School Name
Mathematics Test 2017

Year 9

Linear Equations

Non Calculator

Skills and Knowledge Assessed:

- Substitute values into formulas to determine an unknown (ACMNA234)
- Solve problems involving linear equations, including those derived from formulas (ACMNA235)
- Solve linear inequalities and graph their solutions on a number line (ACMNA236)
- Solve linear equations involving simple algebraic fractions (ACMNA240)

Name_____

Section 1 Short Answer Section

Write all working and answers in the spaces provided on this test paper.

1. Solve $4x - 7 = 13$.

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2. Solve $7a = 20 - 3a$.

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3. Find the value of m for which $\frac{m}{5} + 4 = 7$.

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4. Solve $5(2x - 4) = 10$.

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5. Given the formula $m = \frac{a^2 + b}{2}$, find the value of m when $a = 3$ and $b = 15$.

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6. Solve $3s - 10 = 15 - 2s$.

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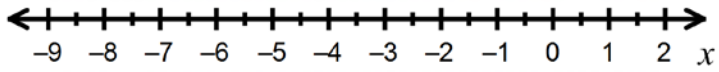
7. Sketch the inequality $x \geq -5$ on the number line below.



8. Using the formula $w = \frac{am}{4} + t$ find the value of m, when $w = 25$, $a = 3$ and $t = 19$.

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9. Determine whether $y = 2$ is a solution to the equation $25 - 2y = 3(y + 5)$.
Show the working that you use to decide on your answer.

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10. Solve $\frac{3a + 18}{5} = 3$.

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11. Solve $30 - 2p = 3(p - 5)$.

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12. Solve $\frac{4e}{3} - 2 = e + 3$.

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13. Given the formula $s = \frac{t}{2}(u + v)$, find the value of u when $s = 24$, $t = 5$ and $v = 6$.

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14. Solve the inequality $3x + 12 \leq x + 4$.

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15. Solve $\frac{15}{k} + 9 = 7 - \frac{3}{2k}$.

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School Name
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Calculator Allowed

Year 9

Linear Equations

Name_____

Section 2 Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.

1. Solve $\frac{c}{4} - 5 = 3$.

   A. $c = -8$ B. $c = -\frac{1}{2}$ C. $c = 2$ D. $c = 32$

2. For what value of k is $8k + 55 = 3k$?

   A. $k = -11$ B. $k = -5$ C. $k = -1$ D. $k = 5$

3. Which is the first incorrect line in the following solution?

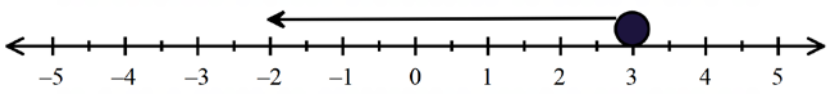
$$\begin{aligned} 7(m-2) &= -35 \\ 7m - 14 &= -35 \quad \text{..... Line 1} \\ 7m &= -35 - 14 \quad \text{..... Line 2} \\ 7m &= -49 \quad \text{..... Line 3} \\ p &= \frac{-49}{7} = -7 \quad \text{..... Line 4} \end{aligned}$$

   A. Line 1 B. Line 2 C. Line 3 D. Line 4

4. Use the formula $s = ut + \frac{1}{2}at^2$ to find the value of s when $u = 6$, $a = 10$ and $t = 5$.

   A. 95 B. 155 C. 185 D. 655

5. Which inequation describes the graph below?



A. $x \geq 3$ B. $x > 3$ C. $x \leq 3$ D. $x < 3$

6. Solve $\frac{4w}{5} + 1 = 3$.

A. $w = 2\frac{1}{2}$ B. $w = 3$ C. $w = 3\frac{1}{2}$ D. $w = 5$

7. Solve $5x - 25 \geq 2x + 2$.

A. $x \geq -9$ B. $x \leq -9$ C. $x \geq 7\frac{2}{3}$ D. $x \geq 9$

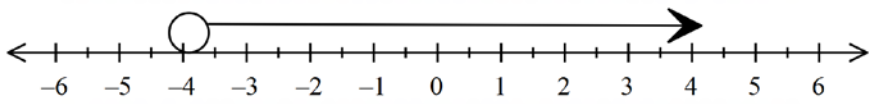
8. To test if $z = 6$ is the correct solution to the equation $2z + 4 = 3z - 2$, Jason completes the following 4 steps.

