St. Patrick's High School, Keady

Mathematics Department

GCSE Mathematics Practice Booklet

M2

Topic 2 –Algebra 1

The Language of Algebra

Expressions

Formulae

Equations

Questions taken from CCEA Past Papers

Mark Scheme included at the end of this booklet

Keady
Maths

Q1 **(a)** Simplify $h + h + h - h - h + h$

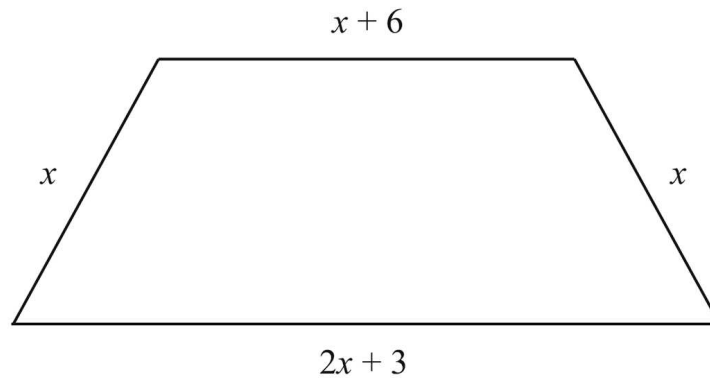Answer _____ [1]

(b) Solve $x - 5 = 13$

Answer $x =$ _____ [1]

(c) Ryan says that $8x + 2x - 10$ is an equation.
Is he correct? Explain your answer.

Answer _____ because _____

_____ [1]

Q2   **(a)** Write an expression, in terms of x, for the perimeter of the trapezium shown.

Give your answer in its simplest form.

$$x + 6$$

$$x \qquad\qquad\qquad\qquad x$$

$$2x + 3$$

Answer _____ [2]

(b) The perimeter of this trapezium is $34\,cm$.

(i) Using the perimeter, write down an equation in terms of x.

Equation _____ [1]

(ii) Solve the equation to find x.

Answer $x = $ _____ [1]

Q3

x	A	7	4	=	+	−

Use any of the letters, numbers and symbols above to write

(a) an equation,

Answer _____ [1]

(b) an expression,

Answer _____ [1]

(c) a formula.

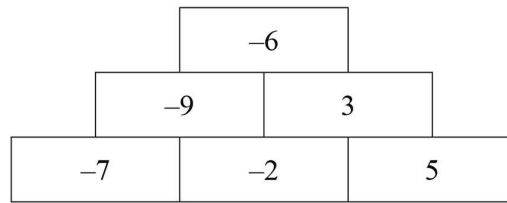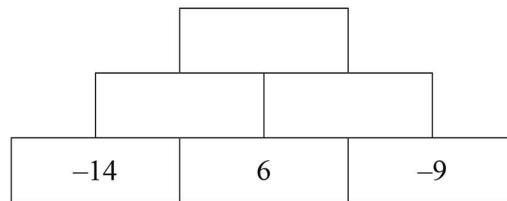Answer _____ [1]

Q4 **(a)** Here is an example of a mathematical pyramid.

To find the number in each box you **add** the two numbers in the boxes beneath it.

	−6	
−9		3
−7	−2	5

(i) Complete the following pyramid in the same way.

−14	6	−9

[2]

(ii) Here is an algebraic pyramid. Complete the top box of this pyramid.

$13a + 7b$		$9a − 4b$
$5a + 7b$	$8a$	$a − 4b$
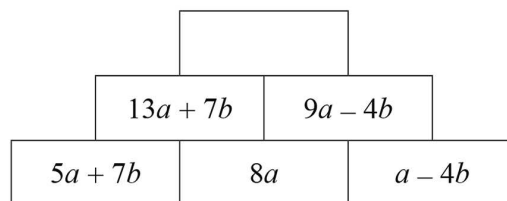
[2]

(b) Here is a different type of pyramid.

To find the number in each box you **multiply** the two numbers in the boxes beneath it.

Complete the pyramid.

