2016 Paper 1 Solutions

(1) $\frac{1}{2}p + q = \frac{1}{2}\begin{pmatrix}4\\-6\end{pmatrix} + \begin{pmatrix}-5\\-1\end{pmatrix} = \begin{pmatrix}2\\-3\end{pmatrix} + \begin{pmatrix}-5\\-1\end{pmatrix} = \underline{\underline{\begin{pmatrix}-3\\-4\end{pmatrix}}}$

(2) $\frac{3}{4}\left(\frac{1}{3} + \frac{2}{7}\right)$ $\qquad \frac{1}{3} + \frac{2}{7} = \frac{7}{21} + \frac{6}{21} = \frac{13}{21}$

$= \frac{3}{4}\left(\frac{13}{21}\right)$ or $\frac{\cancel{3}^{1}}{4}\left(\frac{13}{\cancel{21}_{7}}\right)$

$= \frac{39}{84}$ $\qquad = \frac{13}{28}$

$= \underline{\underline{\frac{13}{28}}}$

(3) area of sector $= \frac{45}{360} \times \pi \times 20^2$ $\qquad A_o = \pi r^2$

$= \frac{1}{8} \times 3.14 \times 400$

$= 3.14 \times 50$

$= \underline{\underline{157\text{cm}^2}}$

$$\begin{array}{r} 3.14 \\ \times 50 \\ \hline 157.00 \end{array}$$

(4) a) $2c + 3d = 9.6$ — (1) $\times 3$

b) $3c + 4d = 13.3$ — (2) $\times -2$

$$\begin{array}{r} 9.6 \\ \times 3 \\ \hline 28.8 \end{array}$$

$6c + 9d = 28.8$ — (3)

$-6c - 8d = -26.6$ — (4)

Add $\quad d = 2.2$

Put $d = 2.2$ into (1)

$2c + 3(2.2) = 9.6$

$2c + 6.6 = 9.6$

$2c = 3$

$c = 1.5$

cloak $= 1.5\text{m}^2$

dress $= \underline{\underline{2.2\text{m}^2}}$

5 a) $D(3, 100)$ $E(15, 340)$

$$m_{DE} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{340 - 100}{15 - 3} = \frac{240}{12} = 20$$

Using $y = mx + c$

$\overset{x}{(3}, \overset{y}{100)}$ $100 = 20(3) + c$

$100 = 60 + c$

$c = 40$

So $y = 20x + 40$

$\underline{\underline{W = 20A + 40}}$

Using $y - b = m(x - a)$ $(\overset{a}{3}, \overset{b}{100})$

$y - 100 = 20(x - 3)$

$y - 100 = 20x - 60$

$+100$ $+100$

$y = 20x + 40$

$\underline{\underline{W = 20A + 40}}$

b) one year old calf is 12 months old

$W = 20A + 40$

$W = 20(12) + 40$

$W = 240 + 40$

$W = \underline{\underline{280 \text{ kg}}}$

6 $f(x) = 7x^2 + 5x - 1$

$a = 7$ $b = 5$ $c = -1$

$b^2 - 4ac$

$= 5^2 - 4(7)(-1)$

$= 25 + 28$

$= 53$

$b^2 - 4ac = 53$

$53 > 0$ so there are 2 real and distinct roots.

7 a) $B(8,4,0)$

b) $\vec{AV} = v - a$

$$= \begin{pmatrix}5\\2\\6\end{pmatrix} - \begin{pmatrix}2\\0\\0\end{pmatrix} = \begin{pmatrix}3\\2\\6\end{pmatrix}$$

$$|\vec{AV}| = \sqrt{3^2+2^2+6^2}$$

$$= \sqrt{9+4+36}$$

$$= \sqrt{49}$$

$$= \underline{\underline{7}} \text{ units}$$

8

$$\overset{\times 6}{\frac{2x}{3}} - \overset{\times 6}{\frac{5}{6}} = \overset{\times 6}{2x}$$

$$4x - 5 = 12x$$

$$-4x \qquad -4x$$

$$-5 = 8x$$

$$8x = -5$$

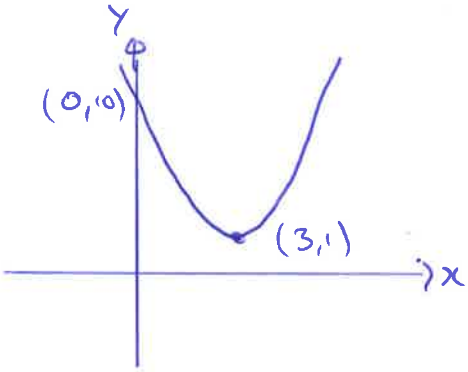
$$\underline{\underline{x = \frac{-5}{8}}}$$

9

$$f(x) = \frac{2}{\sqrt{x}}$$

$$f(5) = \frac{2}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \underline{\underline{\frac{2\sqrt{5}}{5}}}$$

10



11

$$\tan^2 x^\circ \cos^2 x^\circ$$

$$= \frac{\sin^2 x^\circ \cos^2 x^\circ}{\cos^2 x^\circ} \qquad \left(\tan x = \frac{\sin x}{\cos x}\right)$$

$$= \underline{\underline{\sin^2 x^\circ}}$$

12 a) $A_{\square} = lb = (2x+1)(x+8)$

b) $A_{\Delta} = \frac{1}{2}bh = \frac{1}{2}[2(x+5)](3x) = 3x(x+5) = 3x^2 + 15x$

$$A_{\Delta} = A_{\square} \Rightarrow 3x^2 + 15x = (2x+1)(x+8)$$

$$3x^2 + 15x = 2x^2 + 17x + 8$$

$$\underline{\underline{x^2 - 2x - 8 = 0}} \text{ as required}$$

c) $x^2 - 2x - 8 = 0$

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

$x - 4 = 0$ or $x + 2 = 0$

$x = 4$ or $x = -2$

x must be positive so $x = 4$

which gives length $= x + 8 = 4 + 8 = 12$cm

breadth $= 2x + 1 = 8 + 1 = \underline{\underline{9\text{cm}}}$