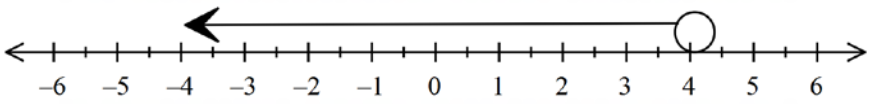
Substitute $z = 6$ ..... ①
LHS $= 2(6) + 4 = 16$..... ②
RHS $= 3(6) - 2 = 15$..... ③
$\therefore$ $z = 6$ is not a solution..... ④

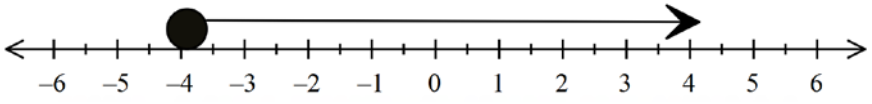
In which step did he first make an error?

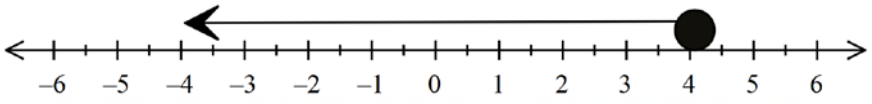
A. Step ①
B. Step ②
C. Step ③
D. Step ④

9. Which number line graph gives the solution to $14 + 3x < 26$?

A. 

B. 

C. 

D. 

10. Use the formula $A = \frac{h}{2}(a + b)$ to find the value of b, when $A = 228$, $h = 6$ and $a = 20$.

A. $b = 28$ B. $b = 42$ C. $b = 56$ D. $b = 112$

11. Use the formula $J = \sigma(E + vB)$ to find the value of B when $J = 3020$, $\sigma = 50$, $E = 6.4$ and $v = 12$.

A. $B = 4.5$ B. $B = 9$ C. $B = 112.5$ D. $B = 225$

12. Solve $7x - 3 \leq 5x + 8$.

A. $x \leq -5\frac{1}{2}$ B. $x \leq 2\frac{1}{2}$ C. $x \leq 5\frac{1}{2}$ D. $x \leq 7\frac{1}{2}$

13. Using the formula $v^2 = u^2 + 2as$ find the value of u when $v = -6$, $a = 3$ and $s = 6$.

A. $-\sqrt{72}$ B. 0 C. 6 D. $\sqrt{72}$

14. Solve $\frac{g}{3} - 3 = 2g + 5$.

A. $g = -4.8$ B. $g = -2.4$ C. $g = 2.4$ D. $g = 9.6$

15. Solve $3x + 8 \leq 7x - 12$.

A. $x \leq 1$ B. $x \geq 1$ C. $x \leq 5$ D. $x \geq 5$

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Linear Equations

Calculator Allowed

Name_____

Section 3 Longer Answer Section

Write all working and answers in the spaces provided on this test paper.

Marks

1. (a) Solve : $12P - 7 = 65$ **2**

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(b) Solve : $\frac{5c}{4} - 3 = 7$. **2**

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(c) Solve : $12a - 7 = 9a + 11$. **2**

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Marks

(d) Use the formula $A = \pi(R^2 - r^2)$ to find the value of A when $\pi = 3.14$, $R = 13$ and $r = 6$. **2**

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2. (a) Solve: $3(3a - 2) = 12 - a$. **3**

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(b) Solve and graph the solution to $9(x - 1) < 36.$. **3**

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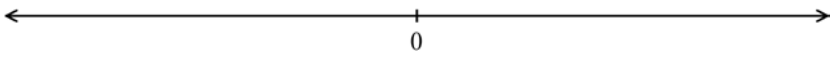

(c) Solve : $\frac{v}{4} + 1 = 15 + 2v$ **3**

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Marks

(d) Use the formula $A = \frac{h}{3}(a + 4b + c)$ to find the value of b, when $A = 190$, $h = 6$, $a = 10$ and $c = 25$. **3**

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3. (a) Solve : $\frac{5w}{4} = \frac{2w}{3} + 7$. **3**

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(b) Owen has two pieces of cable. The longer piece is 3 metres less than 4 times the length of the shorter. The sum of their lengths is 150 m.

