St. Patrick's High School, Keady

Mathematics Department

GCSE Mathematics Practice Booklet

M7

Topic 2 –Algebra l

Trial and Improvement

Direct Proportion

Simultaneous Equations

Changing the Subject

Inequalities

Indices

Sequences

Questions taken from CCEA Past Papers

Keady Maths

Q1 Complete the boxes

$$\frac{2xy}{3y} \times \frac{\square}{\square} = \frac{4xy^2}{9xy}$$

[2]

Q2 Simplify the following.

(a) $4y^3 \times 3y^4$

Answer _____ [1]

(b) $(m^4)^5$

Answer _____ [1]

Q3 Simplify $\frac{m^5 \times m^3}{m^2}$

Answer _____ [1]

Q4 **(a)** Simplify

(i) $12x^5 \div 3x^3$

Answer _____ [2]

(ii) $(x^3)^4$

Answer _____ [1]

Q5 Simplify each of the following.

(a) $4p^3 \times 3p^4$

Answer _____ [1]

(b) $(q^2)^3 \div q^8$

Answer _____ [1]

Q6

(a) Simplify

(i) $w^3 \times w^2$

Answer _____ [1]

(ii) $\frac{y^6}{y^2}$

Answer _____ [1]

(b) Work out the n^{th} term of the sequence

7, 14, 21, 28, 35 …

Answer _____ [1]

Q7 Rewrite $p + 8 = 6 - q$ to make q the subject.

Answer q = _____ [2]

Q8 Rewrite $3y + 1 = 5y - x$ to make x the subject.

Answer $x =$ _____ [2]

Q9 $s = ut + \frac{1}{2}at^2$

Find the value of s when $u = 80$, $a = -5$ and $t = 4$

Answer $s =$ _____ [3]

Q10 Rearrange $y = 8x + 10$ to make x the subject.

Answer _____ [2]

Q11 Make v the subject of $2s = (u + v)t$

Answer v = _____ [2]

Q12

Make m the subject of the formula $H = mr + s$

Answer m = _____ [2]

Q13

Rewrite $4 + x = 9 - y$ to make y the subject.

Give your answer in its simplest form.

Answer y = _____ [2]

Q14 Make y the subject of

$$3y - 12 = 4x$$

Answer $y =$ _____ [2]

Q15 Rearrange $v = u + at$ to make a the subject.

Answer $a =$ _____ [2]

Q16 Solve $4n + 3 > 28$

Answer _____ [2]

Q17

(a) Solve the inequality $6y + 5 \geq 2$

Answer _____ [2]

(b) Write down the smallest **integer** value of y which satisfies the inequality

$6y + 5 \geq 2$

Answer $y =$ _____ [1]

Q18

Solve

$$8x < 6x + 7$$

Answer _____ [2]

Q19 A rectangle has a length of $3x$ cm and a width of $(x + 5)$ cm.

The length is greater than the width.

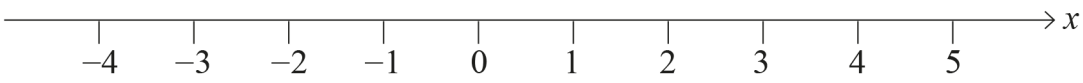
(a) Write this information as an inequality in x.

Answer _____ [1]

(b) **(i)** Solve the inequality.

Answer _____ [1]

(ii) Show your answer on the number line below.



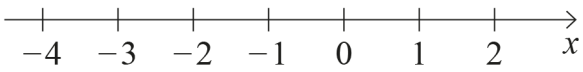
[1]

Q20

(a) Solve $2x - 1 \leq -5$

Answer _____ [2]

(b) Show your solution on the number line.



[1]

Q21

Solve

$4 < 3n \leqslant 18$ for integer n

Answer _____ [3]

Q22 List the values of the integer n which satisfy the inequality

$-7 < 3n \leqslant 6$

Answer _____ [3]

Q23 Solve the inequality $5x + 4 \leqslant 7x - 5$

Answer _____ [2]

Q24 Solve $-9 \leqslant 3y < 6$ where y is an integer.

Answer _____ [2]

Q25 Solve

$$12 - n > 4n - 3$$

Answer _____ [2]

Q26 Look at the sequence below

3 5 9 15 23 .....

(a) What is the next number?

Answer _____ [1]

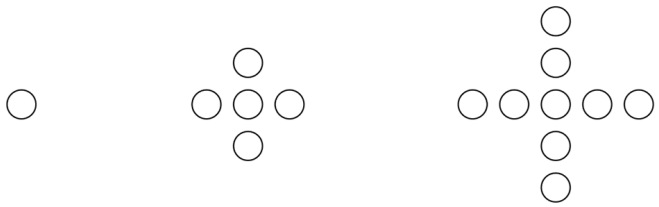
(b) Explain the rule for finding the next number each time.

Answer _____ [1]

Q27 Write down the next two terms in the sequence

23, 21, 17, 11, _____ , _____ [2]

Q28 Here is a sequence of patterns made with circles.



pattern 1 pattern 2 pattern 3

How many circles are needed for pattern 5?

Answer _____ because the rule is _____ [2]

Q29 **(a)** What is the n^{th} term for the sequence?

12, 24, 36, 48, ……

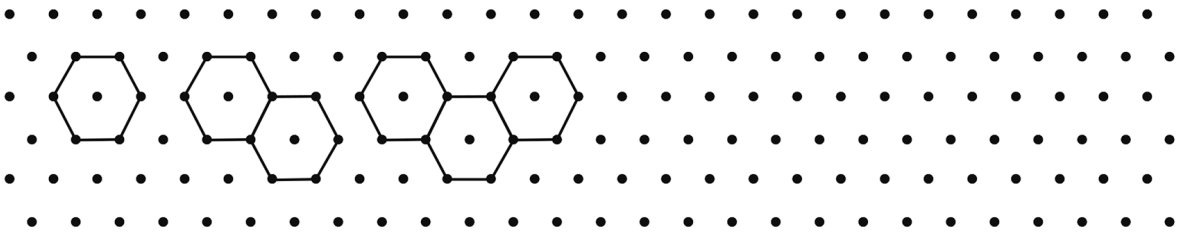
Answer _____ [1]

(b) What is the n^{th} term for the sequence?

13, 9, 5, 1, –3, ……

Answer _____ [2]

Q30 Regular hexagons of side length 1 cm are placed to form a pattern.



pattern 1 pattern 2 pattern 3 pattern 4

(a) Draw pattern 4 [1]

(b) Complete the following table.

pattern number	1	2	3	4
perimeter of shape (cm)	6	10		

[2]

(c) Describe how the perimeter of the shape changes as each new hexagon is added.

