2001: Paper 1

1) $3.1 + 2.6 \times 4$

$= 3.1 + 10.4$

$= 13.5$

2) $3\frac{5}{8} + 4\frac{2}{3}$

$= 7 + \frac{15}{24} + \frac{16}{24}$

$= 7 + \frac{31}{24}$

$= 8\frac{7}{24}$

3) $f(m) = m^2 - 3m$

$\Rightarrow f(-5) = (-5)^2 - 3(-5)$

$= 25 + 15$

$= 40$

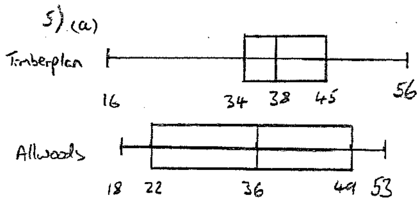
4) $2x - \frac{(3x-1)}{4} = 4$

$\Rightarrow 8x - 3x + 1 = 16$

$\Rightarrow 5x = 15$

$\Rightarrow x = 3$

5) (a)



(b) Should use Timberplan as less spread and therefore more consistent.

6) $A(a^2, a)$; $T(t^2, t)$ $a \neq t$.

$M_{AT} = \frac{t-a}{t^2-a^2}$

$= \frac{t-a}{(t-a)(t+a)}$

$= \frac{1}{t+a}$

7) (a) $P(< 3\text{yrs old}) = \frac{50+80+160+20}{600}$

$= \frac{31}{60}$

(b) $E(> 2000cc, \geq 3\text{yrs old}) = \frac{10}{600} \times 4200$

$= 70$

8) (a) $A(0, -3)$

(b) $4x^2 + 4x - 3 = 0$

$\Rightarrow (2x-1)(2x+3) = 0$

$\Rightarrow x = \frac{1}{2}$ or $x = -\frac{3}{2}$

$\therefore B(-\frac{3}{2}, 0)$

$C(\frac{1}{2}, 0)$

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

$= -\frac{1}{2}$

when $x = -\frac{1}{2}$, $4x^2 + 4x - 3 = 1 - 2 - 3$

$= -4$

9) (a) $7^3 + 1 = (7+1)(7^2 - 7 + 1)$

(b) $n^3 + 1 = (n+1)(n^2 - n + 1)$

(c) $8p^3 + 1 = (2p)^3 + 1 = (2p+1)((2p)^2 - 2p + 1)$

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

10) $\frac{\sqrt{3}}{\sqrt{24}} = \frac{\sqrt{3}}{2\sqrt{6}}$

$= \frac{\sqrt{18}}{12}$

$= \frac{3\sqrt{2}}{12}$

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

11) $I = \frac{20}{2^c}$ $c \geq 0$

(a) $c = 3$.

$I = \frac{20}{2^3}$

$= \frac{20}{8}$

$= 2.5$

(b) $I = 10$,

$10 = \frac{20}{2^c}$

$\Rightarrow 2^c = 2$

$\Rightarrow c = 1$

(c) Max $I = 20$ when $c = 0$.

(as $2^c \geq 1$ $\forall c \geq 0$)

2001: Paper 2

1) 2001 ⇒ not a leap year.

$10000 \times 60 \times 24 \times 365$

$= 5.256 \times 10^9$

2) (a) $\bar{x} = 84.33$

$= 84.3$ (1DP)

$\Sigma x = 843.3$

$\Sigma x^2 = 71130.31$

$\therefore s = \sqrt{\dfrac{71130.31 - \frac{843.3^2}{10}}{10-1}}$

$= 1.28$ (2DP)

(b) Rural petrol prices more and have greater spread.

