

ALGEBRA TRANSITION PROBLEMS 2014/15

- ① FIND THE VALUE OF $5(2a-b)$ WHEN $a = -3$ AND $b = 7$ || ANS = -65
- ② FIND THE VALUE OF $p^2 - 6pq$ WHEN $p = -2$ AND $q = 3$ || ANS = 40
- ③ FIND VALUE OF $\frac{2x-y+3}{x^2+2y}$ WHEN $x = \frac{3}{2}$ AND $y = \frac{2}{3}$ || ANS $\frac{64}{43}$
(EXAM)
- ④ SIMPLIFY $5(4x-1) - 3(2x-5)$ || ANS $14x+10$
- ⑤ SIMPLIFY $2a(4a+3) - 4(3a-7)$ || ANS $8a^2 - 6a + 28$
- ⑥ SIMPLIFY $(2x+3)(x-4)$ || ANS $2x^2 - 5x - 12$
- ⑦ SIMPLIFY $(5a-7)^2$ || ANS = $25a^2 - 70a + 49$
- ⑧ SIMPLIFY $(3x-4)(x^2+3x-6)$ || ANS $3x^3 + 5x^2 - 30x + 24$
(EXAM)
- ⑨ SIMPLIFY $\frac{x+3}{2} + \frac{2x-1}{5}$ || ANS $\frac{9x+13}{10}$
- ⑩ SIMPLIFY $\frac{x-4}{3} - \frac{3x-1}{6} + \frac{2x+5}{4}$ || ANS $\frac{4x+1}{12}$
- ⑪ SIMPLIFY $\frac{3}{p+2} + \frac{5}{p-1}$ || ANS $\frac{8p+7}{(p+2)(p-1)}$
- ⑫ SIMPLIFY $\frac{2}{x-3} - \frac{7}{2x+5} + \frac{2}{3}$ || ANS $\frac{4x^2 - 11x + 63}{(x-3)(2x+5)(3)}$
- ⑬ FACTORISE (BY LOOKING FOR HCF)
- (i) $3p^2 + 6pq$ || ANS = $3p(p+2q)$
- (ii) $ab - 2a^2b + 3ab^2$ || ANS = $ab(1 - 2a + 3b)$
- ⑭ FACTORISE BY GROUPING (INTO PAIRS WITH A COMMON FACTOR)
- (i) $3pr - 3ps + 2r - 2s$ || ANS $(r-s)(3p+2)$
- (ii) $a^2 + xy - ay - ax$
 $a(a-y) + x(y-a)$
 $a(a-y) - x(-y+a)$

(15) FACTORISE $x^2 - 7x + 10$ || ANS $(x-2)(x-5)$

(16) FACTORISE USING DIFFERENCE OF 2 SQUARES,

(i) $x^2 - 16$ || ANS $(x+4)(x-4)$

(ii) $3x^2 - 12y^2$ || ANS $3(x+2y)(x-2y)$

(17) SIMPLIFY (EXAM) $\frac{x^2 + 7x + 12}{x^2 + 2x - 3}$ || ANS $\frac{x+4}{x-1}$

(18) SIMPLIFY $\frac{5}{2x-3} - \frac{3}{2x^2-3x} - \frac{1}{x}$ || ANS $\frac{3}{2x-3}$

(19) REARRANGE $ab + cd = e$ TO MAKE a THE SUBJECT OF THE FORMULA. || ANS $a = \frac{e - cd}{b}$

(20) REARRANGE $C = \frac{5}{9}(F - 32)$ TO FIND $F =$
 || ANS $F = \frac{9C + 160}{5}$

(21) IF $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$... EXPRESS v IN TERMS OF OTHER VARIABLES.
 (EXAM) || ANS $v = \frac{fu}{u-f}$

(22) EXPRESS IN SIMPLEST SURD FORM NOTING " $\sqrt{ab} = \sqrt{a}\sqrt{b}$ "
 (i) $\sqrt{27}$ || ANS $3\sqrt{3}$ (ii) $\sqrt{2\frac{1}{4}}$ || ANS $\frac{3}{2}$ (iii) $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$ " $\sqrt{ka} = a$ "

(23) EXPRESS IN SIMPLEST SURD FORM $\sqrt{180} + \sqrt{20} - \sqrt{125}$
 || ANS $3\sqrt{5}$

(24) EXPRESS FOLLOWING IN SIMPLEST SURD FORM $3\sqrt{5} \times 2\sqrt{3}$
 || ANS $6\sqrt{15}$

(25) EXPRESS IN SIMPLEST SURD FORM (EXAM) $(2+3\sqrt{5})(4-\sqrt{5})$
 || ANS $-7 + 10\sqrt{5}$

(26) SHOW THAT $(2+\sqrt{7})(2-\sqrt{7})$ IS RATIONAL. || ANS -3

① SOLVE THE EQUATION $\frac{1}{2}(7x-2) + 5 = 2x + 7$ || ANS $x=2$

② SOLVE THE EQUATION (EXAM) $\frac{x-7}{2} = \frac{x+3}{6}$ || ANS $x=12$

③ SOLVE THE EQUATION (EXAM) $\frac{3(x+3)}{4} - \frac{2(x-3)}{3} = \frac{x+1}{2}$ || ANS $x=9$

④ THE THREE ANGLES OF A TRIANGLE ARE

$$\frac{8(x-2)}{3}, 4x+7, \frac{5x-10}{2}$$



FIND x . (i.e. 3 ADD UP TO 180°)

|| ANS $x=20$

⑤ SOLVE THE FOLLOWING QUADRATIC EQN.

