Sample Paper - 2022/2023

Higher

Mark Scheme

Guidance on the use of abbreviations within this mark scheme	
M	method mark awarded for a correct method or partial method
P	process mark awarded for a correct process as part of a problem solving question
A	accuracy mark (awarded after a correct method or process; if no method or process is seen then full marks for the question are implied but see individual mark schemes for more details)
C	communication mark awarded for a fully correct statement(s) with no contradiction or ambiguity
B	unconditional accuracy mark (no method needed)
oe	or equivalent
cao	correct answer only
ft	follow through (when appropriate as per mark scheme)
sc	special case
dep	dependent (on a previous mark)
indep	independent
awrt	answer which rounds to
isw	ignore subsequent working

Paper 1

Question	Answer	Mark	Mark scheme	Additional guidance
1	$\frac{73}{35}$	M1 A1	For a method to subtract using common denominators with at least one fraction correct (matching numerator with common denominator) e.g. $\frac{115}{35} - \frac{42}{35}$ or $3\frac{10}{35} - 1\frac{7}{35}$ cao	
2	24	P1 P1 A1	For beginning to solve the problem e.g. $27 \div 9 \times 14 (= 42)$ **or** $8 : 14 : 9$ oe or $8 : 14$ and $14 : 9$ oe (linked) For a full process to solve the problem e.g."42" $\div 7 \times 4$ **or** $\frac{27}{9} \times 14$ or $24 : 42 : 27$ cao	42 may be seen in the ratio $42 : 27$ If 24 clearly identified as cows in working award full marks
3	Estimated value	P1 P1 A1	For using a rounded value in a correct process e.g. $4200 \div 70$ **or** 70×12 **or** 70×10 For a full process to find the number of days e.g. "4200" $\div$ "70" $\div 12 (= 5)$ "4200" $\div$ "70" $\div$ "10"$(= 6)$ **or** For a correct answer following through their rounded values	Their rounded value must be used in a calculation Rounding may appear after correct process
4	$384\ \text{cm}^2$	M1 M1 A1 B1	For a method to find the area of a triangular face e.g. $^1/_2 \times 10 \times 12 (= 60)$ (dep) for finding the total surface area e.g. $4 \times$ "60"$+ 12 \times 12$ For a numerical answer of 384 cm²	
5(a)	Reflection in the line $y = 1$ **or** Rotation $180°$ about $(-3, 1)$	B1	Accept either transformation	Award mark if both **correct** transformations are written down
5(b)	Transformation by $\binom{-3}{-4}$	B1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
6	960	P1 P1 P1 A1	For process to work with ratio e.g. $160 \div (8 + 15 + 17)(= 4)$ **or** $160 \div 40(= 4)$ For process to find length of base or height of triangle e.g. $8 \times$ "4"$(= 32)$ **or** $15 \times$ "4"$(= 60)$ **OR** process to find area scale factor e.g. "4" $\times$ "4"$(= 16)$ Complete process to find the area of the triangle e.g. $1/2 \times$ "32" $\times$ "60" **or** $1/2 \times 8 \times 15 \times$ "4"^{2} cao	
7	1	B1	cao	
8(a)	Youngest $= 6$ Oldest $= 58$ Lower Q $= 14$ Upper Q $= 42$ Median $= 26$	B2 (B1	cao For 2 to 4 correct answers)	
8(b)	Comparison with reference to values found	C1 C1 C1	For finding the range from Jack's birthday party **or** Laura's birthday party e.g. $58 - 6 = 52$ **or** $54 - 11 = 43$ For correct comparison of medians e.g. the median age at Jack's birthday party was less than the median age at Laura's birthday party For a correct comparison of a measure of spread, e.g. IQR (or range) for marks was greater for Jack's birthday party compared with Laura's birthday party For the award of both marks at least one of the comparisons must be in context	Allow ecf from part(a) Accept converse Accept converse
9	54	M1 M1 M1 M1 A1	Recognising $OC = OA$ **or** triangle OAC is isosceles For process of finding of finding angle OCA **or** angle OAC e.g. $(180 - 108) \div 2(= 36)$ Recognising angle OCB is 90° **or** a right angle For finding angle CAB e.g. $90 -$ "36"$(= 54)$ **and** triangle ABC is isosceles cao	

