5.6 Changing the Subject of a Formula: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Make b the subject of the formula a = b + 7.

(Total for Question 1 is 1 mark)

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2 Make h the subject of the formula V = l × w × h.

(Total for Question 2 is 1 mark)

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3 Make n the subject of the formula m = (n + 4) / 5. Show each step.

(Total for Question 3 is 2 marks)

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4 Make l the subject of the formula for perimeter P = 2l + 2w.

(Total for Question 4 is 2 marks)

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5 The formula for average speed is s = d / t, where s is speed in km/h, d is distance in km and t is time in hours. Make t the subject, then find t when s = 60 km/h and d = 30 km. Give your answer in hours and minutes.

(a) Make t the subject of s = d / t. **(1)**

(b) Calculate t when s = 60 and d = 30. Give your answer in hours and minutes. **(2)**

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(Total for Question 5 is 3 marks)

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6 The area of a trapezium is given by A = (a + b)/2 × h. Make h the subject of the formula.

(Total for Question 6 is 2 marks)

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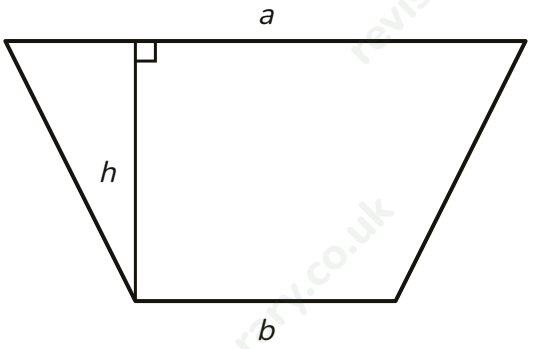
7 Make x the subject of the formula 7x + 3y = 25. Give your answer in terms of y.

(Total for Question 7 is 2 marks)

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8 The area A of a trapezium is given by A = (h/2)(a + b), where a and b are the parallel sides and h is the height. Rearrange this formula to make h the subject.

Diagram NOT accurately drawn



(a) Rearrange A = (h/2)(a + b) to make h the subject. **(2)**

(b) Find h when A = 84, a = 6 and b = 10. **(2)**

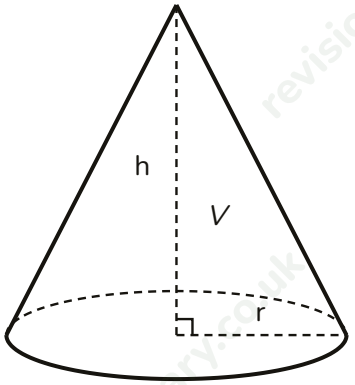
(Total for Question 8 is 4 marks)

9 Make x the subject of the formula: y = (3x + 2)/(x - 4)

(Total for Question 9 is 4 marks)

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10 The volume of a cone is $V = (1/3) * \pi * r^2 * h$. Make r the subject of the formula.



(Total for Question 10 is 4 marks)

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11 Make x the subject of the formula $q = 8x + 6$.

(Total for Question 11 is 2 marks)

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12 Make w the subject of $y = \sqrt{w + 7}$.

(Total for Question 12 is 3 marks)

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13 Make k the subject of $z = 2k^3$.

(Total for Question 13 is 3 marks)

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14 A formula relates the concentration C (in g/L) of a solution to mass m (in g) and volume V (in L): C = m/V. Rearrange this formula to make m the subject. Then a chemist has a solution with concentration 0.12 g/L and volume 250 mL. Calculate the mass m in grams. Give your answer to 2 decimal places. (Note: 1 L = 1000 mL.)

(a) Make m the subject of C = m/V. **(1)**

(b) Calculate m when C = 0.12 g/L and V = 250 mL. Give your answer to 2 decimal places. **(5)**

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(Total for Question 14 is 6 marks)

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15 The formula for the period T of a pendulum of length L is $T = 2pi*\sqrt{L/g}$, where g is gravitational acceleration. Show that $L = gT^2/(4pi^2)$. (You do not need to evaluate numerically.)

