1 - (0580-S 2017-Paper 2 (Extended)/1-Q1) - *INDICES*

Simplify.

$(x^2)^5$

..... [1]

2 - (0580-S 2017-Paper 2 (Extended)/3-Q2) - *FACTORISING*

Factorise completely.

$4x^2 - 8xy$

..... [2]

3 - (0580-S 2017-Paper 2 (Extended)/3-Q4) - *CHANGING THE SUBJECT*

Make a the subject of the formula.

$x = y + \sqrt{a}$

$a =$ ..... [2]

4 - (0580-S 2017-Paper 2 (Extended)/1-Q5) - *FACTORISING*

Factorise completely.

$12n^2 - 4mn$

..... [2]

5 - (0580-S 2017-Paper 2 (Extended)/1-Q6) - *INDICES*

(a) $2^r = \frac{1}{16}$

Find the value of r.

$r =$ ..... [1]

(b) $3^t = \sqrt[5]{3}$

Find the value of t.

$t =$ ..... [1]

6 - (0580-S 2017-Paper 2 (Extended)/2-Q6) - *FACTORISING*

Factorise.

$14x - 21y$

..... [1]

7 - (0580-S 2017-Paper 2 (Extended)/2-Q7) - *FORMULAEE*

Find the value of $5a - 3b$ when $a = 7$ and $b = -2$.

..... [2]

8 - (0580-S 2017-Paper 2 (Extended)/3-Q7) - *VARIATION*

y is inversely proportional to x^2.
When $x = 2$, $y = 8$.

Find y in terms of x.

$y =$ ..... [2]

9 - (0580-S 2017-Paper 2 (Extended)/3-Q8) - *INDICES*

Simplify.

$$\left(\frac{8}{a^{12}}\right)^{\frac{1}{3}}$$

..... [2]

10 - (0580-S 2017-Paper 2 (Extended)/1-Q9) - *VARIATION*

h is directly proportional to the square root of p.
$h = 5.4$ when $p = 1.44$.

Find h when $p = 2.89$.

$h =$ ..... [3]

11 - (0580-S 2017-Paper 2 (Extended)/2-Q10) - *LINEAR EQUAETION*

Solve.

$$2-x=5x+1$$

$x =$ ..... [2]

12 - (0580-S 2017-Paper 2 (Extended)/2-Q13) - *SOLVING INEQUALITIES*

Solve the inequality.

$$3n-11>5n-18$$

..... [2]

13 - (0580-S 2017-Paper 2 (Extended)/2-Q14) - *INDICES*

Work out.

(a) $125^{\frac{2}{3}}$

..... [1]

(b) $\left(\frac{1}{3}\right)^{-2}$

..... [1]

14 - (0580-S 2017-Paper 2 (Extended)/2-Q15) - *CHANGING THE SUBJECT*

Make q the subject of the formula $p = 2q^2$.

$q =$ ..... [2]

15 - (0580-S 2017-Paper 2 (Extended)/3-Q16) - *SOLVING INEQUALITIES*

(a) Solve the inequality.

$$x + 13 \geqslant 3x + 7$$

..... [2]

(b) List the positive integers that satisfy the inequality in **part (a)**.

..... [1]

16 - (0580-S 2017-Paper 2 (Extended)/2-Q21) - *VARIATION*

y is inversely proportional to $\sqrt{1+x}$.
When $x = 8$, $y = 2$.

Find y when $x = 15$.

$y =$ ..... [3]

17 - (0580-S 2017-Paper 2 (Extended)/3-Q21) - *QUADRATIC EQUATIONS*

Solve the equation $5x^2 + 10x + 2 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

18 - (0580-S 2017-Paper 2 (Extended)/1-Q22) - *FACTORISING*

Write as a single fraction in its simplest form.

(a) $\frac{x^2-3x}{x^2-9}$

..... [3]

(b) $\frac{3}{x-4}+\frac{2}{2x+5}$

..... [3]

19 - (0580-S 2017-Paper 2 (Extended)/2-Q22) - *FACTORISING*

Factorise completely.

(a) $9t^2 - u^2$

..... [2]

(b) $2c - 4d - pc + 2pd$

..... [2]

20 - (0580-S 2017-Paper 2 (Extended)/3-Q23) - *BRACKETS AND SYMPLIFYING*

(a) Simplify.

$$\frac{4(x-6)^2}{(x-6)}$$

..... [1]

(b) Expand the brackets and simplify.

$$(x+4)^2 + 5(3x+2)$$

..... [3]

21 - (0580-S 2017-Paper 2 (Extended)/2-Q25) - *INDICES*

(a) Simplify. $(16x^{16})^{\frac{3}{4}}$

..... [2]

(b) $2p^{\frac{3}{2}} = 54$

Find the value of p.

$p =$ ..... [2]

22 - (0580-W 2017-Paper 2 (Extended)/1-Q2) - *INDICES*

Work out.

$2^{-4} \times 2^5$

..... [1]

23 - (0580-W 2017-Paper 2 (Extended)/1-Q5) - *FACTORISING*

Factorise completely.

$12x^2 + 15xy - 9x$

..... [2]

24 - (0580-W 2017-Paper 2 (Extended)/2-Q12) - *BRACKETS AND SYMPLIFYING*

Expand the brackets and simplify.

$(5 - n)(3 + n)$

..... [2]

25 - (0580-W 2017-Paper 2 (Extended)/1-Q13) - *INDICES*

Simplify.

(a) $(m^5)^2$

..... [1]

(b) $4x^3y \times 5x^2y$

..... [2]

26 - (0580-W 2017-Paper 2 (Extended)/2-Q14) - *SOLVING INEQUALITIES*

Find the integers which satisfy the inequality.

$$-5 < 2n - 1 \leqslant 5$$

..... [3]

27 - (0580-W 2017-Paper 2 (Extended)/2-Q15) - *BRACKETS AND SYMPLIFYING*

Write as a single fraction in its simplest form.

$$\frac{x+1}{x} - \frac{y-1}{y}$$

..... [3]

28 - (0580-W 2017-Paper 2 (Extended)/1-Q17) - *VARIATION*

y is inversely proportional to $(x+1)^2$.
$y = 50$ when $x = 0.2$.

(a) Write y in terms of x.

$y =$ ..... [2]

(b) Find the value of y when $x = 0.5$.

$y =$ ..... [1]

29 - (0580-W 2017-Paper 2 (Extended)/2-Q18) - *SIMULTANEOUS EQUATIONS*

Solve the simultaneous equations.
You must show all your working.

$$y = \frac{x}{2}$$
$$2x - y = 1$$

$x =$ .....

$y =$ ..... [3]

30 - (0580-W 2017-Paper 2 (Extended)/1-Q19) - *BRACKETS AND SYMPLIFYING*

Write as a single fraction in its simplest form.

$$\frac{5}{x-3}+\frac{3}{x+7}+\frac{1}{2}$$

..... [4]

31 - (0580-W 2017-Paper 2 (Extended)/2-Q19) - *CHANGING THE SUBJECT*

Make x the subject of the formula.

$$y=\sqrt{x^2+1}$$

$x =$ ..... [3]

32 - (0580-W 2017-Paper 2 (Extended)/2-Q24) - *LINEAR EQUAETION*

Solve the equations.

(a) $7-3n=11n+2$

$n =$ ..... [2]

(b) $\frac{p-3}{5}=3$

$p =$ ..... [2]

33 - (0580-W 2017-Paper 2 (Extended)/2-Q25) - *FACTORISING*

Factorise completely.

(a) $x^2-x-132$

..... [2]

(b) x^3-4x

..... [2]

34 - (0580-W 2017-Paper 2 (Extended)/2-Q27) - *INDICES*

Simplify.

(a) $81^{\frac{3}{4}}$

..... [1]

(b) $x^{\frac{2}{3}} \div x^{-\frac{4}{3}}$

..... [1]

(c) $\left(\frac{8}{y^6}\right)^{-\frac{1}{3}}$

..... [2]

35 - (0580-S 2018-Paper 2 (Extended)/2-Q2) - *BRACKETS AND SYMPLIFYING*

Expand.

$7(x-8)$

..... [1]

36 - (0580-S 2018-Paper 2 (Extended)/3-Q2) - *FACTORISING*

Factorise.

$w+w^3$

..... [1]

37 - (0580-S 2018-Paper 2 (Extended)/1-Q4) - *FORMULAEE*

Find the value of $7x+3y$ when $x=12$ and $y=-6$.

..... [2]

38 - (0580-S 2018-Paper 2 (Extended)/2-Q4) - *LINEAR EQUAETION*

Complete these statements.

(a) When $w =$ ..... , $10w = 70$. [1]

(b) When $5x = 15$, $12x =$ ..... [1]

39 - (0580-S 2018-Paper 2 (Extended)/1-Q8) - *BRACKETS AND SYMPLIFYING*

Expand and simplify.

$$6(2y - 3) - 5(y + 1)$$

..... [2]

40 - (0580-S 2018-Paper 2 (Extended)/1-Q9) - *INDICES*

$$3^{-q} \times \frac{1}{27} = 81$$

Find the value of q.

$q =$ ..... [2]

41 - (0580-S 2018-Paper 2 (Extended)/3-Q9) - *LINEAR EQUAETION*

Solve.

$$\frac{1-p}{3} = 4$$

$p =$ ..... [2]

42 - (0580-S 2018-Paper 2 (Extended)/2-Q10) - *FACTORISING*

Factorise completely.

$$xy + 2y + 3x + 6$$

..... [2]

43 - (0580-S 2018-Paper 2 (Extended)/3-Q10) - *FACTORISING*

Factorise completely.

$$2a+4b-ax-2bx$$

..... [2]

44 - (0580-S 2018-Paper 2 (Extended)/1-Q11) - *INDICES*

Find the exact value of $8^{\frac{2}{3}} \times 49^{-\frac{1}{2}}$.

..... [2]

45 - (0580-S 2018-Paper 2 (Extended)/3-Q11) - *CHANGING THE SUBJECT*

$$A = (2\pi + y)x^2$$

Rearrange the formula to make x the subject.

$x =$ ..... [2]

46 - (0580-S 2018-Paper 2 (Extended)/1-Q12) - *SOLVING INEQUALITIES*

Solve the inequality.

$$3n - 5 > 17 + 8n$$

..... [2]

47 - (0580-S 2018-Paper 2 (Extended)/3-Q13) - *BRACKETS AND SYMPLIFYING*

Simplify.

$$\frac{3+x}{9-x^2}$$

..... [2]

48 - (0580-S 2018-Paper 2 (Extended)/1-Q15) - *VARIATION*

y is directly proportional to $(x-1)^2$.
When $x = 5$, $y = 4$.

Find y when $x = 7$.

$y =$ ..... [3]

49 - (0580-S 2018-Paper 2 (Extended)/3-Q17) - *INDICES*

(a) Find the value of $\left(\frac{1}{81}\right)^{-\frac{3}{4}}$.

..... [1]

(b) Simplify. $\sqrt[3]{27t^{27}}$

..... [2]

50 - (0580-S 2018-Paper 2 (Extended)/2-Q18) - *VARIATION*

A ball falls d metres in t seconds.
d is directly proportional to the square of t.
The ball falls 44.1 m in 3 seconds.

(a) Find a formula for d in terms of t.

$d =$ ..... [2]

(b) Calculate the distance the ball falls in 2 seconds.

..... m [1]

51 - (0580-S 2018-Paper 2 (Extended)/3-Q18) - *BRACKETS AND SYMPLIFYING*

Expand the brackets and simplify.

$$(2p+3)(3p-2)$$

..... [3]

52 - (0580-S 2018-Paper 2 (Extended)/3-Q19) - *VARIATION*

y is directly proportional to $(x-1)^2$.
When $x = 3$, $y = 24$.

Find y when $x = 6$.

$y =$ ..... [3]

53 - (0580-W 2018-Paper 2 (Extended)/3-Q2) - *FACTORISING*

Factorise.

$$y - 2y^2$$

..... [1]

54 - (0580-W 2018-Paper 2 (Extended)/2-Q3) - *INDICES*

Calculate $0.125^{-\frac{2}{3}}$.

..... [1]

55 - (0580-W 2018-Paper 2 (Extended)/2-Q4) - *BRACKETS AND SYMPLIFYING*

Expand.

$$2x(3 - x^2)$$

..... [2]

56 - (0580-W 2018-Paper 2 (Extended)/1-Q5) - *BRACKETS AND SYMPLIFYING*

Expand and simplify.

$$(3x - 7)(2x + 9)$$

..... [2]

57 - (0580-W 2018-Paper 2 (Extended)/3-Q5) - *INDICES*

Work out. $\left(\frac{125}{27}\right)^{-\frac{2}{3}}$

..... [1]

58 - (0580-W 2018-Paper 2 (Extended)/2-Q6) - *SOLVING INEQUALITIES*

Solve.

$7m - 2 \geqslant 19$

..... [2]

59 - (0580-W 2018-Paper 2 (Extended)/1-Q7) - *VARIATION*

y is inversely proportional to x^3.
When $x = 2$, $y = 0.5$.

Find y in terms of x.

$y =$ ..... [2]

60 - (0580-W 2018-Paper 2 (Extended)/3-Q7) - *BRACKETS AND SYMPLIFYING*

Simplify.

$2p - q - 3q - 5p$

..... [2]

61 - (0580-W 2018-Paper 2 (Extended)/2-Q8) - *FACTORISING*

Factorise.

$xy + 5y + 2x + 10$

..... [2]

62 - (0580-W 2018-Paper 2 (Extended)/3-Q10) - *LINEAR EQUAETION*

Solve.

$3w - 7 = 32$

$w =$ ..... [2]

63 - (0580-W 2018-Paper 2 (Extended)/3-Q11) - *CHANGING THE SUBJECT*

$A = \pi rl + \pi r^2$

Rearrange this formula to make l the subject.

$l =$ ..... [2]

64 - (0580-W 2018-Paper 2 (Extended)/1-Q12) - *SOLVING INEQUALITIES*

Find the integer values of n that satisfy the inequality $15 \leqslant 4n < 28$.

..... [3]

65 - (0580-W 2018-Paper 2 (Extended)/1-Q15) - *BRACKETS AND SYMPLIFYING*

Write as a single fraction in its simplest form.

$$\frac{x-5}{3}+\frac{6}{x+2}$$

..... [3]

66 - (0580-W 2018-Paper 2 (Extended)/2-Q16) - *BRACKETS AND SYMPLIFYING*

$$x^2-12x+a=(x+b)^2$$

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

67 - (0580-W 2018-Paper 2 (Extended)/3-Q16) - *INDICES*

(a) Simplify $\frac{w^2}{w^3}$.

..... [1]

(b) Simplify $(3w^3)^3$.

..... [2]

68 - (0580-W 2018-Paper 2 (Extended)/1-Q17) - *INDICES*

(a) $t^x \times t^2 = t^{10}$

Find the value of x.

$x =$ ..... [1]

(b) Simplify.

(i) $\left(\frac{4}{x}\right)^{-2}$

..... [1]

(ii) $a^3b^7 \div a^6b^2$

..... [2]

69 - (0580-W 2018-Paper 2 (Extended)/3-Q17) - *VARIATION*

y is directly proportional to the square root of x.
When $x = 9$, $y = 6$.

Find y when $x = 25$.

$y =$ ..... [3]

70 - (0580-W 2018-Paper 2 (Extended)/1-Q18) - *SIMULTANEOUS EQUATIONS*

Solve the simultaneous equations.
You must show all your working.

$$2x + 3y = -12$$
$$5x + 2y = 14$$

$x =$ .....

$y =$ ..... [4]

71 - (0580-W 2018-Paper 2 (Extended)/3-Q18) - *BRACKETS AND SYMPLIFYING*

Write as a single fraction in its simplest form.

$$\frac{1}{x} - \frac{1}{x+1}$$

..... [3]

72 - (0580-W 2018-Paper 2 (Extended)/1-Q19) - *QUADRATIC EQUATIONS*

Use the quadratic formula to solve the equation $3x^2 + 7x - 11 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

73 - (0580-W 2018-Paper 2 (Extended)/2-Q20) - *CHANGING THE SUBJECT*

Make m the subject of the formula.

$$x = \frac{3m}{2-m}$$

$m =$ ..... [4]

74 - (0580-W 2018-Paper 2 (Extended)/3-Q20) - *QUADRATIC EQUATIONS*

Solve the equation $3x^2 - 2x - 2 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

75 - (0580-W 2018-Paper 2 (Extended)/3-Q22) - *BRACKETS AND SYMPLIFYING*

Simplify.

$$\frac{2x^2 - x - 1}{2x^2 + x}$$

..... [4]

76 - (0580-W 2018-Paper 2 (Extended)/3-Q25) - *FACTORISING*

Factorise completely.

(a) $px+py-x-y$

..... [2]

(b) $2t^2-98m^2$

..... [3]

77 - (0580-S 2019-Paper 2 (Extended)/1-Q2) - *FACTORISING*

Factorise $5y-6py$.

..... [1]

78 - (0580-S 2019-Paper 2 (Extended)/3-Q2) - *FACTORISING*

Factorise $2x^2-x$.

..... [1]

79 - (0580-S 2019-Paper 2 (Extended)/1-Q6) - *INDICES*

Simplify.

(a) $t^{21} \div t^7$

..... [1]

(b) $(u^5)^5$

..... [1]

80 - (0580-S 2019-Paper 2 (Extended)/2-Q6) - *LINEAR EQUAETION*

Solve the equation.

$$9f + 11 = 3f + 23$$

$f =$ ..... [2]

81 - (0580-S 2019-Paper 2 (Extended)/3-Q10) - *CHANGING THE SUBJECT*

Rearrange $2(w + h) = P$ to make w the subject.

$w =$ ..... [2]

82 - (0580-S 2019-Paper 2 (Extended)/3-Q11) - *FACTORISING*

Complete this statement with an expression in terms of m.

$$18m^3 + 9m^2 + 14m + 7 = (9m^2 + 7)(\ldots\ldots\ldots\ldots)$$

[2]

83 - (0580-S 2019-Paper 2 (Extended)/2-Q12) - *INDICES*

Simplify.

(a) $5m^2 \times 2m^3$

..... [2]

(b) $\left(x^8\right)^3$

..... [1]

84 - (0580-S 2019-Paper 2 (Extended)/1-Q13) - *BRACKETS AND SYMPLIFYING*

$$x^2 + 4x - 9 = (x + a)^2 + b$$

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

85 - (0580-S 2019-Paper 2 (Extended)/2-Q14) - *SIMULTANEOUS EQUATIONS*

Solve the simultaneous equations.
You must show all your working.

$$5x + 8y = 4$$
$$\tfrac{1}{2}x + 3y = 7$$

$x =$ .....

$y =$ ..... [3]

86 - (0580-S 2019-Paper 2 (Extended)/3-Q14) - *QUADRATIC EQUATIONS*

One solution of the equation $ax^2 + a = 150$ is $x = 7$.

(a) Find the value of a.

$a =$ ..... [2]

(b) Find the other solution.

$x =$ ..... [1]

87 - (0580-S 2019-Paper 2 (Extended)/1-Q15) - *BRACKETS AND SYMPLIFYING*

Expand and simplify.

$$(x+1)(x+2)+2x(x-3)$$

..... [3]

88 - (0580-S 2019-Paper 2 (Extended)/1-Q17) - *FACTORISING*

(a) Factorise $p^2 - q^2$.

..... [1]

(b) $p^2 - q^2 = 7$ and $p - q = 2$.

Find the value of $p + q$.

..... [2]

89 - (0580-S 2019-Paper 2 (Extended)/3-Q17) - *BRACKETS AND SYMPLIFYING*

Simplify $\frac{x^3+5x^2}{x^2-25}$, giving your answer as a single fraction.

..... [3]

90 - (0580-S 2019-Paper 2 (Extended)/1-Q18) - *INDICES*

(a) Simplify $\left(81y^{16}\right)^{\frac{3}{4}}$.

..... [2]

(b) $2^3 = 4^p$

Find the value of p.

