A level Maths and Further Maths Transition Work – Answers

1. Fractions
   a. $\frac{2}{5}$
   b. $-\frac{1}{7}$
   c. $\frac{7}{10}$
   d. $\frac{5}{2} = 2\frac{1}{2}$
   e. $\frac{5}{24}$
   f. $\frac{47}{30} = 1\frac{17}{30}$
   g. $\frac{38}{15} = 2\frac{8}{15}$
   h. $\frac{203}{15} = 13\frac{8}{15}$
   i. 5
   j. $\frac{3}{5}$

2. Laws of Indices
   a. 2^7
   b. $3^1 = 3$
   c. 4^6
   d. x^{15}
   e. a^6
   f. $c^{-2} = \frac{1}{c^2}$
   g. $\frac{1}{9}$
   h. 1
   i. 54
   j. 36
   k. 8
   l. 3

3. Surds
   a. $5\sqrt{7}$
   b. $\sqrt{2}$
   c. 21
   d. 18
   e. $3\sqrt{2}$
   f. $4\sqrt{2}$
   g. $3\sqrt{6}$
   h. $2\sqrt{3}$

4. Expanding and Simplifying Expressions
   a. $6b^2 + 8b + 3$
   b. $5x - 15$
   c. $-6x - 2$
   d. $22x + 1$
   e. $4x - 6$
   f. $x^2 - 1$
   g. $3a^2 - a - 2$
   h. $6b^2 - 13b + 6$
   i. $4xy$
   j. $9x^2$
   k. $x + 2y$
   l. $\frac{2}{x+2}$
   m. $\frac{2}{5x-2}$

5. Factorising
   a. $4(x + 2)$
   b. $a(2b + d)$
   c. $2x(4x - 5)$
   d. $4ab(2b - a)$
   e. $(x + 3)(x + 1)$
   f. $(x + 5)(x + 3)$
   g. $(x + 14)(x - 2)$
   h. $(x - 15)(x - 2)$
   i. $(x + 6)(x - 6)$
   j. $(2x + 5)(x + 1)$

6. Solving Linear Equations
   a. $x = 5$
   b. $x = \frac{21}{4}$
   c. $x = 6$
   d. $p = \frac{3}{4}$
   e. $x = 2$
   f. $x = 2$
   g. $x = 3$

7. Formulae
   a. $x = 3$
   b. $x = \frac{9}{8}$
   c. $r = 7.00 (3sf)$
   d. $c = 8$
   e. $a = \frac{5}{2}$
   f. $x = \frac{b}{3}$
   g. $x = 5d$
   h. $x = 4 - f$
   i. $x = \frac{5y+2}{6}$
   j. $x = \frac{c}{a-b}$
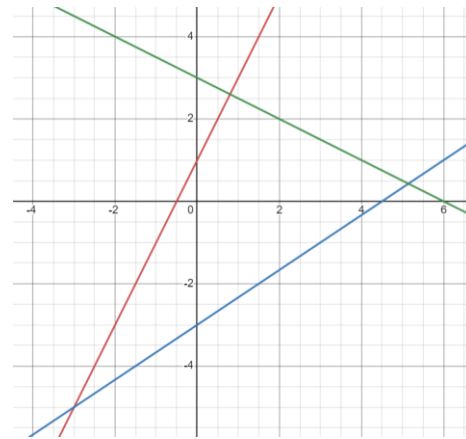   k. $x = \frac{u}{m+2}$
   l. $x = y^2 + 2$

8. Solving Quadratic Equations
   a. $x = -1, x = -4$
   b. $x = 6, x = -2$
   c. $x = 9, x = -9$
   d. $x = 1 + \sqrt{7}, x = 1 - \sqrt{7}$
   e. $x = 3 + \sqrt{17}, 3 - \sqrt{17}$
   f. $x = \frac{-5+\sqrt{46}}{3}, x = \frac{-5-\sqrt{46}}{3}$

9. Simultaneous Linear Equations
   a. $x = 7, y = 4$
   b. $x = \frac{1}{4}, y = \frac{3}{2}$
   c. $x = 3, y = -2$
   d. $x = 2, y = 1$
   e. $x = 1, y = -5$

10. Straight Line Graphs

11. Completing the Square

a $= (x + 1)^2 - 1 + 4$
$= (x + 1)^2 + 3$

b $= (x - 1)^2 - 1 + 4$
$= (x - 1)^2 + 3$

c $= (x - 2)^2 - 4 + 1$
$= (x - 2)^2 - 3$

d $= (x + 3)^2 - 9$

e $= (x + 2)^2 - 4 + 8$
$= (x + 2)^2 + 4$

f $= (x - 4)^2 - 16 - 5$
$= (x - 4)^2 - 21$

g $= (x + 6)^2 - 36 + 30$
$= (x + 6)^2 - 6$

h $= (x - 5)^2 - 25 + 25$
$= (x - 5)^2$

i $= (x + 3)^2 - 9 - 9$
$= (x + 3)^2 - 18$

j $= (x - 2)^2 - 4 + 18$
$= (x - 2)^2 + 14$

k $= (x + \frac{3}{2})^2 - \frac{9}{4} + 3$
$= (x + \frac{3}{2})^2 + \frac{3}{4}$

l $= (x + \frac{1}{2})^2 - \frac{1}{4} - 1$
$= (x + \frac{1}{2})^2 - \frac{5}{4}$

