

Edexcel IGCSE Higher Tier Mathematics Paper 4H – January 2018

1. $T = 24c + 37r$

2.
$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{165}{50} = 3.3 \text{ hours}$$

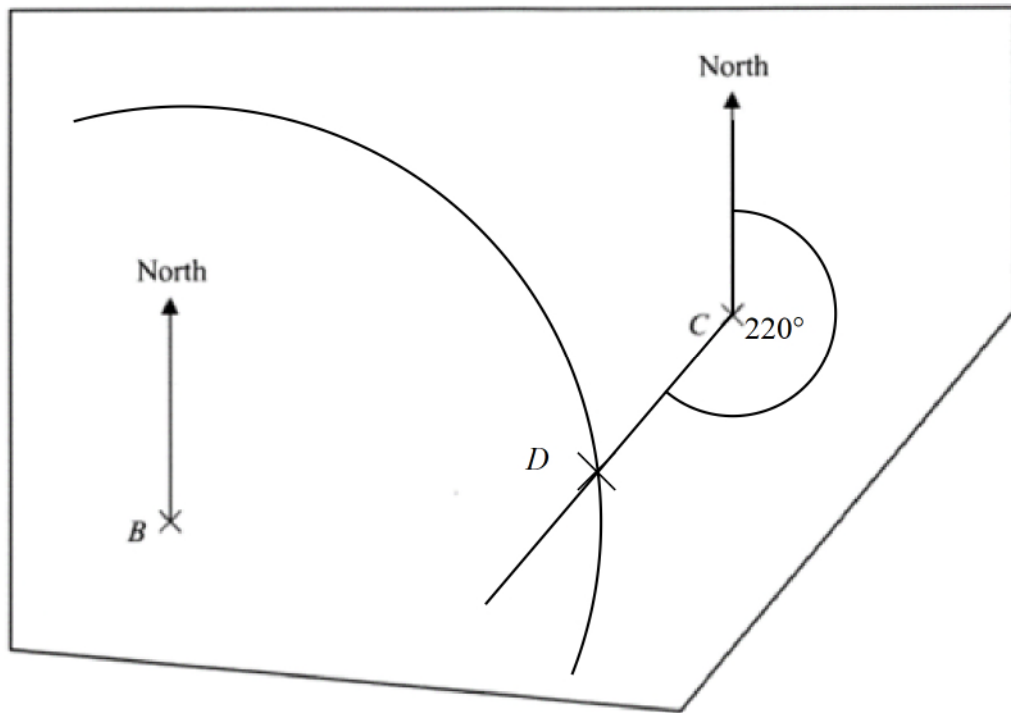
$0.3 \text{ hours} = 0.3 \times 60 = 18 \text{ minutes}$

Time of journey = 3 hours 18 minutes

3. (a) $\frac{2}{7} \div \frac{4}{5} = \frac{2}{7} \times \frac{5}{4} = \frac{5}{14}$