$p =$ ..... [1]

91 - (0580-S 2019-Paper 2 (Extended)/2-Q19) - *CHANGING THE SUBJECT*

Rearrange this formula to make m the subject.

$$P = \frac{k+m}{m}$$

..... [4]

92 - (0580-S 2019-Paper 2 (Extended)/2-Q20) - *QUADRATIC EQUATIONS*

Solve the equation $3x^2 - 2x - 10 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

93 - (0580-W 2019-Paper 2 (Extended)/1-Q2) - *FACTORISING*

Factorise $5p + pt$.

..... [1]

94 - (0580-W 2019-Paper 2 (Extended)/2-Q3) - *BRACKETS AND SYMPLIFYING*

Expand.

$a(a^3 + 3)$

..... [1]

95 - (0580-W 2019-Paper 2 (Extended)/1-Q5) - *BRACKETS AND SYMPLIFYING*

Simplify $5c - d - 3d - 2c$.

..... [2]

96 - (0580-W 2019-Paper 2 (Extended)/1-Q6) - *LINEAR EQUAETION*

Solve.

$\frac{x-2}{3} = 3$

$x =$ ..... [2]

97 - (0580-W 2019-Paper 2 (Extended)/3-Q6) - *BRACKETS AND SYMPLIFYING*

Expand and simplify $(x+3)(x+5)$.

..... [2]

98 - (0580-W 2019-Paper 2 (Extended)/1-Q7) - *INDICES*

Simplify $2x^3 \times 3x^2$.

..... [2]

99 - (0580-W 2019-Paper 2 (Extended)/2-Q9) - *SOLVING INEQUALITIES*

Solve the inequality.

$$\frac{x}{2} - 13 > 12 + 3x$$

..... [2]

100 - (0580-W 2019-Paper 2 (Extended)/1-Q10) - *INDICES*

Simplify.

$$\left(\frac{x^3}{8}\right)^{-\frac{4}{3}}$$

..... [2]

101 - (0580-W 2019-Paper 2 (Extended)/3-Q10) - *LINEAR EQUAETION*

$5n$ is the mean of the three numbers 391, n and $n - 1$.

Find the value of n.

$n =$ ..... [3]

102 - (0580-W 2019-Paper 2 (Extended)/1-Q11) - *CHANGING THE SUBJECT*

$P = 2r + \pi r$

Rearrange the formula to write r in terms of P and π.

$r =$ ..... [2]

103 - (0580-W 2019-Paper 2 (Extended)/3-Q11) - *FACTORISING*

Factorise.

(a) $12x + 15$

..... [1]

(b) $xy - 2x + 3y - 6$

..... [2]

104 - (0580-W 2019-Paper 2 (Extended)/2-Q15) - *SIMULTANEOUS EQUATIONS*

Esme buys x magazines at \$2.45 each and y cards at \$3.15 each.

(a) Write down an expression, in terms of x and y, for the total cost, in dollars, of the magazines and the cards.

\$ ..... [2]

(b) Esme spends \$60.55 in total.
She buys 8 magazines.

How many cards does she buy?

..... [2]

105 - (0580-W 2019-Paper 2 (Extended)/1-Q18) - *BRACKETS AND SYMPLIFYING*

Write $\frac{x}{2} - \frac{2x+4}{x+1}$ as a single fraction, in its simplest form.

..... [3]

106 - (0580-W 2019-Paper 2 (Extended)/2-Q20) - *FACTORISING*

(a) Factorise.

$$18y - 3ay + 12x - 2ax$$

..... [2]

(b) Factorise.

$$3x^2 - 48y^2$$

..... [3]

107 - (0580-W 2019-Paper 2 (Extended)/2-Q21) - *INDICES*

(a) $3^{-2} \times 3^x = 81$

Find the value of x.

$x =$ ..... [2]

(b) $x^{-\frac{1}{3}} = 32x^{-2}$

Find the value of x.

$x =$ ..... [3]

108 - (0580-S 2020-Paper 2 (Extended)/2-Q5) - *FORMULAEE*

$y = mx + c$

Find the value of y when $m = -3$, $x = -2$ and $c = -8$.

$y =$ ..... [2]

109 - (0580-S 2020-Paper 2 (Extended)/3-Q6) - *INDICES*

Simplify.

(a) $p^2 \times p^4$

..... [1]

(b) $m^{15} \div m^5$

..... [1]

(c) $(k^3)^5$

..... [1]

110 - (0580-S 2020-Paper 2 (Extended)/2-Q8) - *INDICES*

Write 2^{-4} as a decimal.

..... [1]

111 - (0580-S 2020-Paper 2 (Extended)/1-Q9) - *FACTORISING*

Factorise completely.

(a) $21a^2 + 28ab$

..... [2]

(b) $20x^2 - 45y^2$

..... [3]

112 - (0580-S 2020-Paper 2 (Extended)/2-Q13) - *INDICES*

Simplify $8t^8 \div 4t^4$.

..... [2]

113 - (0580-S 2020-Paper 2 (Extended)/2-Q14) - *LINEAR EQUAETION*

Solve the equation.

$$\frac{1-x}{3} = 5$$

$x =$ ..... [2]

114 - (0580-S 2020-Paper 2 (Extended)/1-Q16) - *VARIATION*

m is inversely proportional to the square of $(p-1)$.
When $p=4, m=5$.

Find m when $p=6$.

$m =$ ..... [3]

115 - (0580-S 2020-Paper 2 (Extended)/3-Q18) - *QUADRATIC EQUATIONS*

(a) Write $x^2-18x-27$ in the form $(x+k)^2+h$.

..... [2]

(b) Use your answer to **part (a)** to solve the equation $x^2-18x-27=0$.

$x =$ ..... or $x =$ ..... [2]

116 - (0580-S 2020-Paper 2 (Extended)/2-Q19) - *CHANGING THE SUBJECT*

Make y the subject of the formula.

$$h^2 = x^2 + 2y^2$$

$y =$ ..... [3]

117 - (0580-S 2020-Paper 2 (Extended)/1-Q20) - *SIMULTANEOUS EQUATIONS*

The curve $y = x^2 - 2x + 1$ is drawn on a grid.
A line is drawn on the same grid.
The points of intersection of the line and the curve are used to solve the equation $x^2 - 7x + 5 = 0$.

Find the equation of the line in the form $y = mx + c$.

$y =$ ..... [1]

118 - (0580-S 2020-Paper 2 (Extended)/1-Q21) - *BRACKETS AND SYMPLIFYING*

Expand and simplify $(x+3)(x-5)(3x-1)$.

..... [3]

119 - (0580-S 2020-Paper 2 (Extended)/2-Q21) - *INDICES*

Simplify.

(a) $(5x^4)^3$

..... [2]

(b) $(256x^{256})^{\frac{3}{8}}$

..... [2]

120 - (0580-S 2020-Paper 2 (Extended)/2-Q25) - *FACTORISING*

Simplify.

$$\frac{2x^2+x-15}{ax+3a-2bx-6b}$$

..... [5]

121 - (0580-S 2020-Paper 2 (Extended)/2-Q26) - *FORMULAEE*

$\sqrt[3]{y^2} = \sqrt[6]{x}$ and $y = \sqrt[n]{x}$.

Find the value of n.

$n =$ ..... [2]

122 - (0580-W 2020-Paper 2 (Extended)/1-Q1) - *BRACKETS AND SYMPLIFYING*

Simplify.

$3a + 7b - 4a + b$

..... [2]

123 - (0580-W 2020-Paper 2 (Extended)/2-Q3) - *LINEAR EQUAETION*

Solve the equation.

$6 - 2x = 3x$

$x =$ ..... [2]

124 - (0580-W 2020-Paper 2 (Extended)/3-Q4) - *INDICES*

Simplify.

$a^2 \div a^6$

..... [1]

125 - (0580-W 2020-Paper 2 (Extended)/2-Q6) - *FACTORISING*

Factorise completely.

$4-8x$

..... [1]

126 - (0580-W 2020-Paper 2 (Extended)/1-Q7) - *CHANGING THE SUBJECT*

Make x the subject of this formula.

$2y = 5x-7$

$x =$ ..... [2]

127 - (0580-W 2020-Paper 2 (Extended)/2-Q9) - *SIMULTANEOUS EQUATIONS*

Solve the simultaneous equations.

$2x+y = 7$
$3x-y = 8$

$x =$ .....

$y =$ ..... [2]

128 - (0580-W 2020-Paper 2 (Extended)/3-Q10) - *SIMULTANEOUS EQUATIONS*

Solve the simultaneous equations.
You must show all your working.

$$3x - 8y = 22$$
$$x + 4y = 4$$

$x =$ .....

$y =$ ..... [3]

129 - (0580-W 2020-Paper 2 (Extended)/2-Q11) - *BRACKETS AND SYMPLIFYING*

Simplify.

$$2x^2 \times 5x^5$$

..... [2]

130 - (0580-W 2020-Paper 2 (Extended)/3-Q14) - *INDICES*

$$N = 2^4 \times 3 \times 7^5$$

$PN = K$, where P is an integer and K is a square number.

Find the smallest value of P.

$P =$ ..... [2]

131 - (0580-W 2020-Paper 2 (Extended)/3-Q15) - *CHANGING THE SUBJECT*

$$m = 2p + \sqrt{\frac{x}{y}}$$

Make x the subject of this formula.

$x =$ ..... [3]

132 - (0580-W 2020-Paper 2 (Extended)/1-Q16) - *FACTORISING*

Factorise $6x^2 + 7x - 20$.

..... [2]

133 - (0580-W 2020-Paper 2 (Extended)/3-Q18) - *INDICES*

(a) Simplify. $(4xy^2)^3$

..... [2]

(b) $25 = 125^k$

Find the value of k.

$k =$ ..... [1]

134 - (0580-W 2020-Paper 2 (Extended)/3-Q20) - *FACTORISING*

Factorise.

$$3x+8y-6ax-16ay$$

..... [2]

135 - (0580-W 2020-Paper 2 (Extended)/1-Q22) - *FACTORISING*

Simplify.

$$\frac{x^2-5x}{2x^2-50}$$

..... [4]

136 - (0580-W 2020-Paper 2 (Extended)/2-Q23) - *BRACKETS AND SYMPLIFYING*

Write as a single fraction in its simplest form.

$$2-\frac{2x-1}{x+1}$$

..... [3]

137 - (0580-W 2020-Paper 2 (Extended)/3-Q23) - *VARIATION*

y is inversely proportional to the square root of x.
When $y = 7$, $x = 2.25$.

Write y in terms of x.

$y =$ ..... [2]

138 - (0580-W 2020-Paper 2 (Extended)/3-Q24) - *FACTORISING*

Simplify.

$$\frac{x^2 - 25}{x^2 - 17x + 60}$$

..... [4]

139 - (0580-W 2020-Paper 2 (Extended)/2-Q26) - *FACTORISING*

Simplify.

$$\frac{ux-2u-x+2}{u^2-1}$$

..... [4]

140 - (0580-S 2021-Paper 2 (Extended)/1-Q7) - *SIMULTANEOUS EQUATIONS*

Solve the simultaneous equations.
You must show all your working.

$$2x+y=3$$
$$x-5y=40$$

141 - (0580-S 2021-Paper 2 (Extended)/2-Q8) - *FORMULAEE*

$$a=\frac{b^2}{5c}$$

Find b when $a=5.625$ and $c=2$.

$b =$ ..... [2]

142 - (0580-S 2021-Paper 2 (Extended)/1-Q11) - *INDICES*

(a) Simplify fully.

$(4ab^5)^4$

..... [2]

(b) $2p^{\frac{1}{3}} = 6$

Find the value of p.

$p =$ ..... [1]

(c) $81^2 \div 3^t = 9$

Find the value of t.

$t =$ ..... [2]

143 - (0580-S 2021-Paper 2 (Extended)/3-Q11) - *BRACKETS AND SYMPLIFYING*

Simplify $3x^3 \times 4x^4$.

..... [2]

144 - (0580-S 2021-Paper 2 (Extended)/3-Q12) - *SOLVING INEQUALITIES*

x is an integer and $-3 \leqslant 2x-1 < 3$.

Find the values of x.

..... [2]

145 - (0580-S 2021-Paper 2 (Extended)/3-Q13) - *BRACKETS AND SYMPLIFYING*

Expand and simplify.

$$6(t-q)-2(t-3q)$$

..... [2]

146 - (0580-S 2021-Paper 2 (Extended)/1-Q14) - *VARIATION*

y is directly proportional to the square root of $(x-3)$.
When $x = 28$, $y = 20$.

Find y when $x = 39$.

$y =$ ..... [3]

147 - (0580-S 2021-Paper 2 (Extended)/1-Q15) - *CHANGING THE SUBJECT*

Make h the subject of the formula $2mh = g(1-h)$.

$h =$ ..... [4]

148 - (0580-S 2021-Paper 2 (Extended)/2-Q20) - *BRACKETS AND SYMPLIFYING*

Expand and simplify.

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

..... [3]

149 - (0580-S 2021-Paper 2 (Extended)/2-Q21) - *VARIATION*

The force of attraction, F Newtons, between two magnets is inversely proportional to the square of the distance, d cm, between the magnets.

When $d = 1.5$, $F = 48$.

(a) Find an expression for F in terms of d.

$F =$ ..... [2]

(b) When the distance between the two magnets is doubled the new force is n times the original force.

Work out the value of n.

150 - (0580-S 2021-Paper 2 (Extended)/2-Q22) - *FACTORISING*

Simplify.

$$\frac{2x^2 - 5x - 12}{3x^2 - 12x}$$

..... [4]

151 - (0580-S 2021-Paper 2 (Extended)/2-Q24) **-** *LINEAR EQUAETION*

Solve.

$$\frac{1}{x+1}+\frac{9}{x+9}=1$$

$x =$ ..... or $x =$ ..... [5]

152 - (0580-W 2021-Paper 2 (Extended)/3-Q7) **-** *INDICES*

Simplify.

$$32g^{32} \div 4g^{4}$$

..... [2]

153 - (0580-W 2021-Paper 2 (Extended)/1-Q8) - *SIMULTANEOUS EQUATIONS*

Solve the simultaneous equations.
You must show all your working.

$$4x - 2y = -13$$
$$-3x + 4y = 11$$

$x =$ .....

$y =$ ..... [3]

154 - (0580-W 2021-Paper 2 (Extended)/3-Q11) - *CHANGING THE SUBJECT*

$P = M(g^2 + h^2)$

(a) Find the value of P when $M = 100$, $g = 3$ and $h = 4.5$.

$P =$ ..... [2]

(b) Rearrange the formula to write g in terms of P, M and h.

$g =$ ..... [3]

155 - (0580-W 2021-Paper 2 (Extended)/1-Q13) - *SOLVING INEQUALITIES*

Solve.

$$4-3x \geqslant \frac{6-x}{5}$$

..... [3]

156 - (0580-W 2021-Paper 2 (Extended)/2-Q13) - *INDICES*

(a) Write 243×27^{2n} as a single power of 3 in terms of n.

..... [2]

(b) $k = 2 \times 3^2 \times p^3$, where p is a prime number greater than 3.

Write $6k^2$ as a product of prime factors in terms of p.

..... [2]

157 - (0580-W 2021-Paper 2 (Extended)/1-Q14) - *VARIATION*

y is inversely proportional to the square root of $(x-2)$.
When $x = 4.25$, $y = 12$.

Find x when $y = 3$.

$x =$ ..... [3]

158 - (0580-W 2021-Paper 2 (Extended)/1-Q17) - *CHANGING THE SUBJECT*

$$y = \frac{3x-2}{1-x}$$

Make x the subject of the formula.

$x =$ ..... [4]

159 - (0580-W 2021-Paper 2 (Extended)/2-Q17) - *QUADRATIC EQUATIONS*

Solve.

$$(5x-3)(2x+7) = 0$$

$x =$ ..... or $x =$ ..... [1]

160 - (0580-W 2021-Paper 2 (Extended)/2-Q18) - *SIMULTANEOUS EQUATIONS*

Solve the simultaneous equations.
You must show all your working.

$$y = x^2 - 9x + 21$$
$$y = 2x - 3$$

$x =$ ..... $y =$ .....

$x =$ ..... $y =$ ..... [5]

161 - (0580-W 2021-Paper 2 (Extended)/2-Q21) - *BRACKETS AND SYMPLIFYING*

Expand and simplify.

$$(x-3)^2(2x+5)$$

..... [3]

162 - (0580-W 2021-Paper 2 (Extended)/3-Q21) - *INDICES*

Simplify fully.

$$\left(243y^{10}\right)^{\frac{3}{5}}$$

..... [2]

163 - (0580-W 2021-Paper 2 (Extended)/1-Q22) - *INDICES*

(a) Simplify.

$$\frac{x^{\frac{2}{3}}}{x^{\frac{8}{3}}}$$

..... [1]

(b) $16 = 64^k$

Find the value of k.

$k =$ ..... [1]

(c) Solve.

$$3^{3x} \times \left(\frac{1}{9}\right)^{4-3x} = 3$$

$x =$ ..... [3]

164 - (0580-W 2021-Paper 2 (Extended)/3-Q22) - *SIMULTANEOUS EQUATIONS*

Solve the simultaneous equations.
You must show all your working.

$$y = x^2 - 3x - 13$$
$$y = x - 1$$

$x =$ ..... , $y =$ .....

$x =$ ..... , $y =$ ..... [5]

165 - (0580-W 2021-Paper 2 (Extended)/2-Q23) - *BRACKETS AND SYMPLIFYING*

Simplify.

$$\frac{3xy+36y-5x-60}{2x^2-288}$$

..... [4]

166 - (0580-W 2021-Paper 2 (Extended)/3-Q25) - *BRACKETS AND SYMPLIFYING*

Simplify.

$$\frac{3x^2-18x}{ax-6a+2cx-12c}$$

..... [4]

167 - (0580-S 2022-Paper 2 (Extended)/3-Q2) - *FORMULAEE*

Work out the value of $\frac{m\,k^3}{\sqrt{3}}$ when $m = 4$ and $k = 7$.

..... [2]

168 - (0580-S 2022-Paper 2 (Extended)/3-Q6) - *INDICES*

Simplify.

(a) $y^3 \div y^5$

..... [1]

(b) $7x^0$

..... [1]

169 - (0580-S 2022-Paper 2 (Extended)/1-Q8) - *FORMULAEE, CHANGING THE SUBJECT*

$s = \frac{1}{2}at^2$

(a) Work out the value of s when $a = 0.9$ and $t = 4$.

$s =$ ..... [1]

(b) Rearrange the formula to find t in terms of s and a.

$t =$ ..... [2]

170 - (0580-S 2022-Paper 2 (Extended)/1-Q9) - *FACTORISING*

Factorise completely.

$14xy - 7y^2$

..... [2]

171 - (0580-S 2022-Paper 2 (Extended)/2-Q11) - *INDICES*

Find the value of p when $6^p \times 6^4 = 6^{28}$.

$p =$ ..... [1]

172 - (0580-S 2022-Paper 2 (Extended)/3-Q13) - *FACTORISING*

Factorise completely.

(a) $18px - 27p$

..... [2]

(b) $mt - n - m + nt$

..... [2]

173 - (0580-S 2022-Paper 2 (Extended)/1-Q15) - *INDICES*

$4^x = \frac{1}{64}$

Find the value of x.

$x =$ ..... [1]

174 - (0580-S 2022-Paper 2 (Extended)/3-Q15) - *SOLVING INEQUALITIES*

Solve.

$12x - 3 \geqslant 4x + 13$

..... [2]

175 - (0580-S 2022-Paper 2 (Extended)/2-Q20) - *FACTORISING*

Factorise completely.

(a) $2m + 3p - 8km - 12kp$

..... [2]

(b) $5x^2 - 20y^2$

..... [3]

176 - (0580-S 2022-Paper 2 (Extended)/1-Q21) - *FACTORISING*

Factorise completely.

$1 - q - a + aq$

..... [2]

177 - (0580-S 2022-Paper 2 (Extended)/1-Q22) - *INDICES*

Simplify fully $(216y^{216})^{\frac{2}{3}}$.

..... [2]

178 - (0580-S 2022-Paper 2 (Extended)/3-Q22) - *FACTORISING*

Simplify.

$$\frac{5x-x^2}{25-x^2}$$

..... [3]

179 - (0580-S 2022-Paper 2 (Extended)/1-Q23) - *QUADRATIC EQUATIONS*

$x^2+8x+10=(x+p)^2+q$

(a) Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [2]

(b) Solve.

