3.14 Solving Equations: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 80 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Work out the value of x.

x + 7 = 13

(Total for Question 1 is 1 mark)

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2 Solve the equation.

5x = 20

(Total for Question 2 is 1 mark)

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3 Work out x.

2x + 3 = 11

(Total for Question 3 is 2 marks)

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4 Solve the equation. Give your answer as a fraction if needed.

3x = 7

(Total for Question 4 is 2 marks)

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5 Which value of x satisfies the equation 3x - 2 = 13 ?
A) 3 B) 5 C) 15 D) 11/3

- ☐ A) 3
- ☐ B) 5
- ☐ C) 15
- ☐ D) 11/3

(Total for Question 5 is 1 mark)

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6 Work out x. Show all steps.
4x - 5 = 11

(Total for Question 6 is 3 marks)

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7 Solve the equation. Give your answer to 1 decimal place if needed.
2.5x + 1.5 = 6.5

(Total for Question 7 is 3 marks)

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8 A bag contains some counters. Emma says there are n counters. After she adds 4 more counters, there are twice as many counters as she originally thought there were. Write an equation and solve it for n.
(Explain your steps.)

(Total for Question 8 is 5 marks)

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9 Work out x. Give exact answer.

$7x - 4 = 3x + 12$

(Total for Question 9 is 4 marks)

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10 Solve the equation. Check your answer.

$2(x + 3) = 10$

(Total for Question 10 is 4 marks)

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

(Total for Question 11 is 3 marks)

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12 Solve the pair of equations by substitution. Show your steps.

Equation 1: $y = 2x + 1$

Equation 2: $3x + 2y = 18$

(Total for Question 12 is 5 marks)

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13 Solve the equation and state whether the solution is an integer. Show full working.

$5(x - 2) = 3x + 4$

(Total for Question 13 is 7 marks)

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14 Show that the equation $3x^2 - 5x - 2 = 0$ has solutions $x = 2$ and $x = -1/3$.

(a) Show that $x = 2$ and $x = -1/3$ are solutions. **(2)**

(b) Factorise $3x^2 - 5x - 2$. **(3)**

(Total for Question 14 is 5 marks)

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15 Solve the simultaneous equations

$2u + 3v = 7$

$5u - v = 6$

(a) Eliminate v and find u. **(3)**

(b) Find v using your value of u. **(3)**

(Total for Question 15 is 6 marks)

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16 Solve the equation $4/(x - 2) + 1 = 3/(x - 2)$. State any values of x that are not allowed.

(a) Solve for x. **(3)**

(b) State any values of x not allowed and why. **(3)**

(Total for Question 16 is 6 marks)

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Mark scheme · 3.14 Solving Equations: Test Pack

Question 1

x = 6 cao **B1**

Answer: 6 (x = 6).

Question 2

x = 4 cao **B1**

Answer: 4 (x = 4).

Question 3

subtract 3 then divide by 2 shown, e.g. 2x = 8 **M1**

x = 4 cao **A1**

Answer: 4 (x = 4).

Question 4

divide both sides by 3 shown **M1**

x = 7/3 cao **A1**

Answer: 7/3 (x = 7/3).

Question 5

B cao **B1**

Answer: B) x = 5

Question 6

add 5 to both sides shown: 4x = 16 **M1**

divide both sides by 4 shown **M1**

x = 4 cao **A1**

Answer: 4 (x = 4).

Question 7

subtract 1.5 from both sides: 2.5x = 5.0 **M1**

divide both sides by 2.5 shown **M1**

x = 2.0 (or 2 to 1 dp) cao **A1**

Answer: 2.0 (x = 2.0).

Question 8

form equation: n + 4 = 2n (student shows relationship) **M1**

rearrange to get 4 = 2n - n or equivalent **M1**

simplify to n = 4 shown **M1**

interpret and state solution with working **M1**

n = 4 cao **A1**

Answer: n = 4. (Equation n + 4 = 2n gives 4 = n so n = 4; Emma originally thought there were 4 counters.)

Question 9

collect x terms: 7x - 3x = 12 + 4 or equivalent **M1**

simplify to 4x = 16 **M1**

divide by 4 shown **M1**

x = 4 cao **A1**

Answer: 4 (x = 4).

Question 10

expand or divide both sides: 2x + 6 = 10 or x + 3 = 5 **M1**

solve to get x = 2 **M1**

substitute back shown: 2(x+3)=2(2+3)=10 **M1**

x = 2 cao with check **A1**

Answer: 2 (x = 2).

Question 11

expand and collect terms, 6y - 3 = 4y + 5 or equivalent **M1**

isolate y, 6y - 4y = 5 + 3 **M1**

y = 4 cao **A1**

Answer: 4

Question 12

substitute y = 2x + 1 into 3x + 2y = 18 shown **M1**

obtain 3x + 2(2x+1) = 18 or 3x + 4x + 2 = 18 **M1**

simplify and solve for x: 7x = 16, x = 16/7 **M1**

substitute x into y = 2x + 1 to find y **M1**

x = 16/7, y = 2*(16/7)+1 = 32/7+7/7 = 39/7 cao **A1**

Answer: x = 16/7, y = 39/7.

Question 13

expand left side: 5x - 10 = 3x + 4 **M1**

collect x terms: 5x - 3x = 4 + 10 or equivalent **M1**

simplify to 2x = 14 **M1**

divide by 2 shown **M1**

state x = 7 **M1**

substitute back shown: 5(7-2)=5*5=25 and RHS 3*7+4=21+4=25 **M1**

conclude x = 7 and solution is an integer cao **A1**

Answer: x = 7; yes, the solution is an integer.

Question 14

(a) substitute x = 2 and x = -1/3 into $3x^2$ - 5x - 2 and show each gives 0 **M1**

(a) both substitutions give 0 cao **A1**

(a) Answer: Substituting x=2 gives 3(4)-10-2=12-12=0; substituting x=-1/3 gives 3(1/9)-5(-1/3)-2 = 1/3+5/3-2 = 6/3-2 = 2-2 = 0

(b) use roots to write factors or perform factorisation to (x - 2)(3x + 1) or equivalent **M1**

(b) $3x^2$ - 5x - 2 = (x - 2)(3x + 1) cao **A1**

(b) expand to check or state factors correctly **B1**

(b) Answer: (x - 2)(3x + 1)

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Question 15

(a) multiply second equation by 3 and add to first to eliminate v or equivalent **M1**

(a) compute resulting equation, 2u + 3v + 15u - 3v = 7 + 18 **M1**

(a) u = 25/17 cao **A1**

(a) Answer: u = 25/17

(b) substitute u into one equation, e.g. 5u - v = 6 **M1**

(b) calculate v = 5u - 6 with u = 25/17 leading to v = 125/17 - 102/17 **M1**

(b) v = 23/17 cao **A1**

(b) Answer: v = 23/17

Question 16

(a) subtract 3/(x-2) from both sides or combine fractions over common denominator **M1**

(a) get 4/(x-2) - 3/(x-2) + 1 = 0 leading to 1/(x-2) + 1 = 0 **M1**

(a) x = 1 cao **A1**

(a) Answer: x = 1

(b) identify x = 2 is not allowed because denominator x - 2 = 0 **B1**

(b) state that x = 2 would make left and right expressions undefined **B1**

(b) x = 2 not allowed cao **A1**

(b) Answer: x = 2 is not allowed because it makes the denominator zero.

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