National 5

Exam Solutions

Specimen Paper (2013) Solutions

Paper 1

1. $\dfrac{19}{6} \times \dfrac{16}{5}$

$\dfrac{19}{1} \times \dfrac{2}{5}$

$\dfrac{38}{5} = 7\dfrac{3}{5}$

2.

$$2x^3 \quad -8x^2 \quad +2x$$
$$+3x^2 -12x \quad +3$$

$$2x^3 \quad -5x^2 -10x \quad + 3$$

3. $\mathbf{u} + \mathbf{v} = \begin{pmatrix} 2+7 \\ -5+4 \\ -3+-1 \end{pmatrix} = \begin{pmatrix} 9 \\ -1 \\ -4 \end{pmatrix}$

$|\mathbf{u} + \mathbf{v}| \quad = \quad \sqrt{9^2 + (-1)^2 + (-4)^2}$

$= \quad \sqrt{81+1+16}$

$= \quad \sqrt{98}$

$= \quad \sqrt{49}\sqrt{2}$

$= \quad 7\sqrt{2}$

4. $(2x - 3)(x + 5) = 0$

$2x = 3$ or $x = -5$

$x = \dfrac{3}{2}$ or $x = -5$

5. $\dfrac{4\sqrt{6}}{\sqrt{6}\sqrt{6}}$

$\dfrac{4\sqrt{6}}{6}$ *Simplify 4 and 6 by ÷ 2*

$\dfrac{2\sqrt{6}}{3}$

6. $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$m = \dfrac{35 - 23}{17 - 11}$

$m = \dfrac{12}{6} = 2$

$y - b = m(x - a)$

$y - 23 = 2(x - 11)$

$y - 23 = 2x - 22$

$y = 2x + 1$

$S = 2F + 1$

b) $S = 2 \times 8 + 1$

$S = 17$

7. **a)** $x^{-\frac{2}{2}}+x^0$

$x^{-1}+x^0$

$\dfrac{1}{x}+1$

b) $\dfrac{1}{6}+1=1\dfrac{1}{6}=\dfrac{7}{6}$

8. $2p = mv^2$

$\dfrac{2p}{m} = v^2$

$v = \sqrt{\dfrac{2p}{m}}$

9. a)

$y \quad = \quad (x-4)^2 + b$

$y \quad = \quad x^2 - 8x + 16 + b$

$16 + b = 19$

$\Rightarrow \quad b = 3$

$y \quad = \quad (x-4)^2 + 3$

b)

$+ x^2 \Rightarrow \quad U \quad$ minimum TP

TP at $\quad x = 4, y = 3 \quad$ (make the bracket zero)

$\quad (4, 3)$

y int $\quad$ when $x = 0$

$y \quad = \quad x^2 - 8x + 19$

$y \quad = \quad 0 - 0 + 19 = 19$

$\quad (0, 19)$

19

(4, 3)
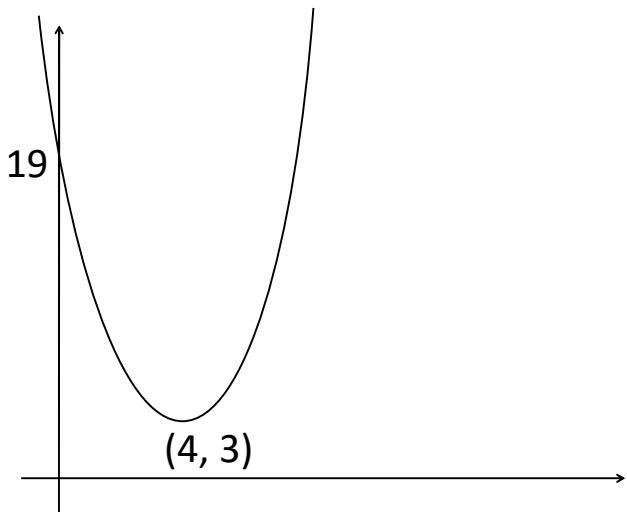
10. a)

$$3f + 4r = 185 \qquad ①×2$$

b)

$$2f + 3r = 130 \qquad ②×3$$

c)

$$6f + 8r = 370 \qquad ③$$
$$6f + 9r = 390 \qquad ④$$

$$④ - ③$$

$$r = 20$$

Sub into ②

$$2f + 60 = 130$$
$$2f = 70$$
$$F = 35$$

Full pass = £35
Restricted pass = £20

11.

$$\frac{4}{x+2} \times (x-4) \over x-4} - \frac{3}{x-4} \times (x+2) \over x+2}$$

$$\frac{4(x-4)}{(x+2)(x-4)} - \frac{3(x+2)}{(x+2)(x-4)}$$

$$\frac{4(x-4)-3(x+2)}{(x+2)(x-4)}$$

$$\frac{4x-16-3x-6}{(x+2)(x-4)}$$

$$\frac{x-22}{(x+2)(x-4)}$$

12.

