School Name

Mathematics Test 2017

Year 7

Introductory Algebra

Non Calculator Section

Name_____

Skills and Knowledge Assessed:

- Introduce the concept of variables as a way of representing numbers using letters (ACMNA175)
- Extend and apply the laws and properties of arithmetic to algebraic terms and expressions (ACMNA177)
- 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. What does $8x$ mean ?

- ☐ $8 + x$
- ☐ $8 - x$
- ☐ $8 \times x$
- ☐ $8 \div x$

2. What does a^3 mean?

- ☐ $a + a + a$
- ☐ $a \times a \times a$
- ☐ $a + 3$
- ☐ $a \div 3$

3. $x + x + x + y + y + y + y = ?$

- ☐ $3x + 4y$
- ☐ $7xy$
- ☐ $x^3 + y^4$
- ☐ x^3y^4

4. Write an expression for the number of minutes in h hours.

5. Simplify $5m + 6m - m$.

6. Simplify $7x \times 5x = ?$

7. Given that a = –6, $c = 12$ and $e = -2$, what is the value of $\frac{a+c}{e}$?

☐ –6 ☐ –4 ☐ –3 ☐ 3

8. Which of these is the same as $\frac{6ac}{3a}$?

☐ $2c$ ☐ $2a$ ☐ ac ☐ $2ac$

9. Which of these does **not** simplify to $15ak$?

☐ $3a \times 5k$ ☐ $15a \times k$

☐ $10ak + 5ak$ ☐ $\frac{30ak}{2a}$

10. Simplify $9m + 5p + 7m + 5p = ?$

11. $3a \times -4ab = ?$

☐ – ab ☐ $12a^2b$ ☐ $-12ab$ ☐ $-12a^2b$

12. Simplify $\frac{45wz^2}{9wz}$.

13. Simplify $12pq + 11p - 9q - 15pq$

☐ $11p - 12pq$ ☐ $11p - 9q - 3pq$ ☐ $8pq - 9q$ ☐ $-pq$

14. If $s = 11$, $u = 12$ and $w = 2$, what is the value of $w(s + 2u)$?

15. $5as \times -2as^2 = ?$

☐ $-10a^2s^2$ ☐ $-10as^3$ ☐ $-10a^2s^3$ ☐ $-10a^3s^3$

16. Angela's teacher asked her to write an expression for :

"The sum of the square of x and a third of x."

Which of these algebraic expressions could represent this?

☐ $3x^2$ ☐ $x^2 + 3x$

☐ $\frac{x^2 + x}{3}$ ☐ $x^2 + \frac{x}{3}$

17. Simplify $\frac{6pq \times 10p^2}{5p \times 2q}$.

18. Complete the two missing values in the table below for the expression $2a^2 - 5$?

a	–2	–1	3
$2a^2 - 5$		–3	

19. $2x + 4y = ?$

☐ $2(x + y)$ ☐ $2(x + 2y)$ ☐ $2(2x + y)$ ☐ $2(2x + 2y)$

20. A bus has x seats each of which holds 2 people and it can also take y people standing.
How many people can the bus take when full?

☐ $2xy$ ☐ $x + 2y$ ☐ $2x + y$ ☐ $2(x + y)$

21. A rectangular paddock measures a metres long and x metres wide.
What is an expression for the perimeter of the paddock (distance around the outside).

22. Using n for the number, write an expression in algebraic symbols for the following.
"*Take any number, square it and subtract 4, then multiply the result by 6.*"

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1. Simplify $15a + 9a$.

2. Simplify $5g + 11f - 6f - 4g$.

3. If $s = -10$ what is the value of $\frac{s+1}{3}$?

4. $\frac{2xy}{z} = ?$

- ☐ $2 + x + y \div z$
- ☐ $2 \times x \times y \div z$
- ☐ $2 \times x \times y - z$
- ☐ $2 + x + y - z$

5. Write $a + a + a + b + b + b + b$ in a shortened form.

6. Simplify $5g \times 2mg$.

☐ $10m^2g$ ☐ $10mg^2$ ☐ $7m^2g^2$ ☐ $10m^2g^2$

7. Write an expression that means "*Take the sum of the squares of x and y.*"

8. The same number of dice are put into each of 8 cups, and there are 5 dice left over.
If c is the number of dice in each cup, which is an expression for the total number of dice?

