

Paper 2 June 2022

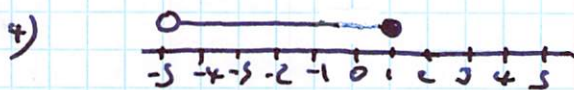
1) 1.25% (i.e. $1\frac{1}{4}\%$)

$$= \frac{125}{10000}$$

$$= \frac{1}{80}$$

2) U is union $\simeq$ OR
 $\cap$ is intersection $\simeq$ AND
 $P(A \cap B')$ reads
 Probability A and not B .

3) Triangular numbers are
 1 3 6 10 15 21
 this is triangular



$$\rightarrow -5 < y \leq 1$$

5) $5(2x-1) = 6x+9$
 $10x-5 = 6x+9$
 $4x = 14$
 $x = 3\frac{1}{2}$

6) $2125 = 25 \times 85$
 and $85 = 5 \times 17$
 so $2125 = 125 \times 17$
 $= 5^3 \times 17$

7) Sam types at $\frac{416 \text{ words}}{8 \text{ minute}}$

so 1534 words takes $\frac{1534}{416} \times 8$

$$= 29 \text{ min } 30 \text{ sec.}$$

Note this is an estimate.

8.) Attendance is

Mon	Tue	Wed	Thu	Fri
72	83	88	97	n

so $72+83+88+97+n = 90 \times 5$

$$n = 450 - 340$$

$$= 110$$

9) 120 calls made

Relative frequency = $\frac{38}{120}$
 not answered
 $= \frac{11}{40}$

Expected sales = $\frac{6}{120} \times 500$
 $= 25$

10) £ hinter Hard drive

Harry	80	25
Ellie	72	30

$$72 = 80 \times 0.9$$

$$30 = 25 \times 1.2$$

Ellie is incorrect.

11) Area shape = triangle + rectangle
 $= \frac{1}{2} \times 16 \times 30 + 52h$

$$h = \sqrt{16^2 + 30^2} = 34$$

This is an 8, 15, 17 right angled triangle
 - a favourite of examiners.

12) $4y = 5x$

$$y = \frac{5}{4}x \text{ i.e. } 125\% x$$

$$x = \frac{4}{5}y \text{ i.e. } 80\% y$$

this matches a statement

13) Volume model cone

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

$$= \frac{1}{3} \pi 24^2 \times 117 + \frac{2}{3} \pi 24^3$$

$$= \frac{1}{3} \pi 24^2 (117 + 2 \times 24)$$

$$= \frac{1}{3} \pi 24^2 \times 165$$

$$= 31680 \pi$$

it is acceptable to leave in π .

Radius	Model : Actual
	2 : 24
	1 : 12
Volume	1 : 12 ³
	1 : 1728

14) Family area is "very important"

Estimated number of crowd that would say "very important"

$$\begin{array}{r} 1475 \\ \hline 1475 + 400 + 375 \\ \hline \end{array} \times 29250$$

$$= 15175$$

However because our sample was biased toward people actually sitting in the family area the actual number in the crowd is over estimated.

So true number likely lower

15) Completed grid is

$$8 \times \frac{1}{4} \times 2 = 1$$

$$\frac{1}{16} \times 1 \times 16 = 1$$

$$2 \times 4 \times \frac{1}{8} = 1$$

16 a) Amol says mean is $3000 \div 30$ but there aren't 30 Mon-Jat in June.

b) Meat : Chicken : Vegan

$$\times 150 \quad \begin{array}{ccc} 2 & : & 4 & : & 7 \\ 1350 & : & 600 & : & 1050 \end{array} = \frac{20}{150} \times 3000$$

$$\text{so } 1350 \times 2.33 + 600 \times 1.89 + 1050 \times x = 6660$$

and we solve for x giving

$$x = \underline{\underline{\pounds 2.19}}$$

17) The rectangle could be the plan of an open-ended cylinder.

It can't be a sphere cone or hemisphere

18) $x^2 + 7x - 11 = 0$

first write out the coefficients

$$a = 1$$

$$b = 7$$

$$c = -11$$

then write out the quadratic formula

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

then substitute the values

$$\frac{-7 \pm \sqrt{7^2 + 44}}{2}$$

$$= \frac{-7 \pm \sqrt{93}}{2}$$

$$= \frac{-7 \pm 9.64}{2}$$

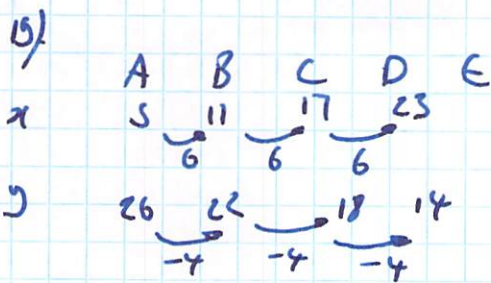
$$= (-7 + 9.64)/2$$

$$\text{or } (-7 - 9.64)/2$$

$$= 1.32 \text{ or } -8.32$$

both solutions are valid in pure maths.

