1. Formulae

Evaluate the required variables given the value of the others ($use\ \pi = \frac{22}{7}$)

1. $A = \pi r^2$ find A when r $= 1.4$

2. $s = ut + \frac{1}{2}at^2$ find s when u $= 6$, a $= 5$, t $= 3$

3. $T = 2\pi\sqrt{\frac{L}{g}}$ find T when g $= 10$, L $= 4.9$

4. $S = 2\pi(r + b)$ find S when r $= 0.5$, b $= 0.25$

5. $S = \frac{a(1-r^n)}{1-r}$ find S when a $= 3$, r $= \frac{1}{3}$, n $= 4$

6. $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ find f when u $= 6$, v $= 8$

2. Fractions

Work out the following, expressing answers as fractions **in their lowest terms**

1. $\frac{a}{3} + \frac{a}{5}$

2. $\frac{c}{3} + \frac{2d}{7}$

3. $\frac{g}{4} - \frac{g^2}{3}$

4. $\frac{2x-1}{3} + \frac{x}{2}$

5. $\frac{3p-2}{4} - \frac{p+3}{2}$

6. $\frac{8q}{r} + \frac{3r}{q}$

7. $\frac{2w}{3r} - \frac{w}{2r}$

8. $pq^2 \times \frac{p}{q}$

9. $\frac{3}{xy} \div \frac{5}{y}$

10. $\frac{1}{1-x} - \frac{2}{2+x}$

11. $\frac{1}{(1+x)^2} + \frac{1}{1+x}$

3. Factorisation

Factorise the following

1. $y^2z + yz^2$

2. $6mq - 3mr^2$

3. $nm + n + 2m + 2$

4. $15 + 3l + 5k + kl$

5. $ru + rt - su - st$

6. $2wx - 3yx + 2wz - 3yz$

7. $x^2 + 6x + 8$

8. $x^2 + 3x - 18$

9. $x^2 - 11x + 28$

10. $35x^2 + x - 6$

11. $a^2 - 36$

12. $9d^2 - y^4$

13. $36y^2 - x^2$

14. $xy + ay + xb + ab$

15. $x(x + 1)^2 + (x + 1)(x^2 - 3)$

16. $(x + 3)^2 - (x - 7)^2$

4. Equations

Solve (find the value of the variable in) the following:-

1. $2x + 1 = 16 - 3x$

2. $x^2 + 2x - 15 = 0$

3. $x^2 = 5x + 14$

4. $\frac{2x-1}{3} - \frac{(x-7)}{5} = 2$

5. $\frac{x-5}{x+1} = \frac{x-7}{x-2}$

6. $\frac{3x+5}{8} = x$

7. $\frac{2x+6}{5} = 3x - 14$

8. $\frac{x-2}{3} = \frac{x+4}{5}$

9. $\frac{3x-5}{6} = \frac{9-x}{9}$

10. $\frac{x-1}{2} + \frac{x+1}{3} = \frac{2x+5}{6}$

5. Simultaneous equations

Solve the following:

1. $7x + 4y = 10$
   $5x + 3y = 7$

2. $5x + 2y + 1 = 10$
   $y = 7x + 3$

3. $y^2 = 4x$
   $y = x$

In the next two questions, find x and y **in terms of a OR t and T**:

4. $2y = x + 4a$
   $5y = x + 25a$

5. $ty = x + t^2$
   $Ty = x + T^2$

6. 'Completing the square'

This is extremely important for topics in Year 12.

Rewrite the following by completing the square

e.g. $x^2 + 6x + 2 = (x + 3)^2 - 3^2 + 2$ $\qquad$ $2x^2 - 10x - 2 = 2(x^2 - 5x - 1)$

$\qquad\qquad\qquad = (x + 3)^2 - 9 + 2$ $\qquad\qquad\qquad = 2\left[(x - \frac{5}{2})^2 - \frac{25}{4} - 1\right]$

$\qquad\qquad\qquad = (x + 3)^2 - 7$ $\qquad\qquad\qquad = 2(x - \frac{5}{2})^2 - \frac{25}{2} - 2$

$\qquad\qquad\qquad\qquad\qquad\qquad = 2(x - \frac{5}{2})^2 - \frac{29}{2}$

How about solving quadratic equations by (a) Factorising (b) completing the square and (c) using the formula $x = \frac{-b \pm (b^2 - 4ac)}{2a}$

1. $x^2 + 6x + 8 = 0$ 6. $a^2 + 28 = 11a$

2. $a^2 + 6a - 16 = 0$ 7. $x^2 - 6x = 3x + 2x - 24$

3. $b^2 - 2b = 15$ 8. $x^2 + 3x = 27 - 3x$

4. $x^2 + 10 = 7x$

5. $2x^2 + 5x = 3$

7. Simplification

Lots of essential skills here, expanding and recollecting, manipulation of surds, arithmetic with algebraic fractions.

1. $(x + h)^3 + (x - h)^3$

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

3. $(1 - \sqrt{2})(2\sqrt{2} + 1)$

4. $\frac{\sqrt{24}}{\sqrt{2}}$

5. $\frac{1 - \frac{1}{t}}{1 - t}$