Paper 1 June 2018

1) $\sqrt[3]{64 \times 1000}$

$= \sqrt[3]{64} \times \sqrt[3]{1000}$

$= 4 \times 10 = 40$ ✓

2) $\begin{bmatrix} -2 \\ 3 \end{bmatrix}$ translates $A \to B$

So $B \to A$ is $\begin{bmatrix} 2 \\ -3 \end{bmatrix}$ ✓

learn and/or understand this

3) $3a - a \times 4a + 2a$

calculate first

$= 3a - 4a^2 + 2a$

combine these

$= 5a - 4a^2$ ✓

4) $\frac{9.8}{0.0195} \simeq \frac{980}{1.95} \simeq \frac{1000}{2}$

$\simeq 500$ ✓

5) $5(x+3) < 60$

Don't multiply out.
Shift the 5 across first

$x + 3 < 12$

$x < 9$ ✓

6) $\frac{2ak}{fkd} = \frac{1.86}{1.6} = \frac{9.3}{8}$

$= \frac{93}{80}$ ✓

7) $A \to B$ is
$(0, 2) \to (6, 5)$ is $\begin{bmatrix} 6 \\ 3 \end{bmatrix}$

$(6, 5) + \begin{bmatrix} 6 \\ 3 \end{bmatrix} + \begin{bmatrix} 6 \\ 3 \end{bmatrix}$

$= (18, 11)$ ✓

8) Relative frequency $= \frac{31}{50}$

$= 0.62$ ✓

b) Is coin biased?
Fair coin would have RF = 0.5

Over 50 throws there is significant evidence of bias.

{ In fact it is possible to calculate the exact probability of 31 heads or more. It's 6%. Now 5% or less is deemed statistically significant. So technically there is no evidence the coin is biased. I think the examiner specifically chose the highest number heads and still not to be statistically significant. How is the student supposed to know all this? What a terribly unfair question }

9) Range is $15\frac{1}{4}$

$-2\frac{7}{8} + 15\frac{1}{4}$

$= \frac{-23}{8} + \frac{122}{8} = \frac{99}{8}$

$= 12\frac{3}{8}$ ✓

10)

x	12	6	$\frac{3}{8}$
y	2	4	

where $x \propto \frac{1}{y}$ ✓

11) One rectangle must be

so $2(3x) = 15$

$x = 2\frac{1}{2}$

large rectangle is $10x$

so 25 cm

12) smallest 6×10^{-4}

8×10^{-4}

4×10^{-2}

0.07

13) $15\ cm^3 \times \frac{10^3 mm^3}{1\ cm^3}$

$= 15000\ mm^3$

That is surprisingly high and counter intuitive considering 10 mm = 1 cm.

But suppose it was just $1\ cm^3$

That is $10 \times 10 \times 10 = 1000 mm^3$

so correct.

14)

	straight lines		arcs	
A	5	×5	8	+4
B	10		12	
3 rows	15		16	
4 rows	20		20	
5 rows	25		24	
6 rows	30		28	
7 rows	35		32	
8 rows	40		36	

which is 10 : 9

So 6 rows were added

This is by far the simplest and most visual way of getting this correct.

15) 20 straights 16 arcs £12

1 straight : 1 arc

×6 (2 : 3) ×6

12 : 18

so 20 arcs cost £18

16 arcs cost $\frac{18}{20} \times 16$

$= \frac{18 \times 4}{5}$

$= £14.40$

Total cost $= £14.40 + £12$

$= £26.40$

This is a non calculator paper so care needed.

15) More biased dice!

Probabilities total 1

P(1 or 3 or 5) OR means ADD

$P(0.25 + 0.15 + 0.3) = 0.7$

Expected "odds" $= 0.7 \times 200$

$= 140$

16) $1.2x = y$

$x : y$

×5 (1 : 1.2) ×5 we swap!

5 : 6

17) The correct relationship is

$$\frac{x}{\sin 42^\circ} = \frac{15}{\sin 104^\circ}$$

18) Six faces

Top area $= \frac{1}{2} 2\pi 10 \times 30$

$= 300\pi$

Bottom area $= \frac{1}{2} 2\pi 7 \times 30$

$= 210\pi$

End area $= \frac{1}{2}(\pi 10^2 - \pi 7^2)$

$= \frac{1}{2} 51\pi$

and there are two so 51π

back $= 3 \times 30$

$= 90$

and there are two so 180

Total is $300\pi + 210\pi + 51\pi + 180$

$= 561\pi + 180$

19) Cumulative frequency graph

IQR $= 1400 - 1100$

$= 300$ hours

b) Estimate number batteries more than 1600 hours

{AQA say 4?} $= 80 - 75 = 5$

c) Summarise the data

	Type A	Type B
LQ.	1100	1100
Median	1250	1300
UQ	1400	1440

So clearly B has greater battery life

These figures have been carefully chosen so the answer is unambiguous even though the question itself is ambiguous.

