Edexcel IGCSE Higher Tier Mathematics Paper 4HR – January 2018

1. (a) Sale price $= 0.88 \times 36 = \$31.68$

(b) Percentage of sale items that were shirts $= \frac{81}{180} \times 100 = 45\%$

2. (a) Area = Left hand rectangle + Right hand rectangle

$= 6 \times 3 + (8-3) \times 2$

$= 28 \text{ cm}^2$

(b) $28h = 350$

$h = \frac{350}{28} = 12.5$

3. Midpoint is $\left(\frac{1+7}{2}, \frac{3+8}{2}\right) = (4, 5.5)$

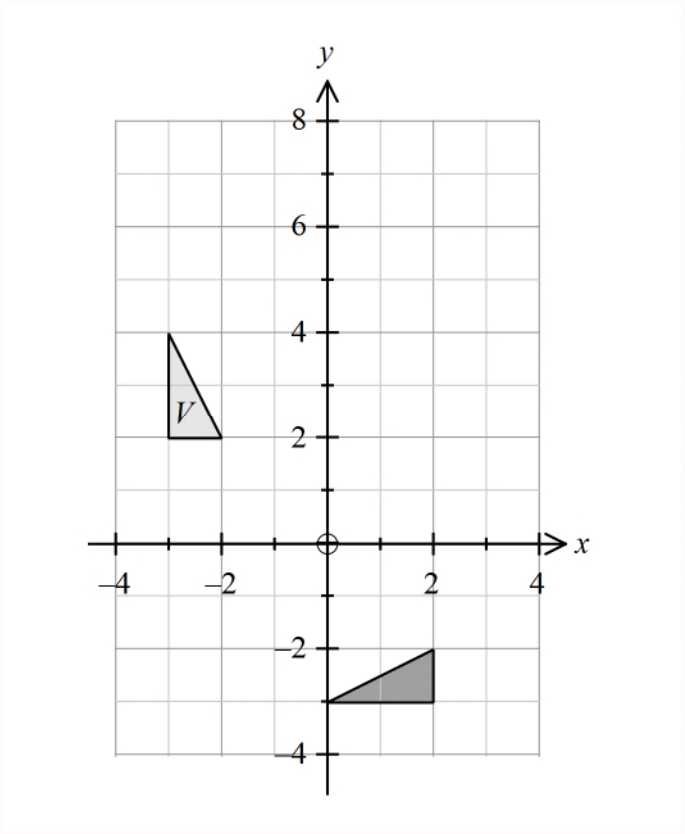
4. Each part $= \frac{400}{5+3} = 50$

No red marbles – No green marbles = 2 parts

$= 2 \times 50 = 100$

5. (a) Translation of $\begin{pmatrix} 4 \\ -1 \end{pmatrix}$

(b)



6. (a) $\text{Mean} = \dfrac{1\times0+8\times1+12\times2+15\times3+4\times4}{40}$

$= \dfrac{93}{40} = 2.325$

(b) Median is $\dfrac{40+1}{2} = 20.5$th value

20 values to left and right of median

Lower quartile will be between 10th and 11th values i.e. 2

Upper quartile will be between 30th and 31st values i.e. 3

Interquartile range is $3-2=1$

(c) $\dfrac{15+4}{40} = \dfrac{19}{40}$

7. (a) $4ab + 7a^2 - a = a(4b + 7a - 1)$

(b) $4 - 8p > 11$

$4 - 11 > 8p$

$8p < -7$

$p < -\frac{7}{8}$

(c) $(x+3)(x-6) = x^2 - 6x + 3x - 18$

$= x^2 - 3x - 18$

(d) $\frac{y^{12}}{y^4} = y^{12-4} = y^8$

(e) $(3e)^2 = 3^2 e^2 = 9e^2$

8. $\frac{BC}{8.4} = \sin 20°$

$BC = 8.4 \sin 20°$

$BC = 2.87$ cm (3 sf)

9. (i) $1, 2, 23, 31, 2 \times 23, 2 \times 31, 23 \times 31, 1426$

i.e. $1, 2, 23, 31, 46, 62, 713, 1426$

(ii) $713 = 23 \times 31$

10. (a) $324\,000\,000$

(b) United Kingdom

(c) $1.38 \times 10^9 + 1.32 \times 10^9 + 6.50 \times 10^7 + 3.24 \times 10^8 = 3.089 \times 10^9$