_____

_____ [1]

(d) What is the perimeter of pattern 9?

Answer _____ cm [2]

Q31 Write down the next two terms in the following sequence

18, 17, 14, 9, _____ , _____ [2]

Q32 Write down the two missing numbers in this sequence.

1, 3, 6, 10, 15, _____ , 28, _____ [2]

Q33 The first four terms of a sequence are

3, 8, 13, 18, ...

(a) Write down the n^{th} term of the sequence.

Answer _____ [2]

(b) Which term of the sequence will equal 73?

Answer _____ [1]

Q34 **(a)** Write down the next two numbers in the sequence

25 24 20 13 _____ _____ [2]

(b) Explain the rule for this sequence.

Answer _____ [2]

Q35 A sequence is formed using the rule:

"Find the next term by adding the previous two terms"

Use this rule to complete the sequences below.

(a) 1, 7, _____, _____, _____ [1]

(b) 3, −5, _____, _____, _____ [1]

(c) x, 4, _____, _____, _____ [1]

Q36

(a) Jenny writes the first six square numbers as

2, 4, 9, 16, 25, 36

Explain why she is wrong.

Answer _____ [1]

(b) Part of the sequence of triangular numbers is shown.

… 21, 28, 36, 45, 55, 66 …

(i) Which triangular number comes directly before 21?

Answer _____ [1]

(ii) Write down the smallest triangular number which is greater than 100

Answer _____ [1]

Q37

Work out the n^{th} term of the sequence 6, 3, 0, −3, ...

Answer _____ [2]

Q38

(a) Fill in the next two terms of this sequence.

14, 13, 11, 8, ☐, ☐ [2]

(b) Write down the name of the numbers in the sequence below.

1, 8, 27, 64, ...

Answer _____ [1]

Q39

Find the *n*th term of the sequence

7, 4, 1, –2, ...

Answer *n*th term = _____ [2]

Q40 Cathy is working on a sequence:

4, 9, 14, 19, ____

She continues this sequence for a few more terms and spots a pattern.

She uses the pattern to predict correctly what the **last digit** is in the 30th term.

What is the last digit?

Answer _____ [1]

Q41 The first four terms of a sequence are

2 7 12 17

Write down an expression for the n^{th} term of the sequence.

Answer _____ [2]

Q42

Each new number in a sequence is found using the rule

multiply the previous number by 3 and then subtract 5

Find the next two numbers in this sequence.

2 , _____ , _____

[2]

Q43

The first three terms of a sequence are 1, 5 and 13

The rule is “add the next multiple of 4”

Find the next two terms in this sequence.

1 5 13 _____ _____ [2]

Q44

A sequence has n^{th} term $n^2 + 4$

(a) Write down the first 3 terms of the sequence.

Answer _____ , _____ , _____ [2]

(b) Here are three sequences

$n^3 + 2$ $3n + 1$ $4n - 1$

The number 13 is a term in one of these. Which one?
Explain your answer clearly.

Answer _____

because _____

_____ [2]

Q45

The first three terms of a sequence are $\frac{1}{2}, \frac{2}{3}, \frac{3}{4} \ldots$

Write down the n^{th} term.

Answer _____ [1]

Q46

A sequence is formed using the rule:

"Find the next term by adding the previous two terms"

Use this rule to complete the sequence below.

x, 4, _____, _____, _____ [1]

Q47

Find the *n*th term of the sequence

7, 4, 1, –2, ...

Answer *n*th term = _____ [2]

Q48 **(a)** The first four terms of a sequence are

$$1, \quad 4, \quad 7, \quad 10$$

What is the n^{th} term for this sequence?

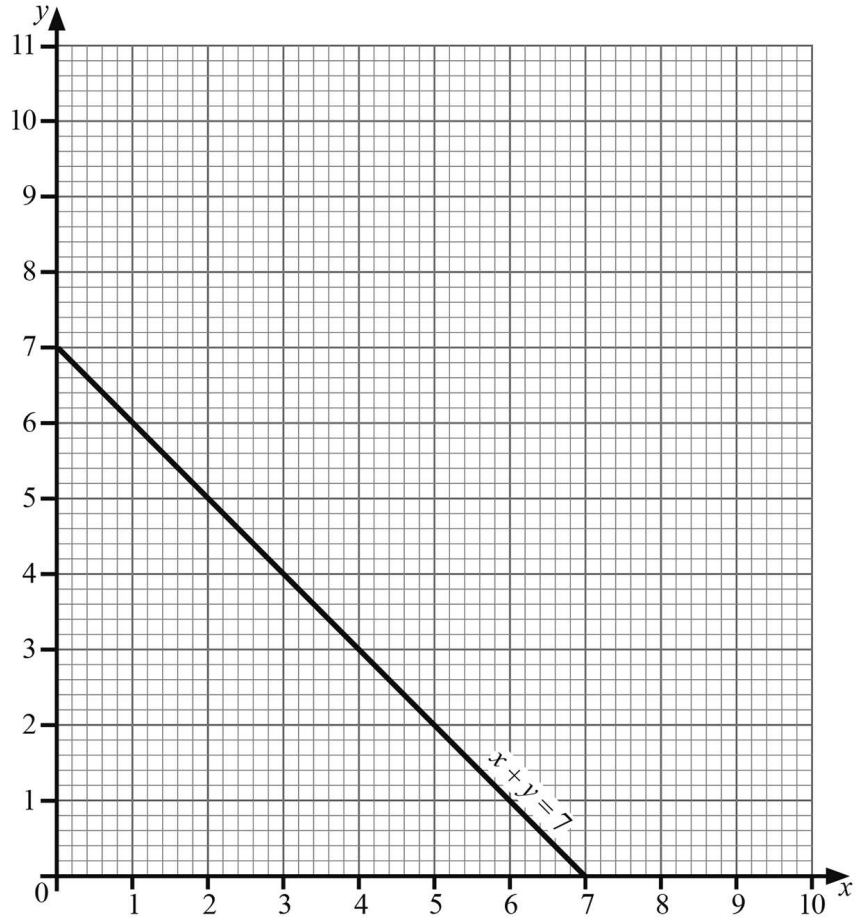
Answer _____ [2]

(b) Hence find the n^{th} term for the sequence below.

$$\frac{1}{1}, \quad \frac{4}{4}, \quad \frac{9}{7}, \quad \frac{16}{10}$$

Answer _____ [2]

Q49 The line $x + y = 7$ is shown below.



