

National 5

Exam Solutions

2014 SQA Exam

Paper 1

1. $\frac{5}{12} \times \frac{20}{9}$

$$\frac{5}{3} \times \frac{5}{9}$$

$$\frac{25}{27}$$

2. $6x^2 + 2x$
 $-15x - 5$

$$6x^2 - 13x - 5$$

3. $(x-7)^2 + b$

$$x^2 - 14x + 49 + b$$

$$49 + b = 44 \Rightarrow b = -5$$

$$(x-7)^2 - 5$$

4. $2\mathbf{u} + \mathbf{v}$

$$\begin{pmatrix} -4 \\ 6 \\ 10 \end{pmatrix} + \begin{pmatrix} 0 \\ 4 \\ 7 \end{pmatrix}$$

$$\begin{pmatrix} -4 \\ 10 \\ 17 \end{pmatrix}$$

5.
$$\frac{x}{\sin K} = \frac{18}{\sin L}$$

$$\frac{x}{0.4} = \frac{18}{0.9}$$

$$x = \frac{18 \times 0.4}{0.9}$$

$$x = \frac{18 \times 4}{9}$$

$$x = 8$$

6. a) (5, 20) & (25, 500)

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{500 - 200}{25 - 5} \\ &= \frac{300}{20} = 15 \end{aligned}$$

$$y - b = m(x - a) \quad (a, b) = (5, 200)$$

$$y - 200 = 15(x - 5)$$

$$y - 200 = 15x - 75$$

$$y = 15x + 125$$

$$C = 15F + 125$$

b) $C = 15F + 125$

$$C = 15 \times 40 + 125$$

$$C = 725 \text{ calories}$$

7. $y = ax^2$

$$45 = a \times (-3)^2$$

$$45 = 9a$$

$$a = 5$$

8. $\sqrt{4}\sqrt{10} + 4\sqrt{10} + \sqrt{9}\sqrt{10}$

$$2\sqrt{10} + 4\sqrt{10} + 3\sqrt{10}$$

$$9\sqrt{10}$$

9. $80\% = 480\,000 \quad (\div 8)$

$$10\% = 60\,000 \quad (\times 10)$$

$$100\% = 600\,000 \text{ tickets}$$

10. $y = a \sin(x + b)$

$$\text{max} = 3 \ \& \ \text{min} = -3$$

$$\Rightarrow a = 3$$

Usually $\sin x$ graph first crosses x axis at 0, here it starts at 40

$$\text{when } x = 40, \quad (x + b) = 0$$

$$\Rightarrow b = -40$$

11 a) $3y = 12 - 4x$

$$y = 4 - \frac{4}{3}x$$

$$\Rightarrow m = \frac{4}{3}$$

b) x axis, $y = 0$

$$4x + 3y = 12$$

$$4x = 12 \quad (\text{when } y = 0)$$

$$x = 3$$

$$(3, 0)$$

12.

$$27 - 15 = 12$$

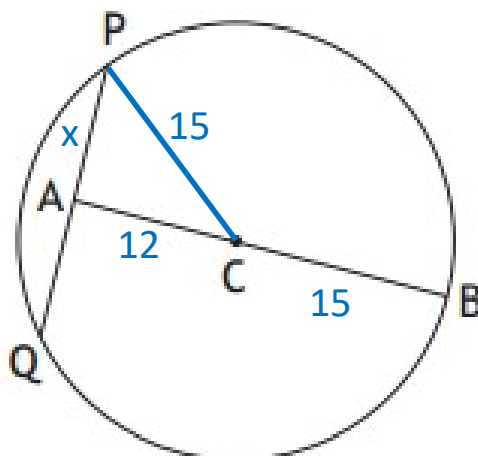
$$x^2 = 15^2 - 12^2$$

$$x^2 = 225 - 144$$

$$x^2 = 81$$

$$x = 9 \text{ cm}$$

$$PQ = 18 \text{ cm}$$



13. a)

$$16t - t^2 = 60$$

$$0 = t^2 - 16t + 60$$

$$t^2 - 16t + 60 = 0$$

$$(t - 6)(t - 10) = 0$$

$$t = 6 \text{ or } t = 10$$

After 6s the height will first be 60m

b)