(d) $n = \frac{1.32 \times 10^9}{1.87 \times 10^7} = 70.58823...$

$n = 71$ (2 sf)

11. (a) $2a^3b^4 \times 4a^2b^5 = 2 \times 4a^{3+2}b^{4+5} = 8a^5b^9$

(b) $\dfrac{1}{\sqrt[4]{c^2}} = \dfrac{1}{c^{\frac{2}{4}}} = \dfrac{1}{c^{\frac{1}{2}}} = c^{-\frac{1}{2}}$

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

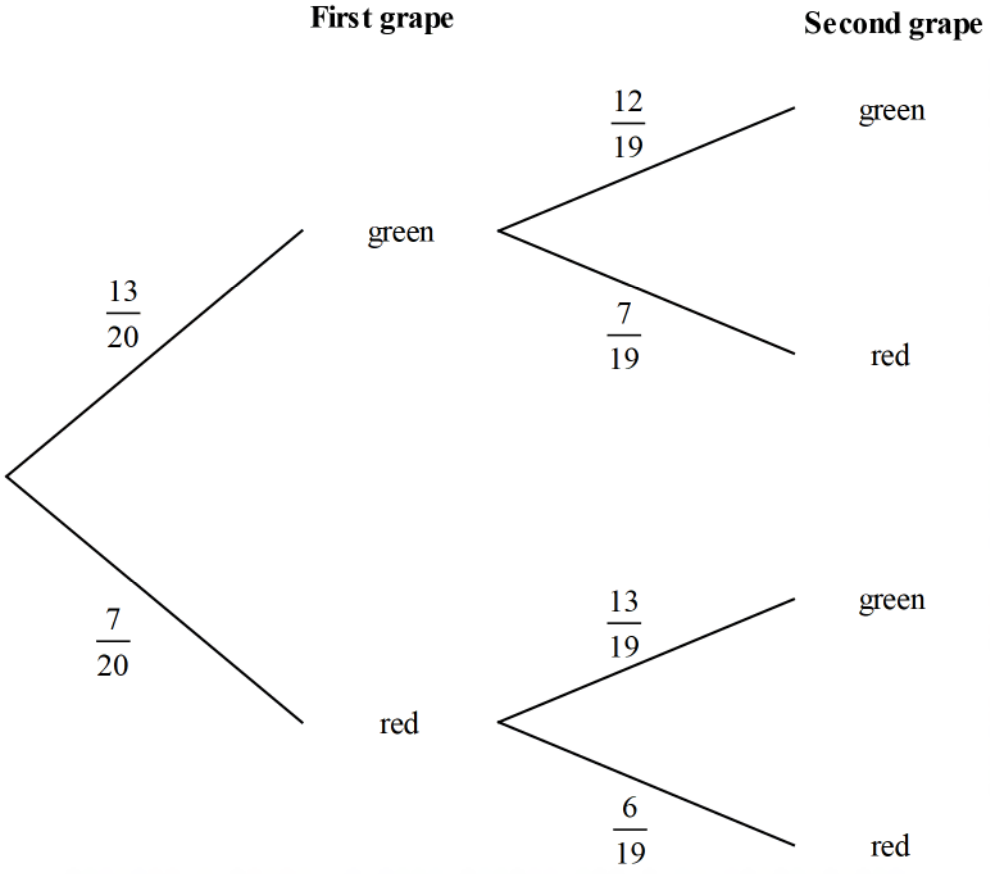
(c) $\dfrac{4(x+2)^2}{6(x+2)} = \dfrac{2}{3}(x+2)$

(d) $3x^2 - 75y^2 = 3(x^2 - 25y^2)$

$= 3(x^2 - (5y)^2)$

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

12. (a)