$x^2+8x+10=30$

$x =$ ..... or $x =$ ..... [2]

180 - (0580-S 2022-Paper 2 (Extended)/3-Q25) - *INDICES*

$m^{-\frac{1}{4}} = 27m^{-1}$

Find the value of m.

$m =$ ..... [3]

181 - (0580-S 2022-Paper 2 (Extended)/1-Q27) - *SIMULTANEOUS EQUATIONS*

The line $y = x + 1$ intersects the graph of $y = x^2 - 3x - 11$ at the points A and B.

Find the coordinates of A and the coordinates of B.
You must show all your working.

A (..... , ...)

B (..... , ...) [4]

182 - (0580-W 2022-Paper 2 (Extended)/2-Q2) - *BRACKETS AND SYMPLIFYING*

Simplify.

$$y \times 27 - y \times 77$$

..... [1]

183 - (0580-W 2022-Paper 2 (Extended)/2-Q4) - *BRACKETS AND SYMPLIFYING*

Expand.

$x(3+x^2)$

..... [2]

184 - (0580-W 2022-Paper 2 (Extended)/3-Q9) - *SIMULTANEOUS EQUATIONS*

Solve the simultaneous equations.

$3x-2y=21$

$5x+2y=51$

$x =$ .....

$y =$ ..... [2]

185 - (0580-W 2022-Paper 2 (Extended)/1-Q10) - *INDICES*

Simplify $18x^{18} \div 9x^9$.

..... [2]

186 - (0580-W 2022-Paper 2 (Extended)/1-Q11) **-** *SIMULTANEOUS EQUATIONS*

Solve the simultaneous equations.

$$x - 3y = 7$$
$$2x - 3y = 11$$

$x =$ .....

$y =$ ..... [2]

187 - (0580-W 2022-Paper 2 (Extended)/1-Q17) **-** *INDICES*

Simplify $\left(3125x^{3125}\right)^{\frac{1}{5}}$.

..... [2]

188 - (0580-W 2022-Paper 2 (Extended)/3-Q17) - *VARIATION*

y is proportional to the square of $(x-7)$.
When $x=12,\ y=2$.

Find y when $x=17$.

$y=$ ..... [3]

189 - (0580-W 2022-Paper 2 (Extended)/1-Q19) - *BRACKETS AND SYMPLIFYING*

Expand and simplify.

$$(2x+3)(x-2)^2$$

..... [3]

190 - (0580-W 2022-Paper 2 (Extended)/1-Q20) - *FACTORISING*

Factorise completely.

(a) $1+x-y-xy$

..... [2]

(b) $2x^3-18xy^2$

..... [3]

191 - (0580-W 2022-Paper 2 (Extended)/2-Q20) - *INDICES*

Simplify fully.

(a) $(81x^{16})^{\frac{3}{4}}$

..... [2]

(b) $\left(\frac{1}{y^2}\right)^{-\frac{1}{2}}$

..... [1]

192 - (0580-W 2022-Paper 2 (Extended)/3-Q22) - *BRACKETS AND SYMPLIFYING*

(a) Expand and simplify.

$$(2x-1)(x+4)(x-3)$$

..... [3]

(b) Write as a single fraction in its simplest form.

$$\frac{4}{2x-3} \div \frac{2x^2+14x}{2x^2+11x-21}$$

..... [4]

193 - (0580-W 2022-Paper 2 (Extended)/1-Q23) - *VARIATION*

y is inversely proportional to $\sqrt{x}$ and x is directly proportional to w^2.
When $w = 12$, $y = 12$.

Find y in terms of w.

$y =$ ..... [3]

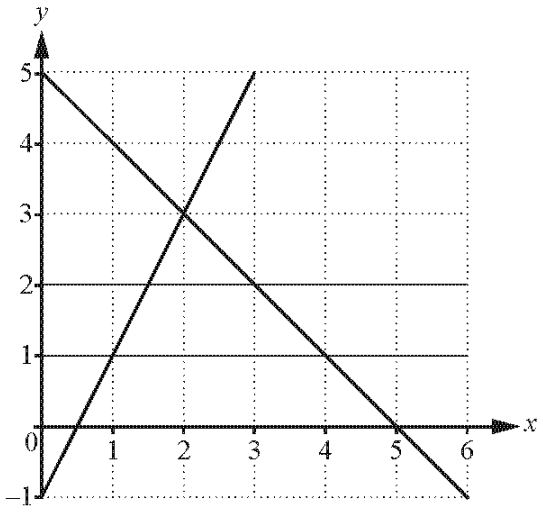
194 - (0580-W 2022-Paper 2 (Extended)/2-Q23) - *BRACKETS AND SYMPLIFYING*

Solve $\frac{4}{x+1} + \frac{2}{2x-5} = 3$.

You must show all your working.

$x =$ ..... or $x =$ ..... [7]

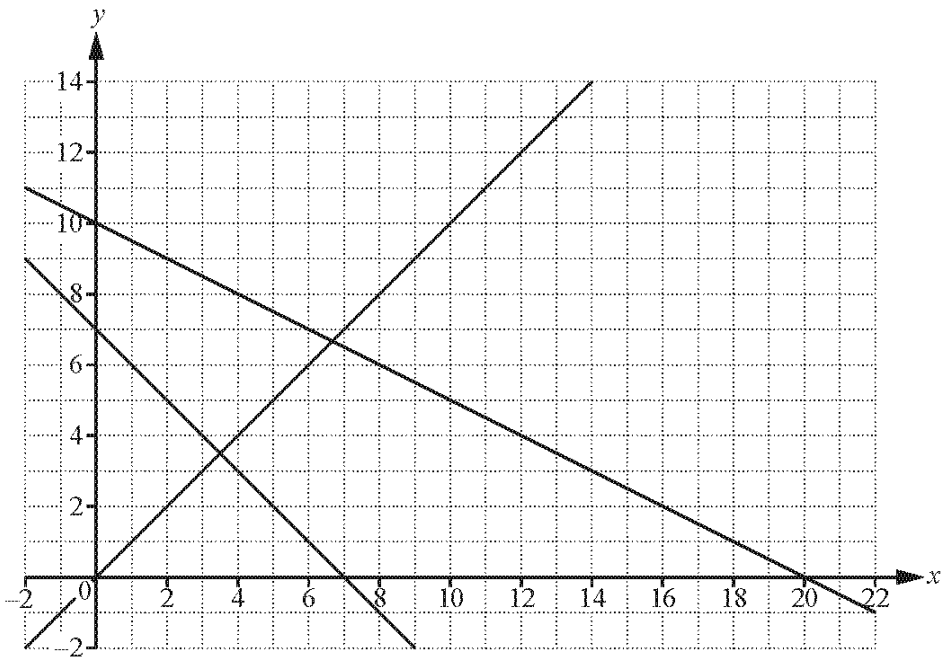
1 - (0580-S 2017-Paper 2 (Extended)/1-Q10) - *LINEAR PROGRAMMING*



By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following four inequalities.

$y \leqslant 2$ $y \geqslant 1$ $y \leqslant 2x - 1$ $y \leqslant 5 - x$ [3]

2 - (0580-S 2017-Paper 2 (Extended)/3-Q11) - *LINEAR PROGRAMMING*



By shading the unwanted regions of the grid above, find and label the region R that satisfies the following four inequalities.

$x \geqslant 0$ $x + y \geqslant 7$ $y \geqslant x$ $x + 2y \leqslant 20$

[3]

3 - (0580-W 2017-Paper 2 (Extended)/1-Q23) - *LINEAR PROGRAMMING*

In one week, Neha spends x hours cooking and y hours cleaning.
The time she spends cleaning is at least equal to the time she spends cooking.
This can be written as $y \geqslant x$.

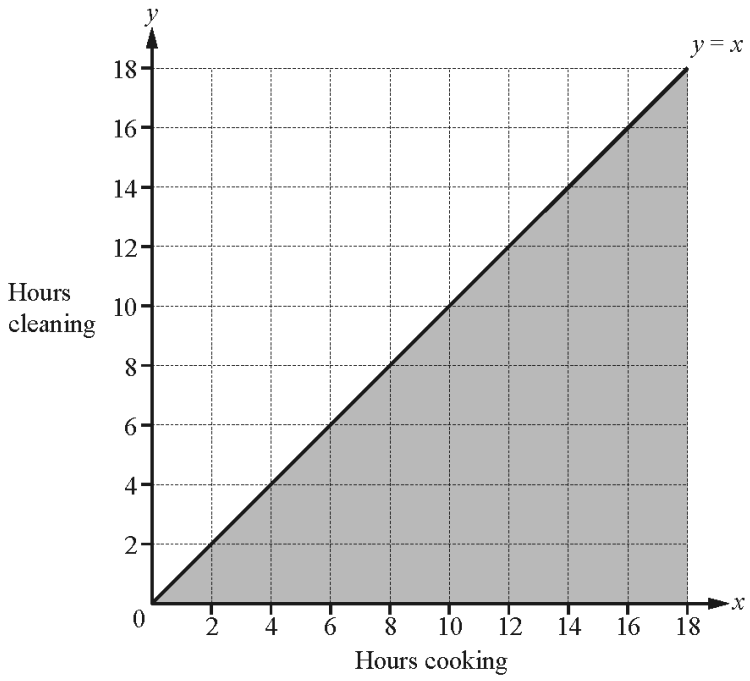
She spends no more than 16 hours in total cooking and cleaning.
She spends at least 4 hours cooking.

(a) Write down two more inequalities in x and/or y to show this information.

.....

..... [2]

(b) Complete the diagram to show the three inequalities.
Shade the **unwanted** regions.



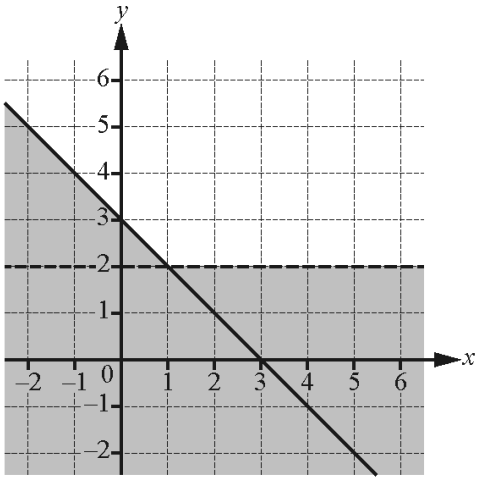
[3]

(c) Neha receives \$10 for each hour she spends cooking and \$8 for each hour she spends cleaning.

Work out the largest amount she could receive.

\$..... [2]

4 - (0580-S 2018-Paper 2 (Extended)/2-Q19) - *LINEAR PROGRAMMING*

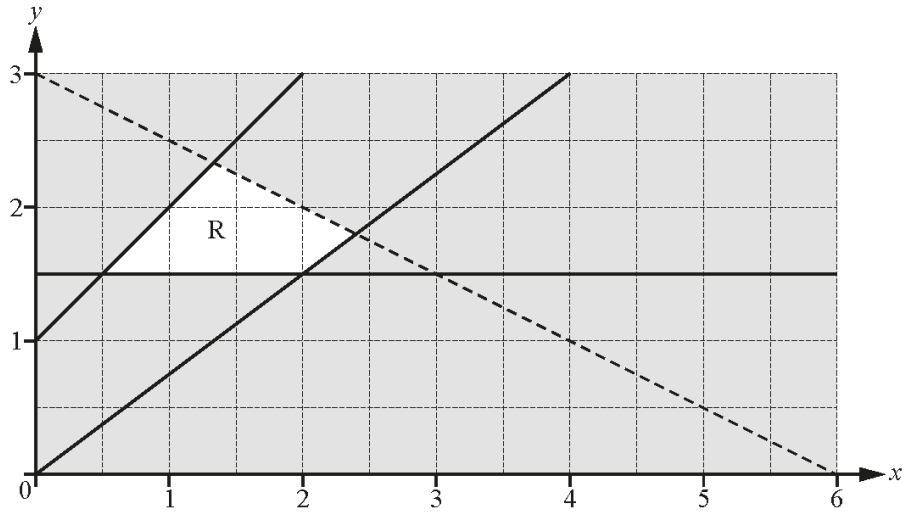


Find the two inequalities that define the region on the grid that is **not** shaded.

.....

..... [3]

5 - (0580-S 2018-Paper 2 (Extended)/1-Q21) - *LINEAR PROGRAMMING*



There are four inequalities that define the region R.
One of these is $y \leqslant x + 1$.

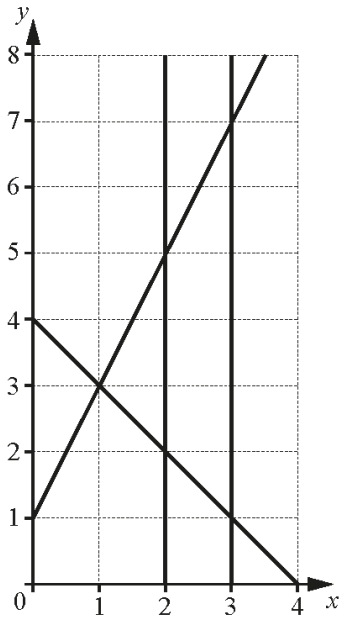
Find the other three inequalities.

.....

.....

..... [4]

6 - (0580-W 2018-Paper 2 (Extended)/2-Q14) - *LINEAR PROGRAMMING*

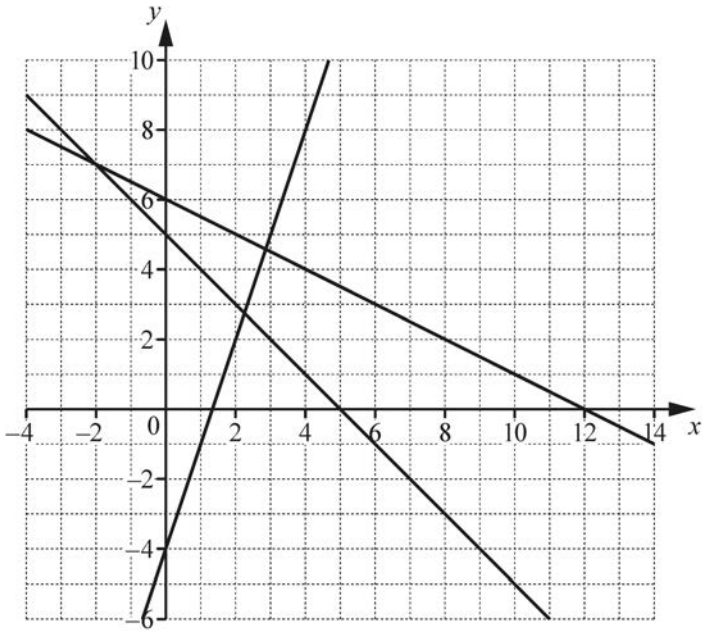


By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following four inequalities.

$x \leqslant 3$ $x \geqslant 2$ $y \leqslant 2x+1$ $y \geqslant 4-x$

[3]

7 - (0580-S 2019-Paper 2 (Extended)/2-Q16) - *LINEAR PROGRAMMING*



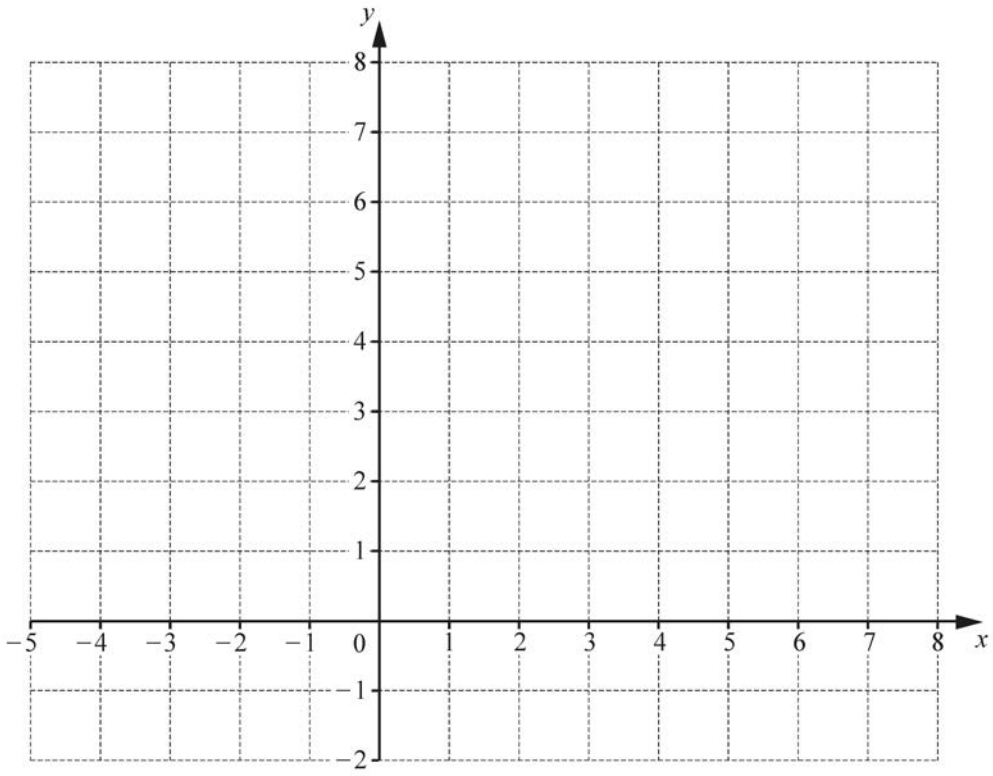
$y \leqslant -\frac{1}{2}x + 6 \qquad y \geqslant 3x - 4 \qquad x + y \geqslant 5$

(a) By shading the **unwanted** regions of the grid, find and label the region R that satisfies the three inequalities. [2]

(b) Find the largest value of $x + y$ in the region R, where x and y are integers.

..... [1]

8 - (0580-S 2019-Paper 2 (Extended)/3-Q24) - *LINEAR PROGRAMMING*

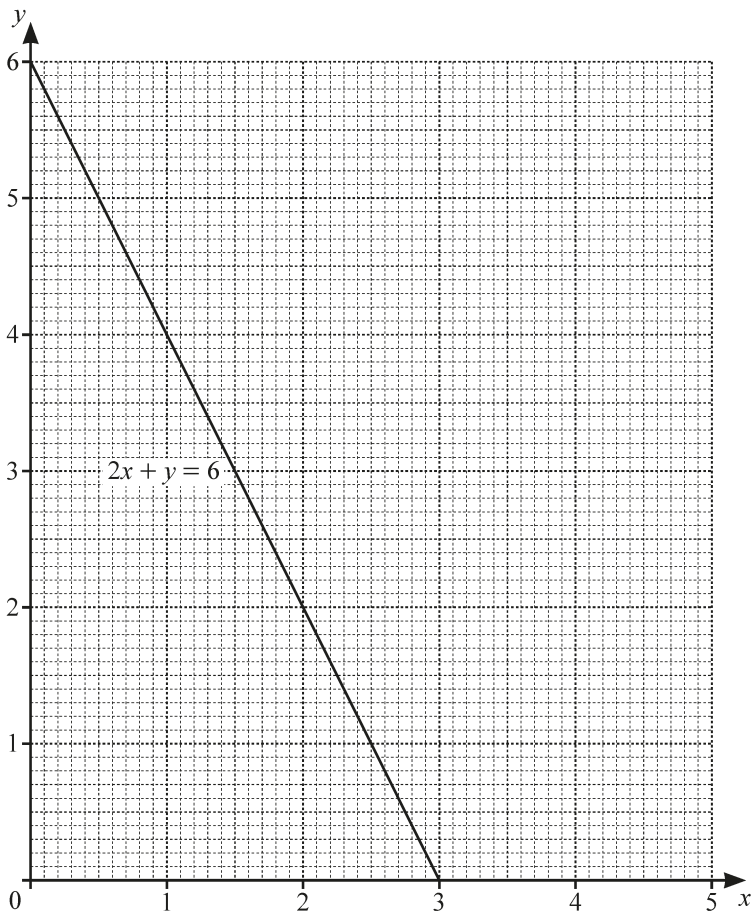


By shading the **unwanted** regions of the grid, draw and label the region R which satisfies the following three inequalities.

