2010 CREDIT SOLUTIONS — PAPER 1

1. 40 % of £11.50 − £1.81

$= \frac{4}{10} \times 11{\cdot}50 - 1{\cdot}81$

(BODMAS)

$11{\cdot}50 \div 10 \times 4$
$= 1{\cdot}15 \times 4$
$= 4{\cdot}60$

$= 4{\cdot}60 - 1{\cdot}81$

$= £2{\cdot}79$

2. $\frac{2}{5} \div 1\frac{1}{10}$

$= \frac{2}{5} \div \frac{11}{10}$

$= \frac{2}{5} \times \frac{10}{11}$ or $\frac{2}{\cancel{5}_1} \times \frac{\cancel{10}^2}{11}$

$= \frac{20}{55}$ $\quad = \frac{4}{11}$

$= \frac{4}{11}$

3. $t = \frac{7s+4}{2}$

$2t = 7s + 4$

$2t - 4 = 7s$

$s = \frac{2t-4}{7}$

4. (a) $x^2 - 4x = 2x + 7$

$x^2 - 6x - 7 = 0$

(b) $(x+1)(x-7) = 0$

either $x + 1 = 0$ or $x + 7 = 0$

$x = -1$ $\qquad x = 7$

$\Rightarrow x = -1, 7$

5. (a) $P(\text{black}) = \frac{4}{9}$

$P(\text{white}) = \frac{5}{9}$

(b) white $= \frac{5}{9} \times 27$

$= 27 \div 9 \times 5$

$= 15$

There are 15 white marbles

6 20% extra $\Rightarrow$

$$\begin{aligned} 120\% &= 900\text{ g} \\ 20\% &= 900\text{ g} \div 6 \\ &= 150\text{ g} \\ 100\% &= 150\text{ g} \times 5 \\ &= 750\text{ g} \end{aligned}$$

A standard box contains 750g of powder.

7. (a) $y = mx + c$ $(2, 7)$

$7 = 2m + c$

(b) $y = mx + c$ $(4, 17)$

$17 = 4m + c$

(c)

$$\begin{aligned} 2m + c &= 7 \quad (1) \\ 4m + c &= 17 \quad (2) \end{aligned}$$

$$\begin{aligned} 4m + 2c &= 14 \quad (1) \times 2 \\ - \quad 4m + c &= 17 \quad (2) \\ \hline c &= -3 \end{aligned}$$

sub. $c = -3$ into (1)

$$\begin{aligned} 2m + (-3) &= 7 \\ 2m - 3 &= 7 \\ 2m &= 10 \\ m &= 5 \end{aligned}$$

check using (2)

$$\begin{aligned} 4(5) + (-3) &= 17 \\ 20 - 3 &= 17 \end{aligned}$$

LHS = RHS

$\Rightarrow$ $m = 5$ and $c = -3$

OR

$$\begin{aligned} c &= 7 - 2m \\ c &= 17 - 4m \\ \Rightarrow \quad 7 - 2m &= 17 - 4m \\ 2m &= 10 \\ m &= 5 \end{aligned}$$