(a) On the diagram illustrate the region represented by the inequalities

$x + y \leqslant 7, \qquad y \geqslant 1, \qquad y \leqslant 5x + 1$

Mark the region with the letter R. [2]

(b) In the region R, what is the greatest value of $2x + y$?

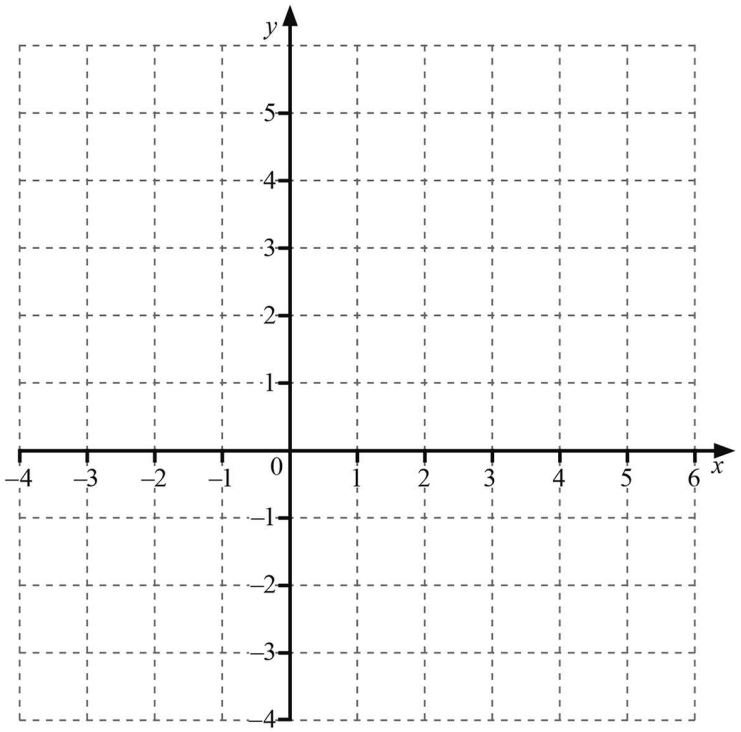
Answer _____ [2]

Q50 **(a)** On the grid below use suitable shading and the letter R to show the region represented by the inequalities

$y \geqslant 4 - 2x$

$y \geqslant 2x$

$y \leqslant 4$

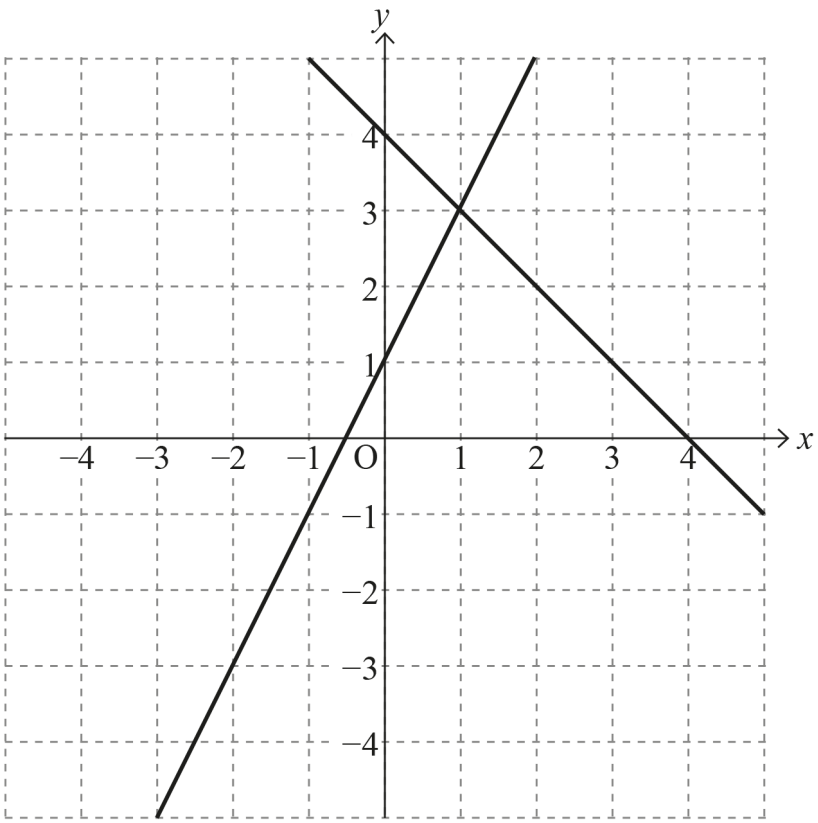


[3]

(b) In the region R, what is the maximum value of $x + y$?

Answer _____ [1]

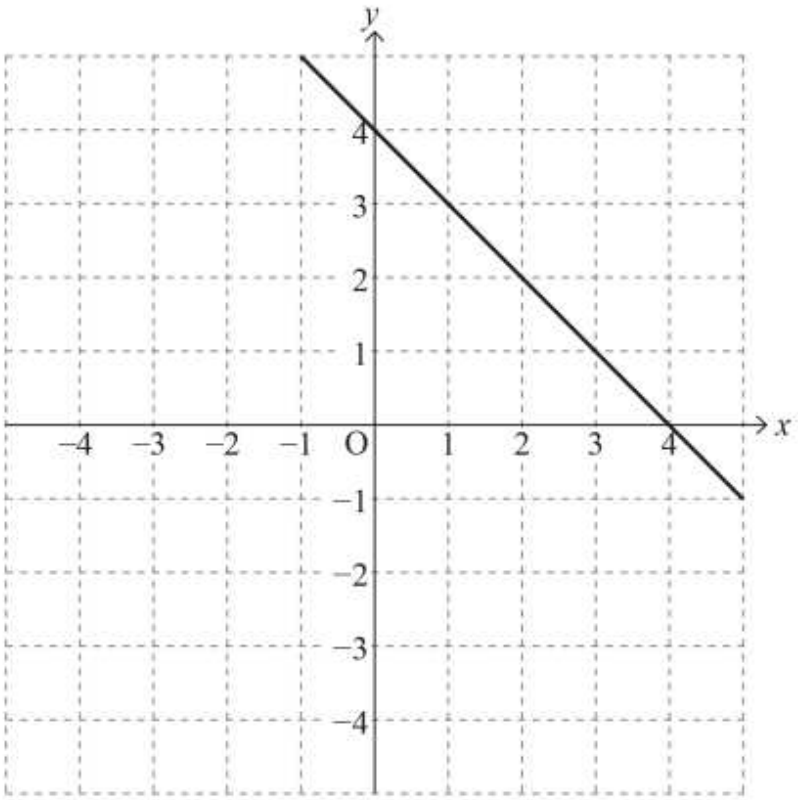
Q51 **(a)**



The lines $y = 2x + 1$ and $x + y = 4$ have been drawn on the grid.