$y \leqslant 2$ $x < 3$ $y \leqslant x+4$

[5]

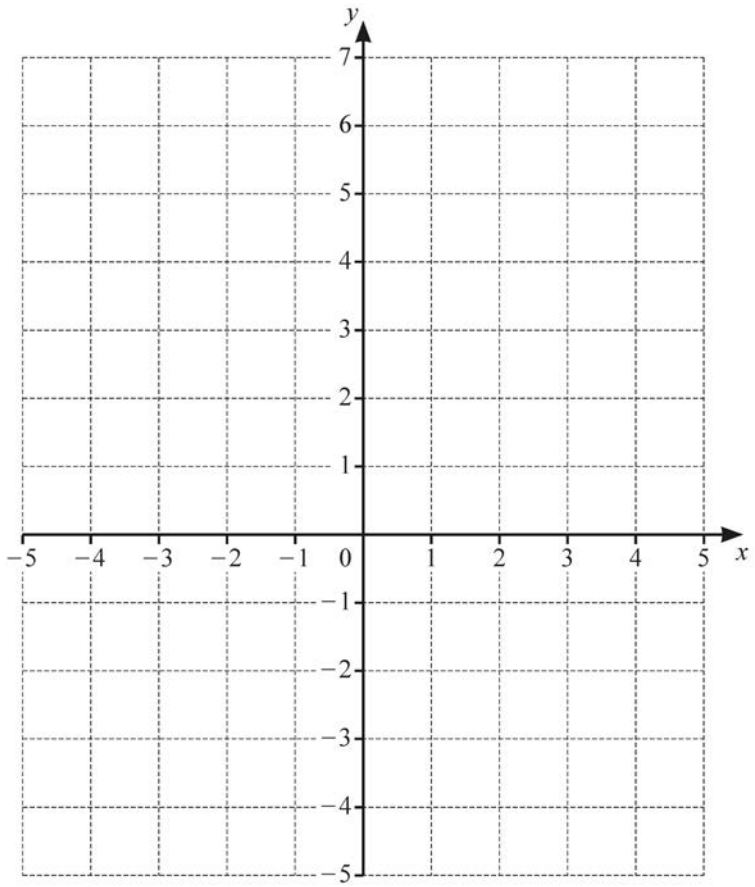
9 - (0580-W 2019-Paper 2 (Extended)/2-Q16) - *LINEAR PROGRAMMING*



By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following inequalities.

$y \leqslant 5$ $2x + y \geqslant 6$ $y \geqslant x + 1$ [4]

10 - (0580-W 2019-Paper 2 (Extended)/3-Q17) **-** *LINEAR PROGRAMMING*

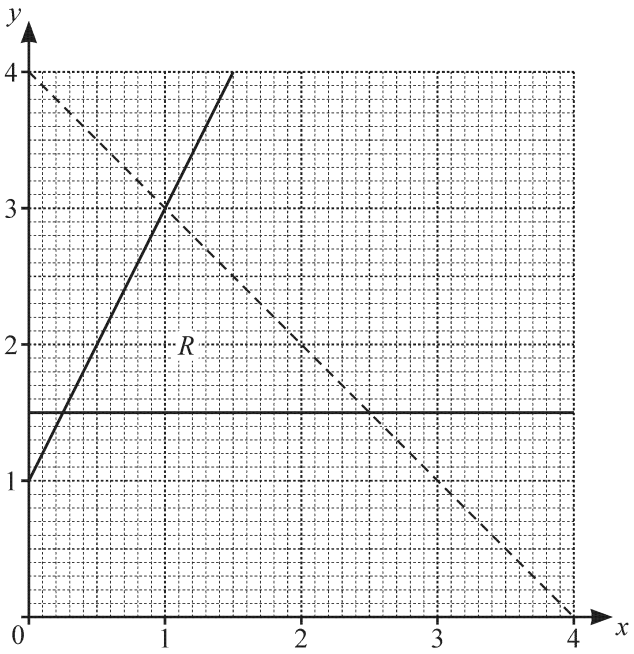


By shading the **unwanted** regions on the grid, draw and label the region R that satisfies the following inequalities.

$$-2 < x \leqslant 3 \qquad y \leqslant x+3$$

[4]

11 - (0580-S 2020-Paper 2 (Extended)/3-Q13) - *LINEAR PROGRAMMING*



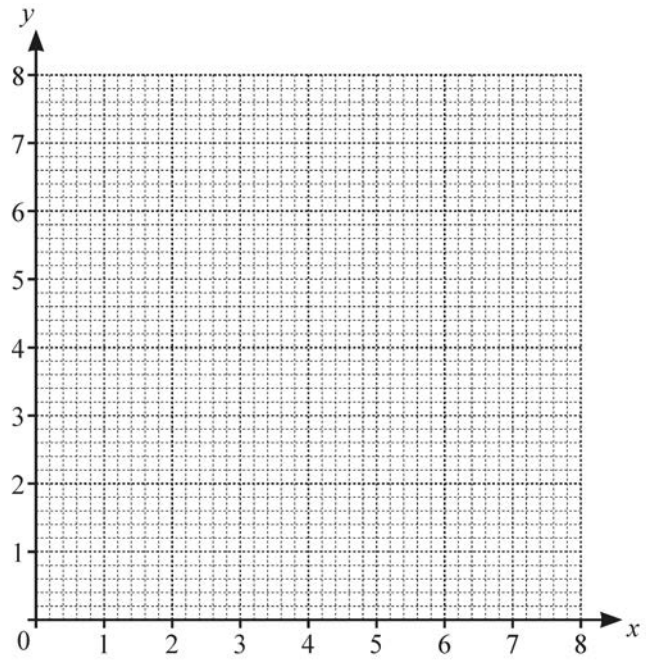
Write down the three inequalities that define the region R.

.....

.....

..... [4]

12 - (0580-S 2020-Paper 2 (Extended)/2-Q23) - *LINEAR PROGRAMMING*



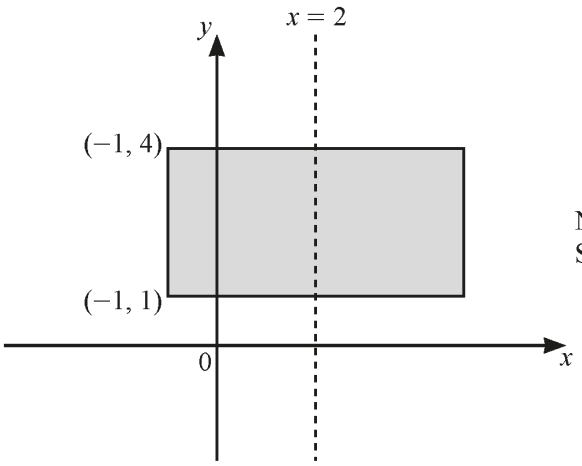
(a) By drawing suitable lines and shading unwanted regions, find the region, R, where

$x \geqslant 2, \quad y \geqslant x$ and $2x + y \leqslant 8$. [5]

(b) Find the largest value of $x + y$ in the region R.

..... [1]

13 - (0580-W 2020-Paper 2 (Extended)/1-Q11) - *LINEAR PROGRAMMING*



NOT TO SCALE

The diagram shows a rectangle with a line of symmetry at $x = 2$.
Two vertices of the rectangle are at $(-1, 1)$ and $(-1, 4)$.

The shaded region is defined by the inequalities $a \leqslant x \leqslant b$ and $c \leqslant y \leqslant d$.

Find the values of a, b, c and d.

$a =$ .....

$b =$ .....

$c =$ .....

$d =$ ..... [2]

1 - (0580-W 2017-Paper 2 (Extended)/2-Q16) - *SEQUENCES*

Here are the first four terms of a sequence.

23 17 11 5

(a) Find the next term.

..... [1]

(b) Find the nth term.

..... [2]

2 - (0580-S 2018-Paper 2 (Extended)/2-Q3) - *SEQUENCES*

Here is a sequence.

a, 13, 9, 3, –5, –15, b, …

Find the value of a and the value of b.

a = ...

b = ... [2]

3 - (0580-S 2018-Paper 2 (Extended)/3-Q22) - *SEQUENCES*

Find an expression for the nth term of each sequence.

(a) 11, 7, 3, –1, …

..... [2]

(b) 3, 6, 12, 24, …

..... [2]

4 - (0580-W 2018-Paper 2 (Extended)/1-Q11) - *SEQUENCES*

These are the first five terms in a sequence.

8 11 14 17 20

(a) Find the next term.

..... [1]

(b) Find an expression for the nth term.

..... [2]

5 - (0580-W 2018-Paper 2 (Extended)/2-Q13) - *SEQUENCES*

These are the first five terms of a sequence.

-4 2 8 14 20

Find an expression for the nth term of this sequence.

..... [2]

6 - (0580-S 2019-Paper 2 (Extended)/1-Q22) - *SEQUENCES*

(a) These are the first four terms of a sequence.

5 8 11 14

(i) Write down the next term.

..... [1]

(ii) Find an expression, in terms of n, for the nth term.

..... [2]

(b) These are the first five terms of another sequence.

$\frac{1}{2}$ $\frac{3}{4}$ $\frac{7}{6}$ $\frac{13}{8}$ $\frac{21}{10}$

Find the next term.

..... [1]

7 - (0580-W 2019-Paper 2 (Extended)/3-Q14) - *SEQUENCES*

Find the nth term of each sequence.

(a) $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{10}$, ...

..... [1]

(b) 1, 5, 25, 125, 625, ...

..... [2]

8 - (0580-S 2020-Paper 2 (Extended)/1-Q5) - *SEQUENCES*

(a) The nth term of a sequence is $60-8n$.

Find the largest number in this sequence.

..... [1]

(b) Here are the first five terms of a different sequence.

12 19 26 33 40

Find an expression for the nth term of this sequence.

..... [2]

9 - (0580-S 2021-Paper 2 (Extended)/1-Q6) - *SEQUENCES*

(a) The nth term of a sequence is n^2+3n.

Find the first three terms of this sequence.

....., ..., ... [2]

(b) These are the first five terms of a different sequence.

25 18 11 4 -3

Find the nth term of this sequence.

..... [2]

10 - (0580-W 2021-Paper 2 (Extended)/3-Q10) - *SEQUENCES*

These are the first four terms of a sequence.

3 −1 −5 −9

(a) Find the next term in this sequence.

..... [1]

(b) Find the *n*th term.

..... [2]

11 - (0580-W 2021-Paper 2 (Extended)/2-Q12) - *SEQUENCES*

The table shows the first five terms of sequences A, B and C.

	1st term	2nd term	3rd term	4th term	5th term	*n*th term
Sequence A	8	3	−2	−7	−12	
Sequence B	2	$\frac{3}{2}$	$\frac{4}{3}$	$\frac{5}{4}$	$\frac{6}{5}$	
Sequence C	$\frac{1}{2}$	1	2	4	8	

Complete the table to show the *n*th term of each sequence.

[5]

12 - (0580-W 2021-Paper 2 (Extended)/1-Q16) - *SEQUENCES*

Find the *n*th term of each sequence.

(a) 8, 15, 34, 71, 132, ...

..... [2]

(b) $\frac{2}{1}$, $\frac{3}{4}$, $\frac{4}{16}$, $\frac{5}{64}$, $\frac{6}{256}$, ...

..... [3]

13 - (0580-S 2022-Paper 2 (Extended)/3-Q5) - *SEQUENCES*

The *n*th term of a sequence is $n^2 - 1$.

Find the first three terms of this sequence.

..... , ... , ... [2]

14 - (0580-S 2022-Paper 2 (Extended)/2-Q8) - *SEQUENCES*

The *n*th term of a sequence is $n^2 + 12$.

Find the first three terms of this sequence.

..... , ... , ... [2]

15 - (0580-S 2022-Paper 2 (Extended)/1-Q10) - *SEQUENCES*

22, 17, 12, 7, 2, …

(a) Find the next term of the sequence.

..... [1]

(b) Find the nth term of the sequence.

..... [2]

16 - (0580-S 2022-Paper 2 (Extended)/3-Q14) - *SEQUENCES*

Find the nth term of this sequence.

8, 17, 32, 53, 80, …

..... [2]

17 - (0580-S 2022-Paper 2 (Extended)/2-Q21) **-** *SEQUENCES*

The nth term of a sequence is $an^2 + bn - 4$.

The first term is -3 and the second term is 2.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [5]

18 - (0580-W 2022-Paper 2 (Extended)/2-Q6) - *SEQUENCES*

(a) These are the first five terms of a sequence.

27 26 23 18 11

Find the next two terms in the sequence.

..... , ... [2]

(b) The table shows information about two different sequences.

	First five terms of sequence	*n*th term
Sequence A	3 10 17 24 31	
Sequence B	2 11 26 47 74	

Complete the table.

[4]

19 - (0580-W 2022-Paper 2 (Extended)/1-Q8) - *SEQUENCES*

(a) 3, 9, 27, 81, …

Write down the next term in this sequence.

..... [1]

(b) 13, 17, 21, 25, …

Find the *n*th term of this sequence.

..... [2]

1 - (0580-S 2017-Paper 4 (Extended)/1-Q6) - *BRACKETS AND SYMPLIFYING, QUADRATIC EQUATIONS*

(a) Expand the brackets and simplify.

(i) $4(2x+5)-5(3x-7)$

..... [2]

(ii) $(x-7)^2$

..... [2]

(b) Solve.

(i) $\frac{2x}{3}+5=-7$

$x =$ ..... [3]

(ii) $4x+9=3(2x-7)$

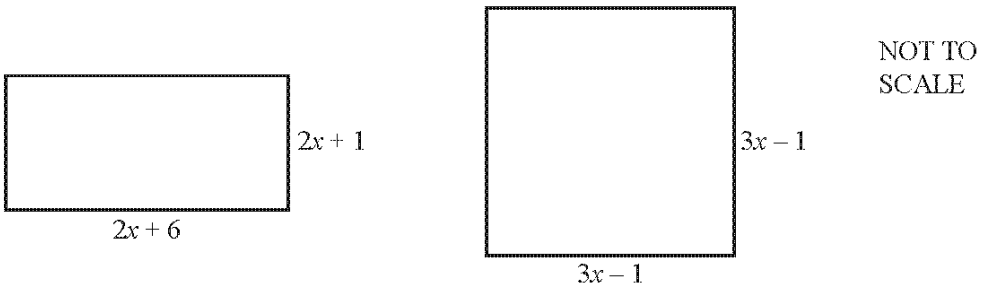
$x =$ ..... [3]

(iii) $3x^2-1=74$

$x =$ ..... or $x =$ ..... [3]

2 - (0580-S 2017-Paper 4 (Extended)/2-Q7) - *FORMULAEE, FACTORISING, QUADRATIC EQUATIONS*

(a) In this part, all lengths are in centimetres.



(i) Find the value of x when the perimeter of the rectangle is equal to the perimeter of the square.

$x =$ ..... [3]

(ii) Find the value of x when the area of the rectangle is equal to the area of the square.
Show all your working.

$x =$ ..... [7]

(b) (i) Factorise $x^2 + 4x - 5$.

..... [2]

(ii) Solve the equation $\frac{5}{x} - \frac{8}{x+1} = 1$.

Show all your working.

$x =$ ..... or $x =$ ..... [4]

3 - (0580-S 2017-Paper 4 (Extended)/3-Q7) - *SIMULTANEOUS EQUATIONS, QUADRATIC EQUATIONS*

(a) Solve the simultaneous equations.
You must show all your working.

$$2x+3y=11$$
$$3x-5y=-50$$

$x =$ .....

$y =$ ..... [4]

(b) $x^2-12x+a=(x+b)^2$

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

(c) Write as a single fraction in its simplest form.

$$\frac{x}{2x-5}+\frac{3x+2}{x-1}$$

..... [4]

4 - (0580-W 2017-Paper 4 (Extended)/3-Q2) **-** *LINEAR EQUAETION, FACTORISING, INDICES*

(a) Solve.

$$\frac{x}{7} = 49$$

$x =$ ..... [1]

(b) Simplify.

(i) x^0

..... [1]

(ii) $x^7 \times x^3$

..... [1]

(iii) $\dfrac{(3x^6)^2}{x^{-4}}$

..... [2]

(c) **(i)** Factorise completely.

$$2x^2 - 18$$

..... [2]

(ii) Simplify.

$$\frac{2x^2 - 18}{x^2 + 7x - 30}$$

..... [3]

5 - (0580-W 2017-Paper 4 (Extended)/1-Q3) **-** *LINEAR EQUAETION, FACTORISING*

(a) Solve.

$11x + 15 = 3x - 7$

$x =$ ..... [2]

(b) (i) Factorise.

$x^2 + 9x - 22$

..... [2]

(ii) Solve.

$x^2 + 9x - 22 = 0$

$x =$ ..... or $x =$ ..... [1]

(c) Rearrange $y = \frac{2(x-a)}{x}$ to make x the subject.

$x =$ ..... [4]

(d) Simplify. $\frac{x^2 - 6x}{x^2 - 36}$

..... [3]

6 - (0580-W 2017-Paper 4 (Extended)/2-Q8) - *FORMULAEE, QUADRATIC EQUATIONS*

(a) The cost of 1 apple is a cents.
The cost of 1 pear is p cents.
The total cost of 7 apples and 9 pears is 354 cents.

(i) Write down an equation in terms of a and p.

..... [1]

(ii) The cost of 1 pear is 2 cents more than the cost of 1 apple.

Find the value of a and the value of p.

$a =$ .....

$p =$ ..... [3]

(b) Rowena walks 2km at an average speed of $x$km/h.

(i) Write down an expression, in terms of x, for the time taken.

..... h [1]

(ii) Rowena then walks 3km at an average speed of $(x - 1)$km/h.
The total time taken to walk the 5km is 2 hours.

(a) Show that $2x^2 - 7x + 2 = 0$.

[3]

(b) Find the value of x.
Show all your working and give your answer correct to 2 decimal places.

$x =$ ..... [4]

7 - (0580-W 2017-Paper 4 (Extended)/3-Q9) **-** *QUADRATIC EQUATIONS*

Luigi and Alfredo run in a 10 km race.
Luigi's average speed was x km/h.
Alfredo's average speed was 0.5 km/h slower than Luigi's average speed.

(a) Luigi took $\frac{10}{x}$ hours to run the race.

Write down an expression, in terms of x, for the time that Alfredo took to run the race.

..... h [1]

(b) Alfredo took 0.25 hours longer than Luigi to run the race.

(i) Show that $2x^2 - x - 40 = 0$.

[4]

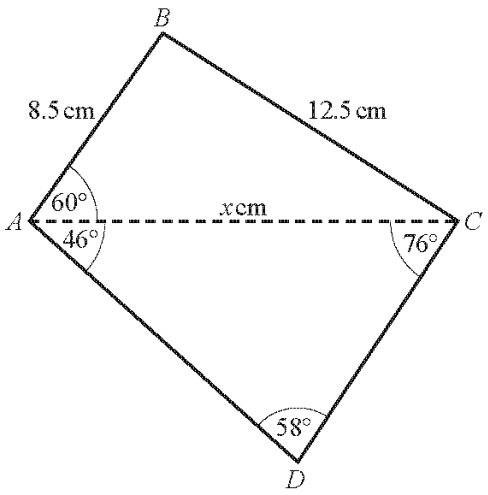
(ii) Use the quadratic formula to solve $2x^2 - x - 40 = 0$.
Show all your working and give your answers correct to 2 decimal places.

x = ... or x = ... [4]

(iii) Work out the time that Luigi took to run the 10 km race.
Give your answer in hours and minutes, correct to the nearest minute.

..... h ..... min [3]

8 - (0580-W 2017-Paper 4 (Extended)/1-Q10) - *QUADRATIC EQUATIONS, TRIGONOMETRY*



NOT TO SCALE

The diagram shows a quadrilateral $ABCD$.

(a) The length of AC is x cm.

Use the cosine rule in triangle ABC to show that $2x^2 - 17x - 168 = 0$.

[4]

(b) Solve the equation $2x^2 - 17x - 168 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(c) Use the sine rule to calculate the length of CD.

$CD =$ ..... cm [3]

(d) Calculate the area of the quadrilateral $ABCD$.

..... cm^2 [3]

9 - (0580-S 2018-Paper 4 (Extended)/2-Q4) - *LINEAR EQUAETION, INDICES*

(a) Simplify.

