School Name

Mathematics Test 2017

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 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. Calculators are **not** allowed.

1. Simplify $4x + 3 + 7x - 12$.

   ☐ $7x - 9$ ☐ $7x + 15$

   ☐ $11x - 9$ ☐ $11x + 15$

2. Simplify $6ab \times 2ab^2$.

   ☐ $8ab^2$ ☐ $8a^2b^3$

   ☐ $12ab^2$ ☐ $12a^2b^3$

3. If $m = 12$, $p = 6$ and $s = 3$, what is the value of $\frac{m+p}{s}$? ?

   ☐ 4 ☐ 6 ☐ 8 ☐ 9

4. Which product below gives an answer of $30ab^2c$

   ☐ $5ab \times 6bc$ ☐ $6a^2 \times 5bc$

   ☐ $10ab \times 3c$ ☐ $15ab \times 2b^2c$

5. Expand $5(3x + 2y)$.

☐ $8x + 7y$ ☐ $15x + 2y$ ☐ $15x + 10y$ ☐ $53x + 52y$

6. Expand $5(p - 9)$.

7. Expand $3(2z + 4x)$.

8. The table below is completed by substituting the x values given into $\frac{3x + 4}{2}$.

x	-4	-2	0	2
$\frac{3x + 4}{2}$	-4	-1	A	B

What two values should replace A and B?

☐ $A = -2$ and $B = -10$ ☐ $A = 2$ and $B = 5$

☐ $A = 3$ and $B = 5$ ☐ $A = 2$ and $B = 10$

9. Expand $-5b(3a - 2ab)$.

10. Expand $6ws^2(2w - 5s)$.

11. Which is not a factor of $30a^2b$?

☐ a^2b^2 ☐ $5a^2$ ☐ $15b$ ☐ $6ab$

12. Factorise $5a^2 - 10a$ completely.

☐ $5(a^2 - 2a)$ ☐ $a(5a - 10)$ ☐ $5a(a - 10)$ ☐ $5a(a - 2)$

13. Factorise $12a - 18b$ completely.

14. Factorise $-25p^2 - 10pq$ completely.

15. Expand and simplify $2pq + 14q + 2q(3p - 5)$.

☐ $-4pq - 4q$ ☐ $4pq + 4q$

☐ $8pq + 4q$ ☐ $8pq + 24q$

16. Expand and simplify $11u^2w^2 - 3u(2uw^2 + 4uw) - 6u^2w$.

17. Factorise $24m^2n - 16mn^2$ completely.

18. Factorise $28e^2g^2 - 16eg^3$ completely.

19. Simplify $\dfrac{5m^2 - 15m}{5m}$.

☐ $m - 5$ ☐ $m - 3$

☐ $m + 3$ ☐ $-14m$

20. Complete the table of values below.

x	0	1	2	3
$12 - x^2$				

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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 $45c - 23x - 15c - 18x$.

- ☐ $-30c - 41x$
- ☐ $30c - 41x$
- ☐ $30c - 5x$
- ☐ $60c - 5x$

2. Simplify $\dfrac{30m^2n^2}{6mn^2}$.

- ☐ $5m$
- ☐ $\dfrac{5m}{n}$
- ☐ $5mn$
- ☐ $\dfrac{5n}{m}$

3. If $p = 2.5$, what is the value of $p^2 + 4p + 1.25$?

- ☐ 16.25
- ☐ 17.5
- ☐ 24.5
- ☐ 25.0

4. Expand $7x(11a - 15b)$.

- ☐ $77x - 105x$
- ☐ $77a + 105bx$
- ☐ $77ax - 105bx$
- ☐ $77x^2 - 105xb$

5. Write two algebraic terms which have a sum of $15x^2$

$$\square + \square = 15x^2$$

6. Expand : $13(2m - 12)$.

7. Expand : $-9(8p - 15)$.

8. Complete the table below by substituting the x values given into $3x^2 + 5x - 1$

x	-2	-1	1	2
$3x^2 + 5x - 1$	1		7	

9. Expand : $6x^2y(5x - 3y)$.

10. Expand and simplify : $-5m + 2(3m - 7n)$.

11. Simplify $\dfrac{12x^3y}{15xy^2}$.

- ☐ $\dfrac{5x^2}{4y}$
- ☐ $\dfrac{4x}{5y}$
- ☐ $\dfrac{2x^2}{3y}$
- ☐ $\dfrac{4x^2}{5y}$

12. Factorise $14c^2 - 21c$ completely.

☐ $7(2c-3)$ ☐ $7c(2c-3)$ ☐ $c(14c-21)$ ☐ $7(2c^2-3c)$

13. Factorise $18m^2n - 24mn$ completely.

14. Factorise $20a^2b - 30a^2b^2 + 50a^3b^3$ completely.

15. Expand and simplify $22xz^2 + 5x(2z^2 - 12x) - 18x^2$.

☐ $10xz^2 - 42x^2$ ☐ $10xz^2 - 78x^2$ ☐ $32xz^2 - 78x^2$ ☐ $32xz^2 - 42x^2$

16. Expand and simplify : $35pq + 18p^2 - 3p(2p + 4q)$.

17. Factorise $35a^2x^2 - 45a^3x^2$ completely.

☐ $5a^2x^2(7-9a)$ ☐ $5ax^2(7-9a^2)$

☐ $5a^2x(7-9a)$ ☐ $5a^2x^2(7a-9)$

18. Factorise $60a^4b^3 - 48a^3b^4$ completely.

19. Simplify $\frac{12m-4}{8}$.

- ☐ $\frac{3m-1}{2}$
- ☐ $\frac{3m-2}{2}$
- ☐ $\frac{3m-1}{4}$
- ☐ $\frac{6m-2}{2}$