	−8	
−2	4	−11
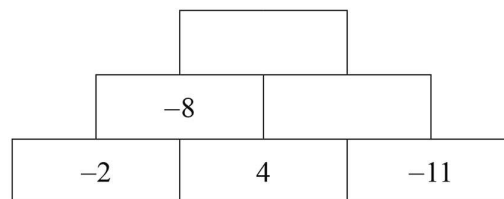
[2]

Q5   Simplify $4a + 3b - a - 5b$

Answer _____ [2]

Q6   Jill bought 3 oranges at x pence each and 4 melons at $2x$ pence each.

(a) Write down an expression for the total cost in terms of x pence.

Answer _____ [1]

(b) She got £1.04 change from £5

Write down an equation in terms of x.

Answer _____ [1]

(c) Solve the equation to find the value of x.

Answer $x =$ _____ [2]

Q7   Which of these shapes has the greatest perimeter?

Show all your working.

Shape A

$4x + 3$

$2x - 1$

Shape B

$6x$

$3x + 2$

x

$2x$
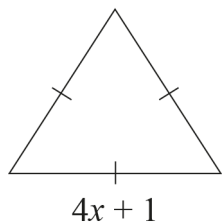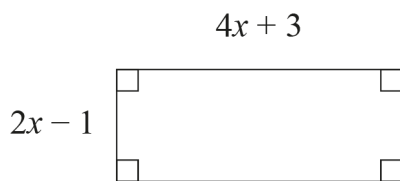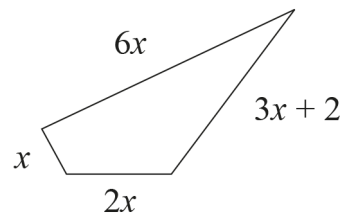
Shape C

Answer Shape _____ [4]

Q8   Simplify the expression

$$6e - 5w + 2e - 4w$$

Answer _____ [2]

Q9

(a) Multiply out $5(2t + 7)$

Answer _____ [1]

(b) Factorise $16r - 8$

Answer _____ [1]

Q10   Factorise

   (a) $8x + 12$

                                             Answer _____ [1]

   (b) $x^2 + 7x$

                                             Answer _____ [1]

_____

Q11   Expand and simplify

        $3(x + 2) - 2x$

                                             Answer _____ [2]

_____

Q12   Factorise fully each of the following:

(a) $12a + 6$

Answer _____ [1]

(b) $y^2 - 6y$

Answer _____ [1]

(c) $b + b^2$

Answer _____ [1]

Q13   Factorise $3x + 6$

Answer _____ [1]

Q14   **(a)** Multiply out $4(3t - 5)$

Answer _____ [1]

(b) Factorise $18w + 21$

Answer _____ [1]

Q15   Expand and simplify

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

Answer _____ [2]

Q16 Simplify $5a + 2b - 3a - 8b$

Answer _____ [2]

Multiply out $4(3x - 5)$

Answer _____ [2]

Solve $8x - 10 = 6x + 2$

Answer $x =$ _____ [3]

Q17 Factorise

(a) $8p + 12t$

Answer _____ [1]

(b) $r - r^2$

Answer _____ [1]

Q18 Expand and simplify $2y(3y - 7) - 8y$

Answer _____ [3]

Q19   **(a)** Use the formula P = 3Q + 7R to find P when Q = 8 and R = 3

Answer P = _____ [2]

(b) Use the formula V = 3W + 9X to find X when V = 57 and W = 7

Answer X = _____ [3]

(c) $d = \dfrac{e - f}{g}$

Calculate the value of d when $e = -8$, $f = 12$ and $g = 4$

Answer d = _____ [2]

Q20 $W = 5X - 2Y^2Z$

Work out the value of W for $X = 5$, $Y = -3$, $Z = 4$

Answer W = _____ [3]

Q21   The total cost (£) of a car service is given by the formula

Total cost = cost of parts + hours worked × 25

(a) Don pays £240 for parts and it takes five hours to service his car.

Work out the total cost of his car service.

