SYDNEY GIRLS HIGH

11m4 Maths Test No 1 29th Feb 2008 Arithmetic and Algebra

1) Write the answer to $(2.3 \times 10^5) \div (1.4 \times 10^{-4})$ correct to 3 significant figures
2) Express $0.7\dot{8}$ as a fraction in simplest form
3) Add together: $\sqrt{27}+\sqrt{48}$
4) Expand and simplify: $(3-2\sqrt{3})^2$
5) Express with a rational denominator: $\dfrac{2}{\sqrt{5}-1}$
6) If $x=2\sqrt{2}-7$, simplify $x^2+\dfrac{1}{x^2}$
7) Expand and simplify: $(2x-3)(x^2+2x+3)$
8) Expand and simplify: $(2x-1)^3$
9) Factorise: $x^2+4x+4-4y^2$
10) Factorise: x^3-8y^3
11) Factorise: $x^2+9x-36$
12) Factorise: $6x^2+5x-14$
13) Factorise: $7x^2+18x-25$
14) Simplify: $\dfrac{2x-2}{3x-3x^2}$
15) Simplify: $\dfrac{2}{x^2-1}+\dfrac{3}{x^2+x-2}$
16) Solve for x: $\dfrac{x}{3}-\dfrac{x+1}{2}+2=0$
17) Solve for x: $x^2-x-72=0$
18) Solve for x as a simplified surd: $4x^2-2x-1=0$
19) Solve for x and y if: $x+2y+\sqrt{2x-y}=5+\sqrt{5}$
20) Solve for x: $5x-x^2>0$
21) Solve for x: $|2x+5|=x-3$
22) Factorise: 3^x+12^x
23) Solve for x: $8^{x-1}=4^{3-x}$
24) Solve for x: $\dfrac{2x}{x-1}>1$

1) $(2.3 \times 10^5) \div (1.4 \times 10^{-4}) = 1642857143$

$= 1640000000$

164×10^7 or 1.64×10^9

2) $0.7888...$

$10x = 7.8888$

$9x = 7.1$

$x = \frac{71}{90}$

3) $\sqrt{27} + \sqrt{48}$

$= 3\sqrt{3} + 4\sqrt{3}$

$= 7\sqrt{3}$

4) $(3 - 2\sqrt{3})^2$

$= (9 - 12\sqrt{3} + 4\sqrt{9})$

$= (9 - 12\sqrt{3} + 12)$

$= (21 - 12\sqrt{3})$

5) $2 \times \sqrt{5} + 1$

$= \frac{2(\sqrt{5}+1)}{5-1}$

$= \frac{2\sqrt{5}+2}{4}$

$= \frac{2(\sqrt{5}+1)}{4}$

$= \frac{(\sqrt{5}+1)}{2}$

6) $x^2 + \frac{1}{x^2}$

$(2\sqrt{2}-7)^2$

$8 - 28\sqrt{2} + 49$

$= 57 - 28\sqrt{2}$.

$= (2\sqrt{2}-7)^2 + \frac{1}{(8 - 28\sqrt{2} + 49)}$

$= (2\sqrt{2}-7)^2 + \frac{1}{57 - 28\sqrt{2}}$

$((2\sqrt{2})-7)^2 + \frac{1}{57 - 28\sqrt{2}} \times 57 + 28\sqrt{2}$

$= (2\sqrt{2}-7)^2 + \frac{57 + 28\sqrt{2}}{3249 - 1568}$

$\frac{1681(57 - 28\sqrt{2}) + (57 + 28\sqrt{2})}{1681}$

$= \frac{\cancel{95817 - 47068\sqrt{2}} + 57 + 28\sqrt{2}}{1681}$

$= \frac{1681(57 - 28\sqrt{2}) + (57 + 28\sqrt{2})}{1681}$

$98825 - 4704$

7) $2x^3+4x^2+6x-3x^2-6x-9$

$= 2x^3+x^2-9$

8) $(2x-1)^3$

$=(2x-1)((2x)^2+2x+1^2)$

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

9) $x^2+4x+4-4y^2$

$=\cancel{x(x+4)+4(1-y^2)}$

$(x+2)^2-4y^2$

$=(x+2)^2-(2y)^2$

$=(x+2-2y)(x+2+2y)$

10) (x^3-8y^3)

