Algebra & Functions (Maths 201–016)

(Marks)

*Show your work—***justify** *all your answers. Just having the correct answer is not sufficient.*
Pace yourself—a rough guide is to spend not more than $2m$ *minutes on a question worth* m *marks.*
You may use the following equations, where useful:
$$SP = C + M, \ M = MR \cdot C, \ SP = OP - D, \ D = DR \cdot OP, \ I = Prt$$

(3×3) 1. Solve the following equations (simplify your answers):

(a) $7(2x - 1) = 6(3 - 2x) + x + 5$ (b) $\dfrac{2x}{3} - \dfrac{x}{6} = \dfrac{11}{12}$

(c) $\frac{1}{2}(x + 2) + \frac{3}{4}(x + 4) = x + 5$

(4×4) 2. Solve each of the following problems; make it clear what equations you are using, and solving.

(a) Jack pays $6300 for a car after getting a discount of 30% on the deal; what was the original sales price for the car?

(b) A store pays its supplier $520 for a fridge that it puts on sale at $650; what is the store's markup rate?

(c) I invested $5000 in an account with an annual simple interest rate of 3%. How much did my investment earn in interest after 4 years?

(d) If a town's population grew from 6000 to 7200 people over a decade, what was its percentage growth (over that time)?

(2) 3. Find an equation for the line through the points $(-5, 11)$ and $(1, 5)$.

(3) 4. Find an equation for the line through $(-10, 4)$ that is perpendicular to $5x - y = 1$.

(5) 5. For the line $6x - 5y + 15 = 0$, find: the slope; the x and y intercepts; and draw a sketch (graph) of the line.

(3×2) 6. Determine if each of the following pairs of lines is parallel, perpendicular, or neither. If not parallel, find the point of intersection, either by substitution or by elimination. Say which method you are using. *(For a bonus (1 mark each), use both methods, and check you get the same answer either way.)*

(a) $\begin{cases} 3x + 2y &= 1 \\ 5x - 2y &= 7 \end{cases}$ (b) $\begin{cases} 3x - 2y &= 6 \\ 2x + 3y &= 4 \end{cases}$

(3×3) 7. Simplify the following expressions: your answers should have no negative exponents.

(a) $(3a^2 b^0 c^{-2})^{-4}(6a^{-3}b^3 c^{-3})^3$ (b) $\left(\dfrac{36x^{-3}y^{-2}z^4}{6x^3 y^5 z^{-7}}\right)^2$ (c) $\dfrac{7v^{-2}}{w^3} \cdot \dfrac{(7v^{-5}w^4)^{-3}}{(vw^{-1})^3}$

(Total: 50)

For extra practice, sketch the pairs of lines above (in Q6).