By drawing another line on the grid above, indicate clearly by the letter R the region satisfying $y \geq 2x + 1$ and $x + y \leq 4$ and $x \geq -1$ [2]

(b)



By drawing more lines on the grid above, indicate clearly by the letter B the region satisfying $y \leq 2x$ and $x + y \leq 4$ and $y \geq 1$ [2]

Q52

Rewrite $3a - b = c(2 - a)$ to make a the subject.

Answer $a =$ _____ [3]

Q53 Rearrange $p = 2q - 5r^2t$ to make r the subject of the formula.

Answer r = _____ [3]

Q54 Rearrange $8(xy - 5) = 3y - 7x$ to make x the subject.

Answer $x =$ _____ [4]

Q55 Make n the subject of the formula $H = \frac{5 - 2n}{6 + n}$

Answer _____ [4]

Q56 Make b the subject of $3(b + 4) = a(5 - 2b)$

Answer b = _____ [4]

Q57 Make x the subject of the formula $y = \frac{b}{\sqrt{x}}$

Answer $x =$ _____ [2]

Q58 Simplify

(a) $m^3 \times m^4$

Answer _____ [1]

(b) $\frac{n^6}{n^3}$

Answer _____ [1]

(c) $\frac{r \times r^3}{r^6}$

Answer _____ [1]

Q59 Simplify each of the following.

(a) $4p^3 \times 3p^4$

Answer _____ [1]

(b) $(q^2)^3 \div q^8$

Answer _____ [1]

Q60

(a) Simplify

(i) $w^3 \times w^2$

Answer _____ [1]

(ii) $\frac{y^6}{y^2}$

Answer _____ [1]

(b) Work out the n^{th} term of the sequence

7, 14, 21, 28, 35 …

Answer _____ [1]

(c) Work out the value of

(i) 5^{-2}

Answer _____ [1]

(ii) $1^5 + 6^0$

Answer _____ [1]

Q61

The height of a balloon, h, varies directly as the square root of its surface area, A.

When the balloon's surface area is 81 its height is 12

What is its height when its surface area is 144?

Answer _____ [3]

Q62

T varies as the square of d

When $d = 0.3$, $T = 10.8$

(a) Express T in terms of d

Answer _____ [3]

(b) Find a value of d for which $T = 30$

Answer _____ [2]

Q63 Solve the simultaneous equations

$$3x - y = 7 \text{ and } 5x - 2y = 10$$

A solution by trial and improvement will not be accepted.

Answer $x =$ _____ $y =$ _____ [3]

1. $\frac{2y}{3x}$ A1 A1

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2. **(a)** $12y^7$ A1

(b) m^{20} A1

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3. m^6 A1

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4. **(a)** **(i)** $4x^2$ A1 A1

(ii) x^{12} A1

5.

(a) $12p^7$ A1

(b) $\frac{1}{q^2}$ or q^{-2} A1

6.

(a) **(i)** w^5 A1

(ii) y^4 A1

(b) 7n A1

7.

$p + q = -2$ MA1

$q = -2 - p$ MA1

8.

$x = 5y - 3y - 1$ MA1

$x = 2y - 1$ A1

9.

$s = 80 \times 4 + \frac{1}{2} \times (-5) \times 16$ MA1

$s = 320 - 40$ A1

$s = 280$ A1

10.

$y - 10 = 8x$ **or** $8x = y - 10$ A1

$\frac{y-10}{8} = x$ **or** $x = \frac{y-10}{8}$ A1

11.

$2s - ut = vt$ MA1

$v = \frac{2s - ut}{t}$ MA1

or

$\frac{2s}{t} = u + v$ MA1

$v = \frac{2s}{t} - u$ MA1

12.

$H - s = mr$ MA1

$m = \frac{H - s}{r}$ A1

13.

$4 + y = 9 - x$ A1

$y = 9 - x - 4$

$y = 5 - x$ or $y = -x + 5$ A1

14.

$3y = 4x + 12$ MA1

$y = \frac{4x + 12}{3}$ or $y = \frac{4}{3}x + 4$ A1

15.

$at = v - u$ MA1

$a = \frac{v - u}{t}$ MA1

16.

$4n > 25$ MA1

$n > \frac{25}{4}\left(6\frac{1}{4}\right)$ MA1

17.

(a) $6y \geq -3$ M1

$y \geq -\frac{1}{2}$ A1

(b) 0 A1

18.

$2x < 7$ MA1

$x < \frac{7}{2}$ or 3.5 A1

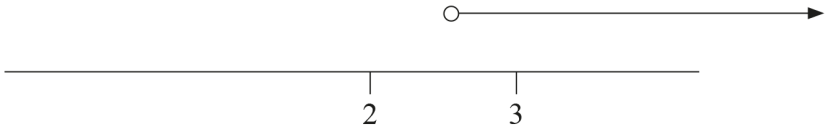
19.

(a) $3x > x + 5$ MA1

(b) **(i)** $2x > 5$

$x > 2.5$ A1

(ii) A1



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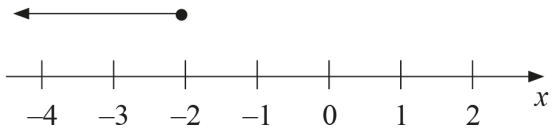
20. **(a)** $2x \leq -5 + 1$ MA1

$2x \leq -4$

$x \leq -2$ A1

(b)



A1

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21. $\frac{4}{3} < n \leq 6$ M1

2, 3, 4, 5, 6 A2

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22. $-\frac{7}{3} < n \leqslant 2$ MA1

–2, –1, 0, 1, 2 MA2

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23. $5 + 4 \leqslant 7x - 5x$ (*or* $9 \leqslant 2x$) M1

$x \geqslant 4.5$ *or* $x \geqslant 4\frac{1}{2}$ *or* $x \geqslant \frac{9}{2}$ A1

24.

$-3 \leqslant y < 2$	MA1
$-3, -2, -1, 0, 1$	A1

25.

$15 > 5n$	MA1
$n < 3$	A1

26.

(a) 33	A1
(b) add an extra 2 each time	MA1

27.

$3, -7$	A1 A1

28.

17	MA1
You add 4 each time	MA1

29.

