Edexcel IGCSE Higher Tier Mathematics Paper 3H – January 2014

1. (a) $\frac{900}{6}\times 13 = 1950$ ml

   (b) $\frac{1250}{\left(\frac{750}{6}\right)} = 10$ people

2. $852\times 10.75 = 9159$ km

3. $\frac{x}{7.8} = \sin 43°$

   $x = 7.8\sin 43° = 5.32$ (3 sf)

4. (a) $2^3\times 2^4 = 2^{3+4} = 2^7$

   (b) $2^n = \frac{280}{5\times 7} = 8$

   $n = 3$

5. (a) $5c\times 4c = 20c^2$

   (b) $4x + x^2 = x(4+x)$

   (c) $y^3 + 5y = 2^3 + 5\times 2 = 8 + 10 = 18$

6. $\angle TOP = 58°$ (alternate angles)

   $\angle OTP = 90°$ (angle between tangent and radius

   $\angle OPT = 180 - 90 - 58 = 32°$ (angles in a triangle add to 180°)

7. (a) $-1 < x \le 4$

   (b) (i) $y - 3 \ge \frac{1}{2}$

   $y \ge 3\frac{1}{2}$

   (ii) $y = 4$

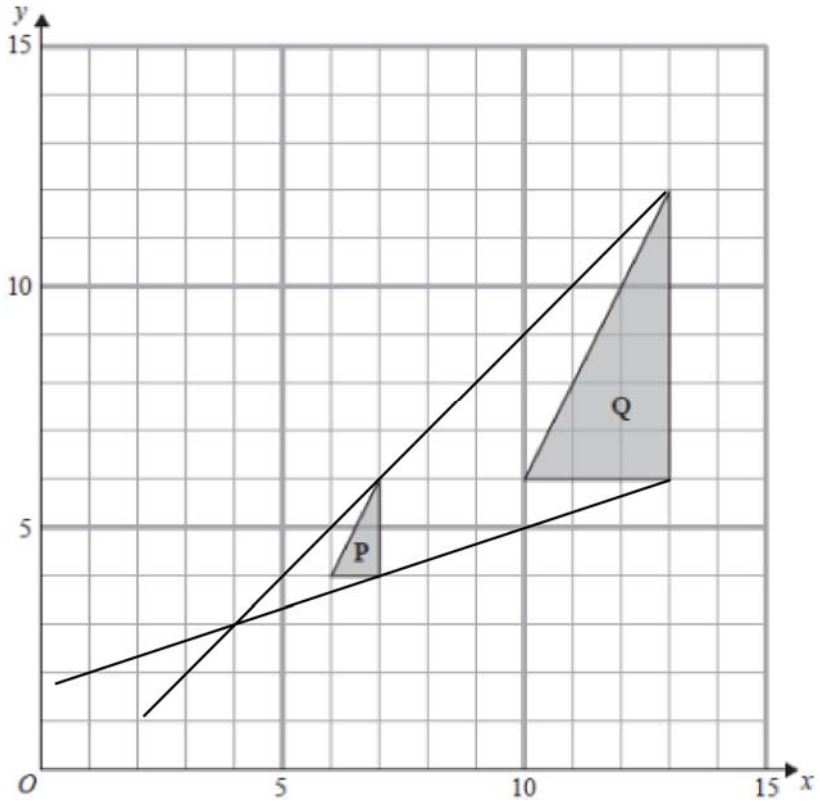
8. (a) $\frac{32+14+6}{80}\times 100 = 65\%$

   (b) $2\times 2.85 + 4\times 2.95 + 22\times 3.05 + 32\times 3.15 + 14\times 3.25 + 6\times 3.35 = 251$ g

