2.12 Writing and Using Formulae: Test Pack

Calculators not allowed · about 55 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write a formula for each description. Use a single letter for the variable.

(a) The perimeter P of a square with side length s. **(1)**

(b) The total cost C in pounds for buying n notebooks at £1.75 each. **(1)**

(c) The area A of a rectangle with width w and length l. **(1)**

(d) Total marks T when a test has q questions worth 2 marks each and m questions worth 3 marks each. **(1)**

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2 Compound operations and formulae. The formula M = 3(a - b) + 2b is used.

(a) Simplify the expression M in terms of a and b. **(2)**

(b) Find M when a = 4 and b = 1. **(1)**

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3 Stretch 1: A small triangle and a similar big triangle have corresponding sides in ratio 1:n. Area of the small triangle is As and area of the big triangle is Ab. Let Ab = k As.

(a) Express k in terms of n, knowing area scales as the square of linear scale factor. **(2)**

(b) Use your expression for k to find Ab when As = 6 and n = 3. **(2)**

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4 Stretch 2: A formula for the temperature T in °C after t hours is T = 20 - 3t. Two students disagree about when T reaches 2°C. Use the formula to find t and state if t is positive.

(a) Solve 20 - 3t = 2 for t. **(1)**

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(b) Is t positive? Give a brief reason. **(1)**

5 Final fluency: Match each algebraic expression to its word description.

(a) Expression: 7m. Description choices: (i) m increased by 7, (ii) 7 times m, (iii) m divided by 7. **(1)**

- ☐ (i) m increased by 7
- ☐ (ii) 7 times m
- ☐ (iii) m divided by 7

(b) Expression: n - 5. Description choices: (i) subtract n from 5, (ii) n minus 5, (iii) 5 minus n. **(1)**

- ☐ (i) subtract n from 5
- ☐ (ii) n minus 5
- ☐ (iii) 5 minus n

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6 Make n the subject of the formula T = 11 - 8n.

(3)

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7 Use the formula $T = 3n^2 - 5$
to work out the value of T when n = 4.

(3)

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8 The cost, C pounds, of hiring a ladder for h days is given by C = 44 + 5h.
Work out the cost of hiring the ladder for 11 days.

(2)

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9 Rearrange the simple formula and solve. The formula is A = 3x + 7.

(a) Given A = 16, find x. **(2)**

(b) Given A = -2, find x. **(1)**

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10 Use the formula v = u + at
to work out the value of v when u = 8, a = 4, t = 8.

(2)

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11 Make x the subject of the formula y = 7x - 9.

(3)

12 Write a formula for the perimeter P of a regular pentagon with side length s.

(1)

13 Using A = 4x + 9, given A = -3, find x.

(1)

14 A parking garage charges a fixed entry fee of 200p plus 8p per minute parked, using the formula C = 200 + 8m. Find the cost of parking for 45 minutes, giving your final answer in pounds.

(3)

15 A delivery charge is M = 4(a - b) + 3b, where a is distance in miles and b is a discount in pounds. Simplify M in terms of a and b, then find M when a = 5 and b = 2.

(3)

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16 Stretch: A large square and a similar small square have sides in ratio n:1. Area scales as the square of the linear scale factor, so the large square's area Al = k times the small square's area As.

(a) Write k in terms of n. **(1)**

(b) Find Al when As = 5 and n = 4. **(3)**

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17 Use the formula S = 3h + 2. Find S when h = -3.

(1)

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Mark scheme · 2.12 Writing and Using Formulae: Test Pack

Question 1

(a) P = 4s cao — **B1**

(a) Answer: **P = 4s**

(b) C = 1.75n cao — **B1**

(b) Answer: **C = 1.75n**

(c) A = l w or A = lw cao — **B1**

(c) Answer: **A = l w**

(d) T = 2q + 3m cao — **B1**

(d) Answer: **T = 2q + 3m**

Question 2

(a) expand 3(a - b) to 3a - 3b or equivalent — **M1**

(a) M = 3a - b cao — **A1**

(a) Answer: **M = 3a - b**

(b) M = 11 cao — **B1**

(b) Answer: **11**

Question 3

(a) state area scale factor = n^2 or show k = n^2 — **M1**

(a) k = n^2 cao — **A1**

(a) Answer: **k = n^2**

(b) substitute Ab = n^2 x As with n=3, As=6 — **M1**

(b) 54 cao — **A1**

(b) Answer: **54**

Question 4

(a) correct algebra to t = 6 — **M1**

(a) Answer: **6**

(b) Yes, t = 6 which is greater than 0 or statement that t is positive because solution is 6 — **B1**

(b) Answer: **Yes**

Question 5

(a) choice (ii) 7 times m — **B1**

(a) Answer: **(ii)**

(b) choice (ii) n minus 5 — **B1**

(b) Answer: **(ii)**

Question 6

correct first step (e.g. undo the addition or subtraction) — **M1**

correct second step (divide by the coefficient) — **M1**

(11 - T)/8 oe cao — **A1**

Answer: **n = (11 - T)/8**

Question 7

correct substitution into the formula — **M1**

correct order of operations when evaluating — **M1**

43 cao — **A1**

Answer: **43**

Question 8

substitutes h = 11: 44 + 5 x 11 — **M1**

£99 cao — **A1**

Answer: **£99**

Question 9

(a) form 3x + 7 = 16 and subtract 7 or equivalent method — **M1**

(a) x = 3 cao — **A1**

(a) Answer: **3**

(b) x = -3 cao — **B1**

(b) Answer: **-3**

Question 10

correct substitution into the formula — **M1**

40 cao — **A1**

Answer: **40**

Question 11

correct first step (e.g. undo the addition or subtraction) — **M1**

correct second step (divide by the coefficient) — **M1**

(y + 9)/7 oe cao — **A1**

Answer: **x = (y + 9)/7**

Question 12

P = 5s oe — **B1**

Answer: **P = 5s**

Question 13

x = -3 cao — **B1**

Answer: **-3**

Question 14

substitutes m = 45 — **M1**

560p — **A1**

converts to £5.60 (ft their pence value) — **B1**

Answer: **£5.60 (560p)**

Question 15

expands the bracket, 4a - 4b + 3b — **M1**

M = 4a - b cao — **A1**

18 cao (ft their simplified formula) — **B1**

Answer: **M = 4a - b; value 18 when a = 5, b = 2**

Question 16

(a) k = n^2 cao — **B1**

(a) Answer: **k = n^2**

(b) substitutes n = 4 into k = n^2 to get k = 16 — **M1**

(b) multiplies k by As — **M1**

(b) 80 cao — **A1**

(b) Answer: **80**

Question 17

-7 cao — **B1**

Answer: **-7**

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