(a) $12n$ A1

(b) $-4n + 17$ or $17 - 4n$ A1 A1

30.

(a) Correct pattern drawn A1

(b) 14 18 A1 A1

(c) The perimeter increases by 4 cm A1

(d) 38 M1 A1

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31. 2 –7 A1, A1

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32. 21, 36 A1 A1

33.

(a) $5n - 2$ A1 A1

(b) 15th A1

34.

(a) 3 – 10 A1 A1

(b) Each time you subtract 3 more than the time before A2

35.

(a) 8, 15, 23 A1

(b) –2, –7, –9 A1

(c) $x + 4$, $x + 8$, $2x + 12$ A1

36.

(a) 2 is not a square number A1

(b) **(i)** 15 A1

(ii) 105 A1

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37. $9 - 3n$ **or** $-3n + 9$ A2

(A1 for answer of $-3n$ + any constant)

38.

(a) 4 and –1 A1 A1

(b) Cube A1

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39. $-3n + 10$ A2

(A1 for $-3n + d$ for any value of d except 10)

---

40. 9 A1

41.

$5n - 3$ A2

(A1 for $5n + d,\ d \neq -3$)

42.

$2 \times 3 - 5 = 1$ MA1
$1 \times 3 - 5 = -2$ MA1

43.

1 5 13 25 41
+4 +8 +12 +16

A1 A1

44.

(a) 5, 8, 13 [A1 for any 2 correct] A2

(b) 3n + 1 A1
because $3 \times 4 + 1 = 13$ A1

Alternative solution

3n + 1 A1
because there is no n value such that $n^3 + 2 = 13$ or such that $4n - 1 = 13$ A1

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45. $\frac{n}{n+1}$ A1

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46. $x + 4, \quad x + 8, \quad 2x + 12$ A1

---

47. $-3n + 10$ A2

(A1 for $-3n + d$ for any value of d except 10)

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48. **(a)** $3n - 2$ A1 A1

Allow A1 for $3n + c (c \neq -2)$

(b) $\frac{n^2}{3n - 2}$ M1 A1

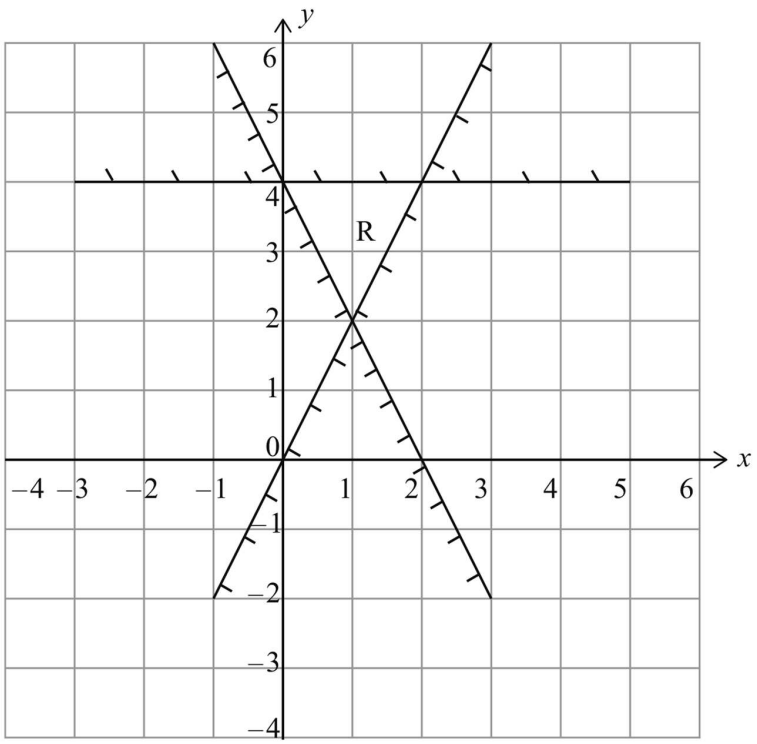
49.

(a) $y = 5x + 1$ and $y = 1$ drawn plus an attempt at shading a region MA1
Region R correct A1

(b) 13 A2
(Allow A1 for (6, 1) identified)

50.

(a)



Each line and appropriate shading MA1 MA1 MA1

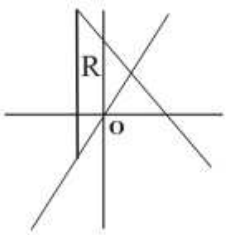
(b) 6 A1

51.

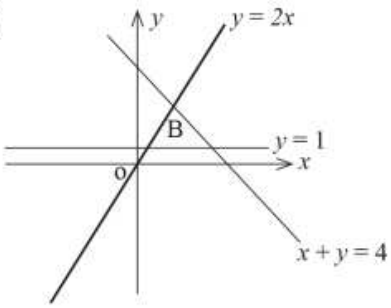
(a) line $x = -1$ drawn, correct triangle indicated MA1 A1

(b) lines $y = 2x$ and $y = 1$, correct triangle indicated MA1 A1

(a)



(b)



52.

$3a - b = 2c - ac$

$3a + ac = 2c + b$ MA1

$a(3 + c) = 2c + b$ MA1

$a = \dfrac{2c + b}{3 + c}$ A1

53.

$5r^2t = 2q - p$ C1

$r^2 = \dfrac{2q - p}{5t}$ C1

$r = \sqrt{\dfrac{2q - p}{5t}}$ C1

54.

$8xy - 40 = 3y - 7x$	MA1
$8xy + 7x = 3y + 40$	MA1
$x(8y + 7) = 3y + 40$	MA1
$x = \frac{3y + 40}{8y + 7}$	A1

55.

$6H + Hn = 5 - 2n$	MA1
$Hn + 2n = 5 - 6H$	MA1
$n(H + 2) = 5 - 6H$	MA1
$n = \frac{5 - 6H}{H + 2}$	A1

56.

$3b + 12 = 5a - 2ab$	MA1
$2ab + 3b = 5a - 12$	MA1
$b(2a + 3) = 5a - 12$	MA1
$b = \frac{5a - 12}{2a + 3}$	A1

57.

$\sqrt{x} = \frac{b}{y}$ M1

$x = \frac{b^2}{y^2}$ **or** $x = \left(\frac{b}{y}\right)^2$ A1

Alternative

$y^2 = \frac{b^2}{x}$

$xy^2 = b^2$ M1

$x = \frac{b^2}{y^2}$ A1

58.

(a) m^7 A1

(b) n^3 A1

(c) r^{-2} **or** $\frac{1}{r^2}$ A1

59.

