CREDIT 2002 – Paper I (Solutions)

1. $7.18 - 2.1 \times 3$
$7.18 - 6.3$
0.88

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2. $1\frac{1}{8} \div \frac{3}{4} \quad\rightarrow\quad \frac{\cancel{9}^{3}}{\cancel{8}_{2}} \times \frac{\cancel{4}^{1}}{\cancel{3}_{1}} \quad\rightarrow\quad \frac{3}{2} \quad\rightarrow\quad 1\frac{1}{2}$

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3. $5 - x > 2(x+1) \quad\rightarrow\quad 5 - x > 2x + 2$

$\rightarrow\ 5 - 2 > 2x + x \quad\rightarrow\quad 3 > 3x \quad\rightarrow\quad 1 > x$

$\rightarrow\ x < 1$

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4. $f(x) = x^2 + 5x \quad\rightarrow f(-3) = (-3)^2 + 5(-3)$

$\rightarrow\quad f(-3) = 9 - 15 \quad = \ -6$

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5. a) $p^2 - 4q^2 \ \rightarrow\ (p+2q)(p-2q)$

b) $\frac{p^2 - 4q^2}{3p + 6q} \rightarrow \frac{\cancel{(p+2q)}(p-2q)}{3\cancel{(p+2q)}} \rightarrow \frac{(p-2q)}{3}$

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6. $L = \frac{1}{2}(h - t) \ \rightarrow\ 2L = h - t \ \rightarrow 2L + t = h$

$\rightarrow\quad h = 2L + t$

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7. Use Cosine Rule

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos A = \frac{5^2 + 4^2 - 6^2}{2(5)(4)} \quad\rightarrow\quad \frac{5}{40} \quad\rightarrow\quad \frac{1}{8}$$

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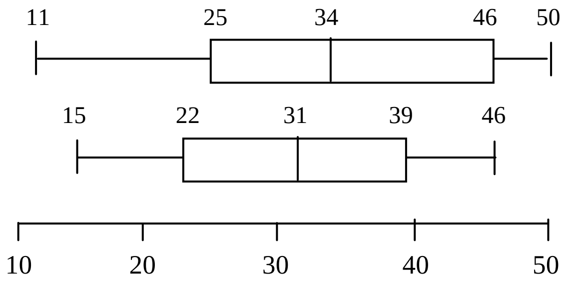
8. Use Box plot (or back to back stem & leaf)

1st Set:
Lo = 11, Q_1 = 25, Q_2 = 34, Q_3 = 46, Hi = 50

2nd Set:
Lo = 15, Q_1 = 22, Q_2 = 31, Q_3 = 39, Hi = 46



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9. $f(x) = g(x) \quad\Rightarrow\quad x^2 + 2x - 1 = 5x + 3$

$\rightarrow\quad x^2 - 3x - 4 = 0$

$\rightarrow\quad (x-4)(x+1) = 0$

$\rightarrow\quad x - 4 = 0 \ \ or \ \ x + 1 = 0$

Hence, $\quad x = 4 \ \ or \ \ x = -1$

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10. $\sqrt{27} + 2\sqrt{3} \ \Rightarrow\ \sqrt{9\times 3} + 2\sqrt{3}$

$\Rightarrow\ \sqrt{9}\sqrt{3} + 2\sqrt{3} \ \Rightarrow\ 3\sqrt{3} + 2\sqrt{3}$

$\Rightarrow\ 5\sqrt{3}$

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11. $y^8 \times (y^3)^{-2} \ \rightarrow\ y^8 \times y^{-6} \ \rightarrow\ y^2$

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12. **A** has co-ordinates (0, 12)

B has co-ordinates (90, 82)

gradient AB = $\frac{82 - 12}{90 - 0} \ \rightarrow\ \frac{70}{90} \ \rightarrow\ \frac{7}{9}$

Using $\quad y = mx + c$

$$g = \frac{7}{9}h + 12$$

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13. Let cost of peach = p pence

Let cost of grapefruit = g pence

a) $4p + 3g = 130$ ….. (1)

b) $2p + 4g = 120$ ….. (2)

Solve simultaneously

(1) ….. $4p + 3g = 130$ ….. (3)

(2) × 2 .. $4p + 8g = 240$ ….. (4)

Subtract: (4) – (3)

$5g = 110$

Hence $g = 22$, substitute into (1)

$4p + 66 = 130$ hence p = 16

Thus 3 peaches + 2 grapefruit cost

$3 \times 16 + 2 \times 22 \ = \ 92$ pence.