☐ $8c + 5$ ☐ $5c + 8$ ☐ $\frac{c}{5} + 8$ ☐ $\frac{c}{8} + 5$

9. Which expression means to "*double x, square the result and then multiply by 5*".

☐ $5(2x^2)$ ☐ $\frac{(2x)^2}{5}$ ☐ $5(2x)^2$ ☐ $2(5x)^2$

10. Simplify $8xw \times 9x + 20x^2w$.

11. Which of the following does **not** simplify to give $24m^2n$?

☐ $4m \times 6mn$ ☐ $3n \times 8m^2$

☐ $\frac{48m^2n^2}{2n}$ ☐ $\frac{(6mn)^2}{3n}$

12. If $f = -4$, what is the value of $\frac{2f^2 + 4f}{5}$?

☐ –6.4 ☐ –3.2 ☐ 0 ☐ 3.2

13. Simplify $2aw + 8w^2 - a^2 + 2wa - 8w^2 + 5a^2$

☐ $4aw + 4a^2$ ☐ $4aw - 16w^2 + 4a^2$

☐ $16w^2 + 4a^2$ ☐ $4aw + 16w^2 + 5a^2$

14. When $p = 4$, $q = -12$ and $r = -2$ what is the value of $p^2 + 2pq + r^2$

☐ –84 ☐ –80 ☐ –76 ☐ –54

15. Simplify $\frac{3a}{b} \times \frac{2a}{5}$.

16. When $c = 5$, which of these has the greatest value?

☐ $2c^2$ ☐ $(2c)^2$ ☐ $2 - c^2$ ☐ $\frac{2}{c^2}$

17. When $x = 12$, $y = -3$ and $z = -6$, what is the value of $\frac{2x - 4y}{3z}$?

☐ –6 ☐ –2 ☐ 1 ☐ 2

18. Simplify $\frac{9p^2q^2 \times 10pq^2}{6p^2q}$.

19. Which expression is not equal to $4a^2bc^2$?

☐ $2abc \times 2ac$ ☐ $\frac{12a^2b^2c^2}{3b}$ ☐ $(2abc)^2$ ☐ $3a^2bc^2 + a^2bc^2$

20. Given that $p = 1\frac{1}{2}$ and $q = 2\frac{1}{4}$, what is the value of $4(q - p)$?

21. Which of these means the same as $\frac{2(a + b)}{c}$.

☐ Double the sum of *a* and *b* and divide the result by *c*.
☐ Divide the sum of *a* and *b* by *c* and double the result.
☐ Take the sum of *b* and twice *a* and divide the result by *c*.
☐ Divide the *a* by *c*, add *b* and double the result.

22. Which of these is always true, regardless of the value of *a*?

☐ $a^2 - a = a - a^2$
☐ $a^2 + a = a + a^2$
☐ $a^2 \div a = a \div a^2$
☐ $a^2 + a^2 = a^2 - a^2$

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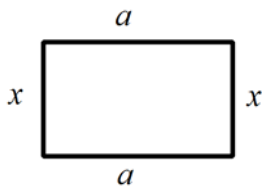
Year 7 **Introductory Algebra** Non Calculator Section

ANSWERS

Question	Working and Answer
1.	$8x = 8 \times x$ **3rd Answer**
2.	$a^3 = a \times a \times a$ **2nd Answer**
3.	$x + x + x + y + y + y + y = 3x + 4y$ **1st Answer**
4.	h hours $= h \times 60$ minutes $= \mathbf{60}\boldsymbol{h}$ minutes
5.	$5m + 6m - m = 11m - m = \mathbf{10}\boldsymbol{m}$
6.	$7x \times 5x = 7 \times 5 \times x \times x = \mathbf{35}\boldsymbol{x}^2$
7.	$a = -6, c = 12, e = -2,$ $\frac{a+c}{e} = \frac{-6+12}{-2}$ $= \frac{6}{-2}$ $= -3$ **3rd Answer**