$2x^2 + 6x = 0$ (TIP FACTORISE BY TAKING OUT COMMON TERM THEN LET EACH FACTOR = 0 TO SOLVE)

|| ANS $x=0$ OR $x=-3$

⑥ SOLVE THE FOLLOWING QUADRATIC EQN.

$x^2 - 64$ || ANS $x=-8$ OR $x=8$

⑦ SOLVE THE FOLLOWING QUADRATIC EQNS.

(i) $x^2 + 2x - 15 = 0$

(ii) $2x^2 + x - 10 = 0$

|| ANS $x=-5$ OR $x=3$

|| ANS $x=-\frac{5}{2}$ OR $x=2$

⑧ (i) FACTORISE $x^2 + 4x + 4$

|| ANS $(x+2)^2$ OR $(x+2)(x+2)$

(ii) SIMPLIFY $\sqrt{x^2 + 4x + 4} + \sqrt{x^2 + 2x + 1}$, GIVEN THAT $x \geq 0$

|| ANS $2x+3$

(iii) GIVEN THAT $x \geq 0$, SOLVE FOR x :

$$\sqrt{x^2 + 4x + 4} + \sqrt{x^2 + 2x + 1} = x^2$$

|| ANS $x=3$ OR $x=-1$

⑨ FORM THE QUADRATIC EQUATION WITH ROOTS -2 AND 4

|| ANS $x^2 - 2x - 8 = 0$

⑩ QUADRATIC EQUATION: NB IF QUESTION REQUESTS ANSWER "FORMULA" "CORRECT TO 2 DEC PLACES, 3 SIG FIGURES, 7 SIGNIFICANT FIGURES, EXPRESS IN SURD FORM" ... USE QUAD FORMULA!

Solve $3x^2 - 5x - 13 = 0$ CORRECT TO 1 DEC PLACE || ANS $x = 3.1$ OR $x = -1.4$

Solve $2x^2 - 7x + 4 = 0$ LEAVING YOUR ANSWER IN SURD FORM
 ANS $x = \frac{7 + \sqrt{17}}{4}$ OR $x = \frac{7 - \sqrt{17}}{4}$

⑪ VERIFY THAT $3 - \sqrt{2}$ IS A ROOT (SOLUTION) OF $x^2 - 6x + 7 = 0$
 [TIP SOLVE EQN USING FORMULA OR YOU COULD SUB "3 - \sqrt{2}" FOR x INTO EQN TO SEE IF IT = 0.]

⑫ SOLVE IF $\frac{1}{x+1} + \frac{4}{2x-1} = \frac{5}{3}$ || ANS $x = 2$ OR $x = -\frac{7}{10}$

(VERIFY THE INTEGER SOLUTION ... DON'T TRY THIS).

⑬ SOLVE $\frac{2}{3x-4} - \frac{1}{2x+1} = \frac{1}{2}$ AND GIVE ANSWER TO 1 DEC PLACE.
 || ANS $x = 2.3$ OR $x = -1.2$

⑭ FIND THE SOLUTION SET OF $4 - 3x \geq 2$, $x \in \mathbb{N}$ AND GRAPH ON A NUMBER LINE. || ANS $x \leq 3$

⑮ FIND THE RANGE OF VALUES OF $x \in \mathbb{R}$ FOR WHICH $4(x-2) > 5(2x-1) - 9$ AND GRAPH SOLUTION ON NUMBER LINE.
 || ANS $x < 1$

(i) FIND A, THE SOLUTION SET OF $3x - 5 < 7$, $x \in \mathbb{Z}$ || ANS $x < 4$
 (ii) FIND B, THE SOLUTION SET OF $\frac{-2-3x}{4} \leq 1$, $x \in \mathbb{R}$ || ANS $-2 \leq x$
 (iii) A AND B LIST THE ELEMENTS OF $A \cap B$.