(i) $(3p^2)^5$

..... [2]

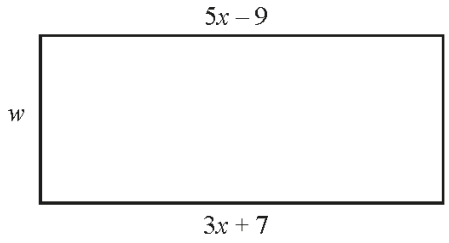
(ii) $18x^2y^6 \div 2xy^2$

..... [2]

(iii) $\left(\frac{5}{m}\right)^{-2}$

..... [1]

(b) In this part, all measurements are in metres.



NOT TO SCALE

The diagram shows a rectangle.
The area of the rectangle is $310\,m^2$.

Work out the value of w.

$w =$ ..... [4]

10 - (0580-S 2018-Paper 4 (Extended)/1-Q5) - *SIMULTANEOUS EQUATIONS, FACTORISING, QUADRATIC EQUATIONS*

(a) Factorise.

(i) $2mn+m^2-6n-3m$

..... [2]

(ii) $4y^2-81$

..... [1]

(iii) t^2-6t+8

..... [2]

(b) Rearrange the formula to make x the subject.

$$k=\frac{2m-x}{x}$$

$x =$ ..... [4]

(c) Solve the simultaneous equations.
You must show all your working.

$$\frac{1}{2}x - 3y = 9$$
$$5x + y = 28$$

$x =$ .....

$y =$ ..... [3]

(d) $\dfrac{3}{m+4} - \dfrac{4}{m} = 6$

(i) Show that this equation can be written as $6m^2 + 25m + 16 = 0$.

[3]

(ii) Solve the equation $6m^2 + 25m + 16 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$m =$ ..... or $m =$ ..... [4]

11 - (0580-S 2018-Paper 4 (Extended)/3-Q5) - *FACTORISING, QUADRATIC EQUATIONS*

(a) At a football match, the price of an adult ticket is $\$x$ and the price of a child ticket is $\$(x-2.50)$.
There are 18 500 adults and 2400 children attending the football match.
The total amount paid for the tickets is \$320 040.

Find the price of an adult ticket.

\$..... [4]

(b) **(i)** Factorise $y^2+5y-84$.

..... [2]

(ii)

NOT TO SCALE

The area of the rectangle is $84\,\text{cm}^2$.

Find the perimeter.

..... cm [3]

(c) In a shop, the price of a monthly magazine is $\$m$ and the price of a weekly magazine is $\$(m-0.75)$.
One day, the shop receives

- \$168 from selling monthly magazines
- \$207 from selling weekly magazines.

The total number of these magazines sold during this day is 100.

(i) Show that $50m^2 - 225m + 63 = 0$.

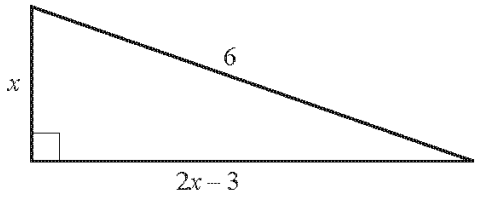
[3]

(ii) Find the price of a monthly magazine.
Show all your working.

\$ ..... [3]

12 - (0580-S 2018-Paper 4 (Extended)/2-Q7) - *QUADRATIC EQUATIONS, TRIGONOMETRY*

In this question, all measurements are in metres.



NOT TO SCALE

The diagram shows a right-angled triangle.

(a) Show that $5x^2 - 12x - 27 = 0$.

[3]

(b) Solve $5x^2 - 12x - 27 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(c) Calculate the perimeter of the triangle.

..... m [2]

(d) Calculate the smallest angle of the triangle.

..... [2]

13 - (0580-W 2018-Paper 4 (Extended)/2-Q2) - *LINEAR EQUAETION, FACTORISING, VARIATION*

(a) Solve $30 + 2x = 3(3 - 4x)$.

$x =$ ..... [3]

(b) Factorise $12ab^3 + 18a^3b^2$.

..... [2]

(c) Simplify.

(i) $5a^3c^2 \times 2a^2c^7$

..... [2]

(ii) $\left(\frac{16a^8}{c^{12}}\right)^{\frac{3}{4}}$

..... [2]

(d) y is inversely proportional to the square of $(x + 2)$.
When $x = 3$, $y = 2$.

Find y when $x = 8$.

$y =$ ..... [3]

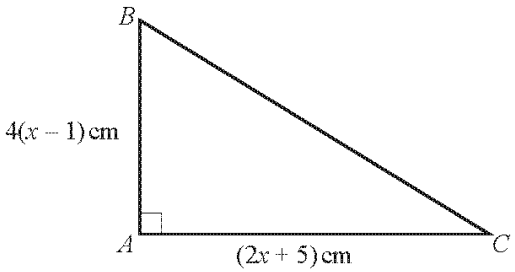
(e) Write as a single fraction in its simplest form.

$$\frac{5}{x-2}-\frac{x-5}{2}$$

..... [3]

14 - (0580-W 2018-Paper 4 (Extended)/2-Q4) - *QUADRATIC EQUATIONS, PYTHAGORAS THEOREM*

The diagram shows a right-angled triangle ABC.



NOT TO SCALE

The area of this triangle is $30\,cm^2$.

(a) Show that $2x^2 + 3x - 20 = 0$.

[3]

(b) Use factorisation to solve the equation $2x^2 + 3x - 20 = 0$.

$x =$ ..... or $x =$ ..... [3]

(c) Calculate BC.

$BC =$ ..... cm [3]

15 - (0580-W 2018-Paper 4 (Extended)/1-Q9) **-** *QUADRATIC EQUATIONS*

Paulo and Jim each buy sacks of rice but from different shops.
Paulo pays \$72 for sacks costing \$$m$ each.
Jim pays \$72 for sacks costing \$(m + 0.9) each.

(a) (i) Find an expression, in terms of m, for the number of sacks Paulo buys.

..... [1]

(ii) Find an expression, in terms of m, for the number of sacks Jim buys.

..... [1]

(b) Paulo buys 4 more sacks than Jim.

Write down an equation, in terms of m, and show that it simplifies to $10m^2 + 9m - 162 = 0$.

[4]

(c) (i) Solve $10m^2 + 9m - 162 = 0$.

m = ... or m = ... [3]

(ii) Find the number of sacks of rice that Paulo buys.

..... [1]

16 - (0580-W 2018-Paper 4 (Extended)/1-Q11) - *FACTORISING, CHANGING THE SUBJECT*

(a) Factorise $5m^2 - 20p^4$.

..... [3]

(b) Make P the subject of the formula $A = P + \frac{PRT}{100}$.

$P =$ ..... [3]

17 - (0580-S 2019-Paper 4 (Extended)/3-Q2) - *LINEAR EQUAETION, INDICES*

(a) Solve.

$$5x - 17 = 7x + 3$$

$x =$ ..... [2]

(b) Find the integer values of n that satisfy this inequality.

$$-7 < 4n \leqslant 8$$

..... [3]

(c) Simplify.

(i) $a^3 \times a^6$

..... [1]

(ii) $(5xy^2)^3$

..... [2]

(iii) $\left(\frac{27x^{12}}{64y^3}\right)^{-\frac{1}{3}}$

..... [3]

18 - (0580-S 2019-Paper 4 (Extended)/2-Q6) - *LINEAR EQUAETION, FACTORISING*

(a) Expand and simplify.

$(x+7)(x-3)$

..... [2]

(b) Factorise completely.

(i) $15p^2q^2 - 25q^3$

..... [2]

(ii) $4fg + 6gh + 10fk + 15hk$

..... [2]

(iii) $81k^2 - m^2$

..... [2]

(c) Solve the equation.

$3(x-4) + \frac{x+2}{5} = 6$

$x =$ ..... [4]

19 - (0580-S 2019-Paper 4 (Extended)/1-Q7) - *QUADRATIC EQUATIONS, CHANGING THE SUBJECT*

(a) $s = ut + \frac{1}{2}at^2$

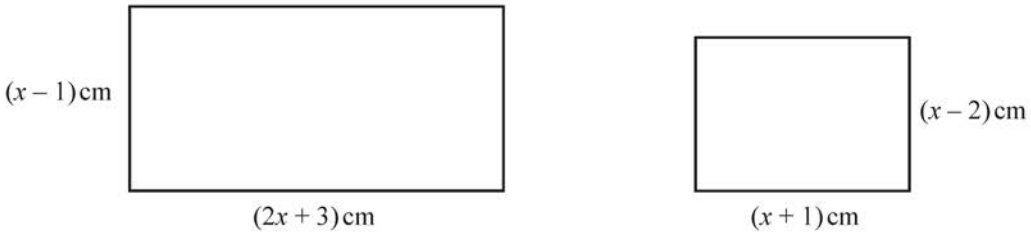
(i) Find s when $t = 26.5$, $u = 104.3$ and $a = -2.2$.
Give your answer in standard form, correct to 4 significant figures.

$s =$ ..... [4]

(ii) Rearrange the formula to write a in terms of u, t and s.

$a =$ ..... [3]

(b)



The difference between the areas of the two rectangles is $62\,\text{cm}^2$.

(i) Show that $x^2 + 2x - 63 = 0$.

[3]

(ii) Factorise $x^2 + 2x - 63$.

..... [2]

(iii) Solve the equation $x^2 + 2x - 63 = 0$ to find the difference between the perimeters of the two rectangles.

..... cm [2]

20 - (0580-S 2019-Paper 4 (Extended)/3-Q8) - *QUADRATIC EQUATIONS, PROBABILITY*

(a) Angelo has a bag containing 3 white counters and x black counters.
He takes two counters at random from the bag, without replacement.

(i) Complete the following statement.

The probability that Angelo takes two black counters is

$$\frac{x}{x+3} \times \frac{\text{.....}}{\text{.....}}.$$

[2]

(ii) The probability that Angelo takes two black counters is $\frac{7}{15}$.

(a) Show that $4x^2 - 25x - 21 = 0$.

[4]

(b) Solve by factorisation.

$$4x^2 - 25x - 21 = 0$$

$x =$ ..... or $x =$ ..... [3]

(c) Write down the number of black counters in the bag.

..... [1]

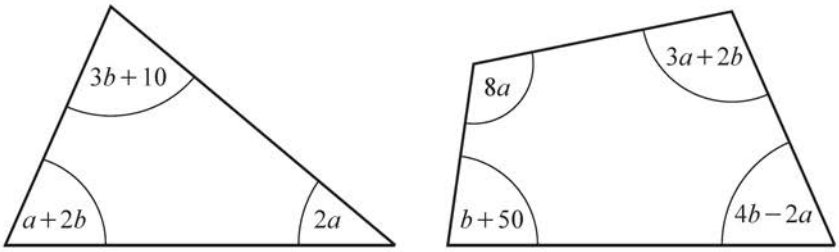
(b) Esme has a bag with 5 green counters and 4 red counters.
She takes three counters at random from the bag without replacement.

Work out the probability that the three counters are all the same colour.

..... [4]

21 - (0580-W 2019-Paper 4 (Extended)/3-Q2) - *LINEAR EQUAETION, INDICES, ANGLES*

(a) The diagram shows a triangle and a quadrilateral.
All angles are in degrees.



NOT TO SCALE

(i) For the triangle, show that $3a + 5b = 170$.

[1]

(ii) For the quadrilateral, show that $9a + 7b = 310$.

[1]

(iii) Solve these simultaneous equations.
Show all your working.

$a =$ .....

$b =$ ..... [3]

(iv) Find the size of the smallest angle in the triangle.

..... [1]

(b) Solve the equation $6x-3=-12$.

$x =$ ..... [2]

(c) Rearrange $2(4x-y)=5x-3$ to make y the subject.

$y =$ ..... [3]

(d) Simplify.

$(27x^9)^{\frac{2}{3}}$

..... [2]

(e) Simplify.

$\frac{x^2+5x}{x^2-25}$

..... [3]

22 - (0580-W 2019-Paper 4 (Extended)/1-Q7) - *SPEED,DISTANCE AND TIME, SIMULTANEOUS EQUATIONS, QUADRATIC EQUATIONS*

(a) Oranges cost 21 cents each.
Alex buys x oranges and Bobbie buys $(x+2)$ oranges.
The total cost of these oranges is \$4.20 .

Find the value of x.

$x =$ ..... [3]

(b) The cost of one ruler is r cents.
The cost of one protractor is p cents.

The total cost of 5 rulers and 1 protractor is 245 cents.
The total cost of 2 rulers and 3 protractors is 215 cents.

Write down two equations in terms of r and p and solve these equations to find the cost of one protractor.

..... cents [5]

(c) Carol walks 12 km at x km/h and then a further 6 km at $(x-1)$ km/h.
The total time taken is 5 hours.

(i) Write an equation, in terms of x, and show that it simplifies to $5x^2 - 23x + 12 = 0$.

[3]

(ii) Factorise $5x^2 - 23x + 12$.

..... [2]

(iii) Solve the equation $5x^2 - 23x + 12 = 0$.

$x =$ ..... or $x =$ ..... [1]

(iv) Write down Carol's walking speed during the final 6 km.

..... km/h [1]

23 - (0580-W 2019-Paper 4 (Extended)/2-Q8) - *CHANGING THE SUBJECT, VECTORS*

(a) Make p the subject of

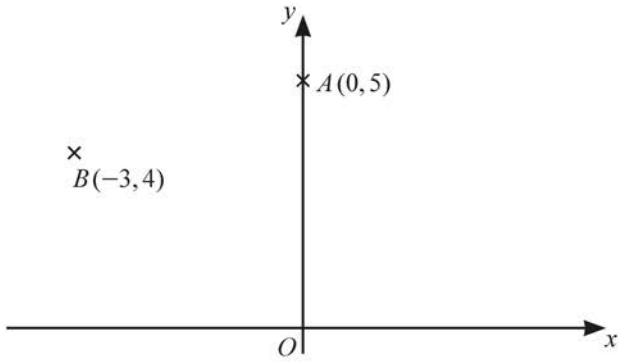
(i) $5p+7=m$,

$p =$ ..... [2]

(ii) $y^2-2p^2=h$.

$p =$ ..... [3]

(b)



NOT TO SCALE

(i) Write $\overrightarrow{OA}$ as a column vector.

$\overrightarrow{OA} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(ii) Write $\overrightarrow{AB}$ as a column vector.

$\overrightarrow{AB} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(iii) A and B lie on a circle, centre O.

Calculate the length of the arc AB.

..... [6]

24 - (0580-W 2019-Paper 4 (Extended)/3-Q10) - *QUADRATIC EQUATIONS*

Solve.

$$\frac{1}{x} - \frac{2}{x+1} = 3$$

Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [7]

25 - (0580-S 2020-Paper 4 (Extended)/1-Q3) - *BRACKETS AND SYMPLIFYING, INDICES*

(a) $s = ut + \frac{1}{2}at^2$

Find the value of s when $u = 5.2$, $t = 7$ and $a = 1.6$.

$s =$ ..... [2]

(b) Simplify.

(i) $3a - 5b - a + 2b$

..... [2]

(ii) $\frac{5}{3x} \times \frac{9x}{20}$

..... [2]

(c) Solve.

(i) $\frac{15}{x} = -3$

$x =$ ..... [1]

(ii) $4(5 - 3x) = 23$

$x =$ ..... [3]

(d) Simplify.

$(27x^9)^{\frac{2}{3}}$

..... [2]

(e) Expand and simplify.

$(3x - 5y)(2x + y)$

..... [2]

26 - (0580-S 2020-Paper 4 (Extended)/3-Q4) - *SIMULTANEOUS EQUATIONS, SOLVING INEQUALITIES*

(a) Solve the inequality.

$$3m + 12 \leqslant 8m - 5$$

..... [2]

(b) Solve the equation. $\frac{2x+5}{3-x} = \frac{14}{15}$

$x =$ ..... [3]

(c) Solve the simultaneous equations.
You must show all your working.

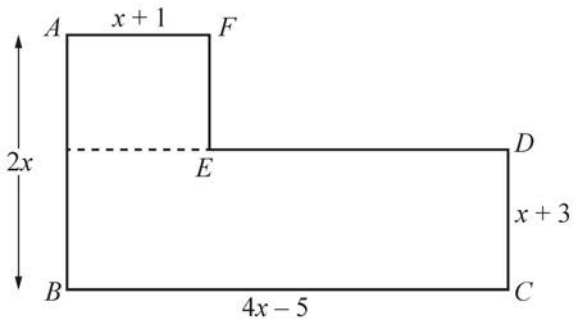
$$y = 4 - x$$
$$x^2 + 2y^2 = 67$$

$x =$ ..... , $y =$ .....

$x =$ ..... , $y =$ ..... [6]

27 - (0580-S 2020-Paper 4 (Extended)/3-Q5) - *QUADRATIC EQUATIONS*

All the lengths in this question are in centimetres.



NOT TO SCALE

The diagram shows a shape $ABCDEF$ made from two rectangles.
The total area of the shape is $342\,\text{cm}^2$.

(a) Show that $x^2 + x - 72 = 0$.

[5]

(b) Solve by factorisation.

$$x^2 + x - 72 = 0$$

$x =$ ..... or $x =$ ..... [3]

(c) Work out the perimeter of the shape *ABCDEF*.

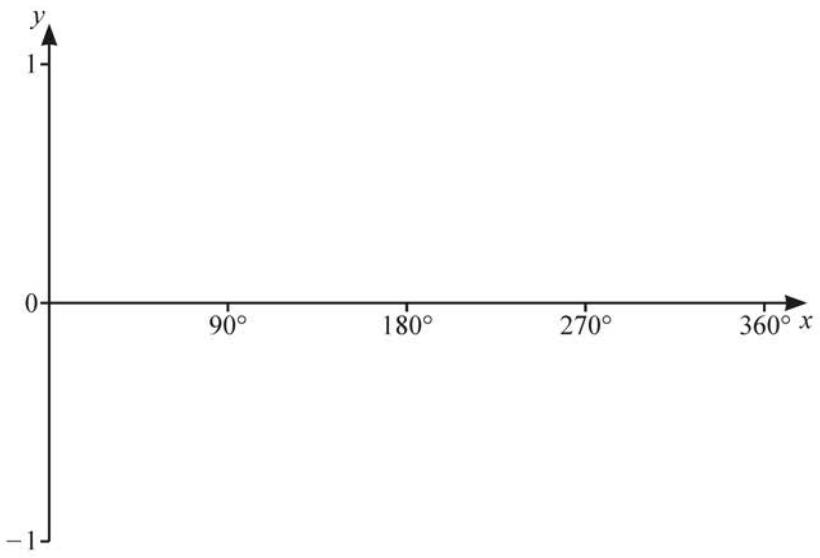
..... cm [2]

(d) Calculate angle *DBC*.

Angle *DBC* = ... [2]

28 - (0580-S 2020-Paper 4 (Extended)/1-Q8) - *QUADRATIC EQUATIONS, TRIGONOMETRY*

(a) (i) On the axes, sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.



[2]

(ii) Describe fully the symmetry of the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.

.....

..... [2]

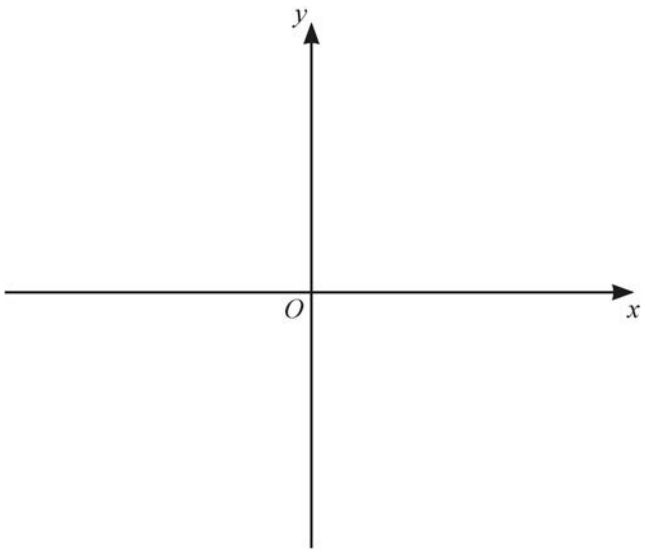
(b) Solve $4\sin x - 1 = 2$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... and $x =$ ..... [3]

(c) **(i)** Write $x^2 + 10x + 14$ in the form $(x+a)^2 + b$.