Question	Working and Answer
8.	$\frac{6ac}{3a} = \frac{2 \cancel{6} \cancel{a} c}{\cancel{3} \cancel{a} 1} = 2c$ **1st Answer**
9.	$\frac{30ak}{2a} = 15k \neq 15ak$ **4th Answer**
10.	$9m + 5p + 7m + 5p = 9m + 7m + 5p + 5p$ $= \mathbf{16m + 10p}$
11.	$3a \times -4ab = 3 \times -4 \times a \times a \times b$ $= -12a^2b$ **4th Answer**
12.	$\frac{45\, w\, z^2}{9\, w\, z} = \frac{5 \cancel{45}\, w\, z^{\cancel{2}}}{\cancel{9}\, w\, \cancel{z}}$ $= \mathbf{5z}$
13.	$12pq + 11p - 9q - 15pq = 11p - 9q + 12pq - 15pq$ $= 11p - 9q - 3pq$ **2nd Answer**
14.	$s = 11, u = 12$ and $w = 2$, $w(s + 2u) = 2(11 + 2 \times 12)$ $= 2 \times (11 + 24)$ $= 2 \times 35$ $= \mathbf{70}$
15.	$5as \times -2as^2 = = 5 \times -2 \times a \times a \times s \times s^2$ $= -10a^2s^3$ **3rd Answer**
16.	*The sum of the square of x and a third of x* $= x^2 + \frac{x}{3}$ **4th Answer**

<table>
<tr><th>Question</th><th>Working and Answer</th></tr>
<tr><td>17.</td><td>$\dfrac{6pq \times 10p^2}{5p \times 2q} = \dfrac{60p^3q}{10pq}$
$= \dfrac{6 \cancel{60} p^{\cancel{3}2} \cancel{q}}{\cancel{10} \cancel{p} \cancel{q}}$
$= \mathbf{6p^2}$</td></tr>
<tr><td>18.</td><td><table><tr><td>a</td><td>–2</td><td>–1</td><td>3</td></tr><tr><td>$2a^2 - 5$</td><td>3</td><td>–3</td><td>13</td></tr></table>
$2 \times (-2)^2 - 5 = 2 \times 4 - 5 = \mathbf{3}$
$2 \times (3)^2 - 5 = 2 \times 9 - 5 = \mathbf{13}$</td></tr>
<tr><td>19.</td><td>$2x + 4y = (x + 2y) + (x + 2y)$
$= 2(x + 2y)$
2nd Answer</td></tr>
<tr><td>20.</td><td>x seats with 2 people on each = $2x$ people
Can also take y people standing
Total people = seated people plus standing people
$= 2x + y$
3rd Answer</td></tr>
<tr><td>21.</td><td> 

Perimeter = $a + a + x + x$
$= \mathbf{2a + 2x}$</td></tr>
<tr><td>22.</td><td>“*Take any number (n)*
Square it gives n^2
Subtract 4, gives $n^2 - 4$
Multiply the result by 6 gives $\mathbf{6(n^2 - 4)}$</td></tr>
</table>

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ANSWERS

Question	Working and Answer
1.	$15a + 9a = \mathbf{24a}$
2.	$5g + 11f - 6f - 4g = 5g - 4g + 11f - 6f$ $= \mathbf{g + 5f}$
3.	$\frac{s+1}{3} = \frac{-10+1}{3}$ $= \frac{-9}{3}$ $= \mathbf{-3}$
4.	$\frac{2xy}{z} = 2 \times x \times y \div z$ **2nd Answer**
5.	$a + a + a + b + b + b + b = \mathbf{3a + 4b}$
6.	$5g \times 2mg = 10mg^2$ **2nd Answer**
7.	*The squares of x and y are* x^2 *and* y^2. *Taking the sum of these is* $\mathbf{x^2 + y^2}$

