4.6 Forming and Solving Equations: Test 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 Write down an equation for the statement: "Seven more than a number x is 12".

(a) Write an equation for the statement. **(1)**

(Total for Question 1 is 1 mark)

2 Form an equation and solve. "Five times a number p minus 7 equals 18."

(a) Write an equation for the statement. **(1)**

(b) Solve the equation for p. **(2)**

(Total for Question 2 is 3 marks)

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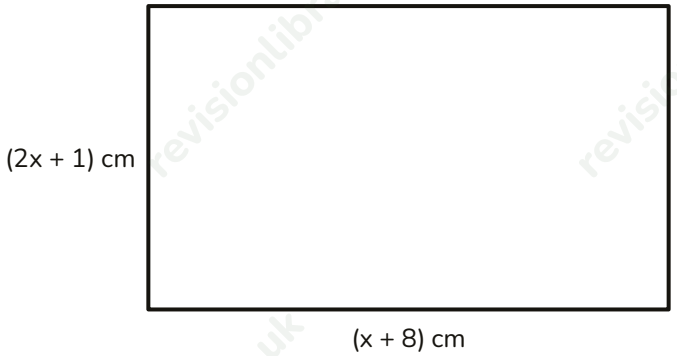
3 Solve $0.5x + 3.2 = 7.7$

(Total for Question 3 is 2 marks)

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4 A rectangle has length $(x + 8)$ cm and width $(2x + 1)$ cm. The perimeter of the rectangle is 90 cm.
Work out the value of x.

Diagram NOT accurately drawn



(Total for Question 4 is 3 marks)

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5 Three consecutive integers have a sum of 96. Let n be the smallest integer.

(a) Form an equation in n and solve it. **(2)**

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(b) Hence write down the three consecutive integers. **(2)**

(Total for Question 5 is 4 marks)

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6 A taxi company charges a fixed booking fee of £2 plus £1.60 per mile. Sophie paid £10.60 for a journey. Form an equation and find how many miles Sophie travelled.

(Total for Question 6 is 4 marks)

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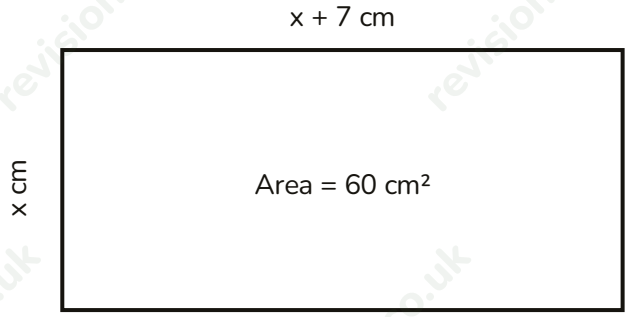
7 Three angles lie on a straight line. The angles are x degrees, (2x + 8) degrees and (3x - 2) degrees. Form and solve an equation to find the value of x.

(Total for Question 7 is 3 marks)

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8 A rectangle has length (x + 7) cm and width x cm. The area of the rectangle is 60 cm².

Diagram NOT accurately drawn



(a) Show that $x^2 + 7x - 60 = 0$ **(2)**

(b) By factorising, solve the equation to find the width of the rectangle. **(3)**

.....

(Total for Question 8 is 5 marks)

9 A triangle has angles of (2x + 10) degrees, (3x - 5) degrees and (x + 25) degrees.

(a) Show that 6x + 30 = 180 **(2)**

(b) Hence find the size of the smallest angle in the triangle. **(3)**

.....

(Total for Question 9 is 5 marks)

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10 Expand and rearrange to form a quadratic, then solve: $(x - 2)(x + 5) = 3x + 4$.

(Total for Question 10 is 4 marks)

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11 Show that the equation $2x^2 - 3x - 5 = 0$ has roots $x = (3 \pm \sqrt{49})/4$ and hence give the exact roots. Give all working.

(Total for Question 11 is 5 marks)

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12 Show that for all x not equal to 2, $(x^2 - 4)/(x - 2) = x + 2$. Hence, or otherwise, evaluate $(x^2 - 4)/(x - 2)$ when $x = 7$ and comment on the value at $x = 2$.

