High School Mathematics Test 2014

Year 8

Further Algebraic Techniques

Non Calculator Section

Skills and Knowledge Assessed:

-

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 **not** allowed.*

1. The expression $3x + 3ax - 5x + ax$ when simplified completely is:

   ☐ $-2x + 4ax$ ☐ $-2x - 4ax$
   ☐ $2x + 4ax$ ☐ $2x - 4ax$

2. Simplify $-3xy \times -6ax$.

   ☐ $-18ax^2y$ ☐ $-18axy$
   ☐ $18axy$ ☐ $18ax^2y$

3. When a = 2, $b = 6$ and $c = 12$, what is the value of $\frac{a^2b}{c}$?

   ☐ 1 ☐ 2 ☐ 6 ☐ 12

4. Which is **not** a factor of $12c^2d$?

   ☐ $2cd$ ☐ $2cd^2$
   ☐ $6c^2d$ ☐ $12cd$

5. Expand $5(3m - 8)$.

   ☐ $5m - 40$ ☐ $15m - 8$
   ☐ $15m - 40$ ☐ $53m - 58$

6. Expand $c(2c - 7)$.

   ☐

7. Expand $-s(2+4s)$.

☐ $-2s-4s^2$ ☐ $-2s+4s^2$

☐ $2s-4s^2$ ☐ $2s+4s^2$

8. The values of $2x^2+x$ when $x=-4$ and $x=4$, respectively are:

☐ -36 and 28 ☐ -28 and 36 ☐ 28 and 36 ☐ 60 and 68

9. Expand $-3y(4x-5yz)$.

☐ $-12xy+15yz$ ☐ $-12xy-15y^2z$

☐ $-12xy+15y^2z$ ☐ $-34xy+35y^2z$

10. Expand $4p(2p-6c)$.

11. Expand $3a^2(5a-6k)$.

12. Which is a correct factorisation of $12s^2-18st$?

☐ $6s(2-3t)$ ☐ $6s(2s-3t)$

☐ $6s(2s-3st)$ ☐ $12s(s-2t)$

13. Factorise $6m-18$.

14. Factorise $3p^2-6p$.

15. Expand and simplify $2ab-a^2+3a(2a-4b)$.

☐ $-7a^2-14ab$ ☐ $-7a^2-10ab$

☐ $5a^2-14ab$ ☐ $5a^2-10ab$

16. Expand and simplify $3m - 3m(2m - 7) + 4m^2$.

17. Factorise $12x - 16xy$.

18. Factorise $20p^2 + 16pq$.

19. Factorise $15a^2bc - 20a^2cd$.

20. Complete the table of values below.

x	0	1	5	10
$2x + 1$				

High School Mathematics Test 2014

Year 8

Further Algebraic Techniques

Calculator Allowed Short Answer Section

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)

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. $12x - 15y - 11x - y =$

   ☐ $-23x - 16y$ ☐ $-x - 14x$
   ☐ $x - 14y$ ☐ $x - 16y$

2. Substitute $x = 5$ into $\frac{6x^2}{15}$.

   ☐ 5 ☐ 10 ☐ 30 ☐ 60

3. When a = 2.5, $b = 3.5$ and $c = 1.2$, what is the value of $\frac{a+b}{c}$?

   ☐ 2 ☐ 5 ☐ 15 ☐ 50

4. Write down two factors which give a result of $36m^2n$?

   ☐ $\times$ ☐ $= 36m^2n$

5. Expand $3(2m - 16)$.

   ☐ $-6m - 19$ ☐ $-6m + 48$
   ☐ $6m + 48$ ☐ $6m - 48$

6. Expand $3d(4c + 7)$.

7. Expand $-4a(2a - 3g)$.

- ☐ $-8a^2 + 12ag.$
- ☐ $-8a^2 - 12ag.$
- ☐ $8a^2 - 12ag.$
- ☐ $8a^2 + 12ag.$

8. Complete the table below for the formula $y = 3x - 5$

x	-2	1	6	20
$y = 3x - 5$				

9. Expand $-11a(9ax - 12y)$.

- ☐ $-99ax + 132ay$
- ☐ $-99a^2x - 132ay$
- ☐ $-99a^2x + 132ay$
- ☐ $-20a^2x + 23ay$

10. Expand $-6t(7t + 15u)$.

11. Expand $12g(3d - 4k + 7)$.

12. Which is a correct factorisation of $8md + 28mk$?

- ☐ $2m(4d + 7k)$
- ☐ $4m(d + 7k)$
- ☐ $4m(2d + 7k)$
- ☐ $8m(d + 7k)$

13. Factorise completely $12ab + 15ac$.

14. Factorise completely $16a^2b - 12ab^2 - 20ab$.

15. Expand and simplify $-24x^2z + 18xz^2 + 8xz(3x - 9z)$.

☐ $-54xz^2$ ☐ $-90xz^2$

☐ $48x^2z - 54xz^2$ ☐ $48x^2z - 90xz^2$

16. Expand and simplify $2p^2q - 3p^2(2q - 6p) - 18p^3$.

17. Factorise: $30ab^2 - 25a^2b^2$.

18. Factorise $18m^2n - 36mn^2 + 27mn$.

19. Factorise $12x(x - 4) - 6x^2(x - 4)$.

20. Complete the table of values below.

x	-2	2	5	20
$x^2 - 3x$				

High School
Mathematics Test 2014

Further Algebraic Techniques
ANSWERS

Non Calculator Section (1 mark each)