DO NOT SHORT CUT THIS METHOD TOO EASY TO MAKE A MISTAKE



vector $\vec{AD} = \frac{23-5}{14-26}$
 $= \begin{bmatrix} 18 \\ -12 \end{bmatrix}$

coord. E = coord D + $\vec{DE}$
 $= (23, 14) + \begin{bmatrix} 9 \\ -6 \end{bmatrix}$
 $= (32, 8)$

20)

New Price = $\frac{5.88}{1.68} = 3.5 \text{ £/kg.}$

or New Price = $\frac{5.60}{1.68 \text{ C}} = 3.5$

$x = \frac{5.60}{3.5 \times 1.68}$

so % reduction is $(1-x) \times 100$
 $= 4.76\%$

21)

$x^2 + y^2 = 6$

equation of a circle is

$x^2 + y^2 = r^2$

so this is the equation of a circle with radius $\sqrt{6}$

22) 8^5 reciprocal is

$\frac{1}{8^5} = 8^{-5}$

23) $3x^2 - 16x - 12$

This is slightly tricky so we could use "Lizzie's Method"

now $a=3$ $b=-16$ $c=-12$

transform the expression by setting $a=1$ and c to ac

$\Rightarrow x^2 - 16x - 36$

factorise this expression

$(x-18)(x+2)$

Now divide the numbers in the two brackets by the original a

$(x - \frac{18}{3})(x + \frac{2}{3})$

Now simplify and/or rationalise

$(x-6)(3x+2)$

which indeed is $3x^2 - 16x - 12$

24) straight line $(2, 8)$ to $(6, 15)$

gradient = $\frac{\Delta y}{\Delta x} = \frac{15-8}{6-2} = \frac{7}{4}$

so gradient of perpendicular = $-\frac{4}{7}$

Now substitute values into expression

$y - y_1 = m(x - x_1)$

$y - 9 = -\frac{4}{7}(x - 0)$

$y - 9 = \frac{-4x}{7}$

$y = \frac{-4x}{7} + 9$

to find x value substitute $y=17$

$17 = \frac{-4x}{7} + 9$

$x = \frac{-8 \times 7}{4}$

$x = -14$

$$\begin{aligned}
 25) \quad f(x) &= 2x + 5 \\
 \text{let } y &= 2x + 5 \\
 2x &= y - 5 \\
 x &= \frac{y - 5}{2} \\
 \text{so } f^{-1}(x) &= \frac{x - 5}{2}
 \end{aligned}$$

$$\begin{aligned}
 \text{so } 3f(x) - 12f^{-1}(x) \\
 &= 3(2x + 5) - 12 \frac{(x - 5)}{2} \\
 &\text{focusing on the } x \text{ alone}
 \end{aligned}$$

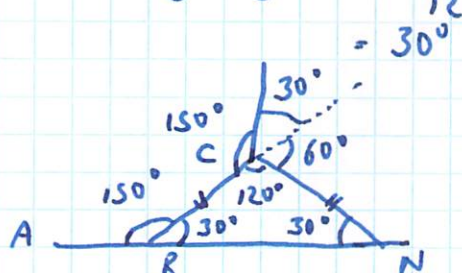
$3 \times 2x - 6x = 0$
 so the expression must simplify to an integer independent of x .
 Note that we have proved this without even working out the actual value.

{ I do not agree with the mark scheme of this question }

$$\begin{aligned}
 26) \quad \text{Pressure J} &= \frac{18.9}{0.45} \\
 \text{Pressure ratio} & 7:8 \\
 \text{Area ratio} & 9:5 \\
 \text{Pressure K} &= \frac{18.9}{0.45} \times \frac{8}{7} \\
 \text{Area K} &= 0.45 \times \frac{5}{9} \\
 \text{Force K} &= \frac{18.9 \times 8}{0.45 \times 7} \times \frac{0.45 \times 5}{9} \\
 &= 12
 \end{aligned}$$

$$\begin{aligned}
 27) \quad \text{Area} &= 2.4 \times 2.9 \\
 \text{Minimum area} &= 2.35 \times 2.85 \\
 &= 6.6975 \\
 &> 6.51
 \end{aligned}$$

$$28) \text{ turning angle} = \frac{360}{12}$$



$\angle ABC = \angle BCN + \angle CNB$
 exterior angle Δ = sum opposite interior angles

Therefore ABN is a straight line.

$$\begin{aligned}
 29) \quad y &= x^2 - 18x + 70 \\
 &= (x - 9)^2 - 81 + 70 \\
 &= (x - 9)^2 - 11
 \end{aligned}$$

Therefore the curve is symmetrical about $x = 9$ and the minimum occurs at $y = -11$
 so the turning point is $(9, -11)$