Question	Answer	Mark	Mark scheme	Additional guidance
10	$8\sqrt{7}$	M1 M1 A1	$5\sqrt{2}$ **or** $-\sqrt{2}$ **OR** For $\sqrt{700}$ **or** $-\sqrt{28}$ For $\sqrt{14} \times 4\sqrt{2}$ or $4\sqrt{28}$ or $4 \times \sqrt{4} \times \sqrt{7}$ cao	
11	$p = \frac{11}{2q^4}$	P1 P1 P1 P1 A1	For setting up correct proportional relationship, e.g. $p \propto \frac{1}{q^2}$ **or** $p = \frac{k}{q^2}$ For setting up a second proportional relationship, e.g. $a \propto q^2$ **or** $a = Kq^2$ (dep P1) for a process to find one of the constants of proportionality e.g. $5.5 = k \div 16 (k = 88)$ **or** $100 = K \times 25 (K = 4)$ Full process to find p in terms of q e.g. $p = \frac{"88"}{("4"q^2)^2}$ oe $p = \frac{11}{2q^4}$ oe	Condone the use of '$\propto$' instead of '$=$' for the four P marks Accept any other letter for 'k' and 'K' Both constants must come from a correct process Expression must have been simplified, but could be given in other equivalent ways e.g. $p = 5.5q^{-4}$
12	0.42	P1 P1 A1	For process to start e.g. $(1 - 0.09) \div (6 + 7) (= 0.07)$ **Or** $(6 + 7) \div (1 - 0.09) (= 100/7)$ **Or** $(100 - 9) \div (6 + 7) (= 7)$ Full process find the required probability e.g. 6×0.07 or $\frac{6}{13} \times (1 - 0.09)$ oe oe	

Question	Answer	Mark	Mark scheme	Additional guidance
13	$t = -\frac{3}{4}s + 21$	P1	For a process to rearrange the equation to give y in terms of x e.g. $y = \frac{4}{3}x + 3$ or $m = \frac{4}{3}$	
		P1	For using their gradient in $mn = -1$	
		P1	For showing a process to find the gradient of AB e.g. $\frac{t-15}{s-8}$ **OR** for substituting $x = 8$ **and** $y = 15$ in $y = "-\frac{3}{4}"x + c$	
		P1	(dep P3) for forming an equation in s and t e.g. $\frac{t-15}{s-8} = "-\frac{3}{4}"$ or $t = "-\frac{3}{4}"s + "21"$ **OR** correct equation in terms of x and y e.g. $y = -\frac{3}{4}x + 21$	y$-15 = -3/4(x - 8)$ gets P4
		A1	For $t = -\frac{3}{4}s + 21$ oe	Accept -0.75 for $-3/4$
14	$4, 5, 6$	M1	For method to solve $5x - 4 > 11$ e.g. $x > (11 + 4) \div 5 (> 3)$ oe	
		M1	For complete method to rearrange $\frac{x^2}{9x-14} < 1$ to the form $ax^2 + bx + c (< 0)$	
		M1	For method to begin to solve $x^2 - 9x + 14 (< 0)$ e.g. $(x - 2)(x - 7) (< 0)$	
		M1	(dep on previous M2) for $x > 2$ **and** $x < 7$ **or** for $2 < x < 7$	
		A1	(dep M4) cao	
			Alternative method	
		M1	For method to solve $5x - 4 > 11$ e.g. $x > (11 + 4) \div 5 (> 3)$ oe **OR** for $5 \times 3 - 4 = 11$	
		M3	For trials with $2, 3, 4, 5$ and 6 in the quadratic inequality, correctly evaluated	
		(M2)	For trials with four of $2, 3, 4, 5$ and 6, correctly evaluated	
		(M1)	For trials with three of $2, 3, 4, 5$ and 6, correctly evaluated	
		A1	(dep M4) cao	