ANS $A = \{3, 2, 1, 0, -1, -2, -3, -4, \dots\}$
 $B = \{-2, -1, 0, 1, 2, 3, 4, 5, 6, \dots\}$ $A \cap B = \{-2, -1, 0, 1, 2, 3\}$

⑰ SOLVE AND SHOW ON NUMBER LINE. ⑱ SOLVE $11 \leq 2x+2 < 11$ $x \in \mathbb{R}$

ALGEBRA III DIVISION

SIMULTANEOUS EQUATIONS

① Solve $2x + 3y = 5$
 $x - 4y = -14$ || ANS $x = -2$
 $y = 3$

② Solve for P and Q $\frac{2P-5}{3} + \frac{Q}{5} = 6$; $\frac{3P}{10} + 2 = \frac{3Q-5}{2}$ || ANS $P=10$
 $Q=5$

③ Solve $2x + 7 = 3$
 $x^2 + xy + y^2 = 3$ || ANS $x=1$ AND $x=2$
 $y=1$ $y=-1$

④ Solve (EXAM) $2r - s = 10$
 $rs - s^2 = 12$ || ANS $r=7$ AND $r=8$
 $s=4$ $s=6$

TIP LET $s = 2r - 10$ AND SUB INTO $rs - s^2 = 12$

⑤ Solve (EXAM) $2f + \frac{2}{3}g + 1 = 0$
 $f + \frac{1}{2}g + 1 = 0$ || ANS $f = \frac{1}{2}$ $g = -3$

⑥ Solve $\frac{1}{u} = \frac{1}{v} + \frac{1}{2}$
 $\frac{2}{u} = \frac{3}{v} - 2$ || ANS $u = \frac{2}{7}$
 $v = \frac{1}{3}$ TIP LET $x = \frac{1}{u}$ $y = \frac{1}{v}$
 $\therefore x = y + \frac{1}{2}$
 $2x = 3y - 2$
 AND SOLVE

⑦ Solve $3x + 4 = 25$
 $x^2 + y^2 = 65$ || ANS $x=7$ AND $x=8$
 $y=4$ AND $y=1$

TIP LET $y = 25 - 3x$ AND SUB INTO $x^2 + y^2 = 65$ FOR x .

⑧ STORIES (EXAM) 3 APPLES AND 4 ORANGES COST £1.30.
 4 APPLES AND 2 ORANGES COST £1.20.
 FIND COST OF AN APPLE. FIND COST OF AN ORANGE.
 FIND COST OF 6 APPLES AND 6 ORANGES. || ANS APPLES = 22c
 ORANGES = 16c

⑨ THE COST OF A MEAL FOR 3 ADULTS AND 2 CHILDREN AMOUNTS TO £~~20~~¹²⁵. THE COST OF A MEAL FOR 2 ADULTS AND 3 CHILDREN AMOUNTS TO £115.
 FIND COST OF ADULT MEAL. [ANS = £29]
 FIND COST OF CHILD MEAL. [ANS = £19].

INDICES

① WRITE DOWN WITHOUT USING INDICES

(i) 6^{-2} (ii) $81^{\frac{1}{2}}$ Ans (i) $\frac{1}{36}$
 (ii) $2\sqrt{81} = 18$

② SIMPLIFY

(i) $(a^3 \times a^4)^2$

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

(iii) $32^{\frac{2}{5}} - 81^{\frac{1}{4}}$

ANS a^{14}
25
1

④ SHOW THAT

(EXAM)

$\frac{(a\sqrt{a})^3}{a^4}$ SIMPLIFIES TO \sqrt{a}

⑤ SIMPLIFY

(EXAM)

$\frac{x^5 \times x^2 \times \sqrt[3]{x^2}}{x^3 \times x^{\frac{4}{3}}}$

GIVE ANS IN FORM $x^{\frac{a}{b}}$

ANS $x^{\frac{10}{3}}$

Rules
 $\frac{a^p a^q}{a^r} = a^{p+q-r}$

$\frac{a^p}{a^q} = a^{p-q}$

$(a^p)^q = a^{pq}$

$a^0 = 1$

$a^{-p} = \frac{1}{a^p}$

$a^{\frac{1}{q}} = \sqrt[q]{a}$

$a^{\frac{p}{q}} = (\sqrt[q]{a})^p = \sqrt[q]{a^p}$

$(ab)^p = a^p b^p$

$\left(\frac{a}{b}\right)^p = \frac{a^p}{b^p}$

EXPONENTIAL EQUATIONS

① FIND x FOR $2^{x+3} = 4^x$ || ANS $(x=3)$

② FIND VALUES OF x FOR WHICH $4 \cdot 9^x = 7^{2+x}$ || ANS $x=2$
 VERIFY YOUR ANSWER.

(EXAM)

③ SOLVE FOR x (i) $27^{4+3x} = 243^{1+2x}$
 || ANS $\Rightarrow x=7$

(ii) $2^{x^2} = 8^{2x+9}$
 || ANS $x=9$
 OR $x=-3$

④ (i) FIND VALS OF 3^6 || ANS = 729

(ii) WRITE 27 IN FORM 3^x || ANS $27=3^3$

(iii) FIND x FOR WHICH $27 \times 3^x = \frac{1}{729}$ || ANS $x=-9$