..... [2]

(ii) On the axes, sketch the graph of $y = x^2 + 10x + 14$, indicating the coordinates of the turning point.



[3]

29 - (0580-S 2020-Paper 4 (Extended)/2-Q9) - *QUADRATIC EQUATIONS*

(a) (i) Write x^2+8x-9 in the form $(x+k)^2+h$.

..... [2]

(ii) Use your answer to **part (a)(i)** to solve the equation $x^2+8x-9=0$.

$x =$ ..... or $x =$ ..... [2]

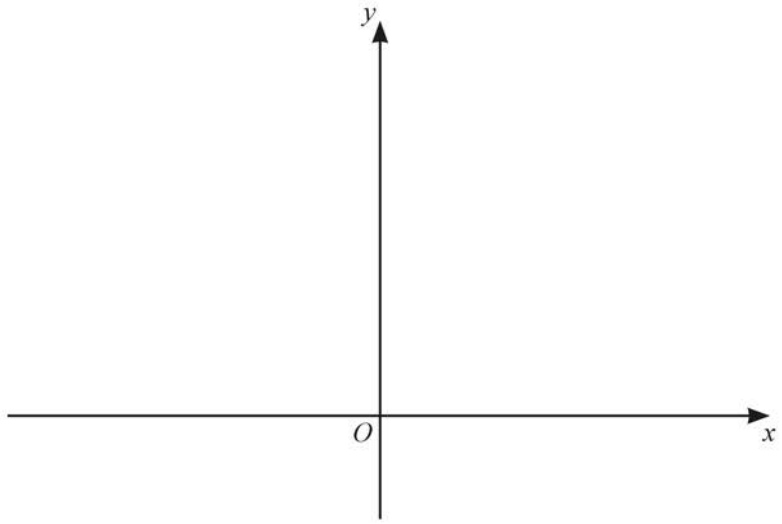
(b) The solutions of the equation $x^2+bx+c=0$ are $\frac{-7+\sqrt{61}}{2}$ and $\frac{-7-\sqrt{61}}{2}$.

Find the value of b and the value of c.

$b =$ .....

$c =$ ..... [3]

(c) (i)



On the diagram,

(a) sketch the graph of $y = (x-1)^2$, [2]

(b) sketch the graph of $y = \frac{1}{2}x + 1$. [2]

(ii) The graphs of $y = (x-1)^2$ and $y = \frac{1}{2}x + 1$ intersect at A and B.

Find the length of AB.

$AB =$ ..... [7]

30 - (0580-W 2020-Paper 4 (Extended)/2-Q5) - *LINEAR EQUAETION, QUADRATIC EQUATIONS*

Ahmed sells different types of cake in his shop.
The cost of each cake depends on its type and its size.

Every small cake costs $\$x$ and every large cake costs $\$(2x + 1)$.

(a) The total cost of 3 small lemon cakes and 2 large lemon cakes is \$12.36 .

Find the cost of a small lemon cake.

$ ..... [3]

(b) The cost of 18 small chocolate cakes is the same as the cost of 7 large chocolate cakes.

Find the cost of a small chocolate cake.

$ ..... [3]

(c) The number of small cherry cakes that can be bought for \$4 is the same as the number of large cherry cakes that can be bought for \$13.

Find the cost of a small cherry cake.

$ ..... [3]

(d) Petra spends \$20 on small coffee cakes and \$10 on large coffee cakes.
The total number of cakes is 45.

Write an equation in terms of x.
Solve this equation to find the cost of a small coffee cake.
Show all your working.

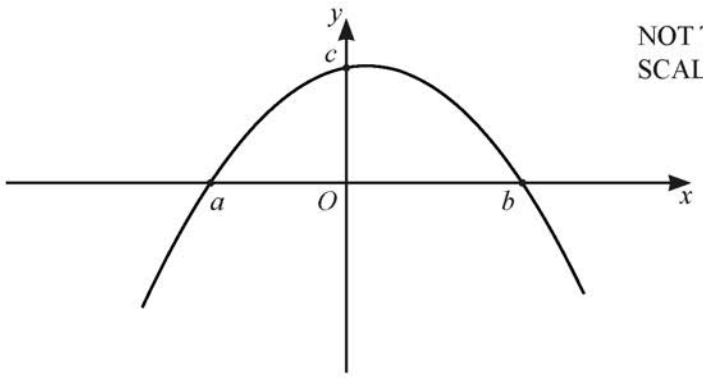
\$ ..... [7]

31 - (0580-W 2020-Paper 4 (Extended)/3-Q7) - *QUADRATIC EQUATIONS, DIFFERENIATION*

(a) (i) Factorise $24+5x-x^2$.

..... [2]

(ii) The diagram shows a sketch of $y = 24+5x-x^2$.



Work out the values of a, b and c.

$a =$ .....

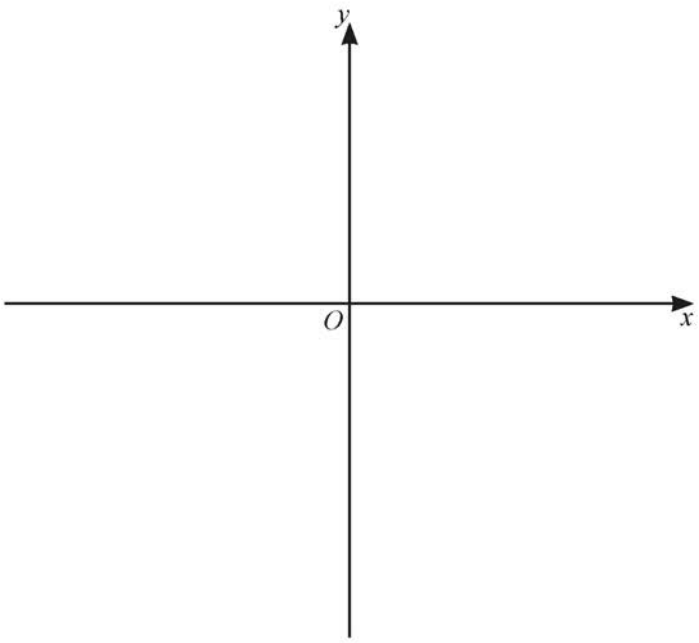
$b =$ .....

$c =$ ..... [3]

(iii) Calculate the gradient of $y = 24+5x-x^2$ at $x = -1.5$.

..... [3]

(b) (i) On the diagram, sketch the graph of $y = (x+1)(x-3)^2$.
Label the values where the graph meets the x-axis and the y-axis.



[4]

(ii) Write $(x+1)(x-3)^2$ in the form ax^3+bx^2+cx+d.

..... [3]

32 - (0580-W 2020-Paper 4 (Extended)/1-Q8) - *BRACKETS AND SYMPLIFYING, QUADRATIC EQUATIONS, INDICES*

(a) Factorise completely.

$3a^2b - ab^2$

..... [2]

(b) Solve the inequality.

$3x + 12 < 5x - 3$

..... [2]

(c) Simplify.

$(3x^2y^4)^3$

..... [2]

(d) Solve.

$\frac{2}{x} = \frac{6}{2-x}$

$x =$ ..... [3]

(e) Expand and simplify.

$(x-2)(x+5)(2x-1)$

..... [3]

(f) Alan invests \$200 at a rate of r% per year compound interest.
After 2 years the value of his investment is \$206.46 .

(i) Show that $r^2 + 200r - 323 = 0$.

[3]

(ii) Solve the equation $r^2 + 200r - 323 = 0$ to find the rate of interest.
Show all your working and give your answer correct to 2 decimal places.

$r =$ ..... [3]

33 - (0580-W 2020-Paper 4 (Extended)/3-Q9) - *FACTORISING, QUADRATIC EQUATIONS*

(a) Find the integer values that satisfy the inequality $2 < 2x \leqslant 10$.

..... [2]

(b) Factorise completely.

(i) $6y^2 - 15xy$

..... [2]

(ii) $y^2 - 9x^2$

..... [2]

(c) Simplify.

$$\frac{3}{x-1} - \frac{2}{2x+1}$$

..... [3]

(d) The straight line $y = 3x + 2$ intersects the curve $y = 2x^2 + 7x - 11$ at two points.

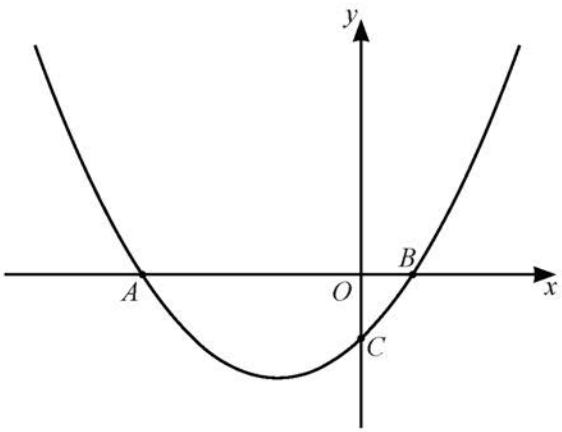
Find the coordinates of these two points.
Give your answers correct to 2 decimal places.

(..... , ...)

(..... , ...) [6]

34 - (0580-W 2020-Paper 4 (Extended)/1-Q10) - *QUADRATIC EQUATIONS, TRIGONOMETRY, DIFFERENIATION*

(a)



NOT TO SCALE

The diagram shows a sketch of the curve $y = x^2 + 3x - 4$.

(i) Find the coordinates of the points A, B and C.

A (..... , ...)

B (..... , ...)

C (..... , ...) [4]

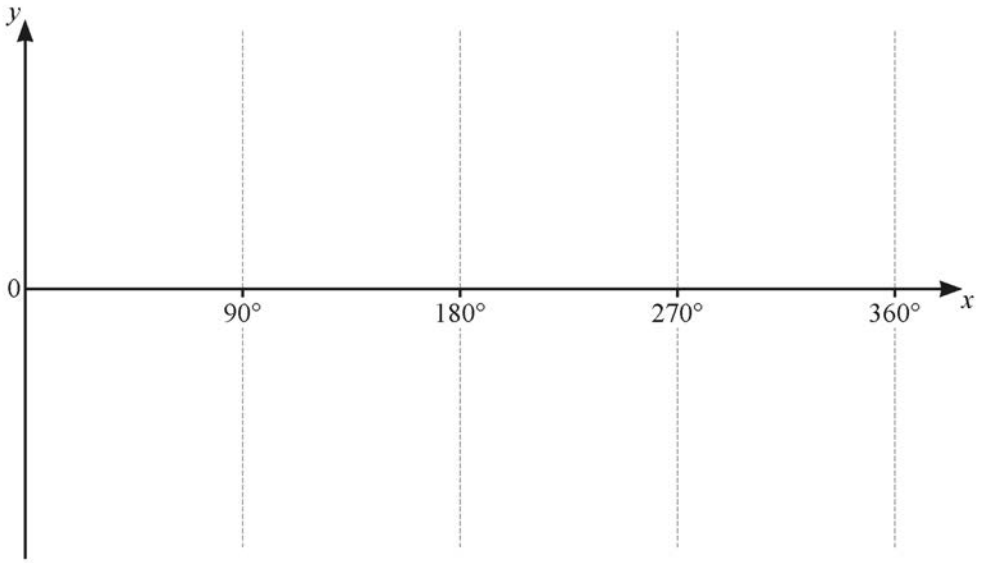
(ii) Differentiate $x^2 + 3x - 4$.

..... [2]

(iii) Find the equation of the tangent to the curve at the point (2, 6).

..... [3]

(b)



(i) On the diagram, sketch the graph of $y = \tan x$ for $0° \leqslant x \leqslant 360°$. [2]

(ii) Solve the equation $5\tan x = -7$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... or $x =$ ..... [3]

35 - (0580-S 2021-Paper 4 (Extended)/3-Q2) - *BRACKETS AND SYMPLIFYING, FACTORISING*

(a) $y = px^2 + t$

(i) Find the value of y when $p = 3$, $x = 2$ and $t = -13$.

$y =$ ..... [2]

(ii) Rearrange the formula to write x in terms of p, t and y.

$x =$ ..... [3]

(b) **(i)** Factorise.

$15x^2 - 2x - 8$

..... [2]

(ii) Solve the equation.

$15x^2 - 2x - 8 = 0$

$x =$ ..... or $x =$ ..... [1]

(c) Factorise completely.

$x^3 - 16xy^2$

..... [3]

(d) Simplify. $\dfrac{2x-1-4ax+2a}{2x^2-x}$

..... [4]

36 - (0580-S 2021-Paper 4 (Extended)/2-Q3) - *FACTORISING, INDICES*

(a) Simplify, giving your answer as a single power of 7.

(i) $7^5 \times 7^6$

..... [1]

(ii) $7^{15} \div 7^5$

..... [1]

(iii) $42 + 7$

..... [1]

(b) Simplify.

$(5x^2 \times 2xy^4)^3$

..... [3]

(c) $P = 2^5 \times 3^3 \times 7$ $Q = 540$

(i) Find the highest common factor (HCF) of P and Q.

..... [2]

(ii) Find the lowest common multiple (LCM) of P and Q.

..... [2]

(iii) $P \times R$ is a cube number, where R is an integer.

Find the smallest possible value of R.

..... [2]

(d) Factorise the following completely.

(i) $x^2 - 3x - 28$

..... [2]

(ii) $7(a+2b)^2 + 4a(a+2b)$

..... [2]

(e) $3^{2x-1} = \frac{1}{9^x} \times 3^{2y-x}$

Find an expression for y in terms of x.

$y =$ ..... [4]

37 - (0580-S 2021-Paper 4 (Extended)/3-Q5) - *SIMULTANEOUS EQUATIONS*

Solve the simultaneous equations.

(a) $x+2y=13$
$x+5y=22$

$x =$ .....

$y =$ ..... [2]

(b) $y=2-x$
$y=x^2+2x+2$

38 - (0580-S 2021-Paper 4 (Extended)/1-Q7) - *BRACKETS AND SYMPLIFYING, FACTORISING, DIFFERENIATION*

(a) Simplify.

$$\frac{x^2-25}{x^2-x-20}$$

..... [3]

(b) Write as a single fraction in its simplest form.

$$\frac{x+5}{x}+\frac{x+8}{x-1}$$

..... [3]

(c) A curve has equation $y = 2x^3 - 4x^2 + 6$.

(i) Find $\frac{dy}{dx}$, the derived function of y.

..... [2]

(ii) Calculate the gradient of the curve $y = 2x^3 - 4x^2 + 6$ at $x = 4$.

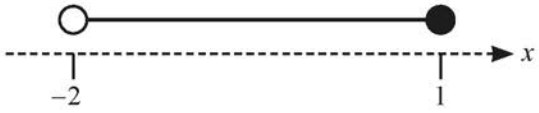
..... [2]

(iii) Find the coordinates of the two stationary points on the curve.

(..... , ...) and (..... , ...) [4]

39 - (0580-S 2021-Paper 4 (Extended)/3-Q7) - *QUADRATIC EQUATIONS, FUNCTIONS*

(a)



Write down the inequality in x shown by the number line.

..... [2]

(b) (i) Write x^2+4x+1 in the form $(x+p)^2+q$.

..... [2]

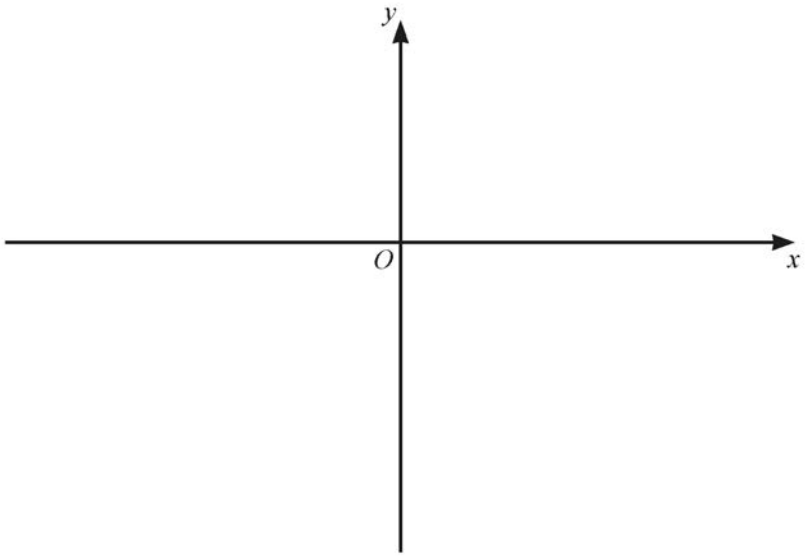
(ii) Use your answer to **part (b)(i)** to solve the equation $x^2+4x+1=0$.

$x =$ ..... or $x =$ ..... [2]

(iii) Use your answer to **part (b)(i)** to write down the coordinates of the minimum point on the graph of $y = x^2 + 4x + 1$.

(..... , ...) [2]

(iv) On the diagram, sketch the graph of $y = x^2 + 4x + 1$.



[2]

40 - (0580-W 2021-Paper 4 (Extended)/1-Q4) **-** *LINEAR EQUAETION, FACTORISING, QUADRATIC EQUATIONS*

(a) Solve.

(i) $6(7-2x)=3x-8$

$x =$ ..... [3]

(ii) $\frac{2x}{x-5}=\frac{2}{3}$

$x =$ ..... [3]

(b) Factorise completely.

(i) $2x^2-288y^2$

..... [3]

(ii) $5x^2+17x-40$

..... [2]

(c) Solve $x^3 + 4x^2 - 17x = x^3 - 9$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [5]

41 - (0580-W 2021-Paper 4 (Extended)/3-Q4) - *SIMULTANEOUS EQUATIONS, FACTORISING, SOLVING INEQUALITIES*

(a) Solve the simultaneous equations.
You must show all your working.

$$2p - q = 7$$
$$3p + 2q = 7$$

$p =$ .....

$q =$ ..... [3]

(b) Solve the equation.

$$\frac{x}{4} + \frac{2x}{3} = 1$$

$x =$ ..... [2]

(c) $-8 < 3x - 2 \leqslant 7$

(i) Solve the inequality.

..... [3]

(ii) Find the integer values of x that satisfy the inequality.

..... [1]

(d) Factorise completely.

$16a - 4a^2$

..... [2]

(e) Write each of the following as a single fraction, in its simplest form.

(i) $\frac{1}{2a} \div \frac{3}{4b}$

..... [2]

(ii) $2 - \frac{x}{x-1}$

..... [2]

42 - (0580-W 2021-Paper 4 (Extended)/2-Q6) - *PERCENTAGES, QUADRATIC EQUATIONS*

(a) Solve.

(i) $4(2x-3)=24$

$x =$ ..... [3]

(ii) $6x+14>6$

..... [2]

(b) Rearrange the formula $V=2x^3-3y^3$ to make y the subject.

$y =$ ..... [3]

(c) Show that $(2n-5)^2-13$ is a multiple of 4 for all integer values of n.

[3]

(d) The expression $5+12x-2x^2$ can be written in the form $q-2(x+p)^2$.

(i) Find the value of p and the value of q.

$p =$ ..... , $q =$ ..... [3]

(ii) Write down the coordinates of the maximum point of the curve $y = 5+12x-2x^2$.

(..... , ...) [1]

(e) The energy of a moving object is directly proportional to the square of its speed.
The speed of the object is increased by 30%.

Calculate the percentage increase in the energy of the object.

..... % [2]

43 - (0580-W 2021-Paper 4 (Extended)/3-Q7) - *QUADRATIC EQUATIONS*

(a) Amir buys 3 cakes that cost c cents each and 2 loaves of bread that cost $(2c - 11)$ cents each.
He spends a total of \$5.87 .

Find the value of c.

$c =$ ..... [3]

(b) A bottle of water costs \$$w$.
A bottle of juice costs \$$(w + 1)$.

Alex spends \$22 on bottles of water and \$42 on bottles of juice.
The number of bottles of water is equal to the number of bottles of juice.

Find the value of w.

$w =$ ..... [3]

(c) Alicia walks a distance of 9 km at a speed of x km/h.
She then runs a distance of 5 km at a speed of $(2x + 1)$ km/h.

The total time Alicia takes is 2.5 hours.

