Mark schemes

Q1.

(a) −30

B1

(b) $4(t - 5)$

Accept 4 × (t − 5)

B1

(c) $6m - 12$ or $5 \quad m + 10$

M1

$11m - 2$

A1

(d) $8g4k5$

B1 for two components correct

B2

(e) $5q(2q - 3r)$

B1 for 5(2q2 − 3qr) or q(10q − 15r)
or 10q(q − 1.5r) or 5q(2q − ?)
or 5q(? − 3r)

B2

[8]

Q2.

(a) $6f + 3e$ or $3e + 6f$

do not accept further working

eg 6f + 3e = 9fe

B1

(b) 36

B1

Additional Guidance

Do not allow embedded answer to score any marks without correct answer 36 on answer

[2]

Q3.

(a) 4

B1

(b) −30

B1

(c) $5c = 19 - 4$ or 15

M1

3

A1

(d) $4(t - 5)$

Accept 4 × (t – 5)

B1

[5]

Q4.

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

oe

Denominator not necessary ... marks for numerator terms

M1

$6x - 9 + 4x - 4$

oe *allow one incorrect term*

M1 dep

their $10x - 13 = 2 \times 12$

oe *eg* $20x - 26 = 2 \times 24$

Do not allow *their* $10x - 13 = 2$

M1 dep

(x =) 3.7 or $\frac{37}{10}$

A1

All steps clearly shown with M3 awarded

Strand (ii)

Q1

[5]

Q5.

(a) 9

B1

Additional Guidance
Answer of 9 on answer line or clearly stated in script is the only acceptable answer
Do not allow embedded answers such as 6 × 9 =

(b) $3y = 9 - 15$ or $3y = -6$

or

$y = \frac{9}{3} - \frac{15}{3}$ or $y = 3 - 5$

or

$(9 - 15) \div 3$

oe

M1

–2

A1

Additional Guidance
Embedded answer. M1 A0
T&I is M0 unless answer stated as –2 then it is full marks.

(c) $4w - 2w$ (= $2w$) or $7 - 2$ (= 5)

oe

M1

$2w = 5$

oe

A1

2.5 or $2\frac{1}{2}$ or $\frac{5}{2}$

ft if M awarded and at most one error

A1ft

Additional Guidance
Allow ft if equation written as $2w = a$ but not $a = 7$ or $a = 2$ or $bw = 5$ but not $b = 4$

$2w = 9$, $w = 4.5$	M1 A0 A1ft
$6w = 5$, $w = \frac{5}{6}$ or 0.83...	M1 A0 A1ft
$6w = 9$	M0
$2w = 7$, $w = 3.5$	M1 A0 A0ft
$2w = 2$, $w = 1$	M1 A0 A0ft
$4w = 5$, $w = 1.25$	M1 A0 A0ft
Embedded answer	M1 A1 A0

T&I is M0 unless answer stated as 2.5 then it is full marks

[6]

Q6.

(a) 3×4 (+) 2×-5 or 12 (+) –10

M1

2

A1

(b) (c =) 12

B1

(c) $6w - 8 = 7$

3w − 4 = 3.5

M1

$6w = 7 + 8$ or $6 \quad w = 15$

3w = 3.5 + 4 or 3w= 7.5

M1

$(w =)$ 2.5

oe eg $\frac{15}{6}$ *or* $\frac{5}{2}$ *or* $2\frac{1}{2}$

A1

(d) $a^3 + 4a$

B1 for a3 or 4a

Do not accept a4

B2

[8]

Q7.

(a) 25

Embedded ie 25 − 7 = 18 B0

B1

(b) An equation whose solution is 8

Equation does not have to be linear

eg x2 = 64

Accept x = 8

B1

(c) Two values where $b - a = 10$

Accept 0, negative numbers and non-integers

B1 for any two values where a + b = 10

or for any two values where a − b = 10

B1 10 + a = b oe seen

B2

[4]

Q8.

