

# Nat 5 2018 Paper 1

$$\begin{aligned} 1. &= \frac{7}{3} + \frac{4}{5} \\ &= \frac{35}{15} + \frac{12}{15} \\ &= \frac{47}{15} \\ &= \underline{\underline{3\frac{2}{15}}} \end{aligned}$$

$$\begin{aligned} 2. &3x^2 - 3x + x - 1 + 2x^2 - 10 \\ &= \underline{\underline{5x^2 - 2x - 11}} \end{aligned}$$

$$\begin{array}{r} 3. \quad 8x + 10y = -6 \\ \quad 30x - 10y = 25 \\ \hline \quad 38x = 19 \\ \quad x = \underline{\underline{\frac{1}{2}}} \end{array}$$

$$\begin{aligned} 4(\frac{1}{2}) + 5y &= -3 \\ 2 + 5y &= -3 \\ 5y &= -5 \\ y &= \underline{\underline{-1}} \end{aligned}$$

$$\begin{aligned} 4. \quad \underline{v} &= (\underline{u} + \underline{v}) - \underline{u} \\ &= \begin{pmatrix} 6 \\ -4 \\ 3 \end{pmatrix} - \begin{pmatrix} 1 \\ 5 \\ 1 \end{pmatrix} \\ &= \underline{\underline{\begin{pmatrix} 5 \\ -9 \\ 2 \end{pmatrix}}} \end{aligned}$$

$$5. (x-8)(x-3)$$

$$6. a=5 \quad b=4.$$

$$7. A(8,14) \quad B(12,20) \quad m = \frac{3}{2}$$

$$\begin{aligned} m_{AB} &= \frac{y_A - y_B}{x_A - x_B} & y - 14 &= \frac{3}{2}(x - 8) \\ &= \frac{14 - 20}{8 - 12} & 2y - 28 &= 3x - 24 \\ &= \frac{-6}{-4} & 2y &= 3x + 4 \\ &= \underline{\underline{\frac{3}{2}}} & y &= \frac{3}{2}x + 2 \\ & & P &= \underline{\underline{\frac{3}{2}d + 2}} \end{aligned}$$

$$\begin{aligned} b) \quad P &= \frac{3}{2}(5) + 2 \\ &= \frac{15}{2} + 2 \\ &= 7.5 + 2 \\ &= \underline{\underline{£9.50}} \end{aligned}$$

$$\begin{aligned} 8 \quad a &= 2 & b^2 - 4ac \\ b &= 4 & = 16 - 4(2)(5) \\ c &= 5 & = 16 - 8(5) \\ & & = 16 - 40 \\ & & = -24 \end{aligned}$$

Since  $b^2 - 4ac < 0$ ,  $f(x)$  has no real roots.