20. Simplify $\frac{15x^2-12xy}{6xy}$.

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ANSWERS

Question	Working and Answer
1.	$4x + 3 + 7x - 12 = 4x + 7x + 3 - 12$ $= 11x - 9$ **3rd Answer**
2.	$6ab \times 2ab^2 = 12a^2b^3$ **4th Answer**
3.	$\frac{m+p}{s} = \frac{12+6}{3}$ $= \frac{18}{3}$ $= 6$ **2nd Answer**
4.	$5ab \times 6bc = 5 \times 6 \times ab \times bc$ $= 30ab^2c$ **1st Answer**
5.	$5(3x + 2y) = 5 \times 3x + 5 \times 2y$ $= 15x + 10y$ **3rd Answer**
6.	$5(p - 9) =$ **$5p - 45$**
7.	$3(2z + 4x) =$ **$6z + 12x$**

Question	Working and Answer
8.	For A, $x = 0$ so $A = \dfrac{3 \times 0 + 4}{2} = \dfrac{4}{2} = 2$ For B, $x = 2$ so $A = \dfrac{3 \times 2 + 4}{2} = \dfrac{10}{2} = 5$ **2nd Answer**
9.	$-5b(3a - 2ab) = \mathbf{-15ab + 10ab^2}$
10.	Expand $6w s^2(2w - 5s) = \mathbf{12w^2s^2 - 30ws^3}$
11.	a^2b^2 is not a factor as there is only one factor of b in $30a^2b$. **1st Answer**
12.	$5a^2 - 10a = \mathbf{5a(a - 2)}$ to be factorised completely. **4th Answer**
13.	$12a - 18b = \mathbf{6(2a - 3b)}$
14.	$-25p^2 - 10pq = \mathbf{-5p(5p + 2q)}$
15.	$2pq + 14q + 2q(3p - 5) = 2pq + 14q + 6pq - 10q$ $= 8pq + 4q$ **3rd Answer**
16.	$11u^2w^2 - 3u(2uw^2 + 4uw) - 6u^2w = 11u^2w^2 - 6u^2w^2 - 12u^2w - 6u^2w$ $= \mathbf{5u^2w^2 - 18u^2w}$
17.	$24m^2n - 16mn^2 = \mathbf{8mn\ (3m - 2n)}$
18.	$28e^2g^2 - 16eg^3 = \mathbf{4eg^2(7e - 4g)}$
19.	$\dfrac{5m^2 - 15m}{5m} = \dfrac{\cancel{5m}\ (m - 3)}{\cancel{5m}}$ $= m - 3$ **2nd Answer**

Question	Working and Answer
20.	

x	0	1	2	3
$12 - x^2$	12	11	8	3

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ANSWERS

Question	Working and Answer
1.	$45c - 23x - 15c - 18x = 30c - 41x$ **3rd Answer**
2.	$\frac{30m^2 n^2}{6mn^2} = 5m$ **1st Answer**
3.	If $p = 2.5$, $p^2 + 4p + 1.25 = (2.5)^2 + 4(2.5) + 1.25$ $= 17.5$ **2nd Answer**
4.	$7x(11a - 15b) = 77ax - 105bx$ **3rd Answer**
5.	Any two like terms in x^2 which sum to $15x^2$ e.g. $10x^2 + 5x^2$ or $7x^2 + 8x^2$
6.	$13(2m - 12) =$ **$26m - 156$**
7.	$-9(8p - 15) =$ **$-72p + 135$**

8.	<table><tr><td>x</td><td>–2</td><td>–1</td><td>1</td><td>2</td></tr><tr><td>$3x^2 + 5x - 1$</td><td>1</td><td>**-3**</td><td>7</td><td>**21**</td></tr></table>
9.	$6x^2y(5x - 3y) = \mathbf{30x^3y - 18x^2y^2}$
10.	$-5m + 2(3m - 7n) = -5m + 6m - 14n$ $= \mathbf{m - 14n}$
11.	$\frac{12x^3y}{15xy^2} = \frac{4x^2}{5y}$ **4th Answer**
12.	$14c^2 - 21c = 7c(2c - 3)$ **2nd Answer**
13.	$18m^2n - 24mn = \mathbf{6mn(3m - 4)}$
14.	$20a^2b - 30a^2b^2 + 50a^3b^3 = \mathbf{10a^2b(2 - 3b + 5ab^2)}$
15.	$22xz^2 + 5x(2z^2 - 12x) - 18x^2 = 22xz^2 + 10xz^2 - 60x^2 - 18x^2$ $= 32xz^2 - 78x^2$ **3rd Answer**
16.	$35pq + 18p^2 - 3p(2p + 4q) = 35pq + 18p^2 - 6p^2 - 12pq$ $= \mathbf{23pq + 12p^2}$
17.	$35a^2x^2 - 45a^3x^2 = 5a^2x^2(7 - 9a)$ **1st Answer**
18.	$60a^4b^3 - 48a^3b^4 = \mathbf{12a^3b^3(5a - 4b)}$

19.	$\frac{12m-4}{8} = \frac{4(3m-1)}{8}$ $= \frac{\cancel{4}\,(3m-1)}{\cancel{8}\,2}$ $= \frac{3m-1}{2}$ **1st Answer**
20.	$\frac{15x^2-12xy}{6xy} = \frac{3x(5x-4y)}{6xy}$ $= \frac{\cancel{3}\,\cancel{x}\,(5x-4y)}{2\,\cancel{6}\,\cancel{x}\,y}$ $= \mathbf{\frac{5x-4y}{2y}}$