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

CREDIT - 2002 Paper II (Solutions)

1. $19.06 \times 10^{-5} \times 18 = 0.0034308$

$= 3.43 \times 10^{-3}$ (3 sig figs)

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2. Price includes 17.5% VAT

So, 117.5% = £ 150

Hence 1% = $\frac{150}{117.5}$

So 100% = $\frac{150}{117.5} \times 100$ = 127.659...

Price ex-VAT = £ 127.66

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3. $2x^2 + 3x - 7 = 0$

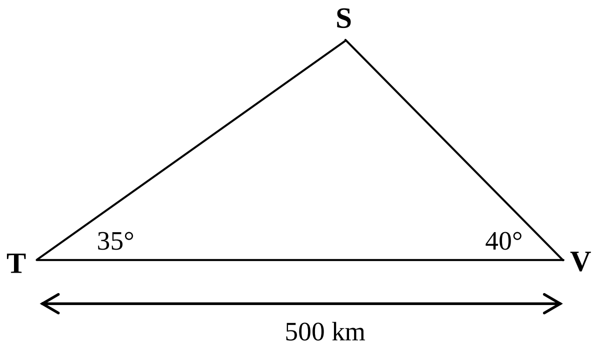
Use the quadratic formula: a = 2, b = 3, c = -7

$$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(-7)}}{2(2)} \rightarrow \frac{-3 \pm \sqrt{9+56}}{4}$$

$$x = \frac{-3 \pm \sqrt{65}}{4} \rightarrow \frac{-3 - 8.06}{4} \ or \ \frac{-3 + 8.06}{4}$$

$$x = -2.8 \ or \ 1.3 \ \text{(1 d.p.)}$$

4.

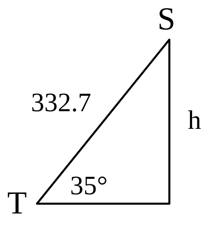


ASA - use Sine Rule to find either side ST or SV
The use SOH-CAH-TOA to find perpendicular height.

First find angle at S = 180° – (35° + 40°) S is 105°

$$\frac{\text{ST}}{\sin 40} = \frac{500}{\sin 105}$$

$$\text{ST} = \frac{500 \sin 40}{\sin 105} \Rightarrow \text{ST} = 332.731...$$



$$\sin 35 = \frac{h}{332.7}$$

$$h = 332.7 \times \sin 35 = 190.828...$$

height of satellite = 191 km

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5. Trough is a prism with cross-section as shown.

Area of cross-section = Area rectangle + semi circle

Radius of semi-circle = 0.6 m ÷ 2 = 0.3 metres

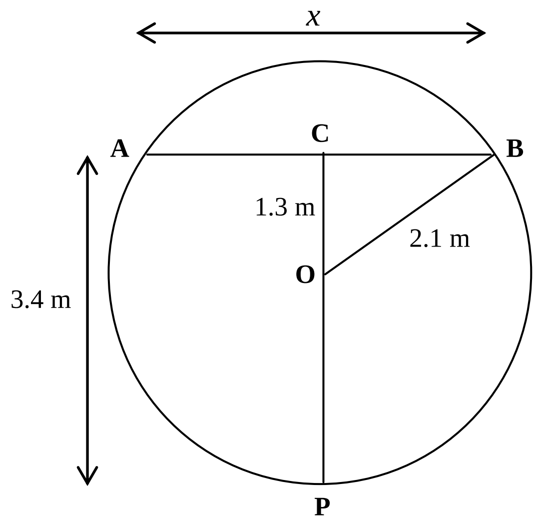
Area of cross-section = $0.6 \times 0.25 + ½ \pi 0.3^2$

= 0.15 + 0.1413… = 0.2913…

Volume = $A \times l$ = 0.2913… × 4

Volume of trough = 1.1654866…. = 1.2 m^3 (2 s.f.)

