Paper 3 June 2018

1) $\frac{11}{20} \times \frac{5}{5} = \frac{55}{100} = 0.55$

closest is 0.56 ✓

2) $-2 < x \leq 4$

$\Rightarrow x = -1, 0, 1, 2, 3, 4$ ✓

3) The largest number is
$3.2\dot{7} = 3.2777...$

4) Regular decagon
turning angle $= \frac{360}{10} = 36°$ ✓

5) a is common factor 72, 120
b is common multiple 6, 9
Highest value $\frac{a}{b}$ → high
→ low

1 × 72	1 × 120
2 × 36	2 × 60
3 × 24 ←	3 × 40
4 × 18	4 × 30
6 × 12	5 × 24 ←
8 × 9	6 × 20
	8 × 15
	10 × 12

HCF

LCM (6, 9) is

6	9
12	18
18 ←	LCM

so $\frac{a}{b} = \frac{24}{18} = \frac{4}{3}$ ✓

6) $x = 54°$

A : B
1 : 1.5 ×6 → 6
w : 9 → w = 6

1 : 1.5 ×5 → ×5
s : h
$h = 7.5$

7) Investment A

$(150 \times 24) \times 1.025 = £3690$

Investment B

$3500 \times 1.03^2 = £3713.15$

B − A = £3713.15 − £3690
= £23.15 ✓

8) $y = 3x + 7$ $m_1 = 3$

$2y = 8 + 6x$

$y = +3x + 4$ $m_2 = 3$ ✓

so lines are parallel.

b) $y = 3x + 7$
point $(-5, -6)$

$-6 \quad -15 + 7$

so if $x = -5$ $y = -8$
to be on line
but $y = -6$
so the point is above the line

9) Original cost ticket is

$\frac{19.25}{1.1} = £17.50$ ✓

this is a really easy 3 marks.

10) n^{th} term $= 12n - 5$

0	1	2	3	4	5	6	7	8	9	10
−5	7	19	31	43	55	67	79	91	103	
	P	P	P	P		P	P			
	×									

so digits 2 and not prime
are 55 and 91 ✓

11) $a = \begin{bmatrix} 6 \\ -10 \end{bmatrix}$ $b = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$ $c = \begin{bmatrix} -4 \\ 7 \end{bmatrix}$

$a + b + c = \begin{bmatrix} 6 - 1 - 4 \\ -10 + 2 + 7 \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ ✓

11) $b = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$

gradient is $\frac{2}{-1} = -2$

$a + 2c = \begin{bmatrix} 6 \\ -10 \end{bmatrix} + \begin{bmatrix} -4 \\ 7 \end{bmatrix} 2$

$= \frac{-2}{4}$

gradient $= \frac{+4}{-2} = -2$

so the vectors are parallel.

12) pressure $= \frac{\text{force}}{\text{area}}$

$= \frac{40}{3 \cdot 2}$

$= 12\frac{1}{2}\ N/m^2$

13)  rhombus

is a flattened square

so diagonals are line symmetry

diagonals bisect

diagonals perpendicular

14) Plot graph.

x	0	1	2	3	4	5	6
y	1	0.8	0.64	0.512	0.4096	0.32768	0.26214

15)

Amy	Billy	Carly
x	$x+3$	$4(x+3)$
		$\downarrow$
		$4x+12$

which is option given.

16) $y = -4x$

$3 = -4x$ so $x = \frac{-3}{4}$

coordinates A are $(-\frac{3}{4}, 3)$

which is an option given.

17) Method A

30 → 31 33 35 37 39 5 options

11, 22, 33, 44, 55, 66, 77, 88, 99

9 options

total options : $35 \times 9 = 315$

Method B

total options $4 \times 5 \times 4 \times 5$

$= 400$

so B has greater number options

18)

$\frac{x+4}{3x} - \frac{5}{2x}$

$= \frac{2x(x+4) - 5(3x)}{6x^2}$

$= \frac{2x^2 + 8x - 15x}{6x^2}$

$= \frac{2x^2 - 7x}{6x^2}$

as $x \neq 0$ divide through by x

$= \frac{2x-7}{6x}$

19) $3x + 2y = 24$

$2y = -3x + 24$

$y = -\frac{3}{2}x + 12$

when line crosses x-axis

$y = 0$

so $x = 8$

So the coordinates are

$(8, 0)$

which is an option given.

20) $x^2 + (7x)^2 = (10y)^2$

$50x^2 = 100y^2$

$\frac{x^2}{y^2} = \frac{100}{50}$

$\frac{x}{y} = \sqrt{2}$

all integers are positive

21) $m \propto h^3$

$m = kh^3$

$1600 = k \times 8^3$

$k = 1600/8^3$

$m = 3.125h^3$

b) $m = 3.125 \times 12^3$

$= 5400$ grams

22)

Angle ACB = 56°

correct reason "alternate segment theorem."

23) $u_{n+1} = \frac{3}{u_n + 1}$ $u_1 = 4$

$u_2 = \frac{3}{4+1} = \frac{3}{5}$

$u_3 = \frac{3}{\frac{3}{5}+1} = 1\frac{7}{8}$

24) Area under graph

$= \frac{1}{2} 10 \times 20 + \frac{1}{2}(20+30)10$

$= 350$ metres.

But this is an underestimate of the distance.

25) $\tan 6° = \frac{DC}{500}$

$DC = 500 \tan 6°$

$= 52.55$ m.

In triangle DAC

$AC^2 = 400^2 + 500^2$

$AC = \sqrt{410000}$

$\tan^{-1} DAC = \frac{500 \tan 6°}{\sqrt{410000}}$

$= 4.69°$

We'd expect the angle to be less than 6° so looks correct.

26)

taking an arbitary scale for the vertical axis.

① = 5 × 15 = 75

② = 6·6 × 5 = 33

③ = 0·8 × 15 = 12

120

so we multiply each by 4

① represents 75 × 4 = 300 cars

Bar ③ is 48 cars and we can split into 3 sections 16/16/16

so 32 cars are exceeding speed limit.

a) Discs Red : Blue

10 : 20

$P(3\text{red}) = \frac{10}{30} \times \frac{9}{31} \times \frac{8}{32} = \frac{3}{124}$

28) $x^2 + y^2 = 80$
if $x = 4$

$4^2 + y^2 = 80$
so $y^2 = 80 - 4^2$
$y^2 = 64$
$y = -8$
negative root by inspection.
so we have two points
(0, 0) and (4, -8)
gradient $= \frac{-8}{4}$
$= -2$
so gradient perpendicular
$= \frac{1}{2}$ $(m_1 m_2 = -1)$

So we have gradient and
point (4, -8)

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

$y + 8 = \frac{1}{2}(x - 4)$

$y + 8 = \frac{1}{2}x - 2$

$y = \frac{1}{2}x - 10$

which looks correct.

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