   (c) $80 - 69 = 11$

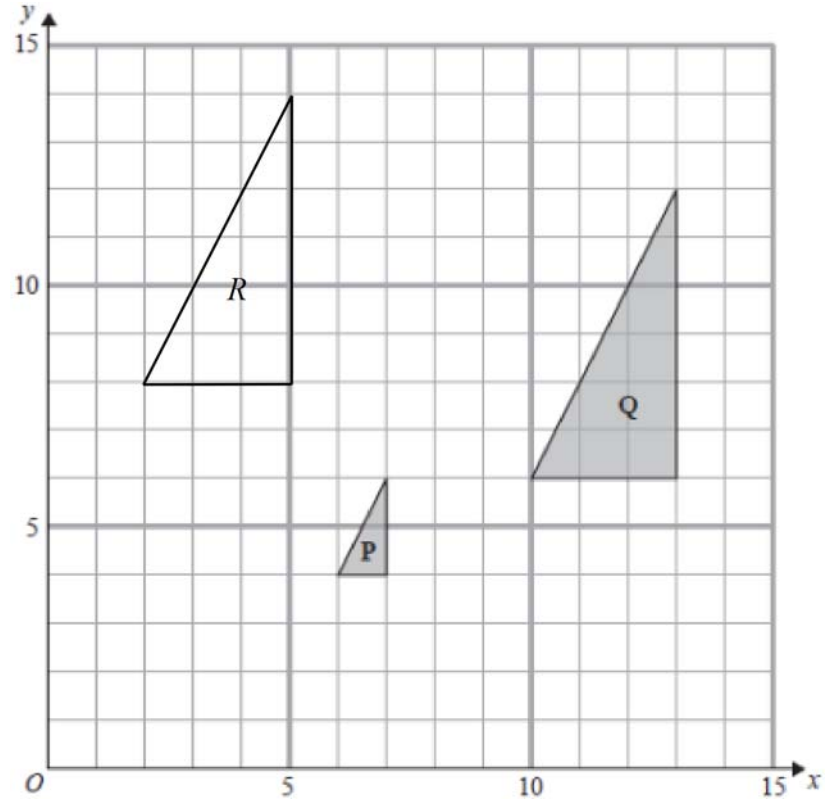
   (d) $3.2 - 3.07 = 0.13$ g

9. (a)

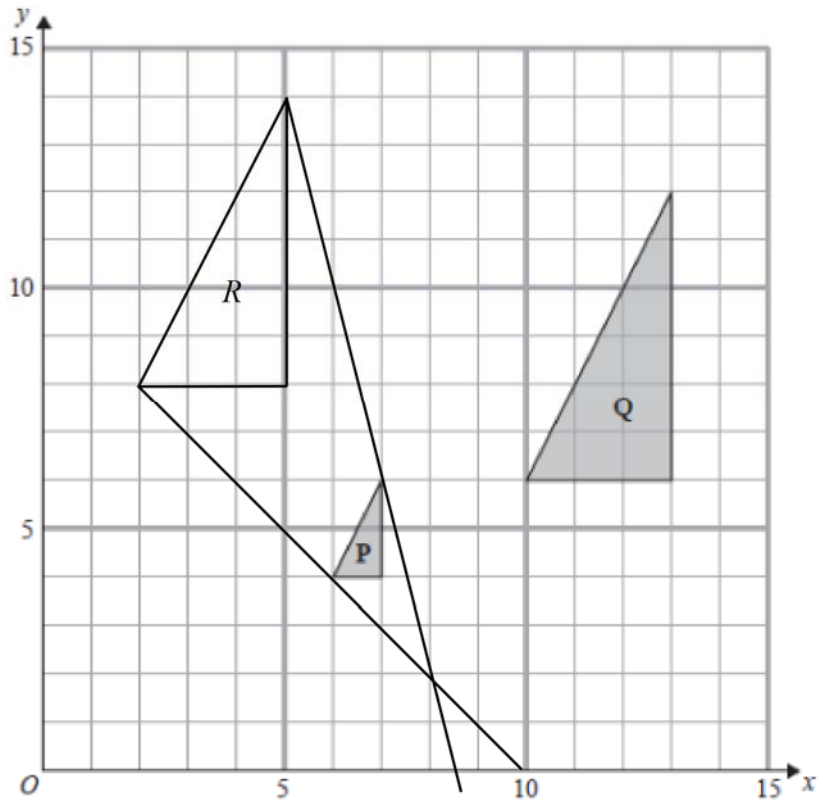


Enlargement scale factor 3, centre (4,3)

(b)



(c)



Enlargement scale factor $\frac{1}{3}$, centre (8,2)

10. $16000 \times 0.85^3 = \$9826$

11.

$$\frac{6x-1}{4} - \frac{5-2x}{2} = 1$$
$$\frac{6x-1-2(5-2x)}{4} = 1$$
$$\frac{6x-1-10+4x}{4} = 1$$
$$\frac{10x-11}{4} = 1$$
$$10x-11 = 4$$
$$10x = 15$$
$$x = 1.5$$

12. $CB = \sqrt{9.5^2 - 7.6^2} = \sqrt{32.49} = 5.7$

$$\text{Area} = \frac{7.6 \times 5.7}{2} + \frac{1}{2}\pi\left(\frac{5.7}{2}\right)^2 = 34.4 \text{ cm}^2 \text{ (3 sf)}$$