Answer £ _____ [2]

(b) Olive's car does not need any new parts but it takes $3\frac{1}{2}$ hours to service it.

What is the total cost of Olive's car service?

Answer £ _____ [1]

(c) Explain what the 25 in the formula stands for.

Answer _____ [1]

Q22   Solve

   (a) $12 - x = 5$

Answer $x =$ _____ [1]

   (b) $8x = 24$

Answer $x =$ _____ [1]

Q23   Solve $4(x - 5) = 48$

Answer $x =$ _____ [3]

Q24 Solve

(a) $\dfrac{x}{5} = 10$

Answer $x =$ _____ [1]

(b) $2x + 5 = 12$

Answer $x =$ _____ [2]

Q25 Solve $4 + 3(2x - 5) = x + 9$

Answer $x =$ _____ [3]

Q26

(a) I think of a number, multiply it by 3 and then add 1

The answer is 28

What was the number?

Answer _____ [2]

(b) I think of a number, subtract 1 from it and then divide by 4

The answer is 3

What was the number?

Answer _____ [2]

Q27   Solve $5(3x - 2) = 7x + 4$

Answer $x =$ _____ [3]

Q28 Solve the equations

(a) $5w = 80$

Answer $w =$ _____ [1]

(b) $\frac{t}{8} = 4$

Answer $t =$ _____ [1]

(c) $30 = c + 18$

Answer $c =$ _____ [1]

(d) $9n - 2 = 52$

Answer $n =$ _____ [2]

Q29   A cinema ticket for an adult costs £t

A cinema ticket for a child costs £3

James bought four adult tickets and seven child tickets.

The total cost was £49

(a) Write down an **expression** for the cost of the four adult tickets.

Answer _____ [1]

(b) (i) Form an equation that can be solved to find the cost of an adult ticket.

Answer _____ [1]

(ii) Solve your equation to find the cost of an adult ticket.

Answer t = _____ [2]

Q30

The diagrams below show a square and an isosceles triangle.

c

$c + 3$ $c + 3$

5
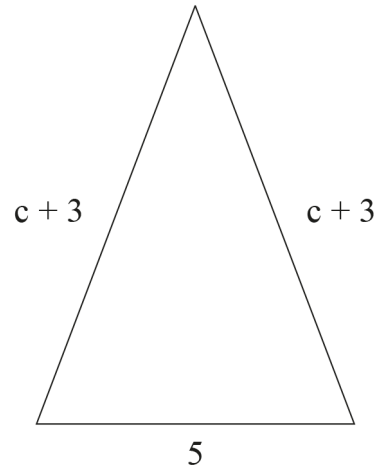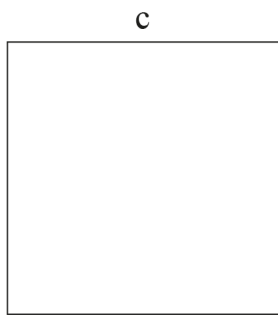
diagrams
not drawn
accurately

They have the same perimeter.

By forming and solving an equation, work out the perimeter.

Answer _____ [4]

Q31
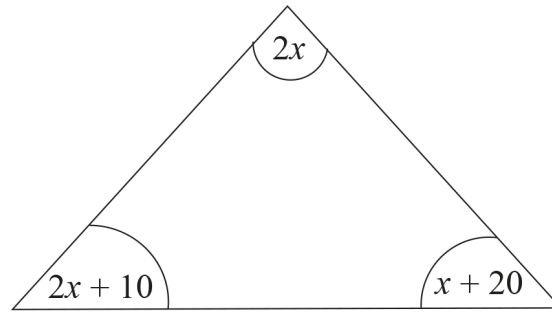
diagram
not drawn
accurately

Form and solve an equation to work out the size of the smallest angle in the triangle above.

Equation _____ [1]

Answer smallest angle = _____° [3]

1. **(a)** $2h$ A1

   (b) 18   A1

   (c) No. There is no equals sign.   A1

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2. **(a)** $2x + 3 + x + 6 + x + x$ MA1
   $5x + 9$ A1

   (b) (i) $5x + 9 = 34$ MA1

   (ii) $5x = 25$
   $x = 5$ MA1

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3. **(a)** Suitable equation   A1

   (b) Suitable expression   A1

   (c) Suitable formula   A1

4.