(i) Show that $10x^2 - 41x - 18 = 0$.

[4]

(ii) Work out Alicia's running speed.
You must show all your working.

..... km/h [4]

44 - (0580-W 2021-Paper 4 (Extended)/2-Q8) - *UPPER AND LOWER BOUND, QUADRATIC EQUATIONS*

(a) Kaito runs along a 12 km path at an average speed of x km/h.

(i) Write down an expression, in terms of x, for the number of hours he takes.

..... hours [1]

(ii) Yuki takes 1.5 hours longer to walk along the same path as Kaito.
She walks at an average speed of $(x-4)$ km/h.

Write down an equation, in terms of x, and show that it simplifies to $x^2-4x-32=0$.

[4]

(iii) Solve by factorisation.

$$x^2-4x-32=0$$

$x =$ ..... or $x =$ ..... [3]

(iv) Find the number of hours it takes Yuki to walk along the 12 km path.

..... hours [2]

(b) A bus travels 440 km, correct to the nearest 10 km.
The time taken to complete the journey is 6 hours, correct to the nearest half hour.

Calculate the lower bound of the speed of the bus.

..... km/h [3]

45 - (0580-S 2022-Paper 4 (Extended)/1-Q3) - *LINEAR EQUAETION, SIMULTANEOUS EQUATIONS*

(a) Geeta buys x apples, $(x+7)$ oranges and $(2x-1)$ bananas.
The total number of pieces of fruit Geeta buys is 30.

(i) Find the number of apples Geeta buys.

..... [3]

(ii) The cost of one apple is 15 cents.
The cost of one orange is 18 cents.
The total cost of all the fruit is \$5.55 .

Find the cost, in cents, of one banana.

..... cents [3]

(b) (i) Solve.

$$\frac{3w}{16} - 1 = \frac{1}{2}$$

$w =$ ..... [2]

(ii) $$\frac{3(2^{-y})}{16} - 1 = \frac{1}{2}$$

Find the value of y.

$y =$ ..... [2]

(c) **(i)** Solve the simultaneous equations.

$$2p + q = 2$$
$$p - q = -\frac{1}{2}$$

$p =$ .....

$q =$ ..... [2]

(ii) Hence, for $0° \leqslant u \leqslant 360°$ and $0° \leqslant v \leqslant 360°$, solve the simultaneous equations.

$$2\sin u + \cos v = 2$$
$$\sin u - \cos v = -\frac{1}{2}$$

$u =$ ..... or $u =$ .....

$v =$ ..... or $v =$ ..... [4]

46 - (0580-S 2022-Paper 4 (Extended)/3-Q6) - *BRACKETS AND SYMPLIFYING, LINEAR EQUAETION, CHANGING THE SUBJECT*

(a) Simplify.

$$a-2b-3a+7b$$

..... [2]

(b) Expand and simplify.

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

..... [2]

(c) Write as a single fraction in its simplest form.

$$\frac{3}{x-5}-\frac{7}{2x}$$

..... [3]

(d) Solve.

$$\frac{13-4x}{3}=6-x$$

$x =$ ..... [3]

(e) Make x the subject of the formula.

$$y = \frac{5(p-2x)}{x}$$

$x =$ ..... [4]

47 - (0580-S 2022-Paper 4 (Extended)/2-Q8) - *LINEAR EQUAETION, SIMULTANEOUS EQUATIONS, CHANGING THE SUBJECT*

(a) Solve.

$$10-3p=3+11p$$

$p =$ ..... [2]

(b) Make m the subject of the formula.

$$mc^2-2k=mg$$

$m =$ ..... [3]

(c) Solve.

$$\frac{1}{x-3}+\frac{4}{2x+3}=1$$

$x =$ ..... or $x =$ ..... [5]

(d) Solve the simultaneous equations.
You must show all your working.

$$x+2y=12$$
$$5x+y^2=39$$

$x =$ …….. $y =$ ……

$x =$ …….. $y =$ …… [5]

(e) Expand and simplify.

$$(2x-3)(x+6)(x-4)$$

..... [3]

48 - (0580-S 2022-Paper 4 (Extended)/3-Q8) - *SIMULTANEOUS EQUATIONS, LINES*

(a) A has coordinates $(-2,7)$, B has coordinates $(1,-5)$ and C has coordinates $(5,4)$.

(i) Find the coordinates of the midpoint of the line AB.

(..... , ...) [2]

(ii) Find $\overrightarrow{AC}$.

$\overrightarrow{AC} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(iii) Find $\left|\overrightarrow{AC}\right|$.

..... [2]

(iv) Find the equation of the line AB.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(v) Find the equation of the line perpendicular to AB that passes through C.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(b) The graphs of $y + 5x = 8$ and $y = 2x^2 + 6x - 13$ intersect at the points P and Q.

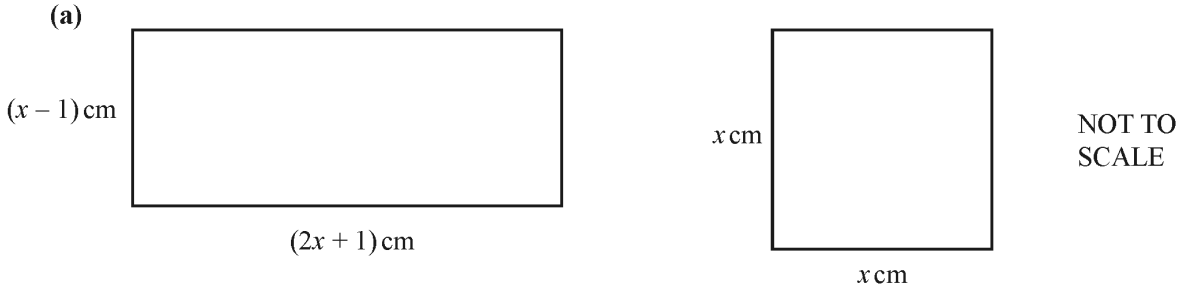
Find the coordinates of P and the coordinates of Q.
Show all your working.

P (..... , ...)

Q (..... , ...) [6]

49 - (0580-S 2022-Paper 4 (Extended)/1-Q9) - *QUADRATIC EQUATIONS, MENSURATION*

(a)

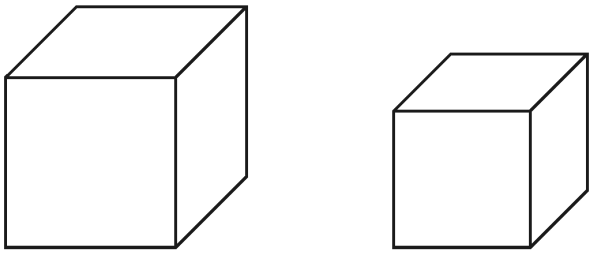


The area of the rectangle is $29\,\text{cm}^2$ greater than the area of the square.
The difference between the perimeters of the two shapes is k cm.

Find the value of k.
You must show all your working.

$k =$ ..... [6]

(b)



NOT TO SCALE

The volume of the larger cube is $5\,\text{cm}^3$ greater than the volume of the smaller cube.

(i) Show that $3y^2 + 3y - 4 = 0$.

[4]

(ii) Find the volume of the smaller cube.
Show all your working and give your answer correct to 2 decimal places.

..... cm^3 [4]

50 - (0580-W 2022-Paper 4 (Extended)/3-Q2) - *QUADRATIC EQUATIONS, INDICES, SEQUENCES*

(a) Simplify fully.

(i) $p^3 \times p^{11}$

..... [1]

(ii) $\dfrac{18m^6}{3m^2}$

..... [2]

(iii) $\left(\dfrac{27x^9y^{27}}{64}\right)^{-\frac{1}{3}}$

..... [3]

(b) A sequence has nth term $3n^2$.

Write down the first 3 terms of this sequence.

..... , ... , ... [2]

(c) Find the nth term for each of these sequences.

(i) 13, 16, 19, 22, 25, …

..... [2]

(ii) 3, 17, 55, 129, 251, …

..... [2]

(d) Solve.

$$\frac{3x-22}{4} = 23$$

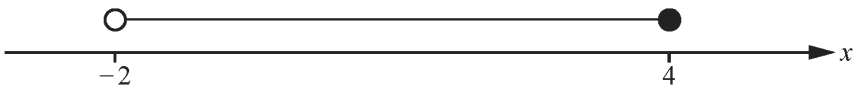
$x =$ ..... [3]

(e) Use the quadratic formula to solve $3x^2 + 8x - 20 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... , $x =$ ..... [4]

51 - (0580-W 2022-Paper 4 (Extended)/1-Q3) - *LINEAR EQUAETION, SOLVING INEQUALITIES*

(a)



Write down the inequality shown by the number line.

..... [1]

(b) $-3 \leqslant 2x+3 < 9$

(i) Solve the inequality.

..... [3]

(ii) Write down all the integer values of x that satisfy the inequality.

..... [2]

(c) Solve the equations.

(i) $3(3-x)-\frac{2(x+2)}{5}=1$

$x =$ ..... [4]

(ii) $\frac{5}{x+3}=\frac{3}{x+5}$

$x =$ ..... [3]

52 - (0580-W 2022-Paper 4 (Extended)/2-Q6) - *QUADRATIC EQUATIONS, VARIATION, DIFFERENIATION*

(a) Solve.

$4x + 15 = 9$

$x =$ ..... [2]

(b) Factorise.

$a^2 - 9$

..... [1]

(c) Write as a single fraction in its simplest form.

$\frac{4a}{5} \div \frac{3ad}{10c}$

..... [3]

(d) $5^n + 5^n + 5^n + 5^n + 5^n = 5^m$

Find an expression for m in terms of n.

$m =$ ..... [2]

(e) Solve by factorisation.

$4x^2 + 8x - 5 = 0$

$x =$ ..... or $x =$ ..... [3]

(f) **(i)** y is directly proportional to $(x+3)^3$.
When $x = 2$, $y = 13.5$.

Find x when $y = 108$.

$x =$ ..... [3]

(ii) g is inversely proportional to the square of d.
When d is halved, the value of g is multiplied by a factor n.

Find n.

$n =$ ..... [2]

(g) Expand and simplify.

$$(2x+3)(x-1)(x+3)$$

..... [3]

(h) Find the derivative, $\frac{dy}{dx}$, of $y = 3x^2 + 4x - 1$.

..... [2]

53 - (0580-W 2022-Paper 4 (Extended)/3-Q6) - *CHANGING THE SUBJECT, SOLVING INEQUALITIES, LINEAR PROGRAMMING*

(a) $P = 5k^2 - 7$

(i) Find the value of P when $k = 3$.

$P =$ ..... [2]

(ii) Rearrange the formula to make k the subject.

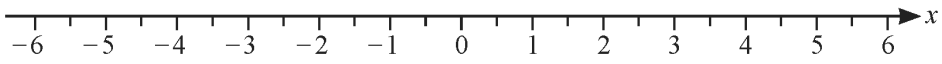
$k =$ ..... [3]

(b) (i) Solve.

$$x - 3 \leqslant 5x + 7$$

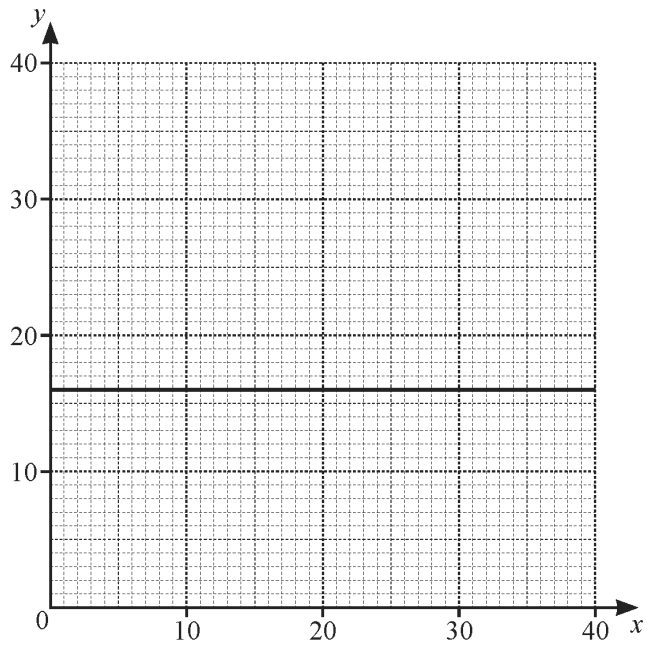
..... [2]

(ii) Show your answer to **part (b)(i)** on the number line.



[1]

(c) The line $y = 16$ is drawn on the grid.



The region R satisfies the following inequalities.

$y \geqslant 16$ $x > 2$ $2x + 3y \geqslant 72$ $y \leqslant 32 - x$

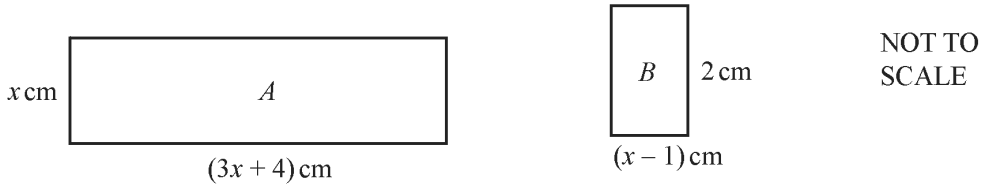
(i) By drawing three more lines and shading the region **not required**, find and label region R. [6]

(ii) Find the integer coordinates (x, y) in the region R that give the maximum value of $2x + y$.

(..... , ...) [2]

54 - (0580-W 2022-Paper 4 (Extended)/1-Q9) - *QUADRATIC EQUATIONS*

(a)



The total of the areas of rectangles A and B is $20\,\text{cm}^2$.

(i) Show that $3x^2 + 6x - 22 = 0$.

[2]

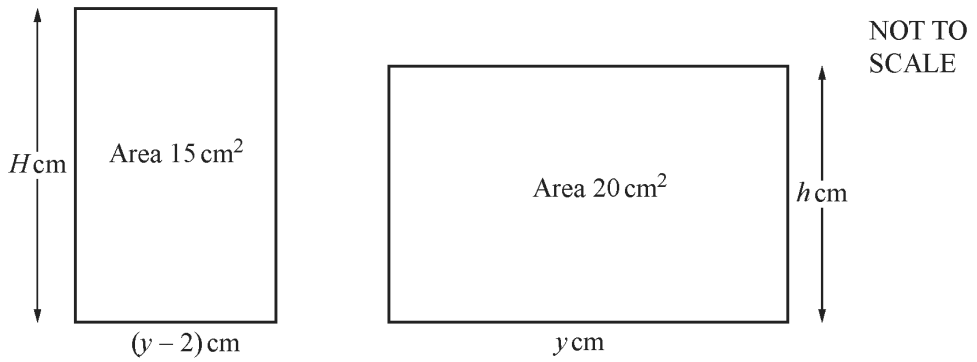
(ii) Solve the equation $3x^2 + 6x - 22 = 0$, giving your answers correct to 4 significant figures. You must show all your working.

$x =$ ..... or $x =$ ..... [4]

(iii) Find the perimeter of rectangle B.

..... cm [1]

(b)



The diagram shows two rectangles where $H - h = 1$.

By forming a quadratic equation and factorising, find the value of y.

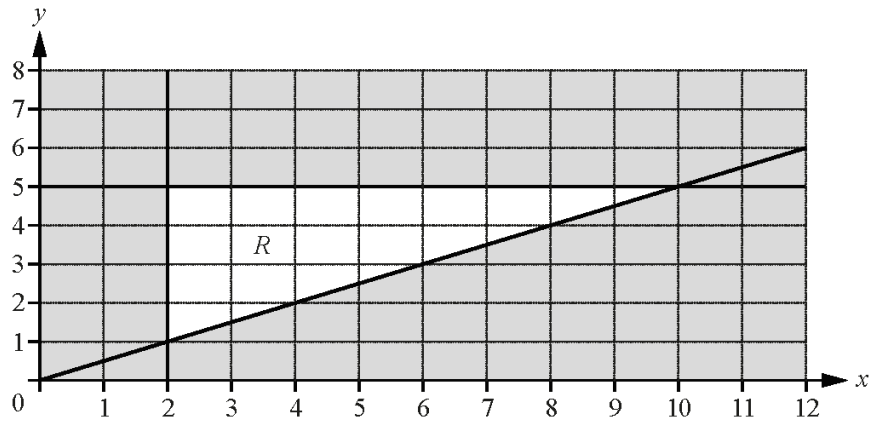
$y =$ ..... [7]

1 - (0580-S 2018-Paper 4 (Extended)/3-Q9) - *LINEAR PROGRAMMING*

(a) Find the equation of the straight line that is perpendicular to the line $y = \frac{1}{2}x + 1$ and passes through the point (1, 3).

..... [3]

(b)



(i) Find the three inequalities that define the region R.

.....

.....

..... [4]

(ii) Find the point (x, y), with integer co-ordinates, inside the region R such that $3x + 5y = 35$.

(..... , ...) [2]

2 - (0580-W 2019-Paper 4 (Extended)/1-Q9) **-** *LINEAR PROGRAMMING*

A car hire company has x small cars and y large cars.
The company has at least 6 cars in total.
The number of large cars is less than or equal to the number of small cars.
The largest number of small cars is 8.

(a) Write down three inequalities, in terms of x and/or y, to show this information.

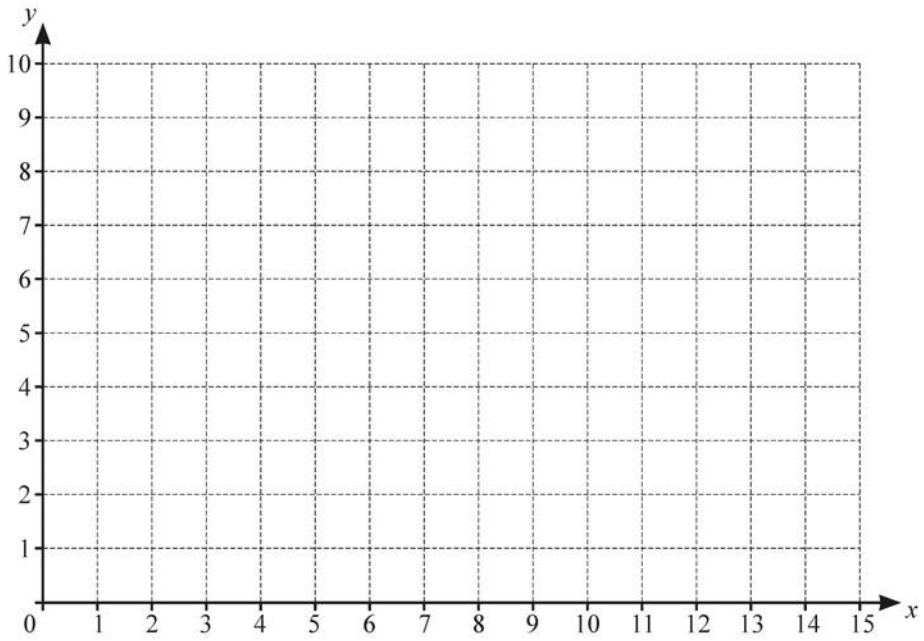
..... , ... , ... [3]

(b) A small car can carry 4 people and a large car can carry 6 people.
One day, the largest number of people to be carried is 60.

Show that $2x+3y \leqslant 30$.

[1]

(c)



By shading the **unwanted** regions on the grid, show and label the region R that satisfies all four inequalities. [6]

(d) **(i)** Find the number of small cars and the number of large cars needed to carry exactly 60 people.

..... small cars, ... large cars [1]

(ii) When the company uses 7 cars, find the largest number of people that can be carried.

..... [2]

3 - (0580-S 2020-Paper 4 (Extended)/1-Q6) - *LINEAR PROGRAMMING*

Raheem makes baskets and mats.
Each week he makes x baskets and y mats.

He makes fewer than 10 mats.
The number of mats he makes is greater than or equal to the number of baskets he makes.

(a) One of the inequalities that shows this information is $y < 10$.

Write down the other inequality.