Alternative method 1– based on a fraction of the number of males

$\frac{1}{4} \times 2x (+) \frac{3}{8} \times x$ or $\frac{7}{8}x$ where x is the number of males

$\frac{1}{4} \times 2 (+) \frac{3}{8} (\times 1)$ *or* $\frac{7}{8}$

M1

$\frac{1}{4} \times 2x + \frac{3}{8} \times x = 84$ or $\frac{7}{8}x = 84$ or $7x = 672$

oe

$\frac{1}{4} \times 2 + \frac{3}{8}$ (×1) linked to 84 or $\frac{7}{8}$ linked to 84

M1dep

84 ÷ their $\frac{7}{8}$ or $x = 84 \times$ their $\frac{8}{7}$ or $x = 96$

oe

Dep on M1M1

84 ÷ their $\frac{7}{8}$ or 84 × their $\frac{8}{7}$ or 96

M1dep

288

A1

Alternative method 2– based on a fraction of the number of females

$\frac{1}{4} \times y$ (+) $\frac{3}{8} \times \frac{y}{2}$ or $\frac{17}{16}y$ where y is the number of females

$\frac{1}{4}$(× 1) (+) $\frac{3}{8} \times \frac{1}{2}$ or $\frac{7}{16}$

M1

$\frac{1}{4} \times y + \frac{3}{8} \times \frac{y}{2} = 84$ or $\frac{7}{16}y = 84$ or $7y = 1344$

oe

$\frac{1}{4}$(×1) + $\frac{3}{8} \times \frac{1}{2}$ linked to 84 or $\frac{7}{16}$ linked to 84

M1dep

$y = 84 \div$ their $\frac{7}{16}$ or $y = 84 \times$ their $\frac{16}{7}$ or $y = 192$

oe

Dep on M1M1

84 ÷ their $\frac{7}{16}$ or 84 × their $\frac{16}{7}$ or 192

M1dep

288

A1

Alternative method 3– based on a fraction of the total number of people

$\frac{1}{4} \times \frac{2}{3} \times z$ or $\frac{4z}{24}$ or $\frac{3}{8} \times \frac{1}{3} \times z$ or $\frac{3z}{24}$

where z is the number of people in the office

oe

$\frac{1}{4} \times \frac{2}{3}$ or $\frac{4}{24}$ or $\frac{3}{8} \times \frac{1}{3}$ or $\frac{3}{24}$

M1

$\frac{1}{4} \times \frac{2}{3} \times z + \frac{3}{8} \times \frac{1}{3} \times z = 84$ or $\frac{7z}{24} = 84$

oe $\frac{3}{8} \times \frac{1}{3} + \frac{1}{4} \times \frac{2}{3}$ linked to 84 or $\frac{7}{24}$ linked to 84

M1dep

$z = 84 \div \text{their}\frac{7}{24}$ or $z = 84 \times \text{their}\frac{24}{7}$ or $7z = 2016$

oe

Dep on M1M1

84 ÷ their $\frac{7}{24}$ or 84 × their $\frac{24}{7}$

M1dep

288

A1

Alternative method 4 – chooses numbers of females and males and factors up or down

Chooses numbers for females and males in the ratio 2 : 1 and works out the numbers of females and males wearing glasses (which should be in the ratio 4 : 3)

eg 32 females and 16 males and $\frac{1}{4} \times 32$ (+) $\frac{3}{8} \times 16$ or 8 and 6 or 14

M1

Works out multiplying factor by 84 ÷ their total number of people wearing glasses

eg $84 \div (\frac{1}{4} \times 32 \div \frac{3}{8} \times 16)$ or 84 ÷ 14 (= 6)

M1dep

Multiplies their total of females and males by their multiplying factor

eg 32 × their 6 + 16 × their 6 or (32 + 16) × their 6

M1dep

288

A1

Additional Guidance

If more than one method is attempted:
if an answer is given, mark the method leading to that answer
if no answer is given, mark each method and award the best mark

[4]

Q9.

(8*x* =) 30 + 10 or (8*x* =) 40

M1

5

SC1 2.5 or $\frac{20}{8}$ oe

A1

Alternative method

$x - \frac{10}{8} = \frac{30}{8}$

or $x = \frac{30}{8} + \frac{10}{8}$

or their (30 + 10) ÷ 8

M1

5

SC1 2.5 or $\frac{20}{8}$ *oe*

A1

[2]

Q10.