a $= 2[x^2 + 2x] + 3$
$= 2[(x + 1)^2 - 1] + 3$
$= 2(x + 1)^2 + 1$

b $= 2[x^2 - 4x] - 7$
$= 2[(x - 2)^2 - 4] - 7$
$= 2(x - 2)^2 - 15$

c $= 3[x^2 - 2x] + 3$
$= 3[(x - 1)^2 - 1] + 3$
$= 3(x - 1)^2$

d $= 4[x^2 + 6x] + 11$
$= 4[(x + 3)^2 - 9] + 11$
$= 4(x + 3)^2 - 25$

e $= -[x^2 + 2x] - 5$
$= -[(x + 1)^2 - 1] - 5$
$= -(x + 1)^2 - 4$

f $= -[x^2 - 10x] + 1$
$= -[(x - 5)^2 - 25] + 1$
$= -(x - 5)^2 + 26$

g $= 2[x^2 + x] - 1$
$= 2[(x + \frac{1}{2})^2 - \frac{1}{4}] - 1$
$= 2(x + \frac{1}{2})^2 - \frac{3}{2}$

h $= 3[x^2 - 3x] + 5$
$= 3[(x - \frac{3}{2})^2 - \frac{9}{4}] + 5$
$= 3(x - \frac{3}{2})^2 - \frac{7}{4}$

i $= 3[x^2 - 8x] + 48$
$= 3[(x - 4)^2 - 16] + 48$
$= 3(x - 4)^2$

j $= 3[x^2 - 5x]$
$= 3[(x - \frac{5}{2})^2 - \frac{25}{4}]$
$= 3(x - \frac{5}{2})^2 - \frac{75}{4}$

k $= 5[x^2 + 8x] + 70$
$= 5[(x + 4)^2 - 16] + 70$
$= 5(x + 4)^2 - 10$

l $= 2[x^2 + \frac{5}{2}x] + 2$
$= 2[(x + \frac{5}{4})^2 - \frac{25}{16}] + 2$
$= 2(x + \frac{5}{4})^2 - \frac{9}{8}$

m $= 4[x^2 + \frac{3}{2}x] - 7$
$= 4[(x + \frac{3}{4})^2 - \frac{9}{16}] - 7$
$= 4(x + \frac{3}{4})^2 - \frac{37}{4}$

n $= -2[x^2 - 2x] - 1$
$= -2[(x - 1)^2 - 1] - 1$
$= -2(x - 1)^2 + 1$

o $= -3[x^2 + \frac{2}{3}x] + 4$
$= -3[(x + \frac{1}{3})^2 - \frac{1}{9}] + 4$
$= -3(x + \frac{1}{3})^2 + \frac{13}{3}$

p $= \frac{1}{3}[x^2 + \frac{3}{2}x] - \frac{1}{4}$
$= \frac{1}{3}[(x + \frac{3}{4})^2 - \frac{9}{16}] - \frac{1}{4}$
$= \frac{1}{3}(x + \frac{3}{4})^2 - \frac{7}{16}$

12. Inequalities
1. $x < 5$
2. $x < 7$
3. $x > 10$
4. $x \geq -3$
5. $x > 2$
6. $x > 6$
7. $x > 4$
8. $x \leq 10$

13. Circles and Tangents

1
a $x^2 + y^2 = 25$
b $(x - 1)^2 + (y - 3)^2 = 4$
c $(x - 4)^2 + (y + 6)^2 = 1$
d $(x + 1)^2 + (y + 8)^2 = 9$
e $(x + \frac{1}{2})^2 + (y - \frac{1}{2})^2 = \frac{1}{4}$
f $(x + 3)^2 + (y - 9)^2 = 12$

2
a centre $(0, 0)$ radius 4
b centre $(6, 1)$ radius 9
c centre $(-1, 4)$ radius 11
d centre $(7, 0)$ radius 0.3
e centre $(-2, -5)$ radius $4\sqrt{2}$
f centre $(8, -9)$ radius $6\sqrt{3}$

1. $y = 5 - 2x$

2. $y = \frac{25}{2} - \frac{3}{4}x$

3. $y = 2x + 15$

4. $y = -2x - 10$

5. $y = \frac{3}{2}x - \frac{13}{2}$

6. $y = 4 - x$

7. $x = 5$

14. Harder Simultaneous Equations

1. $x = -3, y = -14$ or $x = -2, y = -12$

2. $x = -2, y = 2$

3. $x = -1, y = 1$ or $x = 2, y = 4$

4. $x = 1, y = -2$

5. $x = -\frac{18}{5}, y = -\frac{24}{5}$ or $x = 6, y = 0$

6. $x = -4, y = -3$ or $x = 0, y = 5$

7. $x = 1 + \frac{\sqrt{14}}{2}, y = 1 - \frac{\sqrt{14}}{2}$ or $x = 1 - \frac{\sqrt{14}}{2}, y = 1 + \frac{\sqrt{14}}{2}$

15. Trigonometry

θ (degrees)	0°	30°	45°	60°	90°
$\sin\theta$	0	$\dfrac{1}{2}$	$\dfrac{\sqrt{2}}{2}$	$\dfrac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\dfrac{\sqrt{3}}{2}$	$\dfrac{\sqrt{2}}{2}$	$\dfrac{1}{2}$	0
$\tan\theta$	0	$\dfrac{\sqrt{3}}{3}$	1	$\sqrt{3}$	Undef.

1. $x = 3.84cm$
2. $x = 3.85cm$
3. $x = 8.15cm$

1. $x = 51°$
2. $x = 107°$
3. $x = 41°$

1. $A = 9.92cm^2$
2. $A = 14.15cm^2$
3. $A = 15.84cm^2$