4.6 Forming and Solving Equations: 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

Equation-Solving Toolkit

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To solve a linear equation, use inverse operations to get the unknown on its own, always doing the same thing to both sides. Expand any brackets first: a(b + c) = ab + ac. If the unknown appears on both sides, collect all the unknown terms on one side and all the number terms on the other before simplifying. For equations with fractions, multiply through by the denominator (or the lowest common denominator, if there is more than one) to clear the fractions before solving as usual. Work through the fluency questions first to build speed and accuracy with the balance method, then use the exam-style questions to practise forming your own equations from words and real-life contexts.

1 Solve each equation.

(a) x + 9 = 20 **(1)**

.....

(b) y - 8 = 10 **(1)**

.....

(Total for Question 1 is 2 marks)

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2 The three angles of a triangle are x degrees, (3x - 3) degrees and (x + 53) degrees.
Work out the value of x.

(Total for Question 2 is 3 marks)

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3 Aisha thinks of a number. She multiplies the number by 3, then adds 7. The result is 31. Form an equation and solve it to find Aisha's number.

(Total for Question 3 is 3 marks)

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4 The sum of three consecutive odd integers is 51. Let the integers be n, n + 2 and n + 4. Form an equation and solve for n. State the three integers.

(Total for Question 4 is 4 marks)

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5 Chloe is x years old. Her brother Daniel is (2x + 3) years old. In 6 years' time, the sum of their ages will be 45.

(a) Form an equation in x and show that it simplifies to 3x + 15 = 45 **(2)**

(b) Solve the equation to find Chloe's age and Daniel's age now. **(3)**

.....

(Total for Question 5 is 5 marks)

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6 At a school fair, 3 raffle tickets and 2 programmes cost £5.10 in total. 5 raffle tickets and 2 programmes cost £7.50 in total. Let x pounds be the cost of one raffle ticket and y pounds be the cost of one programme.

(a) Write down a pair of simultaneous equations in x and y. **(2)**

.....

(b) Solve your equations to find the cost of one raffle ticket and the cost of one programme. **(3)**

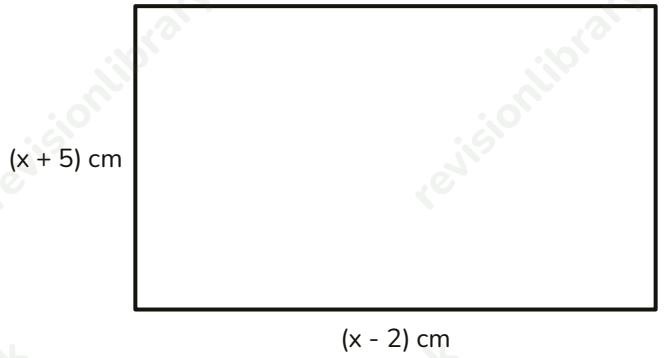
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(Total for Question 6 is 5 marks)

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7 A rectangle has length (x + 5) cm and width (x - 2) cm. The perimeter of the rectangle is 46 cm. Form and solve an equation to find the value of x.

Diagram NOT accurately drawn



(Total for Question 7 is 3 marks)

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8 A toy has an original price of x pounds. It is reduced by 20% in a sale and then a delivery charge of £1.50 is added. The final price paid is £7.50. Form an equation and work out the original price x.

(a) Write an equation in x to represent the sale reduction and delivery charge leading to the final price. **(2)**

(b) Solve your equation to find x. Show each step. **(6)**

(Total for Question 8 is 8 marks)

9 Solve the pair of simultaneous equations

$3x - y = 7$

$2x + y = 4$

(Total for Question 9 is 3 marks)

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10 The sum of three consecutive even numbers is 84. Let n be the smallest of the three numbers.

(a) Write an expression, in terms of n, for the sum of the three numbers. **(1)**

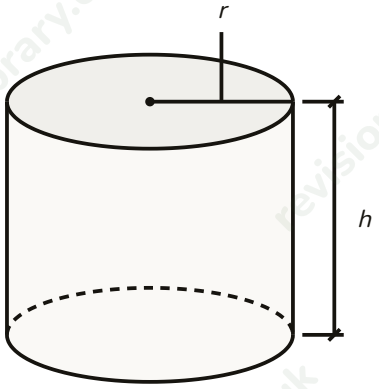
(b) Form and solve an equation to find the value of n. **(3)**

(c) Hence write down the three consecutive even numbers. **(1)**

(Total for Question 10 is 5 marks)

11 A cylinder has radius r and height h. The volume V is given by $V = \pi r^2 h$. Rearrange this formula to make h the subject, then find h when V = 400pi and r = 4.