(a) $(5x + 3 =)\ 3x + 6$

B1

$5x$ – their $3x$= their 6 – 3 or $2x = 3$

oe

M1

1.5

oe

ft for linear equation if B0 scored

A1 ft

(b) $2x + 32$ or $4x - 20$

Accept ax + ab for M1

M1

$6x + 12$ or $6(x + 2)$

A1

$a = 6$ and $b = 2$

ft from their 6x + 12 if M1 earned

SC2 a = 6 and b = 12

SC1 a = 6

A1 ft

[6]

Q11.

$5x - x$ or $4x$ or 16 + 2 or 18 *oe*

M1

$4x = 18$

A1

4.5 *oe*

ft their rearrangement with one error if M1 awarded

A1ft

[3]

Q12.

(a) $3(x - 5)$

B1

(b) $5y + 20t - 10$

B1 for 2 correct terms.
Penalise any incorrect further working.
Eg
$5y + 20t - 10 = 25yt - 10$ is B1
$5y + 20t - 1 = 25yt - 1$ is B0 (error in expansion and incorrect further work)
$5y + 20t - 10 = 5(y + 4t - 2)$ given as answer is B1 as shows a misunderstanding of expanding brackets.

B2

(c) $3w + 6 = 2w - 1$

$w + 2 = \frac{2}{3}w - \frac{1}{3}$

M1

$3w - 2w = -1 - 6$

This mark is for rearranging their expansion correctly to get w terms one side and number terms on the other.

$w - \frac{2}{3}w = -\frac{1}{3} - 2$ *(oe)*

M1

-7

ft on one error

A1ft

[6]

Q13.

$6x - 2x$ $(= 4x)$ or $13 + 5$ $(= 18)$

M1

$4x = 18$

A1

4.5, $\frac{18}{4}$, $\frac{9}{2}$, $4\frac{1}{2}$, etc.

ft on one error
incorrect cancelling after a correct fraction seen is not penalised

A1ft

[3]

Q14.

$5x - 3x$ or $11 + 9$

Implied by $2x = 20$

M1

$2x = 20$

A1

10

ft on one error only

A1ft

[3]

Q15.

(a) $6x = 28 + 5$ *oe*

$\frac{28+5}{6}$

M1

5.5 *oe*

A1

(b) $2a + 7b$

B1 for one correct term
Do not ignore further work

B2

[4]

Q16.

(a) $5x - 10 (= 35)$

x – 2 = 7

M1

$5x = 45$

x = 7 + 2

M1

9

ft For M1M0 or M0M1

A1ft

(b) $9y - 12 = 3$

or 6y – 9y (= –3y)

M1

13 – 1 (= 12)

or 1 – 13 (= –12)

M1

4

ft For M1M0 or M0M1 with only one rearrangement error

A1ft

[6]

Q17.

Alternative method 1

40

May be implied

eg $\frac{2}{40}$

B1

$2 + x + 2x + 5 =$ their 40
or $3x + 7 =$ their 40
or (their 40 – 2 – 5) ÷ 3 or 33 ÷ 3

oe equation e.g. 3x + 5 = 38 (scores B1M1)

their 40 must be an integer

M1

($x =$) 11

ft B0M1

Does not have to be an integer

Accept answer rounded or truncated to at least 2 sf

A1ft

$\frac{27}{40}$ or 0.675 or 67.5%

Only ft evaluation of $\frac{2 \times \text{their integer } x + 5}{40}$

and 0 < answer < 1

Denominator must be 40 (may subsequently be simplified)

B1ft

Alternative method 2

$\frac{2}{2+x+2x+5} = \frac{1}{20}$ or $\frac{x+2x+5}{2+x+2x+5} = \frac{19}{20}$

oe equation

M2

($x =$) 11

A1

$\frac{27}{40}$ or 0.675 or 67.5%

Only ft evaluation of $\frac{2 \times \text{their integer } x + 5}{40}$

and 0 < answer < 1

Denominator must be 40 (may subsequently be simplified)