$=(x-2y)(x^2+2xy+4y^2)$

11) $x^2+9x-36$ $\quad a+b=9$

$=(x+12)(x-3)$ $\quad a\times b=-36$

12) $6x^2+5x-14$ $\quad a+b=5$

$a\times b=-84$

$\frac{(6x-7)(6x+12)}{6}$

$=\frac{(6x-7)6(x+2)}{6}$

$=(6x-7)(x+2)$

13) $7x^2+18x-25$

$=\frac{(7x+25)(7x-7)}{7}$

$=\frac{(7x+25)7(x-1)}{7}$

$=(7x+25)(x-1)$

14) $\frac{2x-2}{3x-3x^2}$

$=\frac{2(x-1)}{3x(1-x)}$

$=\frac{2(x-1)}{-3x(x-1)}$

$=-\frac{2}{3x}$

15) $\frac{2}{x^2-1}+\frac{3}{x^2+x-2}$

$\frac{2}{(x-1)(x+1)}+\frac{3}{(x+2)(x-1)}$

$=\frac{2(x+2)}{(x-1)(x+1)(x+2)}+\frac{3(x+1)}{(x+2)(x+1)(x-1)}$

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

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

16) $\frac{x}{3}-\frac{x+1}{2}+2=0$

$2x-3(x+1)+12=0$

$2x-3x-3+12=0$

$2x-3x=3-12$

$x=9.$

17) $x^2-x-72=0$

$(x-9)(x+8)=0$

$\therefore x=9, \quad x=-8$

18) $4x^2 - 2x - 1 = 0$

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{2 \pm \sqrt{-2^2 - 4 \times 4 \times -1}}{2 \times 4}$

$= \frac{2 \pm \sqrt{+20}}{8}$

=

19) ① $x + 2y = 5$

② $\sqrt{2x - y} = \sqrt{5} \therefore = 2x - y = 5$

① $x + 2y = 5$

② $2x - y = 5$

② $4x - 2y = 10$

① $x + 2y = 5$

$= 5x = 15$

$x = 3$

sub x into ① $3 + 2y = 5$

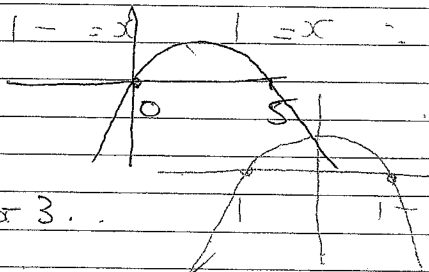
$2y = 2$

$y = 1$

20) $5x - x^2 > 0$

$x(5 - x) > 0$

$\therefore x = 0, \; x = 5$



$\therefore 0 < x < 5$

21) $|2x + 5| = x - 3$.

$2x + 5 = x - 3$

$x = -8$

$-2x - 5 = x - 3$

$-3x = 2$

$x = -\frac{2}{3}$

$|2x - 8 + 5| = -8 - 3$

$11 = -11$

$\therefore x \neq -8$

$\frac{11}{3} = -\frac{11}{3}$

$x \neq 11$

22) $3^x + 12^x$

$= 3^x(1 + 4^x)$

23) $8^{x-1} = 4^{3-x}$

$(2^3)^{x-1} = (2^2)^{3-x}$

$2^{3x-3} = 2^{6-2x}$

$3x - 3 = 6 - 2x$

$5x = 9$

$x = \frac{9}{5}$

24) $\frac{2x}{x-1} > 1$

$\frac{2x}{x-1}(x-1)^2 > (x-1)^2$

$2x(x-1) > (x-1)^2$

$(x-1)^2 < 2x(x-1)$

$(x-1)^2 - 2x(x-1) < 0$

$(x-1)((x-1) - 2x) < 0$

$((x-1))(-x-1) < 0$

$-x - 1 = 0$

$-x = 1$

$\therefore x = 1 \quad x = -1$