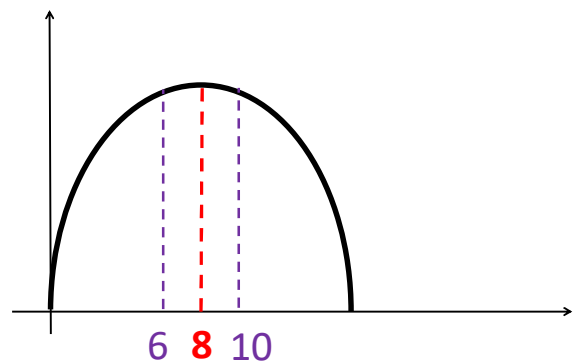
Max TP is in between $t = 6$ & $t = 10$

$$\Rightarrow t = 8$$

$$h(8) = 16 \times 8 - 8^2$$

$$= 128 - 64$$

$$= 64\text{m}$$



Maximum height is 64m so it will not reach a height of 70m

Paper 2

1. 964×0.85^3

$$592.0165$$

590 pupils

2. Point A shares identical x & y components as B
Cube is 4 units

B (8, 4, 10)

C (4, 0, 10)

3. a) $5a + 3c = 158.25$ ① $\times 2$

b) $3a + 2c = 98$ ② $\times 3$

c) $10a + 6c = 316.5$ ③
 $9a + 6c = 294$ ④

$$a = 22.5$$

Sub into ②

$$3a + 2c = 98$$

$$67.5 + 2c = 98$$

$$2c = 30.5$$

$$c = 15.25$$

$$\text{Adult} = \pounds 22.50$$

$$\text{Child} = \pounds 15.25$$

4. a) $\bar{x} = \frac{53+57+58+60+55+56}{6} = \frac{339}{6} = 56.5$

x	\bar{x}	$x - \bar{x}$	$(x - \bar{x})^2$
53	56.5	-3.5	12.25
57	56.5	0.5	0.25
58	56.5	1.5	2.25
60	56.5	3.5	12.25
55	56.5	-1.5	2.25
56	56.5	-0.5	0.25
			29.5

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

$$= \sqrt{\frac{29.5}{5}}$$

$$= \sqrt{5.9}$$

$$= 2.242899$$

b) Standard deviation afterwards is higher

=> Her times were less consistent after
This mean she has not improved her consistency

5. Scale factor = $\frac{24}{15} = 1.6$

Volume SF = $1.6^3 = 4.096$

$V_2 = 750 \times 4.096$

= 3072cm^3

6. set $a = 85$, $b = 75$ and $c = 110$

$a^2 + b^2 = 85^2 + 75^2$

= 12850

$c^2 = 110^2$

= 12100

$a^2 + b^2 \neq c^2$

So by the converse of pythagoras this is not a right angled triangle at L

HLM $\neq 90^\circ$

=> H is not directly North of L

$$\begin{aligned} 7. \quad V_{\text{cone}} &= \frac{1}{3}\pi r^2 h \\ &= \frac{1}{3}\pi \times 4^2 \times 15 \\ &= 251.3274123 \end{aligned}$$

$$\begin{aligned} V_{\text{hemisphere}} &= \frac{1}{2} \text{of } \frac{4}{3}\pi r^3 \\ &= \frac{1}{6}\pi \times 3.7^3 \\ &= 106.0873951 \end{aligned}$$

$$\begin{aligned} V_{\text{glass}} &= V_{\text{cone}} - V_{\text{hemisphere}} \\ &= 145.2400172 \\ &= 150\text{cm}^3 \end{aligned}$$