$$9. \text{Centre} : 360 \div 10 = 36$$

~~11/10~~

$$z^2 = x^2 + y^2 - 2xy \cos z$$

$$= 8^2 + 10^2 - 2(8)(10)\left(\frac{1}{8}\right)$$

$$= 64 + 100 - 160\left(\frac{1}{8}\right)$$

$$= 164 - 20$$

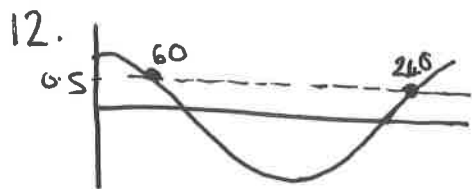
$$= 144$$

$$\underline{\underline{z = 12 \text{ cm}}}$$

$$11. \frac{9}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}}$$

$$= \frac{9\sqrt{6}}{6}$$

$$= \underline{\underline{\frac{3\sqrt{6}}{2}}}$$



$$\cos 240 = 0.5$$

$$13. B(4, 8, 5) \quad C(6, 8, 0)$$

$$14. y = g\sqrt{x}$$

$$\frac{y}{g} = \sqrt{x}$$

$$\left(\frac{y}{g}\right)^2 = x$$

$$\text{or } x = \underline{\underline{\left(\frac{y}{g}\right)^2}}$$

$$15. \left(\frac{2}{3}\right)^2 p^8$$

$$= \underline{\underline{\frac{4}{9} p^8}}$$

16. On y-axis,  $x=0$

$$y = (0-6)(0+4)$$

$$= -6 \times 4$$

$$= \underline{\underline{-24}}$$

On x-axis,  $y=0$

$$(x-6)(x+4) = 0$$

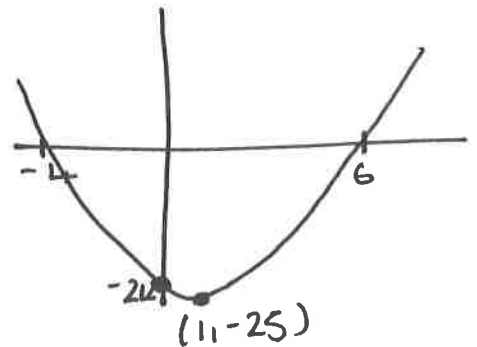
$$\underline{x=6} \quad \underline{x=-4}$$

$$\text{TP } y = (x-6)(x+4)$$

$$= x^2 - 2x - 24$$

$$= (x-1)^2 - 25$$

$$\text{TP } (1, -25)$$



$$17. V = \frac{1}{3} \text{ Area} \times \text{height}$$

$$138 = \frac{1}{3} (6 \times 6) \times h$$

$$138 = 12 \times h$$

$$h = \frac{138}{12}$$

$$h = \frac{23}{2}$$

$$h = 11.5 \text{ cm}$$

$$18. \sin x \cos x \tan x$$

$$\sin x \cos x \left( \frac{\sin x}{\cos x} \right)$$

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

$$19. y = (x-3)^2 - 90$$

$$\text{TP } (3, -90) \text{ so } \underline{\underline{x=3}}$$

$$b) \begin{aligned} a &= 1 \\ b &= -6 \\ c &= -81 \end{aligned}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{6 \pm \sqrt{36 - 4(1)(-81)}}{2}$$

$$= \frac{6 \pm \sqrt{360}}{2}$$

$$= \frac{6 \pm \sqrt{36 \times 10}}{2}$$

$$= \frac{6 \pm 6\sqrt{10}}{2}$$

$$= \underline{\underline{3 \pm 3\sqrt{10}}}$$

2018 Paper 2

$$1. (0.98)^3 \times 125000$$

$$= \underline{\underline{\pounds 117649}}$$

$$2. AL = \frac{x}{360} \times \pi \times d$$

$$= \frac{320}{360} \times \pi \times 14.8$$

$$= 41.329\dots$$

$$= \underline{\underline{41.3 \text{ cm}}}$$

$$3. |r| = \sqrt{24^2 + (-12)^2 + 8^2}$$

$$= \underline{\underline{28}}$$

$$4. \begin{aligned} 3x &< 6x - 6 - 12 \\ -3x &< -18 \\ 3x &> 18 \\ x &> 6 \end{aligned}$$

$$\underline{\underline{x > 6}}$$

$$5.$$

$x$	$x - \bar{x}$	$(x - \bar{x})^2$
120	-6	36
126	0	0
125	-1	1
131	6	36
130	5	25
124	-2	4
		$\Sigma = 102$

$$\bar{x} = \frac{756}{6}$$

$$= \underline{\underline{126}}$$

$$s = \sqrt{\frac{102}{5}}$$

$$= 4.516\dots$$

$$= 4.5$$

	$\bar{x}$	$s$
Sat	126	4.5
Sun	117	6.2

On average, the stalls had more customers on a Saturday

The number of Saturday customers is less varied (more consistent).