   (a) **(i)** $-8, -3$ A1

                -11 A1

       (ii) $22a + 3b$ A1 A1

   (b) -44 A1

        352 A1

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5. $3a - 2b$ A1, A1

6.

   (a) $3x + 8x$ or equivalent   MA1

   (b) $11x + 104 = 500$ or equivalent   MA1

   (c) $11x = 396$ MA1

        $x = 36$ MA1

7.

   $12x + 3$ MA1

   $12x + 4$ MA1

   $12x + 2$ MA1

   Shape B   A1

8.

$8e - 9w$ A1 A1

9.

(a) $10t + 35$ A1

(b) $8(2r - 1)$ A1

10.

(a) $4(2x + 3)$ MA1

(b) $x(x + 7)$ MA1

11.

$3x + 6 - 2x$ M1
$x + 6$ A1

12.

    (a) $6(2a + 1)$ A1

    (b) $y(y - 6)$ A1

    (c) $b(1 + b)$ A1

13.

    $3(x + 2)$ A1

14.

    (a) $12t - 20$ A1

    (b) $3(6w + 7)$ A1

15.

    $8x - 12 - 2x + 10$ MA1

    $= 6x - 2$ MA1

16.

    (a) $2a - 6b$ A1 A1

    (b) $12x - 20$ A1 A1

    (c) $8x - 6x = 2 + 10$ MA1

            $2x = 12$ MA1

            $x = 6$ MA1

17.

    (a) $4(2p + 3t)$ A1

    (b) $r(1 - r)$ A1

18.

  $6y^2 - 14y - 8y$ MA1 MA1

  $6y^2 - 22y$ MA1

19.

    (a) $24 + 21$ MA1
        45   A1

    (b) $57 = 21 + 9X$ MA1
        $9X = 36$ MA1
        $X = 4$ MA1

    (c) $\dfrac{-20}{4}$ MA1

        -5 A1

20.

    $25 - 2 \times 9 \times 4$ MA1

    $25 - 72$ A1

    -47 A1

21.

    (a) $240 + 5 \times 25$ MA1
        365   A1

    (b) 87.50   A1

    (c) cost of one hour's work or similar   A1

22.

    (a) 7   A1

    (b) 3   A1

23.

    $4x - 20 = 48$ MA1

       $4x = 68$ MA1

        $x = 17$ A1

    or

      $x - 5 = 12$ MA2

        $x = 17$ A1

24.

    (a) 50   A1

    (b) $2x = 7$ MA1

        $x = \dfrac{7}{2}$ or 3.5   A1

25.
$$4 + 6x - 15 = x + 9$$ MA1
$$6x - x = 9 - 4 + 15$$
$$5x = 20$$ MA1
$$x = 4$$ MA1

26.

(a) $28 - 1 = 27$ $\dfrac{27}{3} = 9$ A1 A1

(b) $3 \times 4 = 12$ $12 + 1 = 13$ A1 A1

27.

$$15x - 10 = 7x + 4$$ MA1

$$15x - 7x = 4 + 10$$

$$8x = 14$$ MA1

$$x = \frac{14}{8} \ \text{or} \ 1\frac{3}{4}$$ MA1

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28.

   (a) 16   A1

   (b) 32   A1

   (c) 12   A1

   (d) $9n = 54$ MA1
         6   A1

29.

   (a) $4t$ A1

   (b) (i) $4t + 21 = 49$ (or similar, accept $4t = 28$ but not $t = 7$)   A1

       (ii) $4t = 28$ MA1
            7   A1

30.

   $4c = 2c + 11$ MA1
   $2c = 11$ MA1
   $c = 5.5$ A1
   22   A1

31.

$2x + 10 + 2x + x + 20 = 180$ M1

$5x = 150$ MA1

$x = 30$ MA1

Smallest angle = 50   A1