$$\begin{aligned} 8. \quad &\frac{10n^6}{2n^2} \\ &5n^4 \end{aligned}$$

$$9. \quad \frac{7x}{x(x+5)} - \frac{3(x+5)}{x(x+5)}$$

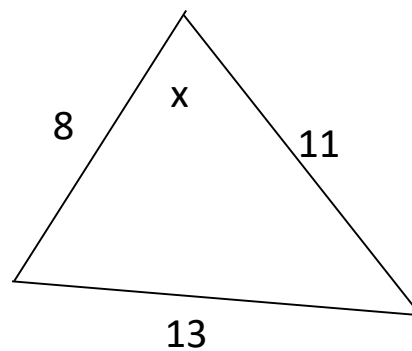
$$\frac{7x - 3(x+5)}{x(x+5)}$$

$$\frac{7x - 3x - 15}{x(x+5)}$$

$$\frac{4x - 15}{x(x+5)}$$

$$10. \text{ a) } \cos x^\circ = \frac{b^2 + c^2 - a^2}{2bc}$$

(letters as given in formula not triangle)



$$\cos x^\circ = \frac{8^2 + 11^2 - 13^2}{2 \times 8 \times 11}$$

$$\cos x^\circ = \frac{16}{176} = 0.0909$$

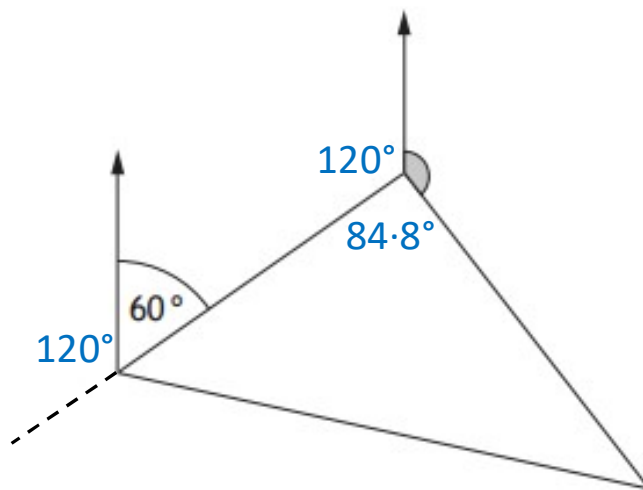
$$x^\circ = 84.78409143^\circ$$

$$\text{use } x^\circ = 84.8^\circ$$

b) $180 - 60 = 120$

$$360 - 120 - 84.8$$

$$= 155.2^\circ$$



11. $s - ut = \frac{1}{2}at^2$

$$\frac{1}{2}at^2 = s - ut$$

$$at^2 = 2(s - ut)$$

$$a = \frac{2(s - ut)}{t^2}$$

12. $11 \cos x = 5$

$$\cos x = \frac{5}{11} = 0.4545454$$

In Q1:

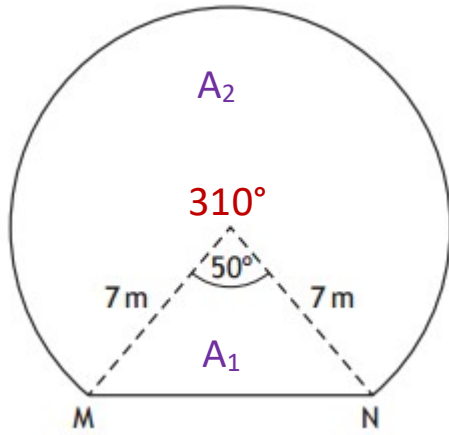
$$\begin{aligned} x &= \cos^{-1}() \\ &= 62.964430821 \\ &\text{use } 63^\circ \end{aligned}$$

$\cos x^\circ$ is positive in Q1 & Q4

In Q4

$$\begin{aligned} x &= 360 - 63 \\ &= 297^\circ \end{aligned}$$

13.



$$A_1 = \frac{1}{2}ab \sin C$$

$$= \frac{1}{2}7 \times 7 \times \sin 50$$

$$= 18.76808886$$

$$A_2 = \frac{310}{360}\pi r^2$$

$$= \frac{310}{360}\pi \times 7^2$$

$$= 132.5577567$$

$$\text{Total} = 151.3256455$$
$$151.33\text{m}^2$$