when $m = 5$,

$$\begin{aligned} c &= 7 - 2(5) \\ c &= 7 - 10 \\ c &= -3 \end{aligned}$$

(c) The gradient, $m = 5$

8. (a) $\sqrt{2} \times \sqrt{18}$

$= \sqrt{36}$

$= 6$

(b) $\sqrt{2} + \sqrt{18}$

$= \sqrt{2} + \sqrt{9 \times 2}$

$= \sqrt{2} + 3\sqrt{2}$

$= 4\sqrt{2}$

(c) $\dfrac{6}{4\sqrt{2}}$

$= \dfrac{6}{4\sqrt{2}} \times \dfrac{\sqrt{2}}{\sqrt{2}}$

$= \dfrac{6\sqrt{2}}{4 \times 2}$

$= \dfrac{6\sqrt{2}}{8}$

$= \dfrac{3\sqrt{2}}{4}$

9. (a) $y = \frac{1}{3}x + 2$

B lies on x-axis

On x-axis, $y = 0$

$\Rightarrow \quad \frac{1}{3}x + 2 = 0$

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

$x = -6$

$\Rightarrow B(-6, 0)$

b) $y < 0$ for all points left of B

ie. $y < 0$ for $x < -6$

10. (a) $1^3 + 2^3 + 3^3 + 4^3 + 5^3 = \dfrac{5^2 \times 6^2}{4}$

(b) $1^3 + 2^3 + 3^3 + \quad + n^3 = \dfrac{n^2 \times (n+1)^2}{4}$

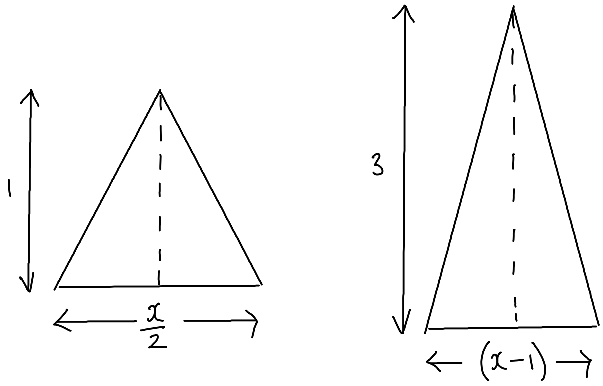
(c) $1^3 + 2^3 + 3^3 + \quad + 9^3 = \dfrac{9^2 \times 10^2}{4}$

$= \dfrac{81 \times 100}{4}$

$= \dfrac{8100}{4}$

$= 2025$

11.



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

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

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

$$x = \frac{12}{2}(x-1)$$ (multiply both sides by 4)

$$x = 6(x-1)$$

$$x = 6x - 6$$

$$6 = 5x$$

$$x = \frac{6}{5}$$

PAPER 2

1. $\text{Weight} = 84000 \times 0.75^3$

$= 35\,437.5$

$\text{Weight} = 35\,400$ tonnes (to 3s.f.)

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

$= x(x-1)(x-1)$

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

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

3. (a) mean, $\bar{x} = \dfrac{808}{8}$

$\bar{x} = 101$ pins

x	$x-\bar{x}$	$(x-\bar{x})^2$
102	1	1
102	1	1
101	0	0
98	−3	9
99	−2	4
101	0	0
103	2	4
102	1	1

$\Sigma(x-\bar{x})^2 = 20$

$s = \sqrt{\dfrac{\Sigma(x-\bar{x})^2}{n-1}}$

$s = \sqrt{\dfrac{20}{7}}$

$s = 1.69$

(b) For example:

- The second machine averaged two more pins more per box.
- The standard deviation of the second machine is higher indicating a greater variation in the number of matches in each box

4. $3x^2 + 5x - 7 = 0$

$a = 3 \quad b = 5 \quad c = -7$

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

$$x = \frac{-5 \pm \sqrt{(5)^2 - 4(3)(-7)}}{2(3)}$$

$$x = \frac{-5 \pm \sqrt{25 + 84}}{6}$$

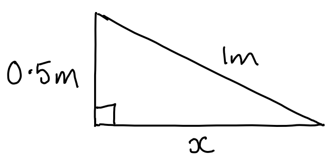
$$x = \frac{-5 \pm \sqrt{109}}{6}$$

either $x = \frac{(-5 + \sqrt{109})}{6}$ or $x = \frac{(-5 - \sqrt{109})}{6}$

$x = 0.907 \qquad x = -2.573$

$\Rightarrow \quad \underline{\underline{x = -2.6,\ 0.9}}$

5. (a)



$x^2 = (1)^2 - (0.5)^2$

$x^2 = 1 - 0.25$

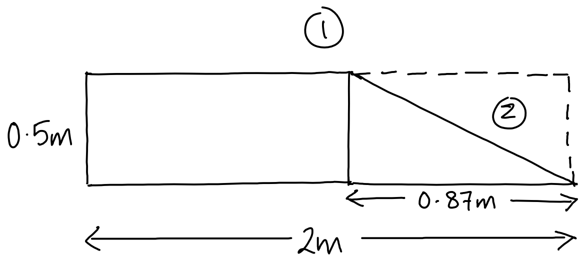
$x^2 = 0.75$

$x = \sqrt{0.75}$

$x = 0.866$

$x = 0.87\,m$ (to 2 d.p)

b)



$A_{①} = lb \qquad A_{②} = \frac{1}{2}bh$

$= 2 \times 0.5 \qquad = \frac{1}{2}.(0.87)(0.5)$

$= 1m^2 \qquad = 0.22\,m^2$

Total Area $= 1 - 0.22$

$= 0.78m^2$

Volume $= Ah$

$= 0.78 \times 2$

$= \underline{\underline{1.56m^3}}$

6. radius $= 36$ cm $\Rightarrow$ diameter $= 72$ cm

$$\text{Arc } AB = \frac{140}{360} \times 72\pi$$

$$= 87{\cdot}96 \text{ cm}$$

$$\text{Arc } AB = 88{\cdot}0 \text{ cm} \quad (\text{to } 1 \text{ d.p.})$$

7. $$\text{Scale Factor (volume)} = \frac{1600}{200}$$

$$= 8$$

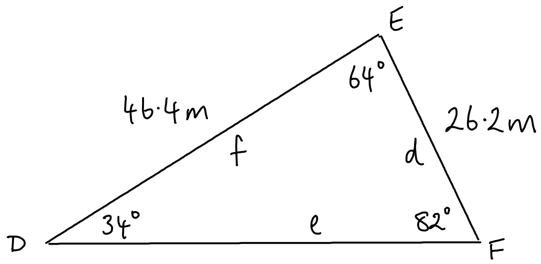
$$\text{Scale Factor (length)} = \sqrt[3]{8}$$