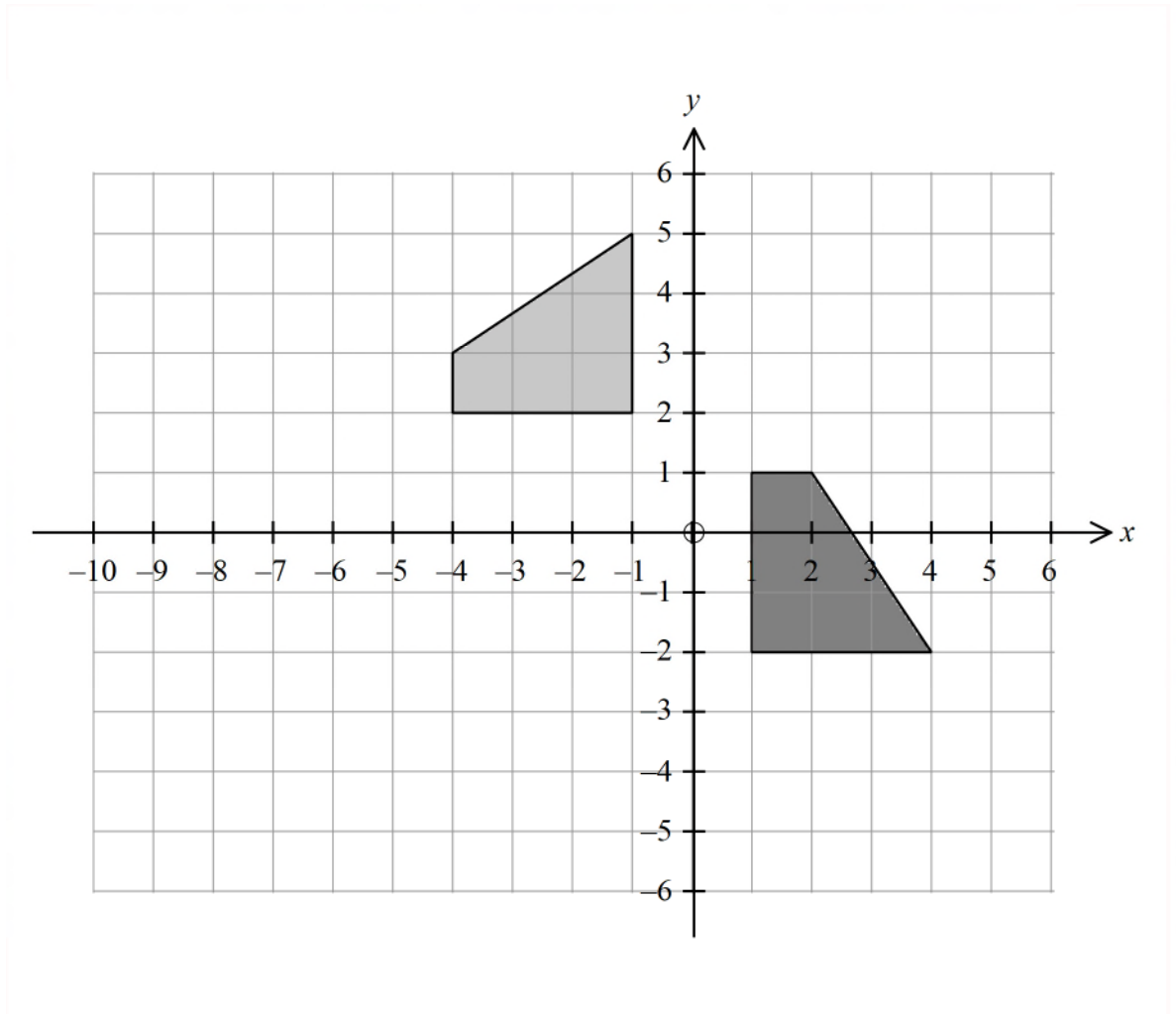
(b) $3\frac{1}{6} - 1\frac{2}{3} = \frac{19}{6} - \frac{5}{3} = \frac{19}{6} - \frac{10}{6} = \frac{9}{6} = \frac{3}{2} = 1\frac{1}{2}$

4.



5. $\text{Circumference} = \pi \times 18 = 56.54866\dots = 56.5 \text{ cm (3 sf)}$

6.



7.

Let the probability of a blue counter = x

$$P(\text{blue}) + P(\text{white}) + P(\text{red}) = 1$$

$$x + 3x + \frac{1}{12} = 1$$

$$4x = 1 - \frac{1}{12} = \frac{11}{12}$$

$$x = \frac{11}{48}$$

$$P(\text{blue}) = \frac{11}{48}$$

8. (a) $(1 - 0.145) \times 62 \text{ million} = 53.01 \text{ million}$

(b) Percentage change = $\frac{\text{Change}}{\text{Original}} \times 100$
 $= \frac{1656 - 1404}{1656} \times 100$
 $= 15.2 \% \text{ (1 dp)}$

(c) Total number of minutes = $3 \times 5 + 16 \times 15 + 6 \times 25 + 4 \times 35 + 1 \times 45$
 $= 590 \text{ minutes}$

9. (a) $A \cup B = \{2, 4, 6, 7, 8, 10, 11, 12\}$

(b) No because 20 although it is an even number is not in the universal set of numbers from 1 to 12.