6.



a) OP = 2.1 m (radius)

Hence, OC = 3.4 – 2.1 = 1.3 m

Using Pythagoras in Δ OCB

$$CB^2 + 1.3^2 = 2.1^2$$

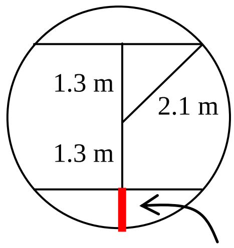
$$CB^2 = 2.1^2 - 1.3^2$$

$$CB = \sqrt{2.72} = 1.649...$$

But x is twice CB

So, width of oil = 3.298... = 3.30 m (3 s.f.)

b) By symmetry, the other depth of oil is



2.1 – 1.3 = 0.8 m

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7. Brazilian : Columbian

2 : 3

20 kg of Brazilian, would require 30 kg of Columbian coffee, there is not enough Columbian coffee, so we need to see how much an be made with the Columbian coffee

Each 1 kg tin contains

400 gm Brazilian : 600 gm Columbian

So 25 kg =25 000 gm

25 000 ÷ 600 = 41.667 ….. tins

Hence 41 one kg tins can be made

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8. We have to solve the simultaneous equations

$$y = 0.4 \quad and \quad y = \sin x$$

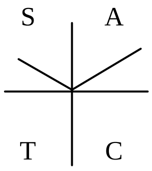
Hence, solve $\sin x = 0.4$

acute value of x is $\sin^{-1} 0.4 = 23.6°$

Use ASTC

sine is positive (+)

So quadrants 1 & 2



Hence, x is 23.6° or 180 – 23.6° = 156.4°

Co-ords are: A (23.6°, 0.4) and B(156.4°, 0.4)

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9. a) Cost of 10 minutes Easy Call
   = 3 × 25p + 7 × 5p = £ 1.10

   b) **Easy Call:** Cost of m minutes (m > 3)

   = 75 + (m – 3) × 5 pence
   = 75 + 5m – 15
   = 60 + 5m pence.

   c) **Green Call:** Cost of m minutes (m > 2)

   = 80 + (m – 2) × 2 pence
   = 80 + 2m – 4
   = 76 + 2m pence

   d) **For Green Call to be cheaper, then**

   76 + 2m < 60 + 5m
   76 – 60 < 5m – 2m
   16 < 3m
   m > 16 ÷ 3
   m > 5.33 minutes

   Least number of minutes used for this to be true is **6 minutes** (to nearest minute)

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10. a) $$T = \frac{kv^2}{r}$$

   b) Speed × 3 then T × 3^2

   Radius is halved then T × 2

   If both occur then T × 3^2 × 2 = T × 18

   Hence, Tension, T, is multiplied by 18

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11. a) $2^n = 32 \Rightarrow n = 5$

   b) Expression for 5 numbers is:

   (1 + 2 + 4 + 8 + 16) = 32 – 1

   c) From above we see

   Last number of 5 numbers is 16, i.e. 2^4

   5 numbers → 2^{5-1} = 2^4

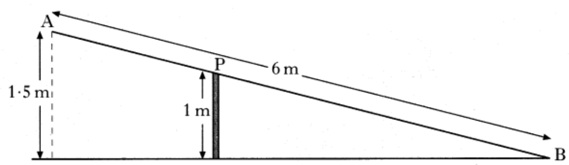
   Last number of n numbers is 2^{n-1}

   (1 + 2 + …… + 2^{n-1}) = 2 × 2^{n-1} -1

   i.e. $2^n - 1$

12.

Figure 1

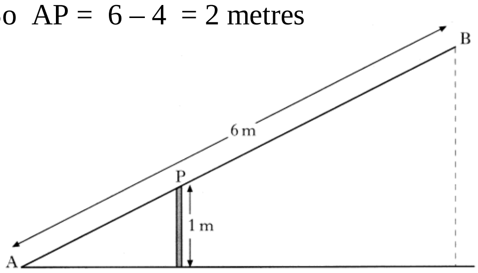


Use similar triangles

$$\frac{BP}{BA} = \frac{1}{1.5} \rightarrow \frac{BP}{6} = \frac{1}{1.5}$$

Hence BP = $\frac{6}{1.5}$ = 4 metres

So AP = 6 – 4 = 2 metres



Using similar triangles again

$$\frac{ht\ B}{ht\ P} = \frac{AB}{AP} \rightarrow \frac{ht\ B}{1} = \frac{6}{2}$$

So height of B above the ground = 3 metres.

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