$$= 2$$

$\Rightarrow$ Salon Bottle $= 2 \times 12$ cm

$= \underline{\underline{24 \text{ cm}}}$

8.



You know all the angles and two sides so you can use either Sine Rule or Cosine Rule.

$$\frac{d}{\sin D} = \frac{e}{\sin E} = \frac{f}{\sin F}$$

$$\frac{e}{\sin 64^\circ} = \frac{46{\cdot}4}{\sin 82^\circ}$$

$$e = \frac{46{\cdot}4 \sin 64^\circ}{\sin 82^\circ}$$

$$e = 42{\cdot}1 \text{ m}$$

OR

$$e^2 = d^2 + f^2 - 2df \cos E$$

$$e^2 = (26{\cdot}2)^2 + (46{\cdot}4)^2 - 2(26{\cdot}2)(46{\cdot}4)\cos 64^\circ$$

$$e^2 = 1773{\cdot}6$$

$$e = \sqrt{1773{\cdot}6}$$

$$e = 42{\cdot}1 \text{ m}$$

Perimeter of DEF $= 46{\cdot}4 + 26{\cdot}2 + 42{\cdot}1$

$= 114{\cdot}7$ m

$\frac{1000}{114{\cdot}7} = 8{\cdot}7 \Rightarrow$ <u>The footballers must run 9 complete circuits to cover at least 1000m.</u>

9. $5 \times 0.8 = 4$

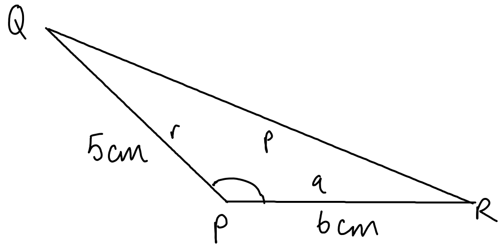
$4 \times 1.2 = 4.8$

$\Rightarrow$ New ratio is $4 : 4.8$

$40 : 48$

$\underline{\underline{5 : 6}}$

10.



Using $A = \frac{1}{2} ab \sin C$

$A = \frac{1}{2} qr \sin P$

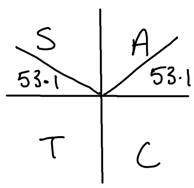
$12 = \frac{1}{2}(6)(5) \sin P$

$12 = 15 \sin P$

$\sin P = \frac{12}{15}$

$P = \sin^{-1}\left(\frac{12}{15}\right)$

Acute angle $= 53.1°$



$180 - 53.1 = 126.9$

$\underline{\underline{\text{Obtuse angle } P = 126.9°}}$

11. (a) $h \propto \frac{V}{b^2}$

$\Rightarrow h = \frac{kV}{b^2}$

(b) $12 = \frac{256k}{(8)^2}$

$12 = \frac{256k}{64}$

$12 = 4k$

$k = 3$

$\Rightarrow h = \frac{3V}{b^2}$

when $V = 600$ & $b = 10$

$h = \frac{3(600)}{(10)^2}$

$h = \frac{1800}{100}$

$\underline{\underline{h = 18 \text{ cm}}}$

12. By Pythagoras:

$$(x+8)^2 = (x+7)^2 + x^2$$

$$x^2+16x+64 = x^2+14x+49+x^2$$

$$16x+64 = x^2+14x+49$$

$$0 = x^2-2x-15$$

$$0 = (x+3)(x-5)$$

$$\Rightarrow x = -3, 5$$

As x is a length $x = 5$ cm

13. (a) $D = 3 + 1.75\sin 30h^\circ$

when $h = 5$, $D = 3 + 1.75\sin 150^\circ$

$D = 3.875$

$D = 3.88$ m (to 2 d.p)

(b) Max value of $1.75\sin 30h^\circ = 1.75$

Min value of $1.75\sin 30h^\circ = -1.75$

Max depth $= 3 + 1.75$

$= 4.75$m

Min depth $= 3 - 1.75$

$= 1.25$m

Maximum difference $= 4.75 - 1.25$

$= 3.5$m