

GCSE MATHEMATICS Intermediate Tier, topic sheet.
MISCELLANEOUS ALGEBRA 2

1. Make t the subject of the following formula. $d(t - r) = 2r - 3$
2. Make d the subject of the following formulas:
i) $h = \sqrt{t + d}$, ii) $g + h = \sqrt{t - d}$.
3. Rearrange the following formulae to make x the subject.
a) $ax + b = cx + d$, b) $ax - b = cx + d^2$, c) $a(x - b) = cx + d$.
4. Simplify the following expressions.
a) $(4c^3.d^2) \times (5c^2.d)$, b) $(5c^2.d^3) \times (6c^2.d)$,
c) $(3c^3.d^2) \times (5c^4.d^2)$, d) $(2c^4.d^3) \times (5c^2.d^4) \times 3c$,
e) $(10c.d^5) \times (4c.d^2) \times (3c.d^2)$, f) $(6a.c^2.d^2) \times (5a^4.d^3) \times (2ac)$.
5. For the following, expand the brackets and simplify.
a) $(x + 1)(x + 3)$, b) $(x + 5)(x + 1)$, c) $(x + 7)(x + 2)$,
d) $(x - 3)(x + 4)$, e) $(x - 5)(x + 10)$, f) $(x - 1)(x + 5)$,
g) $(4x - 5)(2x - 3)$, h) $(5x - 3)(4x + 1)$, i) $(6x - 4)(3x - 2)$.
6. Factorise the following expressions.
a) $x^2 + 4x + 3$, b) $x^2 + 6x + 5$, c) $x^2 + 9x + 14$,
d) $x^2 + x - 6$, e) $x^2 + 4x - 5$, f) $x^2 + 5x - 50$,
g) $x^2 - 8x + 15$, h) $x^2 - 4x + 3$, i) $x^2 - 6x + 8$.
7. Solve the following equations by factorising.
a) $x^2 + 3x - 18 = 0$, b) $x^2 + 4x - 12 = 0$, c) $x^2 + x - 30 = 0$,
d) $x^2 - 7x + 12 = 0$, e) $x^2 - 7x + 10 = 0$, f) $x^2 - 8x + 7 = 0$,
g) $x^2 - 10x + 16 = 0$, h) $x^2 - 11x + 30 = 0$.
8. Solve the equations.
a) $5x + 3(x - 2) = 100 - 2(x + 3)$, b) $5x - 3(x - 2) = 30 - 3(x + 3)$,
c) $\frac{4x + 1}{3} = \frac{2x + 4}{2}$, d) $\frac{3x - 1}{7} + \frac{4x + 1}{3} = 9$,
e) $\frac{5x + 4}{3} - \frac{3x + 4}{4} = 4$, f) $\frac{2x + 5}{5} - \frac{x + 2}{6} = 3$.
9. Solve the following equation. $\frac{2x - 3}{6} + \frac{x + 2}{3} = \frac{5}{2}$.

SOLUTIONS / ANSWERS.

1. We have $d(t - r) = 2r - 3$

expand brackets $dt - dr = 2r - 3$

add 'dr' to both sides $dt = 2r - 3 + dr$

divide by d $t = \frac{2r - 3 + dr}{d}$.

2. i) We have $h = \sqrt{t + d}$

square both sides $h^2 = t + d$

subtract t $h^2 - t = d$.

ii) We have $g + h = \sqrt{t - d}$

square both sides $(g + h)^2 = t - d$

add d $(g + h)^2 + d = t$

subtract $(g + h)^2$ $d = t - (g + h)^2$.

3. a) We have $ax + b = cx + d$

collect the x 's together $ax - cx = d - b$

total the number of x 's $(a - c)x = d - b$

divide by $(a - c)$ $x = \frac{d - b}{a - c}$.

b) We have $ax - b = cx + d^2$

collect the x 's together $ax - cx = d^2 + b$

total the number of x 's $(a - c)x = d^2 + b$

divide by $(a - c)$ $x = \frac{d^2 + b}{a - c}$.

c) $x = \frac{d + ab}{a - c}$.

4. a) We have $(4c^3 \cdot d^2) \times (5c^2 \cdot d)$. **{Note that the \cdot symbol is used to denote multiplication!}**

Re-order the multiplication

$$4 \times 5 \times c^3 \times c^2 \times d^2 \times d$$

which equals

$$20 \times \underline{c \times c \times c} \times \underline{c \times c} \times \underline{d \times d} \times \underline{d}$$

giving an answer of

$$20c^5d^3.$$

b) We have $(5c^2 \cdot d^3) \times (6c^2 \cdot d)$.

Re-order the multiplication

$$5 \times 6 \times c^2 \times c^2 \times d^3 \times d$$

which equals

$$30 \times \underline{c \times c} \times \underline{c \times c} \times \underline{d \times d} \times \underline{d}$$

giving an answer of

$$30c^4d^4.$$

c) $15c^7d^4$ d) $30c^7d^7$ e) $120c^3d^9$ f) $60a^6c^3d^5$.

5. a) $(x + 1) \times (x + 3)$
 $= x^2 + 3x + x + 3$
 $x^2 + 4x + 3.$

	x	3
x	x^2	$3x$
1	x	3

b) $x^2 + 6x + 5.$

c) $x^2 + 9x + 14.$

d) $(x - 3) \times (x + 4)$
 $= x^2 + 4x - 3x - 12$
 $x^2 + x - 12.$

	x	4
x	x^2	$4x$
-3	$-3x$	-12

e) $x^2 + 5x - 50.$

f) $x^2 + 4x - 5,$

g) $(4x - 5)(2x - 3)$
 $= 8x^2 - 12x - 10x + 15$
 $8x^2 - 22x + 15.$

	2x	-3
4x	$8x^2$	$-12x$
-5	$-10x$	15

h) $20x^2 - 7x - 3.$

i) $18x^2 - 24x + 8.$

6. a) $(x + 1)(x + 3)$ b) $(x + 5)(x + 1)$ c) $(x + 7)(x + 2)$
d) $(x + 3)(x - 2)$ e) $(x + 5)(x - 1)$ f) $(x + 10)(x - 5)$
g) $(x - 5)(x - 3)$ h) $(x - 3)(x - 1)$ i) $(x - 4)(x - 2).$

7. a) $-6, 3$ b) $-6, 2$ c) $-6, 5$ d) $3, 4$
e) $2, 5$ f) $1, 7$ g) $2, 8$ h) $5, 6.$

8. a) $x = 10$ b) $x = 3$ c) $x = 5$ d) $x = 5$
e) $x = 4$ f) $x = 10.$

9. $x = 3.5.$