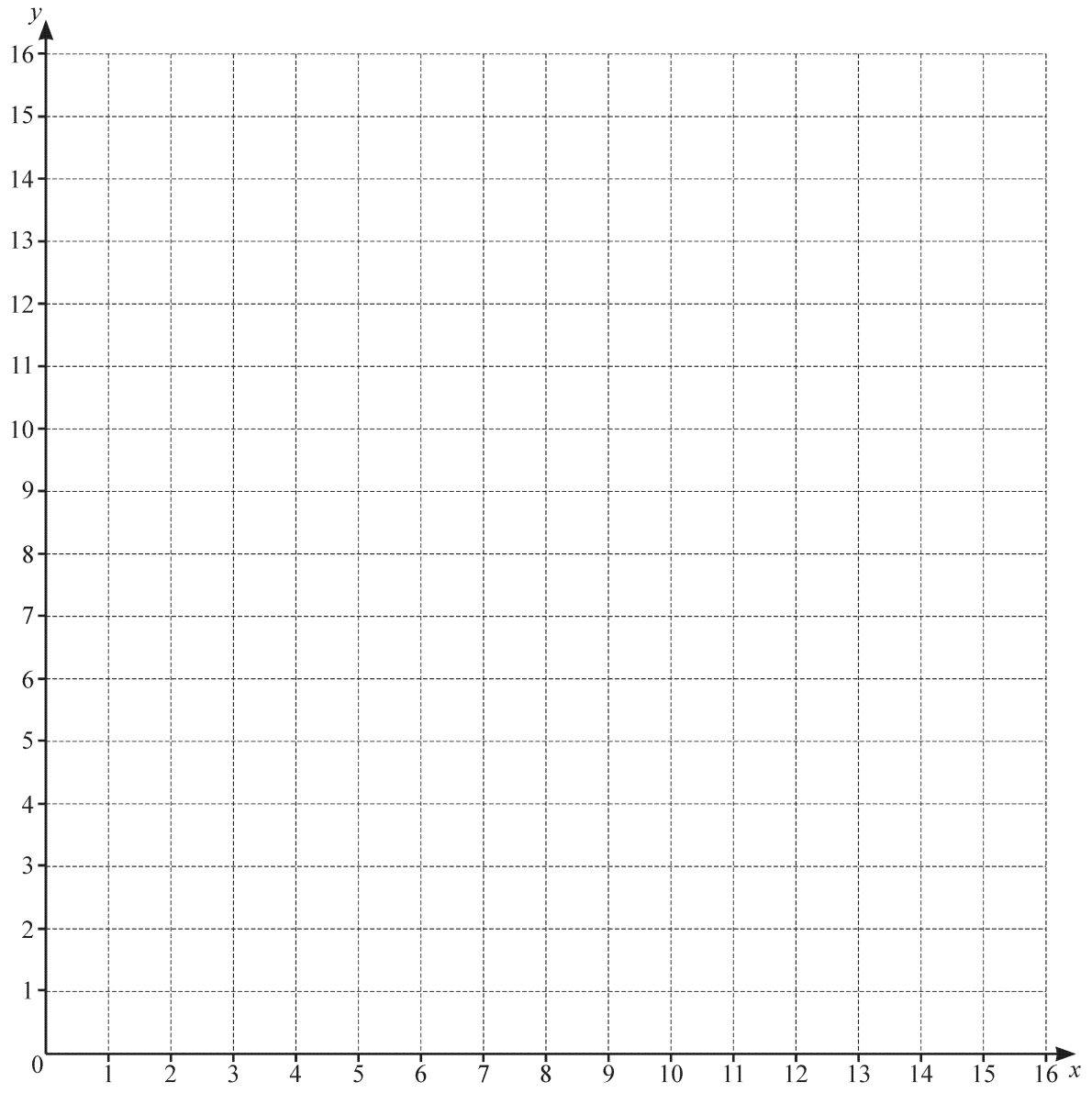
..... [1]

(b) He takes $2\frac{1}{4}$ hours to make a basket and $1\frac{1}{2}$ hours to make a mat.
Each week he works for a maximum of 22.5 hours.

Show that $3x + 2y \leqslant 30$.

[2]

(c) On the grid, draw three straight lines and shade the **unwanted** regions to show these inequalities.



[5]

(d) He makes $40 profit on each basket he sells and $28 profit on each mat he sells.

Calculate the maximum profit he can make each week.

$ ..... [2]

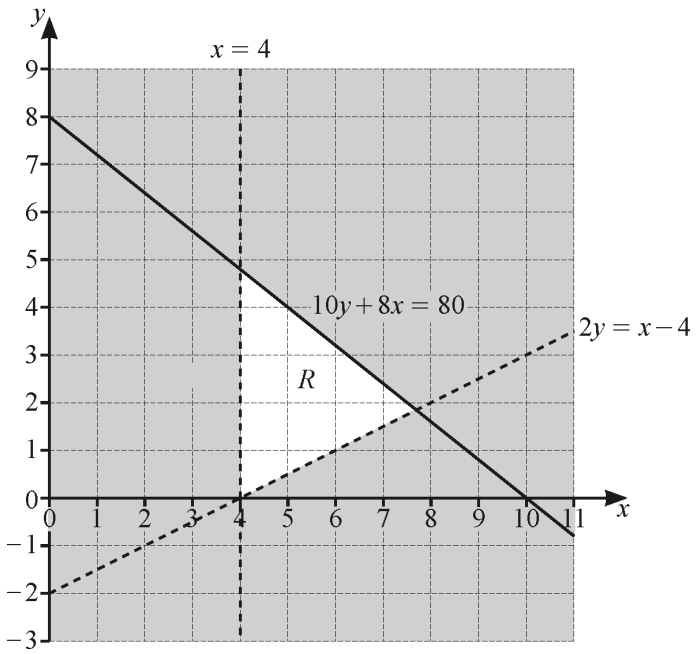
4 - (0580-S 2022-Paper 4 (Extended)/2-Q10) - *LINEAR PROGRAMMING*

(a) Find all the positive integers which satisfy the inequality.

$$3n - 8 > 5n - 15$$

..... [2]

(b)



The region marked R is defined by three inequalities.

(i) Find these three inequalities.

.....

.....

..... [3]

(ii) Write down the largest value of $3x + y$ in the region R for integers x and y.

..... [2]

5 - (0580-W 2022-Paper 4 (Extended)/3-Q6) **-** *CHANGING THE SUBJECT, SOLVING INEQUALITIES, LINEAR PROGRAMMING*

(a) $P = 5k^2 - 7$

(i) Find the value of P when $k = 3$.

$P =$ ..... [2]

(ii) Rearrange the formula to make k the subject.

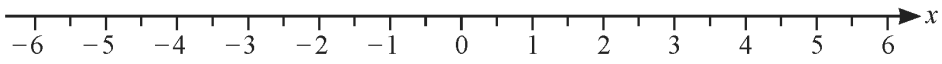
$k =$ ..... [3]

(b) (i) Solve.

$$x - 3 \leqslant 5x + 7$$

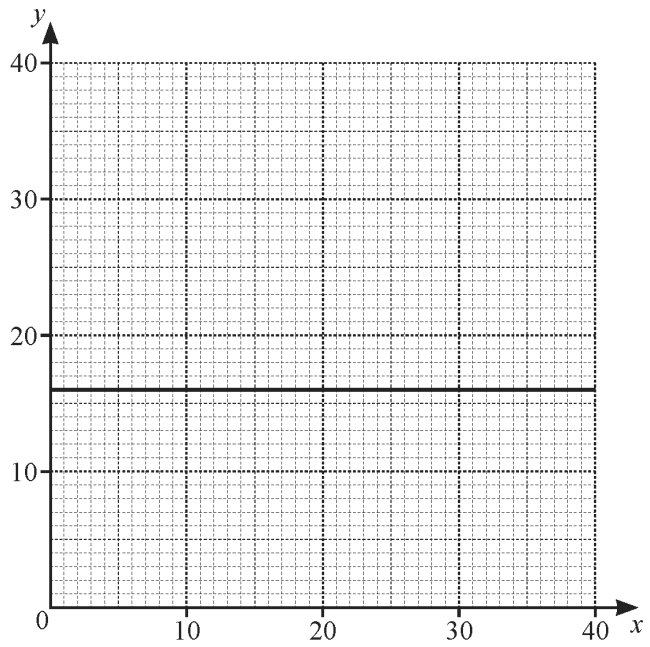
..... [2]

(ii) Show your answer to **part (b)(i)** on the number line.



[1]

(c) The line $y = 16$ is drawn on the grid.



The region R satisfies the following inequalities.

$y \geqslant 16$ $x > 2$ $2x + 3y \geqslant 72$ $y \leqslant 32 - x$

(i) By drawing three more lines and shading the region **not required**, find and label region R. [6]

(ii) Find the integer coordinates (x, y) in the region R that give the maximum value of $2x + y$.

(..... , ...) [2]

1 - (0580-S 2017-Paper 4 (Extended)/1-Q9) - *SEQUENCES*

(a) The nth term of a sequence is $8n - 3$.

(i) Write down the first two terms of this sequence.

..... , ... [1]

(ii) Show that the number 203 is not in this sequence.

[2]

(b) Find the nth term of these sequences.

(i) 13, 19, 25, 31, …

..... [2]

(ii) 4, 8, 14, 22, …

..... [2]

(c) … , 20, 50, …

The second term of this sequence is 20 and the third term is 50.
The rule for finding the next term in this sequence is subtract y then multiply by 5.

Find the value of y and work out the first term of this sequence.

$y =$ .....

First term = ... [4]

2 - (0580-S 2017-Paper 4 (Extended)/3-Q11) - *SEQUENCES*

The table shows the first four terms in sequences A, B, C and D.

Complete the table.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	16	25	36	49			
B	5	8	11	14			
C	11	17	25	35			
D	$\frac{3}{2}$	$\frac{4}{3}$	$\frac{5}{4}$	$\frac{6}{5}$			

[12]

3 - (0580-W 2017-Paper 4 (Extended)/1-Q6) - *SEQUENCES*

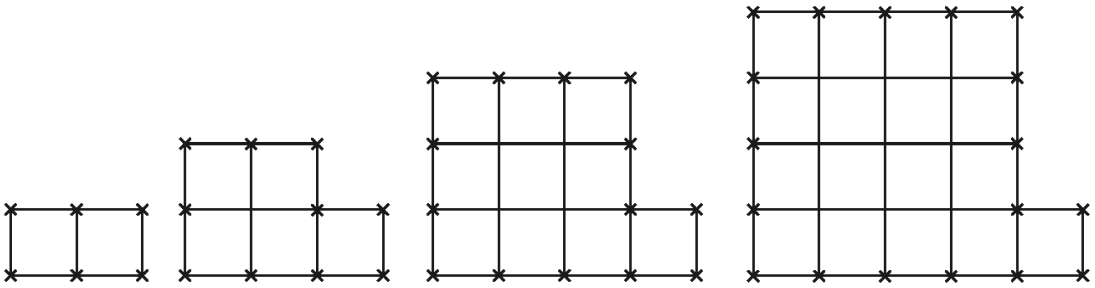


Diagram 1 Diagram 2 Diagram 3 Diagram 4

These are the first four diagrams in a sequence.
Each diagram is made from small squares and crosses.

(a) Complete the table.

Diagram	1	2	3	4	5		*n*
Number of crosses	6	10	14				
Number of small squares	2	5	10				

[6]

(b) Find the number of crosses in Diagram 60.

..... [1]

(c) Which diagram has 226 squares?

Diagram ..... [1]

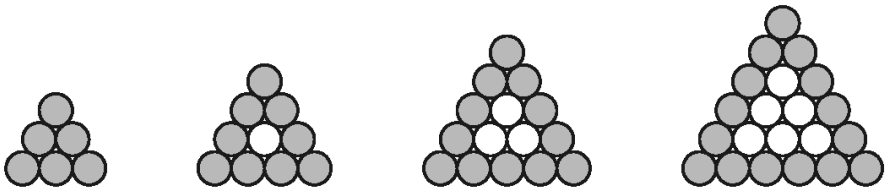
(d) The side of each small square has length 1 cm.
The number of lines of length 1 cm in Diagram n is $2n^2 + 2n + q$.

Find the value of q.

$q =$ ..... [2]

4 - (0580-S 2018-Paper 4 (Extended)/1-Q12) - *SEQUENCES*

Marco is making patterns with grey and white circular mats.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

The patterns form a sequence.
Marco makes a table to show some information about the patterns.

Pattern number	1	2	3	4	5
Number of grey mats	6	9	12	15	
Total number of mats	6	10	15	21	

(a) Complete the table for Pattern 5. [2]

(b) Find an expression, in terms of n, for the number of grey mats in Pattern n.

..... [2]

(c) Marco makes a pattern with 24 grey mats.

Find the total number of mats in this pattern.

..... [2]

(d) Marco needs a total of 6 mats to make the first pattern.
He needs a total of 16 mats to make the first two patterns.
He needs a total of $\frac{1}{6}n^3 + an^2 + bn$ mats to make the first n patterns.

Find the value of a and the value of b.

a = ...

b = ... [6]

5 - (0580-W 2018-Paper 4 (Extended)/3-Q10) - *SEQUENCES*

(a) Find the next term and the nth term of this sequence.

$$\frac{3}{5}, \quad \frac{4}{7}, \quad \frac{5}{9}, \quad \frac{6}{11}, \quad \frac{7}{13}, \quad \ldots$$

Next term = ...

nth term = ... [3]

(b) Find the nth term of each sequence.

(i) –1, –3, –5, –7, –9, …

..... [2]

(ii) 2, 9, 28, 65, 126, …

..... [2]

6 - (0580-S 2019-Paper 4 (Extended)/3-Q10) - *SEQUENCES*

(a) 19, 15, 11, 7, ...

(i) Write down the next two terms of the sequence.

..... , ... [2]

(ii) Find the nth term of this sequence.

..... [2]

(iii) Find the value of n when the nth term is -65.

$n =$ ..... [2]

(b) Another sequence has nth term $2n^2 + 5n - 15$.

Find the difference between the 4th term and the 5th term of this sequence.

..... [2]

7 - (0580-S 2019-Paper 4 (Extended)/2-Q11) - *SEQUENCES*

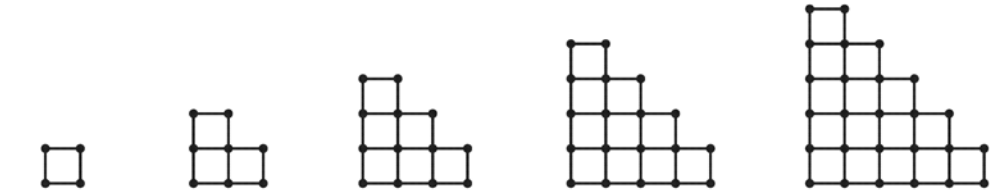


Diagram 1 Diagram 2 Diagram 3 Diagram 4 Diagram 5

The sequence of diagrams above is made up of small lines and dots.

(a) Complete the table.

	Diagram 1	Diagram 2	Diagram 3	Diagram 4	Diagram 5	Diagram 6
Number of small lines	4	10	18	28		
Number of dots	4	8	13	19		

[4]

(b) For Diagram n find an expression, in terms of n, for the number of small lines.

..... [2]

(c) Diagram r has 10 300 small lines.

Find the value of r.

$r =$ ..... [2]

(d) The number of dots in Diagram n is $an^2 + bn + 1$.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [2]

8 - (0580-W 2019-Paper 4 (Extended)/1-Q10) - *SEQUENCES*

(a) Complete the table for the 5th term and the nth term of each sequence.

1st term	2nd term	3rd term	4th term	5th term		nth term
9	5	1	−3			
4	9	16	25			
1	8	27	64			
8	16	32	64			

[11]

(b) 0, 1, 1, 2, 3, 5, 8, 13, 21, …

This sequence is a Fibonacci sequence.
After the first two terms, the rule to find the next term is "add the two previous terms".
For example, $5 + 8 = 13$.

Use this rule to complete each of the following Fibonacci sequences.

2 4 ....

1 11

..... −1 1

[3]

(c) $\frac{1}{3}$, $\frac{3}{4}$, $\frac{4}{7}$, $\frac{7}{11}$, $\frac{11}{18}$, …

(i) One term of this sequence is $\frac{p}{q}$.

Find, in terms of p and q, the next term in this sequence.

..... [1]

(ii) Find the 6th term of this sequence.

..... [1]

9 - (0580-W 2020-Paper 4 (Extended)/1-Q7) - *SEQUENCES*

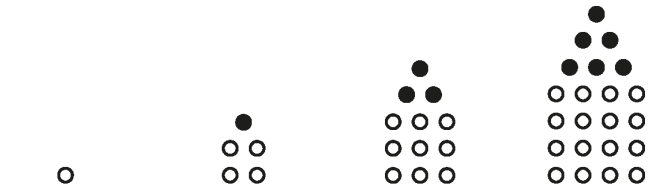


Diagram 1 Diagram 2 Diagram 3 Diagram 4

These are the first four diagrams of a sequence.
The diagrams are made from white dots and black dots.

(a) Complete the table for Diagram 5 and Diagram 6.

Diagram	1	2	3	4	5	6
Number of white dots	1	4	9	16		
Number of black dots	0	1	3	6		
Total number of dots	1	5	12	22		

[2]

(b) Write an expression, in terms of n, for the number of white dots in Diagram n.

..... [1]

(c) The expression for the total number of dots in Diagram n is $\frac{1}{2}(3n^2 - n)$.

(i) Find the total number of dots in Diagram 8.

..... [1]

(ii) Find an expression for the number of black dots in Diagram n.
Give your answer in its simplest form.

..... [2]

(d) T is the total number of dots used to make **all** of the first n diagrams.

$$T = an^3 + bn^2$$

Find the value of a and the value of b.
You must show all your working.

$a =$ .....

$b =$ ..... [5]

10 - (0580-W 2020-Paper 4 (Extended)/2-Q11) **-** *SEQUENCES*

Sequence	1st term	2nd term	3rd term	4th term	5th term		*n*th term
A	13	9	5	1			
B	0	7	26	63			
C	$\frac{7}{8}$	$\frac{8}{16}$	$\frac{9}{32}$	$\frac{10}{64}$			

(a) Complete the table for the three sequences.

[10]

(b) One term in Sequence C is $\frac{p}{q}$.

Write down the next term in Sequence C in terms of p and q.

..... [2]

11 - (0580-W 2020-Paper 4 (Extended)/3-Q11) - *SEQUENCES*

The table shows the first four terms in sequences A, B, and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	4	9	14	19			
B	3	10	29	66			
C	1	4	16	64			

Complete the table.

[9]

12 - (0580-S 2021-Paper 4 (Extended)/2-Q10) - *SEQUENCES*

The table shows four sequences A, B, C and D.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	1	8	27	64			
B	5	11	17	23			
C	0.25	0.5	1	2	4		
D	4.75	10.5	16	21			

Complete the table.

[9]

13 - (0580-S 2021-Paper 4 (Extended)/3-Q11) - *SEQUENCES*

(a) These are the first four terms of a sequence.

11 7 3 −1

(i) Write down the next term.

..... [1]

(ii) Write down the term to term rule for this sequence.

..... [1]

(iii) Find the nth term of this sequence.

..... [2]

(b) The nth term of a different sequence is $\frac{2n}{n+1}$.

(i) Find the difference between the 5th term and the 6th term of this sequence.
Give your answer as a fraction.

..... [2]

(ii) Is $\frac{3}{4}$ a term in this sequence?
Show how you decide.

[3]

14 - (0580-W 2022-Paper 4 (Extended)/3-Q2) - *QUADRATIC EQUATIONS, INDICES, SEQUENCES*

(a) Simplify fully.

(i) $p^3 \times p^{11}$

..... [1]

(ii) $\dfrac{18m^6}{3m^2}$

..... [2]

(iii) $\left(\dfrac{27x^9y^{27}}{64}\right)^{-\frac{1}{3}}$

..... [3]

(b) A sequence has nth term $3n^2$.

Write down the first 3 terms of this sequence.

..... , ... , ... [2]

(c) Find the nth term for each of these sequences.

(i) 13, 16, 19, 22, 25, …

..... [2]

(ii) 3, 17, 55, 129, 251, …

..... [2]

(d) Solve.

$$\frac{3x-22}{4} = 23$$

$x =$ ..... [3]

(e) Use the quadratic formula to solve $3x^2 + 8x - 20 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... , $x =$ ..... [4]