13. (a) (i) $\frac{5+2}{20}=\frac{7}{20}$

(ii) $\frac{1+8}{20}=\frac{9}{20}$

(b) (i) $\frac{2}{20}\times\frac{2}{20}=\frac{1}{100}$

(ii) $\underbrace{\frac{8}{20}\times\frac{5}{20}}_{\text{30 then 50}}+\underbrace{\frac{4}{20}\times\frac{4}{20}}_{\text{40 then 40}}+\underbrace{\frac{5}{20}\times\frac{8}{20}}_{\text{50 then 30}}=\frac{96}{400}=\frac{6}{25}$

14. (a) $D=kt^2$

$8=k\times4^2$

$k=\frac{8}{16}=0.5$

$D=0.5t^2$

(b) $50=0.5t^2$

$t^2=\frac{50}{0.5}=100$

$t=10$

15. $\text{Area}=2\times\frac{1}{2}\times6.7\times8.9\times\sin74°=57.3\text{ cm}^2$ (3 sf)

16.

$y=\sqrt{ay^2+n}$

$y^2=ay^2+n$

$y^2-ay^2=n$

$y^2(1-a)=n$

$y^2=\frac{n}{1-a}$

$y=\sqrt{\frac{n}{1-a}}$

17.

$$(5-\sqrt{x})^2 = y - 20\sqrt{2}$$
$$25 - 10\sqrt{x} + x = y - 20\sqrt{2}$$
$$25 + x - y = 20\sqrt{2} - 10\sqrt{x}$$

Since x and y are integers so is $25 + x - y$

$\therefore 20\sqrt{2} - 10\sqrt{x}$ is an integer

Only true if $20\sqrt{2} - 10\sqrt{x} = 0$

$$20\sqrt{2} = 10\sqrt{x}$$
$$20^2 \times 2 = 10^2 \times x$$
$$x = \frac{2 \times 400}{100} = 8$$
$$25 + 8 - y = 0$$
$$y = 33$$

18. (a) $\sqrt{9 \times 10^{2m}} = \sqrt{9} \times \sqrt{10^{2m}} = 3 \times 10^m$

(b) $\left(\sqrt{9 \times 10^{2n}}\right)^3 = \left(\sqrt{9} \times \sqrt{10^{2n}}\right)^3$

$$= \left(3 \times 10^n\right)^3$$
$$= 3^3 \times (10^n)^3$$
$$= 27 \times 10^{3n}$$
$$= 2.7 \times 10^{3n+1}$$

19.

$$(12x - y)^2 - (4x - 3y)^2 = [12x - y - (4x - 3y)][12x - y + 4x - 3y]$$
$$= (12x - y - 4x + 3y)(16x - 4y)$$
$$= (8x + 2y)(16x - 4y)$$
$$= 2(4x + y)4(4x - y)$$
$$= 8(4x + y)(4x - y)$$

or

$$(12x - y)^2 - (4x - 3y)^2 = 144x^2 - 24xy + y^2 - (16x^2 - 24xy + 9y^2)$$
$$= 128x^2 - 8y^2$$
$$= 8(16x^2 - y^2)$$
$$= 8((4x)^2 - y^2)$$
$$= 8(4x + y)(4x - y)$$

20. (a) $f(3) = 2 \times 3 + 5 = 11$

(b) $2x+5=y$

$$2x=y-5$$

$$x=\frac{y-5}{2}$$

$$\mathrm{f}^{-1}(x)=\frac{x-5}{2}$$

(c) $\mathrm{g}(-3)=(-3)^2-25=9-25=-16$

(d) (i) $\mathrm{gf}(x)=(2x+5)^2-25$

$$=4x^2+20x+25-25$$

$$=4x^2+20x$$

(ii) $4x^2+20x=0$

$$4x(x+5)=0$$

$$x=0 \text{ or } x+5=0$$

$$x=0 \text{ or } x=-5$$

21. (a) (i) $\overrightarrow{DB}=-3\mathbf{b}+12\mathbf{a}$

(ii) $\overrightarrow{DE}=\frac{1}{3}\left(-3\mathbf{b}+12\mathbf{a}\right)=-\mathbf{b}+4\mathbf{a}$

(iii) $\overrightarrow{AE}=\overrightarrow{AD}+\overrightarrow{DE}=3\mathbf{b}-\mathbf{b}+4\mathbf{a}=2\mathbf{b}+4\mathbf{a}$

(b) $\overrightarrow{BC}=\overrightarrow{BD}+\overrightarrow{DC}=-12\mathbf{a}+3\mathbf{b}+18\mathbf{a}=6\mathbf{a}+3\mathbf{b}=1.5\overrightarrow{AE}$

So BC is parallel to AE