(a) $12p^7$ A1

(b) $\frac{1}{q^2}$ or q^{-2} A1

60.

(a) **(i)** w^5 A1

(ii) y^4 A1

(b) 7n A1

(c) **(i)** $\frac{1}{25}$ or 0.04 A1

(ii) 1 + 1 = 2 A1

61.

$h = k\sqrt{A}$ M1

$12 = k\sqrt{81}$

$k = \frac{4}{3}$ A1

$h = \frac{4}{3}\sqrt{144} = 16$ A1

62.

(a) $T = kd^2$ MA1

$10.8 = 0.09k$, $k = 120$ MA1

$T = 120d^2$ A1

(b) $30 = 120d^2$ MA1

$d = 0.5$ (accept -0.5) A1

63.

$6x - 2y = 14$
$5x - 2y = 10$

$x = 4$
$y = 5$

OR

$15x - 5y = 35$
$15x - 6y = 30$

$y = 5$
$x = 4$

MA1 MA1 MA1

Q1 A solution to the equation $x^3 - 4x = 26$ lies between 3 and 4
Use trial and improvement to solve this equation.
Give your answer correct to 1 decimal place.
Show each stage of your working.

x	$x^3 - 4x$	

Answer $x =$ _____ [3]

Q2 Use the method of trial and improvement to solve the equation

$x^3 - 6x = 12$

Give your answer correct to 1 decimal place.

Show all your working.

x	$x^3 - 6x$	

Answer $x =$ _____ [4]

Q3 A solution to the equation $x^2 + 3x = 15$ lies between 2 and 3

Use trial and improvement to solve this equation.

Give your answer correct to 1 decimal place.

Show each stage of your working.

x	$x^2 + 3x$	

Answer x = _____ [3]

Q4 A solution to the equation $3x^2 + x = 67$ lies between $x = 4$ and $x = 5$
Use trial and improvement to solve this equation.
Give your answer correct to 1 decimal place.
Show all your working.

x	$3x^2 + x$	

Answer $x =$ _____ [3]

Q5 The equation $x^3 + 4x^2 = 100$ has a solution between 1 and 5
Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show all your working.

Answer $x =$ _____ [4]

Q6

(a) Show that $20x - x^3 = 1$ has a solution between 4 and 5

[1]

(b) Use Trial and Improvement to find this solution correct to 1 decimal place.

Show all your working.

Answer _____ [3]

Q7 Rewrite $3y + 1 = 5y - x$ to make x the subject.

Answer $x =$ _____ [2]

Q8 Rearrange $y = 8x + 10$ to make x the subject.

Answer _____ [2]

Q9 Look at the sequence below

3 5 9 15 23 .....

(a) What is the next number?

Answer _____ [1]

(b) Explain the rule for finding the next number each time.

Answer _____ [1]

Q10 **(a)** What is the n^{th} term for the sequence?

12, 24, 36, 48, ……

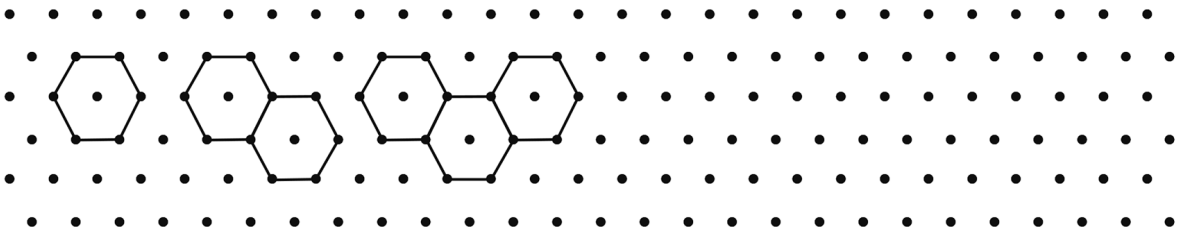
Answer _____ [1]

(b) What is the n^{th} term for the sequence?

13, 9, 5, 1, –3, ……

Answer _____ [2]

Q11 Regular hexagons of side length 1 cm are placed to form a pattern.



pattern 1 pattern 2 pattern 3 pattern 4

(a) Draw pattern 4 [1]

(b) Complete the following table.

pattern number	1	2	3	4
perimeter of shape (cm)	6	10		

[2]

(c) Describe how the perimeter of the shape changes as each new hexagon is added.

_____

_____ [1]

(d) What is the perimeter of pattern 9?

Answer _____ cm [2]

Q12

Write down the two missing numbers in this sequence.

1, 3, 6, 10, 15, _____ , 28, _____ [2]

Q13

(a) Jenny writes the first six square numbers as

2, 4, 9, 16, 25, 36

Explain why she is wrong.

Answer _____ [1]

(b) Part of the sequence of triangular numbers is shown.

… 21, 28, 36, 45, 55, 66 …

(i) Which triangular number comes directly before 21?

Answer _____ [1]

(ii) Write down the smallest triangular number which is greater than 100

Answer _____ [1]

Q14 Solve

$$4 < 3n \leqslant 18 \text{ for integer } n$$

Answer _____ [3]

Q15 Solve $4n + 3 > 28$

Answer _____ [2]

Q16 Solve the inequality $5x + 4 \leqslant 7x - 5$

Answer _____ [2]

Q17 Solve $-9 \leqslant 3y < 6$ where y is an integer.

Answer _____ [2]

Q18

Jenny's height is given as 156 cm, correct to the nearest cm.

Between what limits does Jenny's height lie?

Complete the following:

_____ $\leqslant$ Jenny's height $<$ _____ [2]

Q19

Simplify

(a) $t^3 \times t^8$

Answer _____ [1]