8.	The 8 cups hold $8 \times c = 8c$ dice. So altogether there were $8c + 5$ **1st Answer**
9.	$Double\ x = 2x$ $Square\ the\ result = (2x)^2$ $Then\ multiply\ by\ 5 = 5(2x)^2$ **3rd Answer**
10.	$8xw \times 9x + 20x^2w = 72x^2w + 20x^2w$ $= \mathbf{92x^2w}$
11.	$\frac{(6mn)^2}{3n} = \frac{36m^2n^2}{3n}$ $= 12m^2n$ $\neq 24m^2n$ **4th Answer**
12.	If $f = -4$, $\frac{2f^2 + 4f}{5} = \frac{2(-4)^2 + 4(-4)}{5}$ $= \frac{16}{5}$ $= 3.2$ **4th Answer**
13.	$2aw + 8w^2 - a^2 + 2wa - 8w^2 + 5a^2 = 2aw + 2aw + 8w^2 - 8w^2 + 5a^2 - a^2$ $= 4aw + 4a^2$ **1st Answer**
14.	When $p = 4$, $q = -12$ and $r = -1$ $p^2 + 2pq + r^2 = 4^2 + 2 \times 4 \times (-12) + (-2)^2$ $= 16 - 96 + 4$ $= -76$ **3rd Answer**
15.	$\frac{3a}{b} \times \frac{2a}{5} = \mathbf{\frac{6a^2}{5b}}$

16.	$2c^2 = 2 \times 5^2 = 2 \times 25 = 50$ $(2c)^2 = (2 \times 5)^2 = 10^2 = 100$ $2 - c^2 = 2 - 5^2 = 2 - 25 = -23$ $\frac{2}{c^2} = \frac{2}{5^2} = \frac{2}{25}$ Greatest value is 100 **2nd Answer**
17.	When $x = 12$, $y = -3$ and $z = -6$, $\frac{2x - 4y}{3z} = \frac{2 \times 12 - 4 \times (-3)}{3 \times -6}$ $= \frac{24 + 12}{-18}$ $= \frac{36}{-18}$ $= -2$ **2nd Answer**
18.	$\frac{9p^2q^2 \times 10pq^2}{6p^2q} = \frac{90p^3q^4}{6p^2q}$ $= \mathbf{15pq^3}$
19.	$(2abc)^2 = 4a^2b^2c^2 \neq 4a^2bc^2$ **3rd Answer**
20.	Given that $p = 1\frac{1}{2}$ and $q = 2\frac{1}{4}$, $4(q - p) = 4\left(2\frac{1}{4} - 1\frac{1}{2}\right)$ $= 4\left(\frac{3}{4}\right)$ $= \frac{12}{4} = \mathbf{3}$

21.

Double the sum of a and b and divide the result by c. $\Rightarrow \frac{2(a+b)}{c}$

Divide the sum of a and b by c and double the result. $\Rightarrow 2\left(\frac{a+b}{c}\right)$

Take the sum of b and twice a and divide the result by c. $\Rightarrow \frac{(2a+b)}{c}$

Divide the a by c, add b and double the result. $\Rightarrow 2\left(\frac{a}{c}+b\right)$

1st Answer

22.

$a^2 - a = a - a^2$ is always *FALSE* unless a = 0

The two values will be opposites

e.g. $3^2 - 3 = 9 - 3 = 6$

$3 - 3^2 = 3 - 9 = -6$

Can be shown to be false for any non zero number

$a^2 + a = a + a^2$ is always true as both a and a^2 will have the same value on both sides of the equation and addition is commutative.

e.g. $3^2 + 3 = 9 + 3 = 12$

$3 + 3^2 = 3 + 9 = 12$

Can be shown to be true for any number

$a^2 \div a = a \div a^2$ is always *FALSE* unless a = 1

The two values will be reciprocals

e.g. $3^2 \div 3 = 9 \div 3 = 3$

$3 \div 3^2 = 3 \div 9 = \frac{1}{3}$

Can be shown to be false for any number except 1

$a^2 + a^2 = a^2 - a^2$ is always *FALSE* unless a = 0

The LHS will be a positive number and the LHS will always be zero.

e.g. $3^2 + 3^2 = 9 + 9 = 18$

$3^2 - 3^2 = 9 - 9 = 0$

Can be shown to be false for any non zero number

2nd Answer