(Total for Question 15 is 6 marks)

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Mark scheme · 5.6 Changing the Subject of a Formula: Test Pack

Question 1

b = a - 7 cao **B1**

Answer: b = a - 7

Question 2

h = V/(l × w) cao **B1**

Answer: h = V/(l × w)

Question 3

multiply both sides by 5 or show method leading to n + 4 = 5m **M1**

n = 5m - 4 cao **A1**

Answer: n = 5m - 4

Question 4

subtract 2w from both sides to get 2l = P - 2w **M1**

l = (P - 2w)/2 cao **A1**

Answer: l = (P - 2w)/2

Question 5

(a) rearrange to t = d/s or show method leading to t = d/s **M1**

(a) Answer: t = d/s

(b) substitute values into t = d/s and calculate 30/60 = 0.5 **M1**

(b) 0.5 h = 30 minutes cao **A1**

(b) Answer: 0.5 hours = 30 minutes

Question 6

divide both sides by (a + b)/2 or multiply both sides by 2 then divide by (a + b) **M1**

h = 2A/(a + b) cao **A1**

Answer: h = 2A/(a + b)

Question 7

subtract 3y from both sides or equivalent to isolate 7x **M1**

x = (25 - 3y)/7 cao **A1**

Answer: x = (25 - 3y)/7

Question 8

(a) multiply both sides by 2 then divide by (a + b): 2A = h(a + b) or equivalent **M1**

(a) h = 2A/(a + b) cao **A1**

(a) Answer: h = 2A/(a + b)

(b) substitute values into h = 2A/(a + b): h = 2*84/(6 + 10) **M1**

(b) h = 168/16 = 10.5 cao **A1**

(b) Answer: 10.5

Question 9

multiplies both sides by (x - 4), e.g. y(x - 4) = 3x + 2 **M1**

expands and collects all terms in x on one side, e.g. yx - 3x = 2 + 4y **M1**

factorises out x, e.g. x(y - 3) = 2 + 4y, dependent on the previous method mark **dM1**

x = (2 + 4y)/(y - 3) oe, cao **A1**

Answer: x = (2 + 4y)/(y - 3)

Question 10

multiplies both sides by 3, e.g. $3V = \pi * r^2 * h$ **M1**

divides both sides by π * h, e.g. $r^2 = 3V/(\pi * h)$ **M1**

square roots both sides, dependent on the previous method mark **dM1**

$r = \sqrt{3V/(\π * h)}$ oe, cao (positive root only, since r is a length) **A1**

Answer: $r = \sqrt{3V/(\π * h)}$

Question 11

correct first step, e.g. 8x = q - 6 **M1**

x = (q - 6)/8 oe **A1**

Answer: x = (q - 6)/8

Question 12

isolates the term in the subject **M1**

correct inverse operation (root or square) **M1**

$w = y^2 - 7$ oe **A1**

Answer: $w = y^2 - 7$

Question 13

isolates the term in the subject **M1**

correct inverse operation (root or square) **M1**

$k = (z/2)^{1/3}$ oe **A1**

Answer: $k = (z/2)^{1/3}$

Question 14

(a) m = CV cao **B1**

(a) Answer: m = CV

(b) convert 250 mL to 0.25 L and substitute: m = 0.12 * 0.25 **M1**

(b) multiply to get 0.03 **M1**

(b) 0.03 cao **A1**

(b) round to 2 decimal places correctly: 0.03 (awrt) or 0.03 **B1**

(b) units g stated or implied **B1**

(b) Answer: 0.03 g

Question 15

divide both sides by 2pi to isolate the square root: T/(2pi) = $\sqrt{L/g}$ or equivalent **M1**

square both sides to remove the square root: $T^2/(4pi^2) = L/g$ **M1**

multiply both sides by g: $g * T^2/(4pi^2) = L$ **M1**

reorder to the conventional form $L = gT^2/(4pi^2)$ or state equivalent algebraic rearrangement **M1**

$L = gT^2/(4pi^2)$ cao **A1**

communication: algebraic justification shown clearly, steps shown and logically ordered **C1**

Answer: $L = gT^2/(4pi^2)$

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