(b) $(t^2)^3$

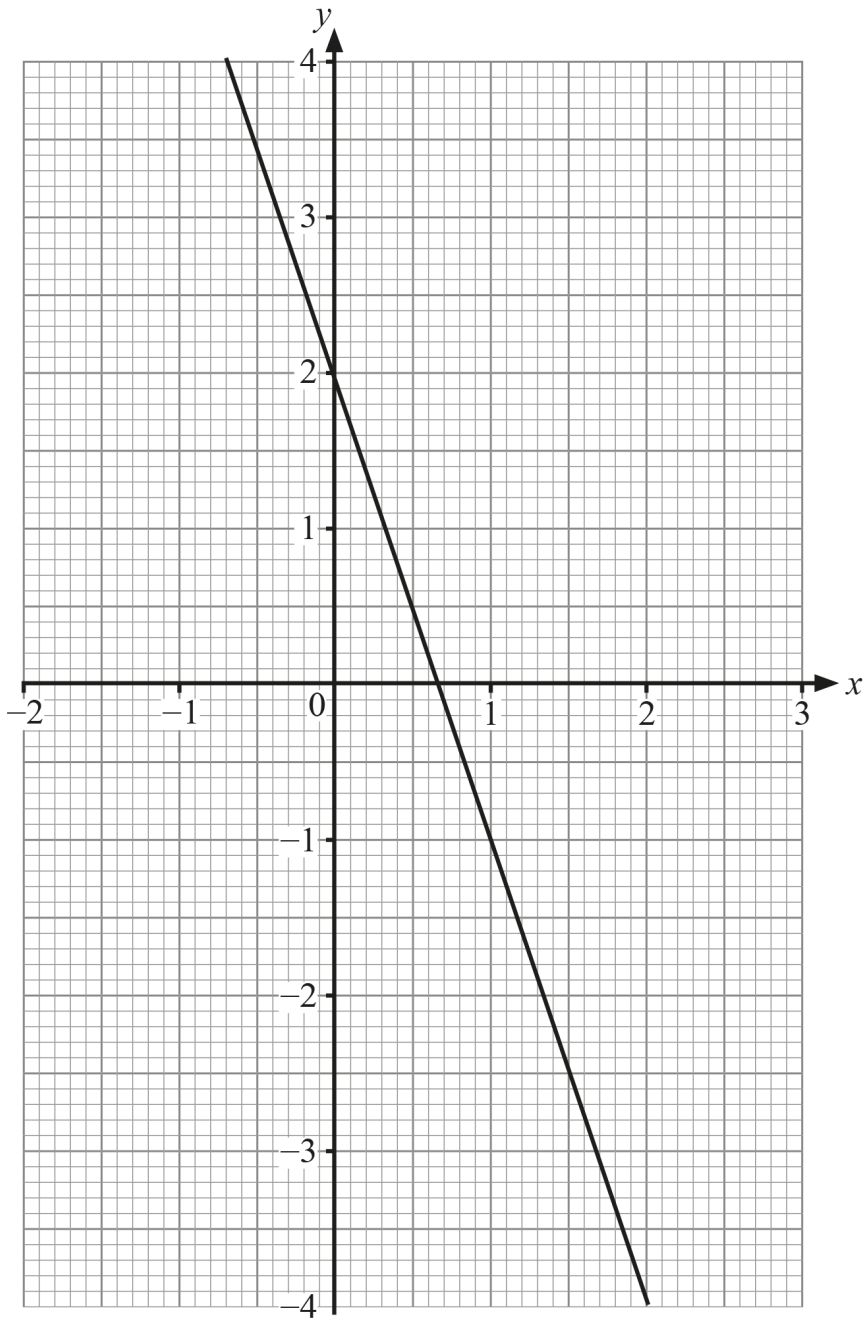
Answer _____ [1]

Q20

Simplify $(x^5)^3$

Answer _____ [1]

Q21



By drawing a suitable line on the grid opposite solve the simultaneous equations

$y = 2x - 2$

$y = -3x + 2$

Answer x = _____ y = _____ [4]

Q22 **(a)** Y is directly proportional to the cube of X.

Y = 960 when X = 4

Express Y in terms of X.

Answer _____ [2]

(b) Calculate the value of X when Y = 405

Answer _____ [2]

Q23 The time (T) of swing of a pendulum varies as the square root of the length (L) of the pendulum.

When T = 1.8 seconds the length of the pendulum is 0.81 m.

(a) Find the formula for T in terms of L.

Answer T = _____ [3]

(b) Use your formula to find T when L = 1.21 m.

Answer _____ seconds [1]

(c) Find the value of L for which the time of swing is 0.5 seconds.

Answer _____ m [1]

Q24 s is directly proportional to the square of v.

When $v = 20$, $s = 250$

Express s in terms of v.

Answer _____ [3]

Q25

T varies as the square of d

When $d = 0.3$, $T = 10.8$

(a) Express T in terms of d

Answer _____ [3]

(b) Find a value of d for which $T = 30$

Answer _____ [2]

Q26 Simplify

(a) $m^3 \times m^4$

Answer _____ [1]

(b) $\frac{n^6}{n^3}$

Answer _____ [1]

(c) $\frac{r \times r^3}{r^6}$

Answer _____ [1]

Q27 Simplify $4x^3y^5 \times 3x^2y$

Answer _____ [2]

Q28

Simplify

$t^3 \times t^8$

Answer _____ [1]

$(t^2)^3$

Answer _____ [1]

$\frac{t^{-3}}{t^2}$

Answer _____ [1]

Q29 Solve the simultaneous equations $5x + 2y = 19$
$4x - 3y = 29$

A solution by trial and improvement will not be accepted.

Answer $x =$ _____ , $y =$ _____ [4]

Q30 Solve $x - 15 = 5y$
$3x = -8y - 1$

Show all your working.
A solution by trial and improvement will not be accepted.

Answer $x =$ _____ $y =$ _____ [4]

Q31 The total weight of 5 brown and 2 white eggs was 21.6 g.

The total weight of 3 brown and 5 white eggs was 23.6 g.

Write down two simultaneous equations and solve them to find the weight of a brown egg and the weight of a white egg.

You may assume that all brown eggs have the same weight and all white eggs have the same weight.

Show all your working.

Answer Brown egg weighs_____ g

White egg weighs _____ g [5]

Q32 A bag contains 60 coins.

Each coin in the bag is either a 20p coin or a 50p coin.

The total value of the coins in the bag is £22.80

Work out how many of each coin is in the bag.

A solution by trial and improvement will not be accepted.

Answer _____ 20p coins

_____ 50p coins [5]

Q33 John earns £x per hour on Fridays and £y per hour on Saturdays.

In March he worked 20 hours on Fridays, 12 hours on Saturdays and earned £322

In April he worked 16 hours on Fridays, 10 hours on Saturdays and earned £262

Use simultaneous equations to find the values of x and y.

Answer $x =$_____

$y =$_____ [5]

Q34 The first four terms of a sequence are

3, 8, 13, 18, ...

(a) Write down the n^{th} term of the sequence.

Answer _____ [2]

(b) Which term of the sequence will equal 73?

Answer _____ [1]

1.

$x = 3.5 \rightarrow 28.875$ and	
$x = 3.4 \rightarrow 25.704$	MA1
$x = 3.45 \rightarrow 27.263625$	MA1
$x = 3.4$	MA1

2.

