2017 National 5 Paper 2

(1) $|v| = \sqrt{18^2 + (-14)^2 + 3^2}$

$= \sqrt{529}$

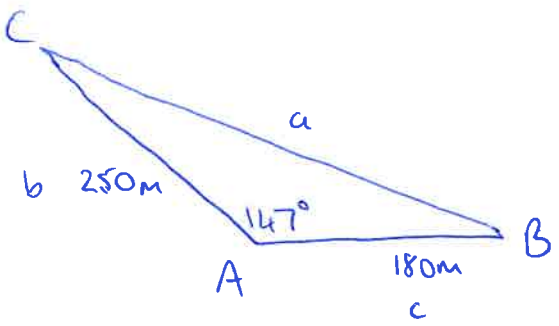
$= \underline{23}$

(2) $100 + 4.5 = 104.5\% = 1.045$

$1200 \times 1.045^3 = 1369.399$

$= \underline{£1369}$ to the nearest pound.

(3)



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

$a^2 = 250^2 + 180^2 - 2 \times 250 \times 180 \times \cos 147^\circ$

$a^2 = 170380.35$

$a = \underline{412.77\text{ m}}$

(4) $2x^2 + 5x - 4 = 0$

$a = 2 \quad b = 5 \quad c = -4$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \dfrac{-5 \pm \sqrt{5^2 - 4 \times 2 \times (-4)}}{4}$

$x = \dfrac{-5 \pm \sqrt{57}}{4}$

$x = \dfrac{-5 + \sqrt{57}}{4}$ or $\dfrac{-5 - \sqrt{57}}{4}$

$x = \underline{0.6}$ or $x = \underline{-3.1}$

(5) $115\% = 4830$

$1\% = \frac{4830}{115} = 42$

$100\% = 100 \times 42 = \underline{\underline{4200}}$ tickets

(6) $V_{sphere} = \frac{4}{3}\pi r^3$

$V_{\substack{whole \\ sweet}} = \frac{4}{3} \times \pi \times 12^3$

$= 7238.229$

$V_{caramel} = \frac{4}{3} \times \pi \times 9^3$

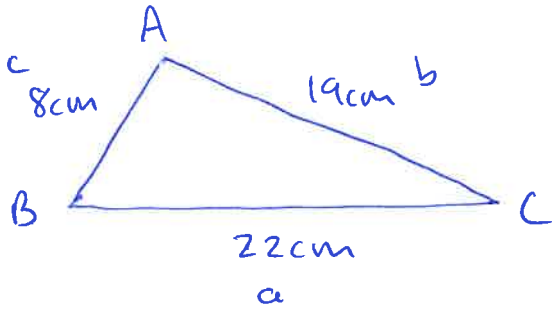
$= 3053.628$

$V_{chocolate} = 7238.229 - 3053.628$

$= 4184.6$

$= \underline{\underline{4180 \text{ mm}^3}}$

(7)



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

$\cos A = \frac{19^2 + 8^2 - 22^2}{2 \times 19 \times 8}$

$\cos A = \frac{-59}{304}$

$A = \underline{\underline{101.19^\circ}}$

Angle $A = 101.19^\circ$ so no angle in this triangle is 90° so the triangle is not right angled.

(8) a) $\overrightarrow{PR} = \overrightarrow{PQ} + \overrightarrow{QR} = \underline{d - c}$

b) $\overrightarrow{TV} = \overrightarrow{TP} + \overrightarrow{PV}$

$= d + \frac{1}{2}(d - c)$ $\quad \left(\overrightarrow{PV} = \frac{1}{2}\overrightarrow{PR}\right)$

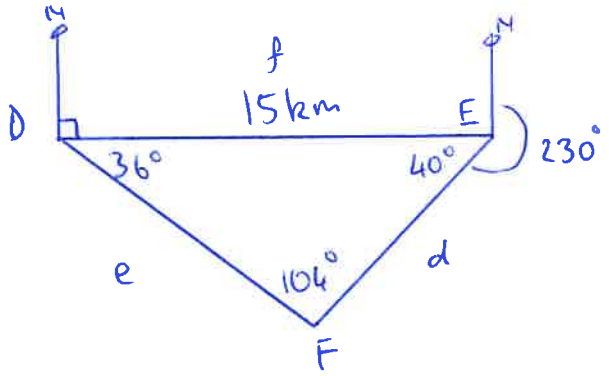
$= d + \frac{1}{2}d - \frac{1}{2}c$

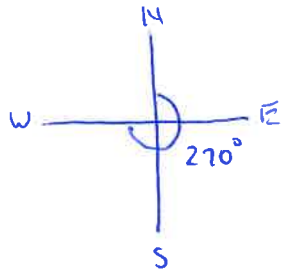
$= \underline{\frac{3}{2}d - \frac{1}{2}c}$