(i) If s is the length of the shorter cable, write an expression for the length of the longer. **1**

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(ii) Write an equation and solve it to find the lengths of the two cables. **2**

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Marks

(c) Solve : $\frac{2}{d} - 6 = 4 - \frac{5}{2d}$. **3**

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(d) Solve : $\frac{4x-2}{5} - 10 \geq 2x - 3$ **3**

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Multiple Choice Answer Sheet

Linear Equations

Name _____

Completely fill the response oval representing the most correct answer.

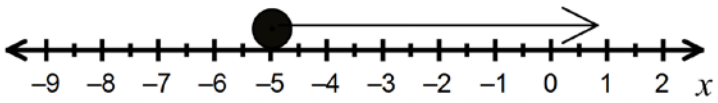
1.	A ⬭	B ⬭	C ⬭	D ⬭
2.	A ⬭	B ⬭	C ⬭	D ⬭
3.	A ⬭	B ⬭	C ⬭	D ⬭
4.	A ⬭	B ⬭	C ⬭	D ⬭
5.	A ⬭	B ⬭	C ⬭	D ⬭
6.	A ⬭	B ⬭	C ⬭	D ⬭
7.	A ⬭	B ⬭	C ⬭	D ⬭
8.	A ⬭	B ⬭	C ⬭	D ⬭
9.	A ⬭	B ⬭	C ⬭	D ⬭
10.	A ⬭	B ⬭	C ⬭	D ⬭
11.	A ⬭	B ⬭	C ⬭	D ⬭
12.	A ⬭	B ⬭	C ⬭	D ⬭
13.	A ⬭	B ⬭	C ⬭	D ⬭
14.	A ⬭	B ⬭	C ⬭	D ⬭
15.	A ⬭	B ⬭	C ⬭	D ⬭

School Name
Mathematics Test 2017

Year 9 — *Linear Equations* — Non Calculator Section

ANSWERS

Question	Working and Answer
1.	$4x - 7 = 13$ $4x = 20$ $x = \frac{20}{4}$ $\boldsymbol{x = 5}$
2.	$7a = 20 - 3a$ $7a + 3a = 20$ $10a = 20$ $a = \frac{20}{10}$ $\boldsymbol{a = 2}$
3.	$\frac{m}{5} + 4 = 7$ $\frac{m}{5} = 3$ $m = 3 \times 5$ $\boldsymbol{m = 15}$
4.	$5(2x - 4) = 10$ $10x - 20 = 10$ $10x = 30$ $x = \frac{30}{10}$ $\boldsymbol{x = 3}$.

Question	Working and Answer
5.	$m = \dfrac{a^2 + b}{2}$ $= \dfrac{3^2 + 15}{2}$ $= \dfrac{9 + 15}{2}$ $= \dfrac{24}{2}$ $\boldsymbol{m = 12}$
6.	$3s - 10 = 15 - 2s$ $5s - 10 = 15$ $5s = 25$ $s = \dfrac{25}{5}$ $\boldsymbol{s = 5}$
7.	
8.	$w = \dfrac{am}{4} + t$ $25 = \dfrac{3m}{4} + 19$ $\dfrac{3m}{4} = 6$ $3m = 24$ $m = \dfrac{24}{3}$ $\boldsymbol{m = 8}$
9.	$25 - 2y = 3(y + 5)$ Substitute $y = 2$ LHS $= 25 - 2 \times 2 = 25 - 4 = 21$ RHS $= 3(2 + 5) = 3 \times 7 = 21$ **As LHS = RHS, $y = 2$ is the solution.**
10.	$\dfrac{3a + 18}{5} = 3$ $3a + 18 = 3 \times 5$ $3a + 18 = 15$ $3a = 15 - 18$ $3a = -3$ $\boldsymbol{a = -1}$

Question	Working and Answer
11.	$30 - 2p = 3(p - 5)$ $30 - 2p = 3p - 15$ $30 = 5p - 15$ $45 = 5p$ $\boldsymbol{p = 9}$
12.	$\frac{4e}{3} - 2 = e + 3$ $\frac{4e}{3} = e + 5$ $4e = 3e + 15$ $\boldsymbol{e = 15}$
13.	$s = \frac{t}{2}(u + v)$ $24 = \frac{5}{2}(u + 6)$ $48 = 5(u + 6)$ $48 = 5u + 30$ $18 = 5u$ $u = \frac{18}{5}$ $\boldsymbol{u = 3\frac{3}{5}}$
14.	$3x + 12 \leq x + 4$ $3x \leq x + 4 - 12$ $3x \leq x - 8$ $2x \leq -8$ $\boldsymbol{x \leq -4}$
15.	$\frac{15}{k} + 9 = 7 - \frac{3}{2k}$ $2k \times \frac{15}{k} + 2k \times 9 = 2k \times 7 - 2k \times \frac{3}{2k}$ $30 + 18k = 14k - 3$ $33 + 18k = 14k$ $33 = -4k$ $k = -\frac{33}{4}$ $\boldsymbol{k = -8\frac{1}{4}}$