B1ft

Alternative method 3

$3x$ → 100% – 5% – 12.5% or $3x$ → 82.5%

Using 2 → *5% and 5* → *12.5%*

oe

M1

x → 82.5% ÷ 3 or x → 27.5%

oe

M1dep

$2x + 5$ → $2 \times 27.5\% + 12.5\%$ *oe*

M1dep

$\frac{27}{40}$ or 0.675 or 67.5%

A1

Alternative method 4

$3x \rightarrow 1 - \frac{1}{20} - \frac{2.5}{20}$ or $3x \rightarrow \frac{16.5}{20}$

Using $2 \rightarrow \frac{1}{20}$ *and* $5 \rightarrow \frac{2.5}{20}$

oe

M1

$x \rightarrow \frac{16.5}{20} \div 30$ or $x \rightarrow \frac{5.5}{20}$

oe

M1dep

$2x + 5 \rightarrow 2 \times \frac{5.5}{20} + \frac{2.5}{20}$ or $2x + 5 \rightarrow \frac{13.5}{20}$

oe

M1dep

$\frac{27}{40}$ or 0.675 or 67.5%

A1

Additional Guidance

(Alt 1) $x = 6$ (no working) Answer $\frac{17}{40}$ (first B1 implied)

B1M0A0B1ft

(Alt 1) $2 + x = 2x + 5 = 20$

B0M1

$x = \frac{13}{3}$ Answer $\frac{13.666}{20}$

A1ftB0ft

Answer $\frac{13.5}{20}$

B1M1A1B0

11 by inspection or T & I scores the first 3 marks

Answer $\frac{2x+5}{40}$

B1M0A0B0

Answer $\frac{2x+5}{3x+7}$

Zero

Ratio eg 27 : 40

B1M1A1B0

Expressed only in words e.g. 27 out of 40

B1M1A1B0

27 out of 40 and $\frac{27}{40}$

B1M1A1B1

$\frac{27}{40}$ seen with incorrect change of form or incorrect cancelling
eg $\frac{27}{40}$ and answer 0.27

B1M1A1B1

Ignore chance words if $\frac{27}{40}$ seen
eg $\frac{27}{40}$ and answer Unlikely

B1M1A1B1

[4]

Q18.

5(4*c* + 3) and 2(*c* – 8)
or
20*c* + 15 and 2*c* – 16

oe e.g. 10(4c + 3) + 4(c – 8)
Allow one error in expansion if not showing brackets
e.g. Allow 20c + 3 and 2c – 16
Equation or fractions not necessary

M1

Correct equation with no unexpanded brackets

e.g.1 20*c* + 15 + 2*c* – 16 = 10

e.g.2 22*c* – 1 = 10

e.g.3 $\frac{(20c+15)}{10}+\frac{(2c-16)}{10}=1$

e.g.4 $\frac{44c-2}{20}=1$

A1

Eliminates denominators correctly and collects terms for their equation

e.g.1 20*c* + 2*c* = 10 – 15 + 16

e.g.2 22*c* = 11

dep on first M1

Do not award this mark if the denominator has been eliminated incorrectly at any time in the working
Allow one sign error when collecting terms

M1dep

$\frac{1}{2}$ or $\frac{11}{22}$

oe
Only ft from M1 A0 M1 with a maximum of one error in expansions and collecting terms
SC2 Answer $\frac{15}{22}$ *oe*

A1ft

[4]

Q19.

$C = 0.6(0)n + 2.5(0)$

oe
Must have C = for B3
B2 C = 0.6n + k (k ≠ 0)
or C = an + 2.5 (a ≠ 0)
or 0.6n + 2.5
B1 0.6n or an + 2.5 (a ≠ 0)
or C = 60n + 250

B3

Additional Guidance

Allow correct fractions eg $\frac{3}{5}$ or $\frac{1}{1.6}$ for 0.6 and/or $\frac{5}{2}$ for 2.5

