CREDIT 2001 – Paper I

1. $3.1 + 2.6 \times 4$
$3.1 + 10.4$
13.5

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

Add whole number parts: $7 + \frac{5}{8} + \frac{2}{3}$

Use common denominator of 24

$7 + \frac{15}{24} + \frac{16}{24} \rightarrow 7 + \frac{31}{24} \rightarrow 7 + 1\frac{7}{24}$

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

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

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

$f(-5) = 25 + 15 \quad \Rightarrow \quad 40$

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

Multiply throughout by 4; carefully!!

$8x - (3x - 1) = 16$

Simplify $\quad 8x - 3x + 1 = 16$

$5x + 1 = 16$ subtract 1 from each side

$5x = 15$ divide both sides by 3

$x = 3$

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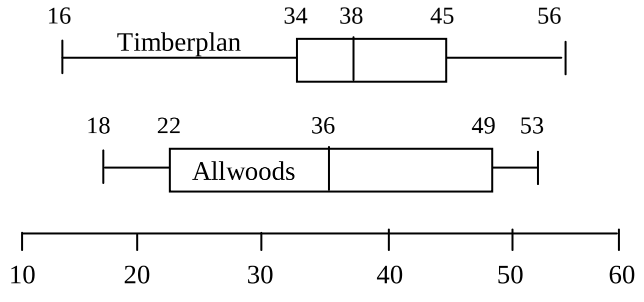
5. This table is a five figure summary for each supplier.

Company	*Minimum*	*Maximum*	*Lower Quartile*	*Median*	*Upper Quartile*
Timberplan	16	56	34	38	45
Allwoods	18	53	22	36	49

a) Draw box plots



5b). The interquartile range of Timberplan is much lower than that of Allwoods, hence they are more consistent in their deliveries.

So use **Timberplan**

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6. A is the point (a^2, a)

T is the point $(t^2, t) \quad a \neq t$

Gradient = $\frac{\text{Rise}}{\text{Run}} = \frac{\text{Change in } y}{\text{Change in } x}$

Change in y: $\quad a - t$

Change in x: $\quad a^2 - t^2$

Gradient = $\frac{a-t}{a^2 - t^2}$

Note that $a^2 - t^2$ is difference of 2 squares

i.e. $(a+t)(a-t)$

So, Gradient = $\frac{a-t}{a^2-t^2} = \frac{a-t}{(a+t)(a-t)}$

cancelling gives: $\frac{\cancel{a-t}}{(a+t)\cancel{(a-t)}} \Rightarrow \frac{1}{a+t}$

7a). Total number of cars:
50 + 80 + 160 + 20 + 60 + 100 + 120 + 10
= 600 cars *(also given this in the question)*

Less than 3 years old is the top row:
50 + 80 + 160 + 20 = 310 cars

P(less than 3 years old) = $\frac{310}{600} = \frac{31}{60}$

7b). From sample table :

greater than 2000 cc and 3 or more years old

= 10 cars.

Probability of this is $\frac{10}{600} \Rightarrow \frac{1}{60}$

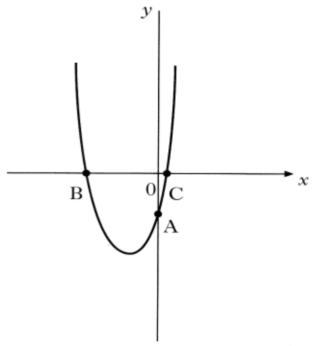
So out of a sample of 4200 cars

We would expect: $\frac{1}{60} \times 4200$ = **70 cars**

to be > 2000 cc and 3 or more years old

CREDIT 2001 – Paper I *(continued)*

8.



$$y = 4x^2 + 4x - 3$$

8a). Coordinates of A are (0, –3)
From equation, when x = 0, y = –3

8b). Solve the equation $4x^2 + 4x - 3 = 0$
Factorise
$(2x-1)(2x+3) = 0$
So:
$2x - 1 = 0 \Rightarrow 2x = 1 \Rightarrow x = \frac{1}{2}$
and
$2x + 3 = 0 \Rightarrow 2x = -3 \Rightarrow x = -\frac{3}{2}$
Looking at the graph, clearly,

B is $\left(-\frac{3}{2}, 0\right)$ and C is $\left(\frac{1}{2}, 0\right)$

8c). Since a parabola is symmetrical,
the minimum value is at the bottom of the curve.

This will have its *x*–coordinate half way between B and C.

x–coordinate of minimum point is $-\frac{1}{2}$
use equation to find *y*, i.e. the minimum value

$y = 4\left(-\frac{1}{2}\right)^2 + 4\left(-\frac{1}{2}\right) - 3$

$y = 1 - 2 - 3 \Rightarrow -4$

minimum value of : $y = 4x^2 + 4x - 3$ is –4

9a) Look at the pattern:
$7^3 + 1 = (7+1)(7^2 - 7 + 1)$

9b). Again looking at the pattern
$n^3 + 1 = (n+1)(n^2 - n + 1)$

9c). $8p^3 + 1 \Rightarrow 8p^3 + 8 - 7$
Take out common factor of 8 in 1st 2 terms.
$8(p^3 + 1) - 7$ and using result from (b)
$8(p+1)(p^2 - p + 1) - 7$

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10. $\frac{\sqrt{3}}{\sqrt{24}}$ use rules of surds to combine

i.e. $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$ So $\frac{\sqrt{3}}{\sqrt{24}} \Rightarrow \sqrt{\frac{3}{24}}$

Simplify:

$\sqrt{\frac{3}{24}} \Rightarrow \sqrt{\frac{1}{8}}$ Look for largest square in 8

$\sqrt{\frac{1}{8}} \Rightarrow \sqrt{\frac{1}{4 \times 2}}$ Use rules of surds again

i.e. $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$ $\sqrt{\frac{1}{4 \times 2}} \Rightarrow \frac{1}{\sqrt{4 \times 2}}$

Now use rule for product of surds:

i.e. $\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$ $\Rightarrow \frac{1}{2\sqrt{2}}$

To rationalise the denominator, multiply top and bottom by $\sqrt{2}$.

$\Rightarrow \frac{1}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{4}$ (since $\sqrt{a} \times \sqrt{a} = a$)

11.a) $I = \frac{20}{2^c}$ put $c = 3$
$I = \frac{20}{2^3} \Rightarrow I = \frac{20}{8} \Rightarrow I = \frac{5}{2}$

11b). $I = \frac{20}{2^c}$ put $I = 10$
$10 = \frac{20}{2^c} \Rightarrow 10 \times 2^c = 20$
divide both sides by 10
$\Rightarrow 2^c = 2$ so, $c = 1$

11c). Maximum possible intensity is when the denominator is as small as possible.
This will be when $c = 0$

$I = \frac{20}{2^0} \Rightarrow I = \frac{20}{1} \Rightarrow I = 20$

because $2^0 = 1$

END OF QUESTION PAPER (*Rev. March 2007)*