a) $x = r - 5$
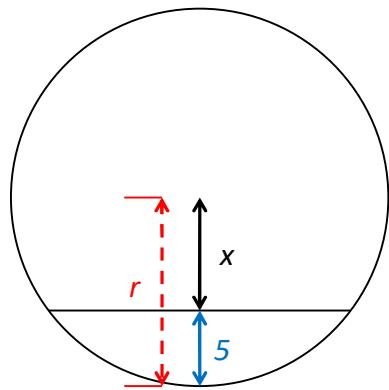
b)

$$r^2 = x^2 + 9$$

$$r^2 = (r-5)^2 + 9^2$$

$$r^2 = r^2 - 10r + 25 + 81$$

$$10r = 106$$

$$r = 10.6\text{cm}$$
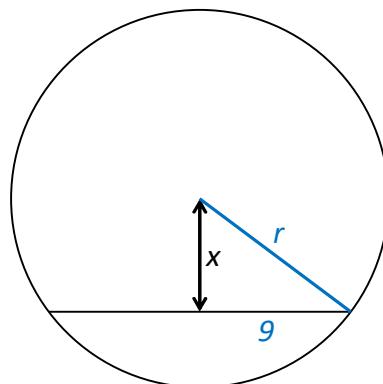
Paper 2

1. $56 \times 1\cdot15^3$

85·169 miles

2.   5·5L   =   5500ml

$5500 \times 3 \times 10^5$

$1\cdot65 \times 10^9$

3.   a)   **b** − **a**

   b)   **b** − **a** + **b** − **a**

2**b** − 2**a**

4. y = kx^2

−16 = $k \times (2)^2$

−16 =   4k

k   =   −4

5.

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$x^2 = 8^2 + 3^2 - 2 \times 8 \times 3 \cos 120°$$

$$x^2 = 97$$

$$x = \sqrt{97}$$
$$= 9 \cdot 8488578$$
$$= 9 \cdot 8 cm$$

6.

$$V_{cone} = \frac{1}{3}\pi r^2 h$$

$$= \frac{1}{3}\pi \times 6^2 \times 11 \quad (h = 17 - 6)$$

$$= 414 \cdot 69023027$$

$$V_{hemisphere} = \frac{1}{2}\frac{4}{3}\pi r^3$$

$$= \frac{1}{2}\frac{4}{3}\pi \times 6^3$$

$$= 904 \cdot 778684233$$

Total $= 1319 \cdot 4689$
$\quad\quad\;\; = 1300 \text{ cm}^3$

7.   120%   =   465

20%   =   465 ÷ 6
        =   77·5

100%   =   77·5 × 5
        =   £387·52

(alternative is 465 ÷ 1·2)

8. $\bar{x} = \dfrac{23+19+21+20+19+24}{6} = \dfrac{126}{6} = 21$

x	$\bar{x}$	$x - \bar{x}$	$(x - \bar{x})^2$
23	21	2	4
19	21	−2	4
21	21	0	0
20	21	−1	1
19	21	−2	4
24	21	3	9
			22

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

$= \sqrt{\dfrac{22}{5}}$

$= 2·0976$

b)   Mean of B is lower
=> On average machine B produces less sprouts per bag

SD of B is higher
=> Sprouts in bags by machine B are less consistent.

9. Scale Factor $= \dfrac{36}{15}$

$= 2\cdot4$

Volume SF $= 2\cdot4^3$

$= 13\cdot824$

Maxi Vol $= 0\cdot3 \times 13\cdot824$

$= 4\cdot1472$ litres

10. Max = 2, Min = -4

From max to min = 6

$\Rightarrow$ a = 3

If a = 3 then usual max & min would be 3 & –3

b= –1 makes Max = x and min = –4 as shown.

11. a)

$$A = \frac{110}{360} \times \pi r^2$$

$$A = \frac{110}{360} \times \pi \times 40^2$$

$$A = 1535 \cdot 88974$$
$$= 1535 \cdot 9 \text{ cm}^2$$

b)

$$l = \frac{250}{360} \times \pi d$$

$$l = \frac{250}{360} \times \pi \times 80$$

$$l = 174 \cdot 532925$$
$$= 174 \cdot 5 \text{ cm}$$

12.   a = p,   b = −2 and c = 3

$$b^2 - 4ac \quad < \quad 0$$

$$(-2)^2 - 4 \times p \times 3 \quad < \quad 0$$

$$4 - 12p \quad < \quad 0$$

$$4 \quad < \quad 12p$$

$$\frac{1}{3} \quad < \quad p$$

$$p \quad > \quad \frac{1}{3}$$

13.

a) $\dfrac{50}{\sin D} = \dfrac{79}{\sin 130}$

$\dfrac{\sin D}{50} = \dfrac{\sin 130}{79}$

$\sin D = \dfrac{50 \sin 130}{79}$

sin D = 0·48483

D =   29·001°
    (use 29°)

79km

40°
90°
50km
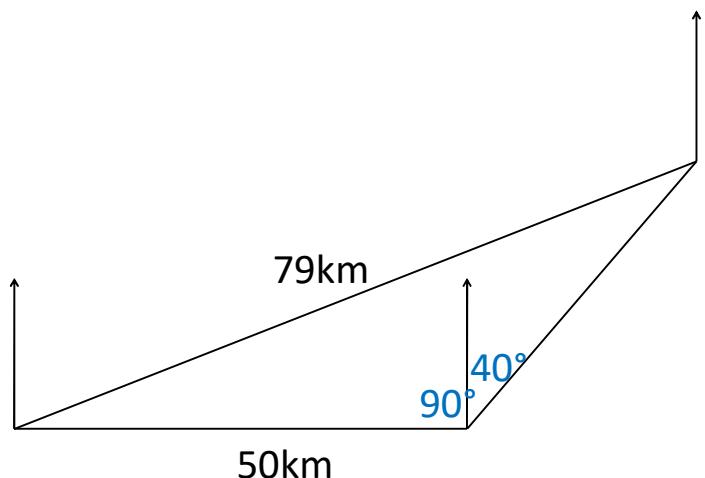
b) Create line underneath D
Alternate angle makes 40°

180 + 40 +29 = 249°

180°
29°
40°
40°
90°