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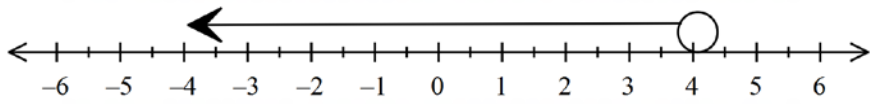
Year 9

Linear Equations

Calculator Allowed
Multiple Choice
Section

ANSWERS

Question	Working	M C Answer
1.	$\frac{c}{4} - 5 = 3.$ $\frac{c}{4} = 8$ $c = 32$	**D**
2.	$8k + 55 = 3k$ $5k + 55 = 0$ $5k = -55$ $k = -11$.	**A**
3.	Line 2 should read $7m = -35 + 14$ Which leads to a correct answer of m = –-3	**B**
4.	$s = ut + \frac{1}{2}at^2$ $s = 6 \times 5 + \frac{1}{2} \times 10 \times 5^2$ $= 30 + 125$ $= 155$	**B**
5.	Arrow to left indicates less than, and shaded circle indicates it can also be equal to, so $x \leq 3$.	**C**
6.	$\frac{4w}{5} + 1 = 3$ $\frac{4w}{5} = 2$ $4w = 10$ $w = \frac{10}{4}$ $w = 2\frac{1}{2}$	**A**

7.	$5x - 25 \geq 2x + 2$ $3x - 25 \geq 2$ $3x \geq 27$ $x \geq 9$	**D**
8.	Line ③ should be RHS $= 3(6) - 2 = 16$	**C**
9.	$14 + 3x < 26$ $3x < 12$ $x < 4$ 	**B**
10.	$A = \frac{h}{2}(a + b)$ $228 = \frac{6}{2}(20 + b)$ $228 = 3(20 + b)$ $228 = 60 + 3b$ $168 = 3b$ $b = 56$	**C**
11.	$J = \sigma(E + vB)$ $3020 = 50(6.4 + 12B)$ $3020 = 320 + 600B$ $2700 = 600B$ $B = \frac{2700}{600}$ $B = 4.5$	**A**
12.	$7x - 3 \leq 5x + 8$ $7x \leq 5x + 11$ $2x \leq 11$ $x \leq 5\frac{1}{2}$	**C**
13.	$v^2 = u^2 + 2as$ $(-6)^2 = u^2 + 2 \times 3 \times 6$ $36 = u^2 + 36$ $u^2 = 0$ $u = 0$	**B**

14.	$\frac{g}{3} - 3 = 2g + 5$ $g - 9 = 6g + 15$ $g = 6g + 24$ $-5g = 24$ $g = \frac{24}{-5}$ $g = -4.8$	**A**
15.	$3x + 8 \leq 7x - 12$ $3x \leq 7x - 20$ $-4x \leq -20$ $x \geq \frac{-20}{-4}$ $x \geq 5$	**D**

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Multiple Choice Answer Sheet

Linear Equations

Name _____

Completely fill the response oval representing the most correct answer.

1.	A ○	B ○	C ○	D ●
2.	A ●	B ○	C ○	D ○
3.	A ○	B ●	C ○	D ○
4.	A ○	B ●	C ○	D ○
5.	A ○	B ○	C ●	D ○
6.	A ●	B ○	C ○	D ○
7.	A ○	B ○	C ○	D ●
8.	A ○	B ○	C ●	D ○
9.	A ○	B ●	C ○	D ○
10.	A ○	B ○	C ●	D ○
11.	A ●	B ○	C ○	D ○
12.	A ○	B ○	C ●	D ○
13.	A ○	B ●	C ○	D ○
14.	A ●	B ○	C ○	D ○
15.	A ○	B ○	C ○	D ●

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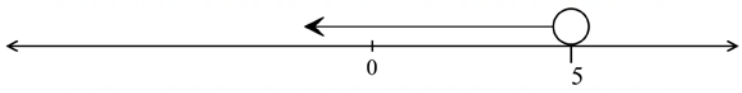
Year 9