Diagram NOT accurately drawn



(Total for Question 11 is 5 marks)

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Mark scheme · 4.6 Forming and Solving Equations: 1-hour Pack

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

Question 1

(a) x = 11 cao **B1**

(a) Answer: x = 11

(b) y = 18 cao **B1**

(b) Answer: y = 18

Question 2

sum of the three angles = 180 **M1**

5x + 50 = 180 **M1**

x = 26 **A1**

Answer: x = 26

Question 3

correct equation, 3x + 7 = 31 oe, where x is the number **B1**

correct method to solve, 3x = 24 oe **M1**

x = 8 cao **A1**

Answer: x = 8

Question 4

form equation n + (n + 2) + (n + 4) = 51 **M1**

collect terms to 3n + 6 = 51 and solve to n = 15 **M1**

state the three integers correctly **M1**

integers are 15, 17 and 19 cao **A1**

Answer: 15, 17, 19

Question 5

(a) correct expressions for future ages, (x+6) + (2x+3+6) = 45 oe **M1**

(a) cso, correctly simplified to 3x + 15 = 45 with all steps shown **A1**

(a) Answer: 3x + 15 = 45 (shown)

(b) 3x = 30 oe (ft from part a) **M1**

(b) x = 10 (Chloe's age) cao **A1**

(b) ft, Daniel's age = 23 (2*10 + 3) **B1**

(b) Answer: Chloe is 10, Daniel is 23

Question 6

(a) 3x + 2y = 5.10 oe **B1**

(a) 5x + 2y = 7.50 oe **B1**

(a) Answer: 3x + 2y = 5.10 and 5x + 2y = 7.50

(b) correct elimination method, subtract equations to get 2x = 2.40 oe **M1**

(b) x = 1.20 (ft) **A1**

(b) y = 0.75 (ft) **A1**

(b) Answer: Raffle ticket = £1.20, programme = £0.75

Question 7

correct equation formed, 2(x+5) + 2(x-2) = 46 oe, or 4x + 6 = 46 **M1**

correct method to solve, 4x = 40 oe **M1**

x = 10 cao **A1**

Answer: x = 10

Question 8

(a) recognise 20% reduction gives 0.8x or (1 - 0.2)x **M1**

(a) equation 0.8x + 1.50 = 7.50 cao **A1**

(a) Answer: 0.8x + 1.50 = 7.50

(b) subtract 1.50 from both sides, 0.8x = 6.00 seen **M1**

(b) divide both sides by 0.8 seen **M1**

(b) correct intermediate calculation 6.00 / 0.8 = 7.5 or equivalent **M1**

(b) x = 7.50 cao **A1**

(b) clear presentation of method leading to correct answer **C1**

(b) award if answer 7.5 is given with correct working shown in different equivalent form **SC1**

(b) Answer: £7.50

Question 9

add or eliminate y to get 5x = 11 or equivalent elimination **M1**

divide to find x = 11/5 **M1**

x = 11/5, y = -2/5 cao **A1**

Answer: x = 11/5, y = -2/5

Question 10

(a) 3n + 6 oe (from n + (n+2) + (n+4)) **B1**

(a) Answer: 3n + 6

(b) 3n + 6 = 84 oe (ft from part a) **M1**

(b) 3n = 78 oe **M1**

(b) n = 26 cao **A1**

(b) Answer: n = 26

(c) ft, 26, 28 and 30 all stated **B1**

(c) Answer: 26, 28, 30

Question 11

rearrange to h = V / (π r^2) or equivalent **M1**

substitute V = 400pi and r = 4 to get h = 400pi / (π * 16) **M1**

cancel π and simplify 400 / 16 correctly **M1**

obtain h = 25 **M1**

h = 25 units cao **A1**

Answer: 25

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