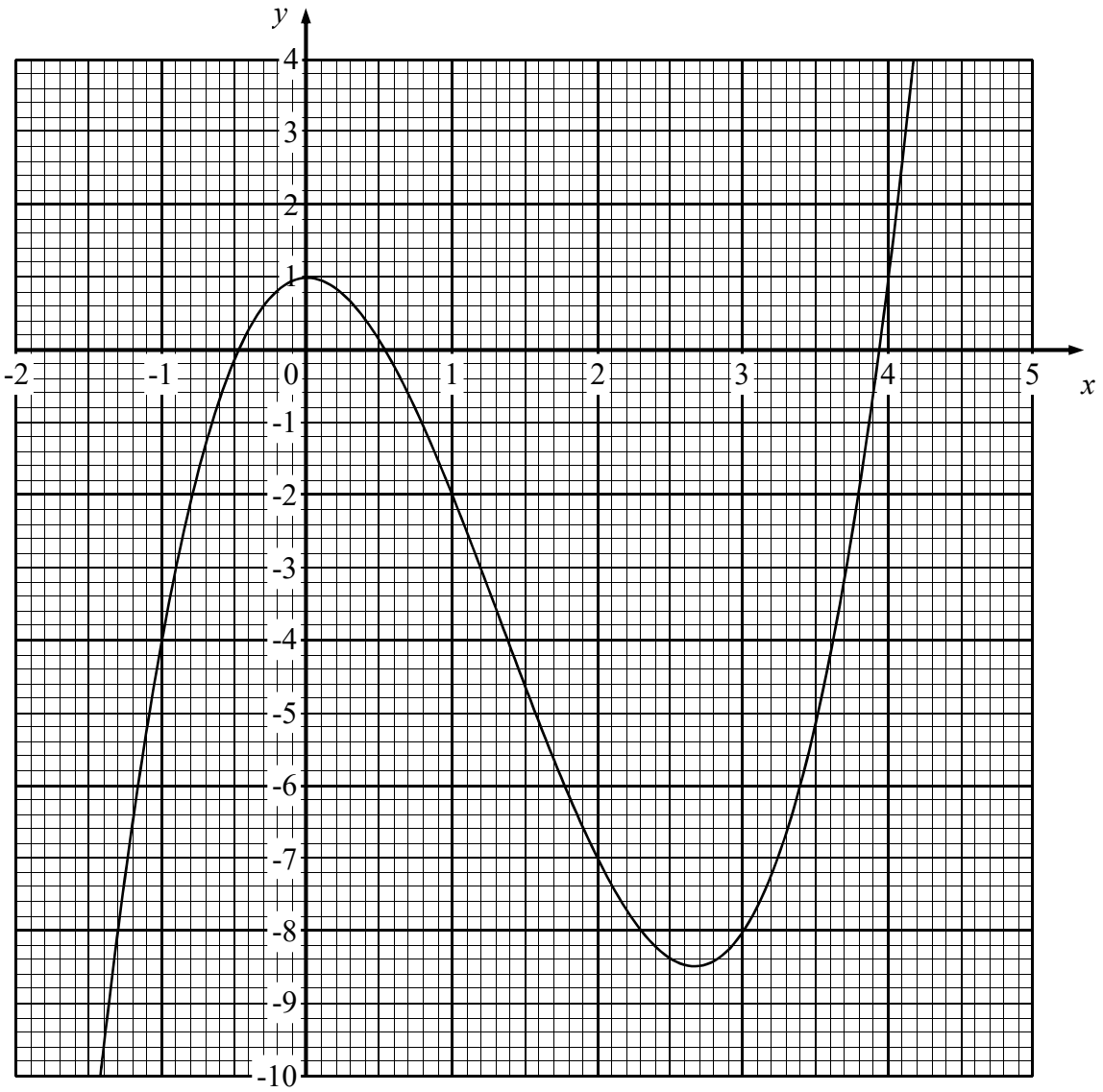


(b) $\dfrac{13}{20} \times \dfrac{12}{19} = \dfrac{39}{95}$

(c) $\text{P(GGR)} + \text{P(GRG)} + \text{P(RGG)} = \dfrac{13}{20} \times \dfrac{12}{19} \times \dfrac{7}{18} + \dfrac{13}{20} \times \dfrac{7}{18} \times \dfrac{12}{19} + \dfrac{7}{18} \times \dfrac{13}{20} \times \dfrac{12}{19}$

$= \dfrac{91}{190}$

13.