Linear Equations

Calculator Allowed
Longer Answer Section

ANSWERS

Question	Working and Answer	Marks
1.	(a) $12P - 7 = 65$ $12P = 72$ $P = \frac{72}{12} = 6$	**2 marks for correct answer with working.** **1 mark for working with a single error.**
	(b) $\frac{5c}{4} - 3 = 7$ $\frac{5c}{4} = 10$ $5c = 40$ $c = 8$	**2 marks for correct answer with working.** **1 mark for working with a single error.**
	(c) $12a - 7 = 9a + 11$ $12a = 9a + 18$ $3a = 18$ $a = 6$	**2 marks for correct answer with working.** **1 mark for working with a single error.**
	(d) $A = \pi(R^2 - r^2)$ $= 3{\cdot}14(13^2 - 6^2)$ $= 3{\cdot}14(169 - 36)$ $= 3{\cdot}14 \times 133$ $= 417{\cdot}62$	**2 marks for correct answer with working.** **1 mark for working with a single error.**

Question	Working and Answer	Marks
2.	(a) $3(3a-2) = 12 - a$. $9a - 6 = 12 - a$ $9a = 18 - a$ $10a = 18$ $a = \frac{18}{10} = 1.8$	**3 marks for correct answer with working.** **2 marks for working with a single error in logic or calculation** **1 mark for working with some correct logic.**
	(b) $9(x - 1) < 36.$ $9x - 9 < 36$ $9x < 45$ $x < 5$ 	**3 marks for correct answer with working and correct graph.** **2 marks for working with a single error in logic or calculation or for correct answer with error in graph** **1 mark for working with some correct logic.**
	(c) $\frac{v}{4} + 1 = 15 + 2v$ $v + 4 = 60 + 8v$ $v = 56 + 8v$ $-7v = 56$ $v = \frac{56}{-7}$ $v = -8$	**3 marks for correct answer with working.** **2 marks for working with a single error in logic or calculation** **1 mark for working with some correct logic.**

Question	Working and Answer	Marks
	(d) $A = \frac{h}{3}(a + 4b + c)$ $190 = \frac{6}{3}(10 + 4b + 25)$ $190 = 2(4b + 35)$ $190 = 8b + 70$ $120 = 8b$ $b = \frac{120}{8} = 15$	**3 marks for correct answer with working.** **2 marks for working with a single error in logic or calculation** **1 mark for working with some correct logic.**
3.	(a) $\frac{5w}{4} = \frac{2w}{3} + 7$ $12 \times \frac{5w}{4} = 12 \times \frac{2w}{3} + 12 \times 7$ $15w = 8w + 84$ $7w = 84$ $w = \frac{84}{7} = 12$	**3 marks for correct answer with working.** **2 marks for working with a single error in logic or calculation** **1 mark for working with some correct logic.**
	(b) (i) shorter = s longer = $4s - 3$ (ii) $s + 4s - 3 = 150$ $5s - 3 = 150$ $5s = 153$ $s = \frac{153}{5}$ $= 30.6\ m$ Longer cable = $4(30.6) - 3$ $= 119.4\ m$ Lengths are 30.6 m and 119.4 m.	**(i) 1 mark for correct answer** **(ii) 3 marks for correct answer with working.** **2 marks for working with a single error in logic or calculation** **1 mark for working with some correct logic.**

Question	Working and Answer	Marks
	(c) $\frac{2}{d} - 6 = 4 - \frac{5}{2d}$ $2d \times \frac{2}{d} - 2d \times 6 = 2d \times 4 - 2d \times \frac{5}{2d}$ $4 - 12d = 8d - 5$ $4 = 20d - 5$ $9 = 20d$ $d = \frac{9}{20}$	**3 marks for correct answer with working.** **2 marks for working with a single error in logic or calculation** **1 mark for working with some correct logic.**
	(d) $\frac{4x-2}{5} - 10 \geq 2x - 3$ $\frac{4x-2}{5} \geq 2x + 7$ $4x - 2 \geq 10x + 35$ $-6x - 2 \geq 35$ $-6x \geq 37$ $x \leq \frac{37}{-6}$ $x \leq -6\frac{1}{6}$	**3 marks for correct answer with working.** **2 marks for working with a single error in logic or calculation** **1 mark for working with some correct logic.**