2.1 Algebra: Expressions and Formulae: 2-hour Pack

Calculator allowed · about 120 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write an expression.
Divide a number, q, by 6, then add 9.

(1)

2 Simplify 5x + 3y + 4x + 2y.

(2)

3 Simplify 7a - 9 - 3a + 5.

(2)

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4 Simplify each expression fully. Take care with negative terms.

(a) 5a - 8a **(1)**

(b) 3x - 7 + 5x + 2 **(2)**

(c) 6 - 2y - 9 + 5y **(2)**

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5 Simplify each expression using the laws of indices.

(a) $x^2 * x^3$ **(1)**

(b) y^7 / y^2 **(1)**

(c) $(a^2)^3$ **(1)**

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6 Expand and simplify each expression fully.

(a) 3(x + 2) + 2(x - 1) **(2)**

(b) 4(2y - 3) - 3(y - 5) **(3)**

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7 Priya has (2x + 5) pens and gives away (x - 3) pens.

(a) Write an expression, in its simplest form, for the number of pens she has left. **(2)**

(b) Find the number of pens left when x = 6. **(1)**

8 Expand and simplify each expression fully.

(a) (x + 3)(x + 5) **(3)**

(b) (2x - 1)(x + 4) **(3)**

9 The cost of hiring a bike is given by the formula H = 6d + 15, where H is the cost in pounds and d is the number of days.

(a) Work out the cost of hiring a bike for 4 days. **(2)**

(b) A customer pays £63 to hire a bike. Work out how many days they hired it for. **(2)**

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10 A number x is doubled and then 7 is added. This expression is then multiplied by 3. Write down, in its simplest form, an expression for the result. Then evaluate your expression when x = 5.

(3)

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11 Simplify $8a^2 + 6a + 2a^2 - 2a + 5$.

(3)

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12 A gym charges £54 to join and £6 per month. Write a formula for the total cost, C pounds, after t months.

(2)

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13 I think of a number, t. I multiply it by 7 and then add 5. Write an expression for the result.

(2)

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14 Use the formula $T = 3n^2 - 5$
to work out the value of T when n = 2.

(3)

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15 A pen costs t pence. Write an expression for the cost of 7 pens and a 7p ruler.

(2)

16 Tickets cost £2 each and there is a booking fee of £6 for the whole order. Write a formula for the total cost, C pounds, of h tickets.

(2)

17 Use the formula $E = mc^2$
to work out the value of E when m = 9, c = 3.

(2)

18 Use the formula F = 9C/5 + 32
to work out the value of F when C = 25.

(3)

19 A rectangle has length h cm and its width is 7 cm shorter than its length. Write a formula for the perimeter, P cm.

(2)

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20 I think of a number, x. I subtract 10 and then divide the result by 7. Write an expression for the result.

(2)

21 Simplify q + 8m + 8q - 4m.

(2)

22 Expand -2(n - 3).

(2)

23 Expand p(3p - 9).

(2)

24 Work out the value of $t^2 + 13$ when t = 1.

(2)

25 Use the formula $T = 3n^2 - 5$
to work out the value of T when n = 8.

(3)

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26 Simplify 3y - 7 - 8y + 3z + 8.

(3)

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27 Work out the value of $x^2 + 13$ when x = 7.

(2)

---

28 Simplify a + 7 + 4a + 9n + 2.

(3)

---

29 I think of a number, n. I subtract 7 and then divide the result by 5. Write an expression for the result.

(2)

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30 Work out the value of 6n + 10 when n = -3.

(2)

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31 Expand 4(4x - 9).

(2)

32 Simplify $5m^2 - 9m + 4m^2 - 7m - 3$.

(3)

33 Work out the value of $7a^2$ when a = 4.

(2)

34 Expand x(4x + 7).

(2)

35 I think of a number, x. I multiply it by 5 and then add 9. Write an expression for the result.

(2)

36 A plumber charges a call-out fee of £47 plus £5 for every hour of work. Write a formula for the total cost, C pounds, of a job that takes h hours.

(2)

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Mark scheme · 2.1 Algebra: Expressions and Formulae: 2-hour Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

q/6 + 9 oe	B1
Answer: **q/6 + 9**	

Question 2

collects x terms or y terms correctly	M1
9x + 5y cao	A1
Answer: **9x + 5y**	

Question 3

collects a terms or number terms correctly	M1
4a - 4 cao	A1
Answer: **4a - 4**	

Question 4

(a) -3a cao	B1
(a) Answer: **-3a**	
(b) 3x+5x (=8x) or -7+2 (=-5) seen	M1
(b) 8x - 5 cao oe	A1
(b) Answer: **8x - 5**	
(c) -2y+5y (=3y) or 6-9 (=-3) seen	M1
(c) 3y - 3 cao oe	A1
(c) Answer: **3y - 3**	

Question 5

(a) x^5 cao	B1
(a) Answer: **x^5**	
(b) y^5 cao	B1
(b) Answer: **y^5**	
(c) a^6 cao	B1
(c) Answer: **a^6**	

