(9 + 5p)$

<table>
<tr><td>19.</td><td>$\dfrac{3p^2 - 9p}{3p} = \dfrac{3p(p-3)}{3p}$
$= p - 3$</td><td>2nd answer</td></tr>
<tr><td>20.</td><td><table>
<tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>$3x + x^2$</td><td>0</td><td>4</td><td>10</td><td>18</td></tr>
</table></td><td>4 answers in table.</td></tr>
</table>

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ANSWERS

No.	WORKING	ANSWER
1.	$15p + 7w - 18p - 17w = -3p - 10w$	2nd Answer
2.	$\frac{-12x^3y^2}{4x^2y} = -3xy$	4th Answer
3.	If $r = 11$, $\frac{r^2 - 2r + 1}{r - 1} = \frac{121 - 22 + 1}{10}$ $= \frac{100}{10}$ $= 10$	1st Answer
4.	Several possibilities. e.g. $6m \times mn$ or $3m^2 \times 2n$ or $2m \times 3mn$ etc	Any two terms with required product.
5.	$12a(7 - 14b) = 84a - 168ab$	3rd Answer
6.	$15(q - 20) = 15q - 300$	$15q - 300$
7.	$-7(3z + 7) = -21z - 49$.	$-21z - 49$
8.	<table><tr><td>x</td><td>-2</td><td>-1</td><td>1</td><td>2</td></tr><tr><td>$3x + 4$</td><td>-2</td><td>1</td><td>7</td><td>10</td></tr></table>	7 and 10 in last 2 boxes

9.	$-12a(6a - 15b^2) = -72a^2 + 180ab^2$	$-72a^2 + 180ab^2$
10.	$-5m^2(3am - 7n) = -15am^3 + 35m^2n$	$-15am^3 + 35m^2n$
11.	$8(2y - 6x + 10) = 16y - 48x + 80$	4th Answer
12.	$15xy - 30y^2 = 15y(x - 2y)$	1st Answer
13.	$24a^2 - 48ac = 24a(a - 2c)$	$24a(a - 2c)$
14.	$8t^2u^2 - 12tu^3 + 16t^3u^2 = 4tu^2(2t - 3u + 4t^2)$	$4tu^2(2t - 3u + 4t^2)$
15.	$15ab + 3a^2 - 7a(a - b) = 15ab + 3a^2 - 7a^2 + 7ab$ $= 22ab - 4a^2$	3rd Answer
16.	$15y^2 + 3y(y^2 + 2y + 1) - 3y = 15y^2 + 3y^3 + 6y^2 + 3y - 3y$ $= 21y^2 + 3y^3$	$21y^2 + 3y^3$
17.	$-32d^2e^3 - 48d^2e = -16d^2e(2e^2 + 3)$	2nd answer
18.	$63g^2h - 18gh = 9gh(7g - 2)$	$9gh(7g - 2)$
19.	$\frac{16a^2 - 12ab}{4a} = \frac{4a(4a - 3b)}{4a}$ $= 4a - 3b$	4th answer
20.	$\frac{50y^3 + 30y^2 - 40y}{5y} = \frac{10y(5y^2 + 3y - 4)}{5y}$ $= 2(5y^2 + 3y - 4)$ $= 10y^2 + 6y - 8$	$10y^2 + 6y - 8$ or $2(5y^2 + 3y - 4)$