IGCSE Revision 6

1. Simplify $2 + \dfrac{3}{5 + \dfrac{2}{1 - \frac{7}{3-2x}}}$. [Careful about signs] $\boxed{\frac{15x+20}{7x+7}}$

2. If $f(x) = x^2 + 3x - 2$, find $f(2x - 1)$. $\boxed{4x^2 + 2x - 4}$

3. If $g(x) = \frac{3}{2x-1}$ find $gg(x - 1)$. $\boxed{\frac{6x-9}{9-2x}}$

4. (a) Complete the square for $x^2 + 8x - 9$. $\boxed{(x + 4)^2 - 25}$

   (b) Hence write down the vertex on the curve for $y = x^2 + 8x - 9$. $\boxed{(-4, -25)}$

5. F is proportional to the cube of r. If $r = 7$ when $F = 98$, find the relationship between the two variables. $\boxed{F = \frac{2r^3}{7}}$

6. If $y = x + \sqrt{x}$ find the equation of the tangent (in the form $y = mx + c$) when

   (a) $x = 1$, $\boxed{y = \frac{3}{2}x + \frac{1}{2}}$

   (b) $x = 4$, $\boxed{y = \frac{5}{24}x + 1}$

   (c) $x = 2$. [Fully simplified; no calculators allowed.] $\boxed{y = \left(\frac{4+\sqrt{2}}{4}\right)x + \frac{\sqrt{2}}{2}}$

7. A bag contains 5 yellow, 4 blue and 3 red balls. Three balls a removed at once. Find the probability

   (a) they are all yellow. $\boxed{\frac{1}{22}}$

   (b) they are all different colours. $\boxed{\frac{3}{11}}$

   (c) there are two of one colour and one of another. $\boxed{\frac{29}{44}}$

8. In the triangle GHI, $GH = 7$, $GI = 8$ and $HI = 9$ find angle GIH. $\boxed{48.2°}$

9. If $t(x) = x^2 - 2x + 1$, find the range of $t(x)$ (by completing the square). $\boxed{t(x) \geqslant 0}$

10. The gradient between $(3, 7)$ and $(5, k)$ is m. The gradient between $(3, 7)$ and $(5, k + 1)$ is $2m$. Find k. $\boxed{k = 8}$

11. Q is inversely proportional to the square root of y. If $Q = 10$ when $y = 49$, find a relationship between Q and y. $\boxed{Q = \frac{70}{\sqrt{y}}}$

12. The length of a race track is 400m (correct to the nearest 10 metres). An athlete can run at 8.1 m/s (correct to 2 sig figs). Find the longest possible time that might be needed for him to run 400m. $\boxed{50.31 \text{ seconds}}$

13. A die is rolled repeatedly until the sum of the scores of *all* the rolls exceeds 4. Find the probability that it takes

    (a) exactly two rolls. $\boxed{\frac{1}{2}}$

    (b) more than two rolls. $\boxed{\frac{1}{6}}$

14. For $m(x) = x^2 + 9x - 2$ the domain is $x < -6$. Find the range of $m(x)$. $\boxed{m(x) > -20}$

15. For $p(x) = x^2 - 7x + 1$ the domain is $x > 1$. Find the range of $p(x)$. $\boxed{p(x) \geqslant -\frac{45}{4}}$

16. The domain for $k(x) = \tan x$ is $45 < x < 135$ with $x \neq 90$. Find the range of $k(x)$.

    $\boxed{k(x) \geqslant 1 \text{ or } k(x) \leqslant -1}$

17. A bag contains r red and 4 blue balls. Two balls are removed from the bag simultaneously. The probability that they are different colours is $\frac{28}{55}$. Find the value of r. [Anyone trying trial and improvement will be summarily shot.] $\boxed{r = 7}$