6.  $f(x) = 5 + 4x$

$f(a) = 5 + 4a = 73$

$4a = 68$

$a = \frac{68}{4}$

$a = 17$

7.  $V_{\text{sph}} = \frac{4}{3} \pi r^3$

$= \frac{4}{3} \pi (3.2)^3$

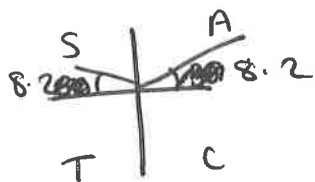
$= 137.258$

$= 140 \text{ cm}^3$

8.  $7 \sin x + 2 = 3$

$7 \sin x = 1$

$\sin x = \frac{1}{7}$



~~$\sin^{-1}(\frac{1}{7})$~~   $\sin^{-1}(\frac{1}{7}) = 8.2$

$x = 8.2^\circ, 180 - 8.2^\circ$

$= 8.2^\circ, 171.8^\circ$

9.  $BDC = 180 - 75$

$\frac{b}{\sin 105} = \frac{20}{\sin 37}$

$b = \frac{20 \sin 105}{\sin 37}$

$= 32.01 \text{ cm}$

10.  $\vec{BC} = \vec{BA} + \vec{AE} + \vec{ED} + \vec{DC}$   
 $= -\underline{y} \underline{i} + \underline{w} + 2\underline{y} + \frac{1}{2}\underline{w}$   
 $= \underline{y} - \frac{1}{2}\underline{w}$

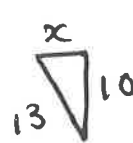
11.  $85\% = 9.3 \times 10^{11}$

$1\% = 1.094 \dots \times 10^{10}$

$100\% = 1.094 \times 10^{12} \text{ km}^3$

in

12.  $\text{width} = 13 + x$



$x = \sqrt{13^2 - 10^2}$

$= \sqrt{169 - 100}$

$= 8.3$

$\text{width} = 13 + 8.3$

$= 21.3 \text{ cm}$

13.  $\cos T = \frac{5.6^2 + 10.3^2 - 7.2^2}{2(5.6)(10.3)}$

$= \frac{1223}{1648}$

$T = \cos^{-1}(\frac{1223}{1648})$

$= 42^\circ$

$\text{bearing} = 240 + 42$

$= 282^\circ$

14. On y-axis  $x=0$

$$2(0) - 5y = 20$$

$$-5y = 20$$

$$\underline{\underline{y = -4}}$$

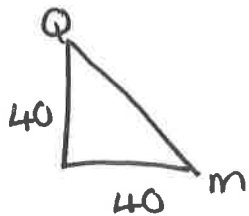
(0, -4)

$$15. \frac{n}{(n-2)(n+2)} \times \frac{(n-2)}{3}$$

$$= \frac{n(n-2)}{3(n-2)(n+2)}$$

$$= \underline{\underline{\frac{n}{3(n+2)}}}$$

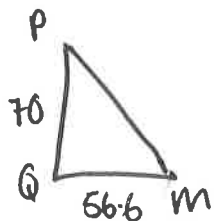
16. 1. Find MQ (back left corner)



$$Qm = \sqrt{40^2 + 40^2}$$

$$= 56.568\dots$$

$$= \underline{\underline{56.6 \text{ cm}}}$$



$$Pm = \sqrt{70^2 + 56.6^2}$$

$$= 90.01$$

$$= \underline{\underline{90 \text{ cm}}}$$

The umbrella will fit as it is 5cm shorter than Pm.

$$17. \text{A sector} = \frac{x}{360} \times \pi r^2$$

$$= \frac{75}{360} \times \pi \times 30^2$$

$$= 589.04$$

$$= \underline{\underline{589 \text{ cm}^2}}$$

$$\text{A triangle} = \frac{1}{2} ab \sin C$$

$$= \frac{1}{2} (55) (38) \sin 75$$

$$= \underline{\underline{929.7 \text{ cm}^2}}$$

$$\text{Shaded area} = 929.7 - 589$$

$$= \underline{\underline{340.7 \text{ cm}^2}}$$

$$18a \quad (ESF)^3 \times 576 = 1125$$

if similar

$$\left(\frac{24}{16}\right)^3 \times 576 = 1944 \text{ cm}^3$$

If they were similar, the large would be 1944 cm<sup>3</sup>.

$$b) \quad \left(\frac{x}{16}\right)^3 \times 576 = 1500$$

$$\left(\frac{x}{16}\right)^3 = \frac{125}{48}$$

$$\frac{x}{16} = \sqrt[3]{\frac{125}{48}}$$

$$\frac{x}{16} = 1.37$$

$$\underline{\underline{x = 22 \text{ cm}}}$$