Question 6

(a) both brackets expanded correctly: 3x+6 and 2x-2 seen	M1
(a) 5x + 4 cao oe	A1
(a) Answer: **5x + 4**	
(b) 4(2y-3) expanded correctly: 8y - 12	M1
(b) -3(y-5) expanded correctly with correct signs: -3y + 15	M1
(b) 5y + 3 cao oe	A1
(b) Answer: **5y + 3**	

Question 7

(a) removes the bracket correctly, e.g. 2x + 5 - x + 3	M1
(a) x + 8 cao	A1
(a) Answer: **x + 8**	
(b) 14 cao (ft their simplified expression)	B1
(b) Answer: **14**	

Question 8

(a) at least two of the four products x^2, 5x, 3x, 15 correctly found	M1
(a) all four products correctly found (unsimplified), i.e. x^2 + 5x + 3x + 15	M1
(a) x^2 + 8x + 15 cao oe	A1
(a) Answer: **x^2 + 8x + 15**	
(b) at least two of the four products $2x^2$, 8x, -x, -4 correctly found	M1
(b) all four products correctly found (unsimplified), i.e. $2x^2$ + 8x - x - 4	M1
(b) $2x^2$ + 7x - 4 cao oe	A1
(b) Answer: **$2x^2$ + 7x - 4**	

Question 9

(a) substitutes d = 4	M1
(a) 39 cao	A1
(a) Answer: **39**	
(b) sets up 63 = 6d + 15 and subtracts 15	M1
(b) 8 cao	A1
(b) Answer: **8**	

Question 10

forms 3(2x + 7) before expanding	M1
6x + 21 cao	A1
51 cao (ft their expression)	B1
Answer: **6x + 21; value 51 when x = 5**	

Question 11

collects at least one pair of like terms correctly	M1
collects a second set of like terms correctly	M1
$10a^2$ + 4a + 5 cao	A1
Answer: **$10a^2$ + 4a + 5**	

Question 12

one correct term or a correct structure	M1
C = 54 + 6t oe cao	A1
Answer: **C = 54 + 6t**	

Question 13

one correct operation applied to the letter, eg a product or a sum	M1
7t + 5 oe cao	A1
Answer: **7t + 5**	

Question 14

correct substitution into the formula	M1
correct order of operations when evaluating	M1
7 cao	A1
Answer: **7**	

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Question 15

one correct operation applied to the letter, eg a product or a sum	M1
7t + 7 oe cao	A1

Answer: **7t + 7**

Question 16

one correct term or a correct structure	M1
C = 2h + 6 oe cao	A1

Answer: **C = 2h + 6**

Question 17

correct substitution into the formula	M1
81 cao	A1

Answer: **81**

Question 18

correct substitution into the formula	M1
correct order of operations when evaluating	M1
77 cao	A1

Answer: **77**

Question 19

one correct term or a correct structure	M1
P = 4h - 14 oe cao	A1

Answer: **P = 4h - 14**

Question 20

one correct operation applied to the letter, eg a product or a sum	M1
(x - 10) ÷ 7 oe cao	A1

Answer: **(x - 10) ÷ 7**

Question 21

collects at least one pair of like terms correctly	M1
9q + 4m cao	A1

Answer: **9q + 4m**

Question 22

one term correctly expanded	M1
-2n + 6 cao	A1

Answer: **-2n + 6**

Question 23

one term correctly expanded	M1
$3p^2$ - 9p cao	A1

Answer: **$3p^2$ - 9p**

Question 24

substitutes t = 1 correctly (brackets round negative numbers)	M1
14 cao	A1

Answer: **14**

Question 25

correct substitution into the formula	M1
correct order of operations when evaluating	M1
187 cao	A1

Answer: **187**

Question 26

collects at least one pair of like terms correctly	M1
collects a second set of like terms correctly	M1
-5y + 3z + 1 cao	A1

Answer: **-5y + 3z + 1**

Question 27

substitutes x = 7 correctly (brackets round negative numbers)	M1
62 cao	A1

Answer: **62**

Question 28

collects at least one pair of like terms correctly	M1
collects a second set of like terms correctly	M1
5a + 9n + 9 cao	A1

Answer: **5a + 9n + 9**

Question 29

one correct operation applied to the letter, eg a product or a sum	M1
(n - 7) ÷ 5 oe cao	A1

Answer: **(n - 7) ÷ 5**

Question 30

substitutes n = -3 correctly (brackets round negative numbers)	M1
-8 cao	A1

Answer: **-8**

Question 31

one term correctly expanded	M1
16x - 36 cao	A1

Answer: **16x - 36**

Question 32

collects at least one pair of like terms correctly	M1
collects a second set of like terms correctly	M1
$9m^2$ - 16m - 3 cao	A1

Answer: **$9m^2$ - 16m - 3**

Question 33

substitutes a = 4 correctly (brackets round negative numbers)	M1
112 cao	A1

Answer: **112**

Question 34

one term correctly expanded	M1
$4x^2$ + 7x cao	A1

Answer: **$4x^2$ + 7x**

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Question 35

one correct operation applied to the letter, eg a product or a sum	**M1**
5x + 9 oe cao	**A1**

Answer: **5x + 9**

Question 36

one correct term or a correct structure	**M1**
C = 47 + 5h oe cao	**A1**

Answer: **C = 47 + 5h**

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