Allow $0.6 \times n$ or $n \times 0.6$ for $n0.6$

eg $C = 0.6 \times n + 2.5$

B3

$n \times 0.6 + 2.5$

B2

$0.6 \times n$

B1

Penalise by one mark the use of $n0.6$ for a or 0.6

eg $C = n0.6 + 2.5$

B2

$n0.6 + 2.5$

B1

$n0.6$

B0

Penalise by one mark the use of different letters

eg $y = 0.6x + 2.5$

B2

$0.6x + 2.5$

B1

$2p + 2.5$

B0

Transposing 0.6 and 2.5 scores zero eg $C = 2.5n + 0.6$

B0

Ignore £ signs e.g. £€£0.6n + £2.5 or C = £0.60n + £2.5

B3

$C = 1.2n + 2.5$

B2

$1.2n + 2.5$

B1

$C = 0.6n + 2.5$ in working with $0.6n + 2.5$ on answer line

B3

Equivalent formula but not C the subject scores B2
eg $100C = 60n + 250$

B2

[3]

Q20.

$3(10 - x)$

or $30 - 3x$

Do not accept $54 + 15x = 3(10 - x)$

Do not accept $54 + 15x = 30 - 3x$

$\frac{18}{3} + \frac{5x}{3}$

or $6 + \frac{5x}{3}$

M1

$18 + 5x = 30 - 3x$

$6 + \frac{5x}{3} = 10 - x$

M1dep

$5x + 3x = 30 - 18$

Collecting their 4 terms (2 stages)

oe

$\frac{5x}{3} + x$ = 10 − 6

M1

1.5 or $\frac{3}{2}$ or $1\frac{1}{2}$

dep on 3rd M1

A1ft

[4]

Q21.

(a) 4

B1

(b) 2*x* = 1 − 5 or 2*x* = −4

M1

−2

A1

[3]

Q22.

12*x* − 28 (= 20)

3x − 7 = 20 ÷ 4

M1

12*x* = 20 + 28

3x = 5 + 7

3x = $\frac{20}{4}$ *+ 7*

This mark is for separating terms in their equation

M1

4

ft if M1M0 or M0M1

A1ft

[3]

Q23.

(a) Alternative method 1

4*x* − 10

B1

6*x* − their 4*x* = their −10 − 4

or 2*x* = −14

oe

$\frac{\text{their } -10 - 4}{6 - \text{their } 4}$

or $\frac{-14}{2}$

M1

–7

ft their (4x – 10)

A1ft

Alternative method 2

$3x + 2 = 2x - 5$

B1

their $3x - 2x =$ – 5 – their 2

oe

M1

–7

ft their (3x + 2)

A1ft

Additional Guidance

their $(4x - 10)$ must be two terms with one correct to award the method mark

their $(3x + 2)$ must be two terms with one correct to award the method mark

$6x + 4 = 4x - 5$, $2x = -9$, $x = -\frac{9}{2}$

B0M1A1ft

$3x + 4 = 2x - 5$, $x = -9$

B0M1A1ft

$6x + 4 = 22x - 25$ (2 incorect terms), $29 = 16x$, $x = \frac{29}{16}$

B0M0A0

(b) $2y - y4$

B1 each term

Do not ignore fw for B2

B2

Additional Guidance

Do not accept $y2$

$2y + - y4$

B1

$2y - y^4 = y3$

B1

$2 \times y - y4$

B1

$y \times 2 - y \times y3$

B0

$y2 + -y4$

B0

[5]

Q24.

$9 + 3x + x - 5 + x^2$
or $6x + 4$
or $3x + x - 5 + x^2$
or $6x - 5$

oe

M1

Their $(6x + 4) = 100$
or their $6x - 5 = 91$
or $6x = 96$

oe

$\frac{9}{\text{their } (6x+4)} = \frac{9}{100}$

M1

$x = 16$

A1

$\frac{11}{100}$

ft their 16

B1ft

[4]

Q25.

(a) $y - 8 = 3w$

$\frac{y}{3} = w + \frac{8}{3}$

M1

$\frac{y-8}{3} = w$

or $\frac{y}{3} - \frac{8}{3} = w$

SC1 $\frac{y-8}{3}$ *or* $\frac{y}{3} - \frac{8}{3}$

Do not ignore further work

A1

(b) $5x + 20$

B1

$5x - 3x = 23 - 20$

or $2x = 3$

their 5x − 3x = 23 − their 20

M1

1.5

oe

A1ft

[5]