3) $\text{Value}_{2002} = 90\,000 \times (1.05)^3 + 60000 \times (0.92)^3$

$= £150907.53$

4) (a) $y = mx + c$

$c = 2$

$y = mx + 2$

$M_{AB} = \dfrac{6-2}{12-0}$

$= \frac{1}{3}$

$\therefore y = \frac{1}{3}x + 2$

$\Rightarrow 3y - x = 6$ ■

(b) $4y + 5x = 46$ — ①

$3y - x = 6$ — ②

① + 5×② :

$19y = 76$

$\Rightarrow y = 4$

Sub in ② : $12 - x = 6$

$\Rightarrow x = 6$

∴ point of intersection is:

$(6, 4)$

5) $V = \pi r^2 h$

$= \pi \times \left(\frac{6.5}{2}\right)^2 \times 15$

$= 158.4375\,\pi$.

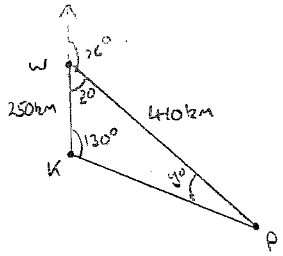
$\therefore 158.4375\,\pi = \pi r^2 \times 12$

$\Rightarrow r = \sqrt{\dfrac{158.4375}{12}}$

$\Rightarrow r = 3.63$ cm (2DP)

$\therefore d = 7.3$ cm (1DP)

6)



$\dfrac{\sin y}{250} = \dfrac{\sin 130}{410}$

$\Rightarrow \sin y = \dfrac{250 \sin 130}{410}$

$\Rightarrow y = 27.85°$ (2DP)

$z = 180 - 130 - y$

$\Rightarrow z = 22.15°$ (2DP)

$x = 180 - z$

$\Rightarrow x = 157.8°$ (1DP)

7) $\tan 40 = 2\sin x + 1$ $\quad 0 \leq x < 360$

$\Rightarrow \sin x = \dfrac{\tan 40 - 1}{2}$

S | A
T | C

$\Rightarrow x = \cancel{-4.61°}$, $355.4°$, $184.6°$ (1DP)

8) "$A = \frac{1}{2} ab \sin C$"

$\therefore A = \frac{1}{2} \times 8 \times 14 \times \sin 100$

$= 55.15\text{ cm}^2$ (2DP)

$\therefore V = 55.15 \times 5$

$= 275.7\text{ cm}^3$ (1DP)

9) $R \propto \dfrac{L}{d^2}$

$R_A = R_B$

$d_A = 2,\ L_A = 3.$

$d_B = 3,\ L_B = ?.$

$R = \dfrac{Lk}{d^2}$

$R_A = R_B \Rightarrow \dfrac{3k}{2^2} = \dfrac{kL_B}{3^2}$

$\Rightarrow L_B = \dfrac{3^3}{2^2}$

$\Rightarrow L_B = \dfrac{27}{4}$

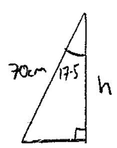
$\Rightarrow L_B = 6.75$ m

10) (a) "$\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$"

$\Rightarrow \cos A = \dfrac{14^2 + 12^2 - 21^2}{2 \times 14 \times 12}$

$\Rightarrow A = 107.5°$ (1DP)

(b)



$\cos 17.5° = \dfrac{h}{70}$

$\Rightarrow h = 70 \cos 17.5$

$\Rightarrow h = 66.8$ cm (1DP)

11) (a) $30 + x$

(b) $L_{new} = 30 + x$

$W_{new} = 20 + x$

$\therefore A_{new} = (30 + x)(20 + x)$

$= 600 + 50x + x^2$ ∎

(c) $x^2 + 50x + 600 = 1.4 \times 30 \times 20$

$\Rightarrow x^2 + 50x - 240 = 0$

$$\Rightarrow x = \frac{-50 \pm \sqrt{50^2 + 4 \times 240}}{2}$$

$\Rightarrow x = 4.41$ or $-\cancel{54}.41$ (2DP)

$\therefore$ minimum dimensions to nearest cm:

$L = 35$cm

$W = 25$cm