(c) e.g. $\{1, 3, 7\}$

Must have 7 and two out of 1, 3, 5, 9

It cannot have 11 in as there is only 1 thing in B and C

10. (a) $25m + 30n = 5(5m + 6n)$

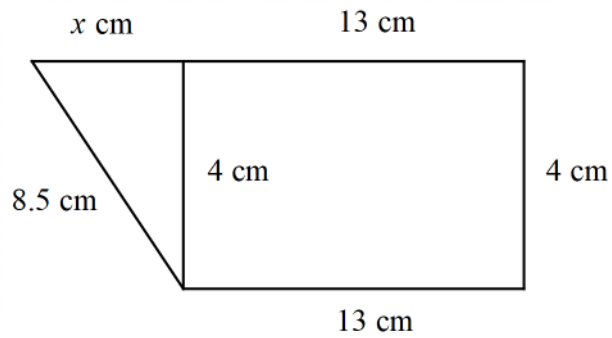
(b) $p(2p - 3) = 2p^2 - 3p$

(c) $\frac{y^5 \times y^8}{y^4} = y^{5+8-4} = y^9$

(d) $(x + 7)(x - 3) = x^2 - 3x + 7x - 21$
 $= x^2 + 4x - 21$

(e) $36p^3m^2 + 27p^5m = 9p^3m(4m + p^2)$

11.



$$x = \sqrt{8.5^2 - 4^2} = \sqrt{56.25} = 7.5$$

$$\begin{aligned} \text{Area} &= \frac{13 + (13 + 7.5)}{2} \times 4 \\ &= 67 \text{ cm}^2 \end{aligned}$$

12. (a) Read up from 150 cm and across to find out how many sunflowers have height less than 150 cm = 33

$$\text{Number that have height more than 150} = 80 - 33 = 47$$

(b) Read across from $\frac{1}{2} \times 80 = 40$ and down so median estimate is 156 cm (watch scale)

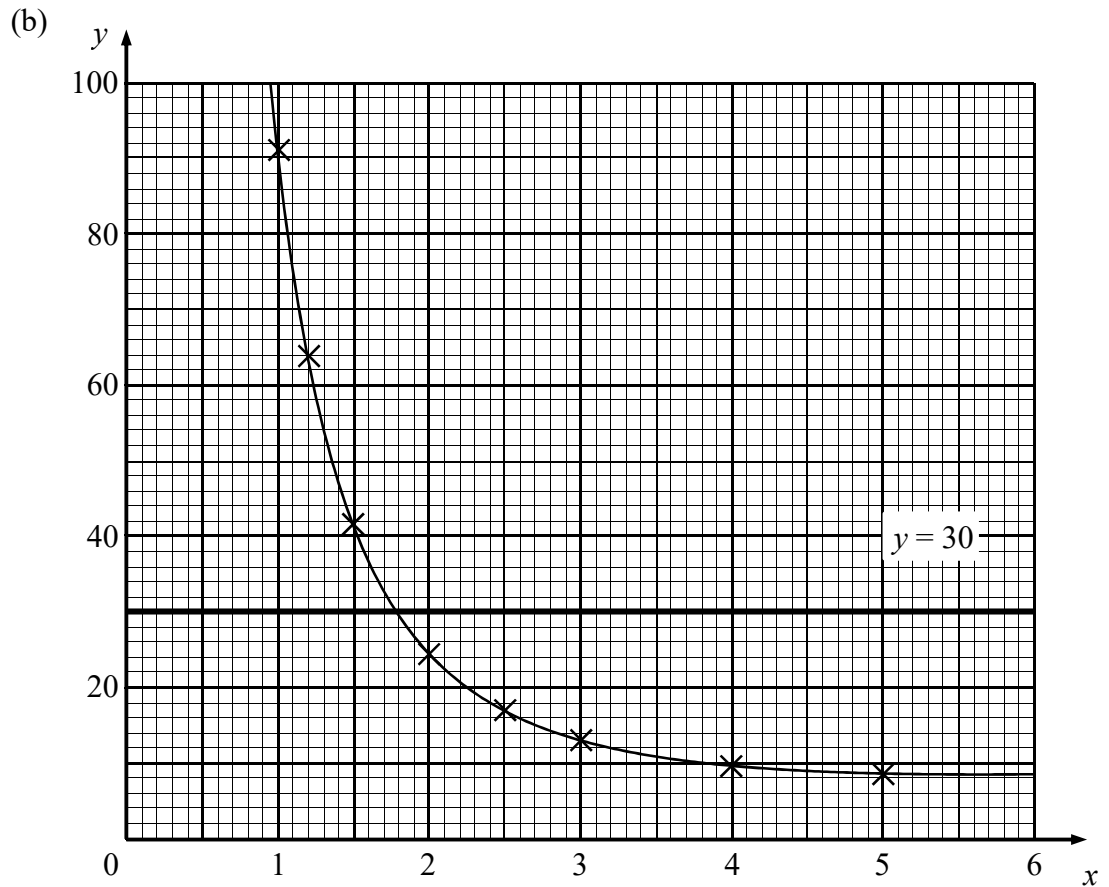
13. (a) $24 = 2^3 \times 3$
 $30 = 2 \times 3 \times 5$