(9) a) $4x^2 - 25 = (2x)^2 - 5^2 = \underline{(2x - 5)(2x + 5)}$

b) $\frac{4x^2 - 25}{2x^2 - x - 10} = \frac{(2x - 5)(2x + 5)}{(2x - 5)(x + 2)} = \underline{\frac{2x + 5}{x + 2}}$

(10)





$\frac{e}{\sin E} = \frac{f}{\sin F} \Rightarrow \frac{e}{\sin 40^\circ} = \frac{15}{\sin 104^\circ}$

$e = \frac{15 \sin 40^\circ}{\sin 104^\circ} = \underline{9.94\text{km}}$

(11) $3x - 5y - 10 = 0$

$+5y \qquad +5y$

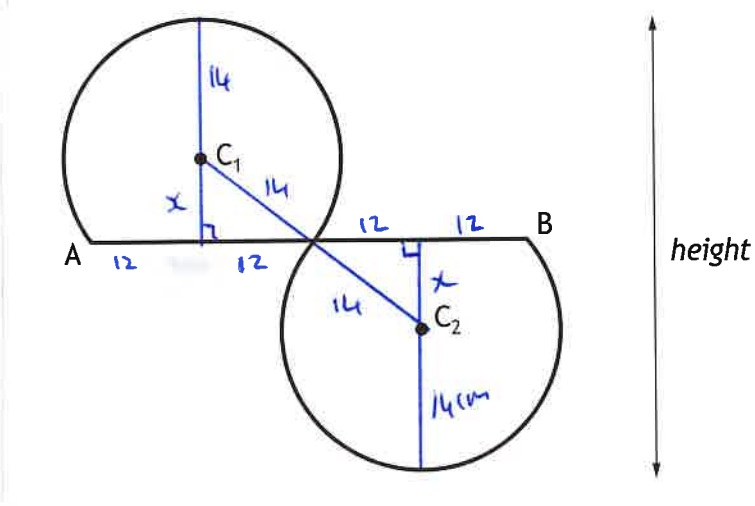
$3x - 10 = 5y$

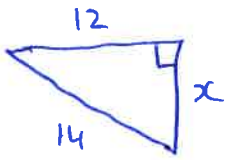
$5y = 3x - 10$

$y = \frac{3}{5}x - 2 \qquad \underline{m = \frac{3}{5}}$

(12) $\dfrac{1}{\sqrt[3]{x^1}} = \dfrac{1}{x^{1/3}} = \underline{\underline{x^{-1/3}}}$

(13)





$x^2 = 14^2 - 12^2$

$x^2 = 196 - 144$

$x^2 = 52$

$x = \sqrt{52}$

$x = 7.21$ cm

So total height $= 14 + 7.21 + 7.21 + 14$

$= \underline{\underline{42.42 \text{ cm}}}$

(14) angle at centre $= \dfrac{\text{arc length}}{\text{Circumference}} \times 360^\circ$

$C = \pi D$

$= \pi \times 12.8$

$= 40.2$cm

$= \dfrac{31.5}{40.2} \times 360$

$= \underline{\underline{282^\circ}}$

(15) a) $h = 40 + 23\cos x^\circ$

when $x = 60^\circ$, $h = 40 + 23\cos 60^\circ$

$= 40 + 11.5$

$= \underline{\underline{51.5\text{m}}}$

b) when $x = 180^\circ$, $h = 40 + 23\cos 180^\circ$

$= 40 - 23$

$= \underline{\underline{17\text{m}}}$

c) $h = 61$ $\Rightarrow$ $h = 40 + 23\cos x^\circ$

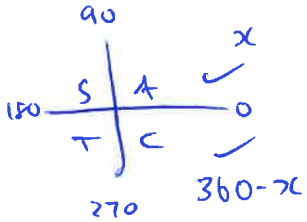
$61 = 40 + 23\cos x^\circ$

$-40 \qquad -40$

$21 = 23\cos x^\circ$

$23\cos x^\circ = 21$

$\cos x^\circ = \frac{21}{23}$



$x = \underline{24.1^\circ}$ or $\underline{335.9^\circ}$