Q no		Answer
1.	$3x + 3ax - 5x + ax = -2x + 4ax$	1st
2.	$-3xy \times -6ax = 18ax^2y.$	4th
3.	When a = 2, $b = 6$ and $c = 12$, $\frac{a^2b}{c} = \frac{2^2 \times 6}{12} = \frac{4 \times 6}{12} = \frac{24}{12} = 2$	2nd
4.	$2cd^2$ is not a factor of $12c^2d$?	2nd
5.	$5(3m - 8) = 5 \times 3m - 5 \times 8 = 15m - 40$	3rd
6.	$c(2c - 7) = c \times 2c - c \times 7 = 2c^2 - 7c$	$c^2 - 7c$
7.	$-s(2 + 4s) = -2s - 4s^2.$	1st
8.	When $x = -4$; $2x^2 + x = 2 \times (-4)^2 + (-4) = 2 \times 16 - 4 = 32 - 4 = 28$ When $x = 4$; $2x^2 + x = 2 \times (4)^2 + (4) = 2 \times 16 + 4 = 32 + 4 = 36$	3rd
9.	$-3y(4x - 5yz) = -12xy + 15y^2z.$	3rd
10.	$4p(2p - 6c) = 8p^2 - 24pc.$	$8p^2 - 24pc$
11.	$3a^2(5a - 6k) = 15a^3 - 18a^2k$	$15a^3 - 18a^2k$
12.	$12s^2 - 18st = 6s \times 2s - 6s \times 3t = 6s(2s - 3t)$	2nd
13.	$6m - 18 = 6(m - 3)$	$6(m - 3)$
14.	$3p^2 - 6p = 3p(p - 2).$	$3p(p - 2)$
15.	$2ab - a^2 + 3a(2a - 4b) = 2ab - a^2 + 6a^2 - 12ab$ $= 5a^2 - 10ab$	4th
16.	$3m - 3m(2m - 7) + 4m^2 = 3m - 6m^2 + 21m + 4m^2$ $= 24m - 2m^2$	$24m - 2m^2$
17.	$12x - 16xy = 4x(3 - 4y).$	$4x(3 - 4y)$
18.	$20p^2 + 16pq = 4p(5p + 4q)$	$4p(5p + 4q)$

<table>
<tr><td>19.</td><td>$15a^2bc - 20a^2cd = 5a^2c(3b - 4d)$.</td><td>$5a^2c(3b - 4d)$</td></tr>
<tr><td>20.</td><td colspan="2"><table>
<tr><td>x</td><td>0</td><td>1</td><td>5</td><td>10</td></tr>
<tr><td>$2x + 1$</td><td>1</td><td>3</td><td>11</td><td>21</td></tr>
</table></td></tr>
</table>

High School
Mathematics Test 2014

Calculator Allowed Short Answer Section (1 mark each)

Q no		Answer
1.	$12x - 15y - 11x - y = 12x - 11x - 15y - y = x - 16y$	4th
2.	When $x = 5$; $\frac{6x^2}{15} = \frac{6 \times 5^2}{15} = \frac{6 \times 25}{15} = \frac{150}{15} = 10$	2nd
3.	When a = 2.5, $b = 3.5$ and $c = 1.2$; $\frac{a+b}{c} = \frac{2.5 + 3.5}{1.2} = \frac{6}{1.2} = 5$	2nd
4.	Any two which are correct eg $18m \times 2mn$, $9m^2 \times 4n$, $2 \times 18m^2n$, $36 \times m^2n$ etc.	various
5.	$3(2m - 16) = 6m - 48$	4th
6.	$3d(4c + 7) = 12cd + 21d$	$12cd + 21d$
7.	$-4a(2a - 3g) = -8a^2 + 12ag.$	1st
8.	x: -2, 1, 6, 20 $y = 3x - 5$: -11, -2, 13, 55	
9.	$-11a(9ax - 12y) = -99a^2x + 132ay$	3rd
10.	$-6t(7t + 15u) = -42t^2 - 90tu$	$-42t^2 - 90tu$
11.	$12g(3d - 4k + 7) = 36gd - 48gk + 84g$	$36gd - 48gk + 84g$
12.	$8md + 28mk = 4m(2d + 7k).$	3rd
13.	$12ab + 15ac = 3a(4b + 5c)$	$3a(4b + 5c)$
14.	$16a^2b - 12ab^2 - 20ab = 4ab(4a - 3b - 5)$	$4ab(4a - 3b - 5)$
15.	$-24x^2z + 18xz^2 + 8xz(3x - 9z) = -24x^2z + 18xz^2 + 24x^2z - 72xz^2 = -54xz^2$	1st
16.	$2p^2q - 3p^2(2q - 6p) - 18p^3 = 2p^2q - 6p^2q + 18p^3 - 18p^3 = -4p^2q$	$-4p^2q$

<table>
<tr><td>17.</td><td>$30ab^2 - 25a^2b^2 = 5ab^2(6 - 5a)5ab^2(6 - 5a)$</td><td>$5ab^2(6 - 5a)$</td></tr>
<tr><td>18.</td><td>$18m^2n - 36mn^2 + 27mn = 9mn(2m - 4n + 3)$</td><td>$9mn(2m - 4n + 3)$</td></tr>
<tr><td>19.</td><td>$12x(x - 4) - 6x^2(x - 4) = 6x(x - 4)(2 - x)$</td><td>$6x(x - 4)(2 - x)$</td></tr>
<tr><td>20.</td><td colspan="2"><table>
<tr><td>x</td><td>-2</td><td>2</td><td>5</td><td>20</td></tr>
<tr><td>$x^2 - 3x$</td><td>$4 + 6 = 10$</td><td>$4 - 6 = -2$</td><td>$25 - 15 = 10$</td><td>$400 - 60 = 340$</td></tr>
</table></td></tr>
</table>