$$\text{LCM}(24, 30) = 2^3 \times 3 \times 5 = 120 \text{ (highest power of each prime)}$$

(b) $\text{HCF}(A, B) = 2 \times 3^2 = 18$ (lowest power of each prime)

14. (a)

x	1	1.2	1.5	2	2.5	3	4	5
y	91	63.7	41.5	24.5	16.9	13	9.625	8.6



$$(c) \frac{1}{2} \left(x + \frac{90}{x^2} \right) = 15$$

$$x + \frac{90}{x^2} = 30$$

Draw $y = 30$

$$x = 1.8$$

15.

$$P = \frac{k}{d^2}$$

$$25.6 = \frac{k}{\left(\frac{1}{8}\right)^2}$$

$$k = 25.6 \times \left(\frac{1}{8}\right)^2$$

$$= 0.4$$

$$P = \frac{0.4}{d^2}$$

16. (a) Area = $\frac{1}{2} \times 10.5 \times 17.6 \times \sin 109^\circ = 87.4 \text{ cm}^2$ (3 sf)

$$\begin{aligned} \text{(b) } KL &= \sqrt{10.5^2 + 17.6^2 - 2 \times 10.5 \times 17.6 \times \cos 109^\circ} \\ &= \sqrt{540.3399\dots} \\ &= 23.2 \text{ cm (3 sf)} \end{aligned}$$

17. (a) $y = 2x^3 - 9x^2 + 7$

$$\frac{dy}{dx} = 6x^2 - 18x$$

(b)

$$\frac{dy}{dx} = -\frac{27}{2}$$

$$6x^2 - 18x = -\frac{27}{2}$$

$$12x^2 - 36x = -27$$

$$12x^2 - 36x + 27 = 0$$

$$4x^2 - 12x + 9 = 0$$

$$(2x - 3)^2 = 0$$

$$2x - 3 = 0$$

$$x = 1.5$$

$$y = 2 \times 1.5^3 - 9 \times 1.5^2 + 7 = -6.5$$

P is (1.5, -6.5)

18. (a) $\overline{CA} = -\overline{AC}$
 $\overline{DA} = \overline{DC} + \overline{CA}$
 $= \begin{pmatrix} 5 \\ 6 \end{pmatrix} + \begin{pmatrix} -3 \\ 8 \end{pmatrix}$
 $= \begin{pmatrix} 2 \\ 14 \end{pmatrix}$

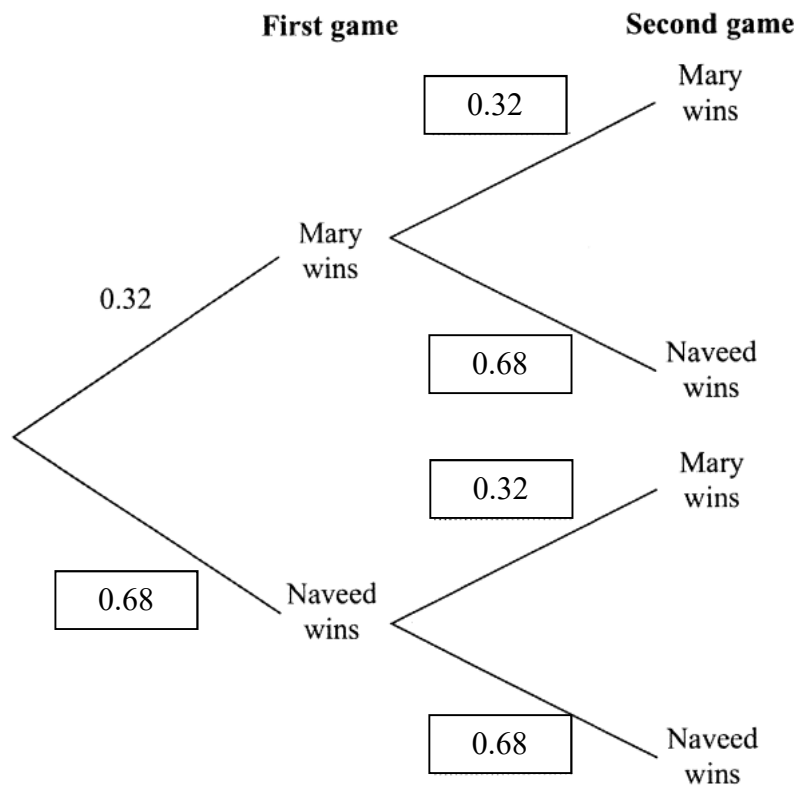
(b) $\overline{DE} = 2\overline{AC} = 2 \begin{pmatrix} 3 \\ -8 \end{pmatrix} = \begin{pmatrix} 6 \\ -16 \end{pmatrix}$