$3^3 - 6 \times 3 = 9$	
$4^3 - 6 \times 4 = 40$	MA1
$3.1^3 - 6 \times 3.1 = 11.191$	
$3.2^3 - 6 \times 3.2 = 13.568$	MA1
$3.15^3 - 6 \times 3.15 = 12.355875$	MA1
Ans = 3.1	A1

3.

$x = 2.6$	14.56	
$x = 2.7$	15.39	MA1
$x = 2.65$	14.9725	MA1
$x = 2.7$		A1

4.

$x = 4.5$	65.25	
$x = 4.6$	68.08	MA1
$x = 4.55$	66.6575	MA1
$x = 4.6$		A1

5.

x	$x^3 + 4x^2$	Comment
3.5	91.875	too low
3.6	98.496	too low
3.7	105.413	too high
3.65	101.917125	too high

between 3 and 4	MA1
between 3.6 and 3.7	MA1
Using 3.65	MA1
3.6	A1

---

6. **(a)** $20 \times 4 - 64 = 16$ and $20 \times 5 - 125 = -25$ MA1

(b)

x	$20x - x^3$		
4.5	–1.125	(too small)	
4.4	2.816	(too big)	MA1
4.45	0.878875	(too small)	MA1

Answer 4.4 A1

---

7. $x = 5y - 3y - 1$ MA1

$x = 2y - 1$ A1

---

8. $y - 10 = 8x$ **or** $8x = y - 10$ A1

$\frac{y-10}{8} = x$ **or** $x = \frac{y-10}{8}$ A1

---

9. **(a)** 33 A1

(b) add an extra 2 each time MA1

10.

(a) $12n$ A1

(b) $-4n + 17$ or $17 - 4n$ A1 A1

11.

(a) Correct pattern drawn A1

(b) 14 18 A1 A1

(c) The perimeter increases by 4 cm A1

(d) 38 M1 A1

12.

21, 36 A1 A1

13.

(a) 2 is not a square number A1

(b) **(i)** 15 A1

(ii) 105 A1

14.

$\frac{4}{3} < n \leq 6$ M1

2, 3, 4, 5, 6 A2

15.

$4n > 25$ MA1

$n > \frac{25}{4}\left(6\frac{1}{4}\right)$ MA1

16.

$5 + 4 \leqslant 7x - 5x$ (*or* $9 \leqslant 2x$) M1

$x \geqslant 4.5$ *or* $x \geqslant 4\frac{1}{2}$ *or* $x \geqslant \frac{9}{2}$ A1

17.

$-3 \leqslant y < 2$ MA1

$-3, -2, -1, 0, 1$ A1

18.

155.5 ⩽ Jenny's height < 156.5 A1 A1

19.

(a) t^{11} A1

(b) t^{6} A1

20.

x^{15} A1

21.

Correct line drawn M1 A1

$x = 0.8$ $y = -0.4$ A1 A1

Correct line drawn M1 A1

$x = 0.8$ $y = -0.4$ A1 A1

22.

(a) $960 = k \times 64$ MA1

$k = 15$ hence $Y = 15X^3$ MA1

(b) $\frac{405}{15} = X^3$ MA1

$X = 3$ A1

23.

(a) $T = k\sqrt{L}$ MA1

$1.8 = k\sqrt{0.81}$

$k = 2$ MA1

$T = 2\sqrt{L}$ MA1

(b) $T = 2\sqrt{1.21} = 2.2$ MA1

(c) $0.5 = 2\sqrt{L}$

$L = 0.0625\left(\frac{1}{16}\right)$ MA1

24.

$s = Kv^2$

$250 = K \times 400, K = \frac{5}{8}$ M1 A1

$s = \frac{5}{8}v^2$ A1

25.

(a) $T = kd^2$ MA1

$10.8 = 0.09k, k = 120$ MA1

$T = 120d^2$ A1

(b) $30 = 120d^2$ MA1

$d = 0.5$ (accept -0.5) A1

26.

(a) m^7 A1

(b) n^3 A1

(c) r^{-2} **or** $\frac{1}{r^2}$ A1

27.

$12x^5y^6$ A2
(A1 for 2 terms correct)

28.

(a) t^{11} A1

(b) t^6 A1

(c) t^{-5} or $\frac{1}{t^5}$ A1

29.

$15x + 6y = 57$	**or**	$20x + 8y = 76$	M1
$8x - 6y = 58$		$20x - 15y = 145$	M1
$23x = 115 \Rightarrow x = 5$		$23y = -69 \Rightarrow y = -3$	A1
$25 + 2y = 19$		$5x - 6 = 19$	
$y = -3$		$x = 5$	A1

30.

$x - 5y = 15$	
$3x + 8y = -1$	MA1
$3x - 15y = 45$	
$3x + 8y = -1$	MA1
$-23y = 46$	
$y = -2$	A1
$x = 5$	A1

31.

$5b + 2w = 21.6$			
$3b + 5w = 23.6$			MA1
$25b + 10w = 108$	or	$15b + 25w = 118$	MA1
$6b + 10w = 47.2$		$15b + 6w = 64.8$	MA1
$19b = 60.8$		$19w = 53.2$	
$b = 3.2$		$w = 2.8$	A1
$16 + 2w = 21.6$		$5b + 5.6 = 21.6$	
$w = 2.8$		$b = 3.2$	A1

32.

x 20p coins and y 50p coins

$x + y = 60$ MA1

$20x + 50y = 2280$ MA1

$2x + 5y = 228$

$2x + 2y = 120$ or $5x + 5y = 300$ M1

$3y = 108$ or $3x = 72$

$y = 36$ or $x = 24$ A1

$x = 24$ or $y = 36$ A1

(24 are 20p and 36 are 50p)

33. $20x + 12y = 322$ (Follow through all parts for numerical errors)

$16x + 10y = 262$ (both equations correct) MA1

$100x + 60y = 1610$ (1st equation × 5) MA1

$96x + 60y = 1572$ (2nd equation × 6) MA1

$4x = 38,\ x = 9.50$ (solving for x) MA1

$190 + 12y = 322 \quad y = 11$ (substituting for y) MA1

alternative (after 2 correct equations)

$80x + 48y = 1288$ (1st equation × 4) MA1

$80x + 50y = 1310$ (2nd equation × 5) MA1

$2y = 22, y = 11$ (solving for y) MA1

$20x + 132 = 322 \quad x = 9.50$ (substituting for x) MA1
Correct answers with no simultaneous equations – no marks awarded

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34. **(a)** $5n - 2$ A1 A1

(b) 15th A1
