



4.6H Forming and Solving Equations: Higher Tier Practice

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 75 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

1 Solve $3(2x - 1) = 5x + 4$.

(Total for Question 1 is 2 marks)

2 The perimeter of a rectangle is $2x + 14$. The length is $x + 4$ and the width is $x - 2$. Form an equation and solve for x .

(Total for Question 2 is 3 marks)

3 Solve the pair of simultaneous equations

$$3x - y = 7$$

$$2x + y = 4$$

(Total for Question 3 is 3 marks)

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

(Total for Question 4 is 4 marks)

- 5** A taxi company charges a fixed booking fee of 2 pounds plus 1.6 pounds per mile. Sophie paid 10.6 pounds for a journey. Form an equation and find how many miles Sophie travelled.

(Total for Question 5 is 4 marks)

- 6** 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 6 is 5 marks)

- 7** 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 7 is 4 marks)

- 8** 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 $V = 400\pi$ and $r = 4$.

(Total for Question 8 is 5 marks)

- 9** 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 9 is 6 marks)

- 10** Find the value(s) of k for which the linear equation $kx + 6 = 2k - x$ has no solution, exactly one solution, or infinitely many solutions. Explain your reasoning.

(Total for Question 10 is 4 marks)

Mark scheme · 4.6H Forming and Solving Equations: Higher Tier Practice

Question 1

- **M1** expand and collect terms correctly, e.g. $6x - 3 = 5x + 4$ or equivalent method
- **A1** $x = 7$ cao
- **Answer: 7**

Question 2

- **M1** form equation using perimeter $2(\text{length} + \text{width}) = 2x + 14$, eg $2((x + 4) + (x - 2)) = 2x + 14$
- **M1** collect terms and simplify correctly to a linear equation: $4x + 4 = 2x + 14$
- **A1** $x = 5$ cao
- **Answer: 5**

Question 3

- **M1** add or eliminate y to get $5x = 11$ or equivalent elimination
- **M1** divide to find $x = 11/5$
- **A1** $x = 11/5$, $y = -2/5$ cao
- **Answer: $x = 11/5$, $y = -2/5$**

Question 4

- **M1** 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 $x^2 = 14$
- **A1** $x = \sqrt{14}$ or $x = -\sqrt{14}$ (both values required) cao
- **Answer: $x = \sqrt{14}$ or $x = -\sqrt{14}$**

Question 5

- **M1** form equation $2 + 1.6m = 10.6$ or equivalent
- **M1** subtract 2 to get $1.6m = 8.6$
- **M1** divide to get $m = 8.6/1.6$
- **A1** $m = 5.375$ miles or 5.375 cao (allow 5.38 awrt) cao
- **Answer: 5.375**

Question 6

- **M1** 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
- **A1** final exact roots $x = (3 + 7)/4 = 5/2$ and $x = (3 - 7)/4 = -1$ arise cao
- **Answer: $x = 5/2$ or $x = -1$**

Question 7

- **M1** 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
- **A1** integers are 15, 17 and 19 cao
- **Answer: 15, 17, 19**

Question 8

- **M1** rearrange to $h = V / (\pi r^2)$ or equivalent
- **M1** substitute $V = 400\pi$ and $r = 4$ to get $h = 400\pi / (\pi * 16)$
- **M1** cancel π and simplify $400 / 16$ correctly
- **M1** obtain $h = 25$
- **A1** $h = 25$ units cao
- **Answer: 25**

Question 9

- **M1** 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
- **A1** final details: $(x^2 - 4)/(x - 2) = x + 2$ for $x \neq 2$, value at 7 is 9, at 2 expression is undefined cao
- **Answer: Simplifies to $x + 2$ for $x \neq 2$; value at $x = 7$ is 9; expression is undefined at $x = 2$.**

Question 10

- **M1** bring x terms together: $kx + x = 2k - 6$ giving $x(k + 1) = 2k - 6$
- **M1** consider $k + 1 = 0$ case ($k = -1$) and substitute to check
- **M1** state that if $k = -1$ then equation becomes $0x + 6 = -2 - 6$ so $6 = -8$ which is false hence no solution
- **A1** for $k \neq -1$ there is exactly one solution $x = (2k - 6)/(k + 1)$; no k gives infinitely many solutions. cao
- **Answer: $k = -1$ gives no solution; for $k \neq -1$ there is exactly one solution $x = (2k - 6)/(k + 1)$; no value of k gives infinitely many solutions.**