D is (2,5)

Moving $\begin{pmatrix} 6 \\ -16 \end{pmatrix}$ from there gives E is (2+6, 5-16)

E is (8,-11)

19. (a)



(b) $P(\text{Mary}, \text{Naveed}) + P(\text{Naveed}, \text{Mary}) = 0.32 \times 0.68 + 0.68 \times 0.32 = 0.4352$

(c) Situation is clearly without replacement

$$P(\text{water}, \text{water}) + P(\text{orange}, \text{orange}) + P(\text{cola}, \text{cola}) = \frac{3}{10} \times \frac{2}{9} + \frac{5}{10} \times \frac{4}{9} + \frac{2}{10} \times \frac{1}{9} = \frac{14}{45}$$

20. (a)

$$\begin{aligned}\left(\frac{125e^{12}}{27f^3}\right)^{-\frac{2}{3}} &= \left(\frac{27f^3}{125e^{12}}\right)^{\frac{2}{3}} \\ &= \frac{27^{\frac{2}{3}} f^{3 \times \frac{2}{3}}}{125^{\frac{2}{3}} e^{12 \times \frac{2}{3}}} \\ &= \frac{(\sqrt[3]{27})^2 f^2}{(\sqrt[3]{125})^2 e^8} \\ &= \frac{3^2 f^2}{5^2 e^8} \\ &= \frac{9f^2}{25e^8}\end{aligned}$$

(b)

$$2^{\frac{1}{2}} \times 2^{\frac{n}{3}} = \frac{8^x}{4^n}$$

$$2^{\frac{1}{2} + \frac{n}{3}} = \frac{(2^3)^x}{(2^2)^n}$$

$$2^{\frac{1}{2} + \frac{n}{3}} = \frac{2^{3x}}{2^{2n}}$$

$$2^{\frac{1}{2} + \frac{n}{3}} = 2^{3x - 2n}$$

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

$$3x = \frac{1}{2} + \frac{n}{3} + 2n$$

$$3x = \frac{1}{2} + \frac{7n}{3}$$

$$x = \frac{1}{6} + \frac{7n}{9}$$

21.

$$\text{Diameter}_{\min} = 6.75 \text{ cm}$$

$$\text{Radius}_{\min} = 3.375 \text{ cm}$$

$$\begin{aligned}\text{Total surface area} &= \pi r_{\min}^2 + \pi r_{\min} l_{\min} \\ &= \pi \times 3.375^2 + \pi \times 3.375 \times 9.15 \\ &= \frac{13527}{320} \pi \\ k &= 42.2718... \\ k &= 42.3 \text{ (3 sf)}\end{aligned}$$

22.

$$y = 3 - 2x$$

$$x^2 + (3 - 2x)^2 = 18 \quad \text{substituting for } y$$

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

$$x^2 + 9 - 6x - 6x + 4x^2 = 18$$

$$5x^2 - 12x - 9 = 0$$

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

$$5x + 3 = 0 \quad \text{or} \quad x - 3 = 0$$

$$x = -\frac{3}{5} \quad \text{or} \quad x = 3$$

$$\text{When } x = -\frac{3}{5} = -0.6, y = 3 - 2 \times (-0.6) = 4.2$$

$$\text{When } x = 3, y = 3 - 2 \times 3 = -3$$