(Total for Question 12 is 6 marks)

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Mark scheme · 4.6 Forming and Solving Equations: Test Pack

Question 1

(a) x + 7 = 12 cao **B1**

(a) Answer: x + 7 = 12

Question 2

(a) equation formed, e.g. 5p - 7 = 18 oe **M1**

(a) Answer: 5p - 7 = 18

(b) add 7 then divide by 5 (5p = 25 -> p = 5) ft **M1**

(b) p = 5 cao **A1**

(b) Answer: 5

Question 3

0.5x = 4.5 oe **M1**

x = 9 cao **A1**

Answer: x = 9

Question 4

2((x + 8) + (2x + 1)) = 90 **M1**

simplifies to 6x + 18 = 90 **M1**

x = 12 **A1**

Answer: x = 12

Question 5

(a) correct equation, n + (n+1) + (n+2) = 96 oe, or 3n + 3 = 96 **B1**

(a) n = 31 cao **A1**

(a) Answer: n = 31

(b) correct method, n+1 and n+2 found (ft) **M1**

(b) 31, 32 and 33 all cao **A1**

(b) Answer: 31, 32, 33

Question 6

form equation 2 + 1.6m = 10.6 or equivalent **M1**

subtract 2 to get 1.6m = 8.6 **M1**

divide to get m = 8.6/1.6 **M1**

m = 5.375 miles or 5.375 cao (allow 5.38 awrt) cao **A1**

Answer: 5.375

Question 7

correct equation formed, x + (2x+8) + (3x-2) = 180 oe **M1**

correct simplification, 6x + 6 = 180 oe **M1**

x = 29 cao **A1**

Answer: x = 29

Question 8

(a) correct area expression, x(x+7) = 60 oe **M1**

(a) cso, correctly expanded and rearranged to $x^2 + 7x - 60 = 0$ with all steps shown **A1**

(a) Answer: $x^2 + 7x - 60 = 0$ (shown)

(b) correct factorisation, (x+12)(x-5) = 0 oe, or valid alternative method **M1**

(b) x = -12 or x = 5 both found **A1**

(b) x = 5 cm selected (dep), with reason that width must be positive **A1**

(b) Answer: x = 5 cm

Question 9

(a) correct collection of the three angle expressions, (2x+10) + (3x-5) + (x+25) oe **M1**

(a) cso, correctly simplified to 6x + 30 = 180, using angles in a triangle sum to 180 degrees, with all steps shown **A1**

(a) Answer: 6x + 30 = 180 (shown)

(b) 6x = 150 oe (ft from part a) **M1**

(b) x = 25 (ft), substituted into all three angle expressions **M1**

(b) 50 degrees cao, correctly identified as the smallest angle (angles are 60, 70 and 50 degrees) **A1**

(b) Answer: 50 degrees

Question 10

expand LHS to $x^2 + 3x - 10$ or equivalent expansion **M1**

rearrange to standard form $x^2 + 3x - 10 - 3x - 4 = 0$ giving $x^2 - 14 = 0$ **M1**

take square roots or factor correctly leading to $x^2 = 14$ **M1**

$x = \sqrt{14}$ or $x = -\sqrt{14}$ (both values required) cao **A1**

Answer: $x = \sqrt{14}$ or $x = -\sqrt{14}$

Question 11

substitute into quadratic formula or complete square to get $x = (3 \pm \sqrt{9 + 40})/4$ or equivalent **M1**

show discriminant step leading to $\sqrt{49}$ **M1**

write $x = (3 \pm \sqrt{49})/4$ **M1**

simplify $\sqrt{49} = 7$ and substitute **M1**

final exact roots x = (3 + 7)/4 = 5/2 and x = (3 - 7)/4 = -1 arise cao **A1**

Answer: x = 5/2 or x = -1

Question 12

factorise numerator to (x - 2)(x + 2) or equivalent **M1**

cancel (x - 2) to obtain x + 2, with domain note $x \neq 2$ **M1**

state simplified form (x + 2) and that it holds for $x \neq 2$ **M1**

substitute x = 7 to get 9 **M1**

state that expression is undefined at x = 2 because original denominator is 0 **M1**

final details: $(x^2 - 4)/(x - 2) = x + 2$ for $x \neq 2$, value at 7 is 9, at 2 expression is undefined cao **A1**

Answer: Simplifies to x + 2 for $x \neq 2$; value at x = 7 is 9; expression is undefined at x = 2.

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