20) A linear sequence

1	2	3	4	5
$a+2b$	$a+6b$	$a+10b$	$a+14b$	$a+18b$
	↓ 8			↓ 44

So $a + 6b = 8$ ①

$a + 18b = 44$ ②

So $(18-6)b = 44-8$

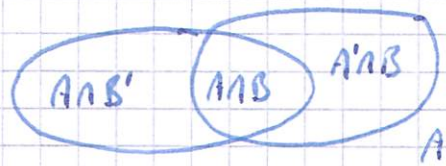
$b = \frac{36}{12} = 3$

Hence ① $a = -10$

check ② $-10 + 54 = 44$ ✓ checks

21. This is an enlargement.
see diagram.
This is just so cool.

22)



We label the 4 areas as intersections.

Now we are being asked for the complement of $A' \wedge B$

$(A' \wedge B)' = A \cup B'$

Like algebra we can multiply through the brackets with the ' symbol which also conveniently flips the $\wedge$ to a $\vee$

This is so neat.

23) Income March $= p \times n$

Income April $= 1.2p \times 0.75n$

$= 0.9pn$.

So we have a 10% decrease in April.

or $\frac{1}{10}$ decrease.

24 a) $2^{14} \div (2^9)^2$

$= 2^{14} / 2^{18} = 2^{-4}$

$= \frac{1}{2^4} = \frac{1}{16}$ ✓

24 b) $25^{3/2} = \sqrt[2]{25^3}$

or $(\sqrt{25})^3$

which is much easier to calculate

$= 5^3 = 125$ ✓

25) See sketch

$\cos x = \cos 60$

so $x = 300°$ ✓

b) $\cos x = -\cos 60$

so $x = 240°$ ✓

This is a non calculator paper but try these values on a calculator and satisfy yourself that these are correct.

26) $b = \frac{2}{3}c$ $5a = 4c$

a : b : c

$\frac{2}{3} : 1$

$2 : 3$

×3 (4 : 5) ×3) ×5

→ 12 10 : 15 ✓

Just remember to swap the equation over when summarising as ratios.

27 a) $x^2 + 3x - 5 = 0$

So wants solutions but says as it doesn't factorise there aren't any.

Sometimes quadratics really don't have a solution because the curve doesn't intersect the x-axis but is this one of them?

The answer lies in the value of $b^2 - 4ac$.

If $b^2 - 4ac < 0$ there are no solutions because there are no real values to the square root of a negative number. Let's check

$3^2 - 4 \times 1 \times (-5) = 29$

Think about this logically. That c value-negative- moves the curve down and ensures it cuts the x-axis.

What detail of all this does the examiner expect to see?

b) Solutions of $9(x+3)^2 = 4$

so $(x+3)^2 = \frac{4}{9}$

so $x + 3 = \pm\sqrt{4/9}$

$x = \pm\sqrt{4/9} - 3$

$= \pm \frac{2}{3} - 3$

x is $-3\frac{2}{3}$ or $-2\frac{1}{3}$ ✓

ROBERT GOODHAND

28) $\sqrt{80} + \sqrt{2\frac{2}{9}}$

$= \sqrt{16 \times 5} + \sqrt{\frac{20}{9}}$

$= 4\sqrt{5} + \frac{2\sqrt{5}}{3}$

$= \left(4\frac{2}{3}\right)\sqrt{5} = \frac{14}{3}\sqrt{5}$ ✓

29) $f(x) = x^2 - 1$

We want to translate this 3 units to the left.

so $x \Rightarrow x+3$ — "left" is positive

$g(x) = (x+3)^2 - 1$

$= x^2 + 6x + 9 - 1$

$= x^2 + 6x + 8$

so $b = 6$ and $c = 8$ ✓

b) if we reflect $y = x^2 - 1$ in the x-axis then

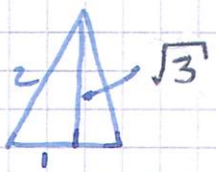
$g(x) = -f(x)$

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

$= -x^2 + 1$ ✓

30) $\cos 30° \times \tan 60° + \sin 30°$

This is a standard final question. We must know how to work out standard trig angles.



$\Rightarrow \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{1} + \frac{1}{2}$

$= \frac{3}{2} + \frac{1}{2}$

$= 2$ ✓

This is a non calculator paper but check this out on a calculator.