(a) Where $y = 2$ meets given line - $x = 4.05$

(b) Need a horizontal line $y = k$ to meet curve exactly twice i.e. $k = 1$ or $k = -8.45$.

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

Need to work on both sides to get $x^3 - 4x^2 + 1$ on the left

$x^3 - 4x^2 + 1 = -x + 3$ (taking x from each side and adding 3)

$y = -x + 3$ is the line needed

14. (a) $P = kQ^2$

$180 = k \times 12^2$

$k = \dfrac{180}{12^2} = 1.25$

$P = 1.25Q^2$

(b) $P = 1.25 \times 30^2 = 1125$

15. (a) $BD = \sqrt{8^2 + 11^2 - 2 \times 8 \times 11 \times \cos 25°}$

$= \sqrt{25.489829...}$

$= 5.048745...$

$= 5.05$ cm (3 sf)

(b) $AC \times AB = AD \times AE$ (intersecting chords theorem)

$\text{AC} \times 8 = 11 \times 6$

$AC = \dfrac{66}{8} = 8.25$ cm

16. (a) $y = 2x^3 - 9x^2 + 31$

$\dfrac{\mathrm{d}y}{\mathrm{d}x} = 6x^2 - 18x$

(b) At M, $\dfrac{\mathrm{d}y}{\mathrm{d}x} = 0$

$6x^2 - 18x = 0$

$6x(x - 3) = 0$

$x = 3$ at M since $x > 0$

$y = 2 \times 3^3 - 9 \times 3^2 + 31 = 54 - 81 + 31 = 4$

Gradient $OM = \dfrac{4 - 0}{3 - 0} = \dfrac{4}{3}$

17. (a) (i) $\overrightarrow{PS} = \overrightarrow{PQ} + \overrightarrow{QR} + \overrightarrow{RS}$

$= 6\mathbf{a} + 4\mathbf{b} + 2\mathbf{c}$

(ii) $\overrightarrow{VW} = \overrightarrow{VQ} + \overrightarrow{QW}$

$= \frac{1}{2}\overrightarrow{PQ} + \frac{1}{2}\overrightarrow{QR}$

$= \frac{1}{2} \times 6\mathbf{a} + \frac{1}{2} \times 4\mathbf{b}$

$= 3\mathbf{a} + 2\mathbf{b}$

(b) $\overrightarrow{UX} = \overrightarrow{UP} + \overrightarrow{PQ} + \overrightarrow{QR} + \overrightarrow{RX}$

$= \frac{3}{4}\overrightarrow{SP} + \overrightarrow{PQ} + \overrightarrow{QR} + \frac{3}{4}\overrightarrow{RS}$

$= -\frac{3}{4}(6\mathbf{a} + 4\mathbf{b} + 2\mathbf{c}) + 6\mathbf{a} + 4\mathbf{b} + \frac{3}{4}(2\mathbf{c})$

$= \frac{3}{2}\mathbf{a} + \mathbf{b}$

$= \frac{1}{2}(3\mathbf{a} + 2\mathbf{b})$

$= \frac{1}{2}\overrightarrow{VW}$

UX and VW are parallel

(c) Magnitude of $\overrightarrow{RS} = \sqrt{6^2 + 5^2} = \sqrt{61}$

18. $2 \times$ Lower Bound of AD = Lower Bound of Perimeter $- 2 \times$ Upper Bound of AB

$= 63.5 - 2 \times 17.5$

$= 28.5$

Lower Bound of $AD = \dfrac{28.5}{2} = 14.25$ cm

19.

$x^2 - 105 + x^2 - 65 + 470 - 30x + 510 - 30x = 360$ (angles in quadrilateral add to 360°)

$2x^2 - 60x + 450 = 0$

$x^2 - 30x + 225 = 0$

$(x - 15)(x - 15) = 0$

$x = 15$

Angles are

$x^2 - 105 = 120$

$x^2 - 65 = 160$

$470 - 30x = 20$

$510 - 30x = 60$

There are two pairs of angles adding to 180°

120 & 60

160 & 20

So quadrilateral is a trapezium