END

Paper 2

Question	Answer	Mark	Mark scheme	Additional guidance
1(a)	g^7	B1	cao	
1(b)	$27x^9y^{12}$	B2 (B1	cao for 2 of 3 terms correct in a single product)	
1(c)	$4s^2t^2$	B2 (B1	cao for 2 of 3 terms correct in a single product)	
2	224	M1 A1	For listing at least 3 multiples of both 14 and 32 **or** finds the prime factors of both 14 and 32 cao	
3	$y = -\frac{1}{2}x - 4$	M1 M1 A1	For a correct method to find the gradient of the line, or $m = -\frac{1}{2}$ **or** identifies -4 as the intercept in words or in a partial equation **or** $y - b - m(x - a)$ where $m \neq -\frac{1}{2}$ and (a, b) is a correct coordinate For $y = -\frac{1}{2}x + c$ or $(A =) -\frac{1}{2}x - 4$ **or** $y = "-\frac{1}{2}"x - 4$ **or** $y - y1 = 3(x - x1)$ **or** $y - b = "-\frac{1}{2}"(x - a)$ where (a, b) is a correct coordinate Accept $y = -\frac{1}{2}x + -4$ oe	
4	$2 : 7$	P1 P1 P1 P1 A1	For process to find 10% **or** 90% of the cost, e.g. $7000 \times 0.1 (= 700)$ oe **or** $7000 \times 0.9 (= 6300)$ oe For process to find total cost of payments, e.g. $16 \times 306.25 (= 4900)$ For complete process to find value of deposit e.g. $"6300" - "4900" (= 1400)$ **or** $7000 - "4900" (= 2100)$ **and** $"2100" - "700" (= 1400)$ **or** the deposit as a proportion of the total cost e.g. $1 - \frac{4900}{6300} (= \frac{7}{9})$ For finding a correct un-simplified ratio, e.g. $1400 : 4900$ oe Accept $1 : 3.5$ **or** $1 : \frac{7}{2}$	

Question	Answer	Mark	Mark scheme	Additional guidance
5	Yes (supported)	P1 P1 A1	For a process to calculate the initial or new pressure, e.g. $(350 + 50) \div (20 + 5)(= 16)$ **or** $400 \div 25$ **or** $350 \div 20(= 17.5)$ For a complete process to make a comparison e.g. $0.9 \times$ "17.5"$(= 15.75)$ **or** $\frac{17.5-16}{17.5} \times 100(= 8.57 \ldots)$ **or** any other method to compare For a complete conclusion supported by accurate figures	
6	$\frac{5}{14}$	P1 P1 P1 A1	For a process to find a first value e.g. female/cycling $= 21 - 15(= 6)$ **Or** walking/total $= 75 - 21 - 32(= 22)$ **Or** male/total $= 75 - 33(= 42)$ For a process to find a secondary value, e.g. female/running = $33 - 10 - 6 = 17$ Complete process to find male/running e.g. $32 - 17(= 15)$ oe accept 0.35 to 0.36	
7	$\begin{pmatrix} 2 \\ -8 \end{pmatrix}$	M1 M1 A1	For writing $\boldsymbol{x}$ and $\boldsymbol{y}$ as column vectors e.g. $\binom{4}{-1}$ **and** $\binom{2}{2}$ Attempt to do $2\boldsymbol{x} - 3\boldsymbol{y}$ e.g. $2'\binom{4}{-1}' - 3'\binom{2}{2}'$ cao	Allow ecf from first step
8(a)	15	B1	cao	
8(b)	$\frac{80}{3}$	M1 A1	$fg(x) = \frac{5(4x^4)^2}{3}$ oe **or** $g(-1) = 4$ **or** $\frac{5(4\times1^4)^2}{3}$ oe accept 26.6 to 26.7	
9	$60°$	M1 M1 A1	For angle $BDE = 60$ **and** because angle $ODE = 90$ as FDE is a tangent e.g. $90 - 30 = 60$ $x =$ "60" **because** of **alternate segment** theorem cao	

Question	Answer	Mark	Mark scheme	Additional guidance
10	225	P1 P1 A1	For attempting to work out the area under the graph For using the formula for area of a trapezium e.g. $\frac{(30+15)}{2} \times 10 (= 225)$ **or** finding the area of two triangles and a rectangle e.g. $\left(\frac{1}{2} \times 10 \times 5\right) + \left(\frac{1}{2} \times 10 \times 10\right) + (15 \times 10)$ cao	
11	$x^2 + y^2 = 16$	B2 (B1	For $x^2 + y^2 = 16$ **or** $x^2 + y^2 = 4^2$ For $x^2 + y^2 = k$ where $k \neq 16$ **or** for writing down radius $= 4$	
12(a)	$a = 8$ $b = 15$ $c = 7$ $d = 2$	M1 A1	for a correct method to find at least 2 frequencies from bars of different widths e.g. $10 \times 0.8 (= 8), 15 \times 1 (= 15),$ $10 \times 0.7 (= 7), 20 \times 0.1 (= 2)$ cao	
12(b)	23	M1 A1	For $\frac{3(35+1)}{4} (= 27)$ **or** $11 + \left(\frac{12}{15} \times 15\right)$ cao	
13	616	P1 P1 P1 P1 A1	For correct use of formula for volume of a sphere e.g. $3/4 \times 4/3 \times \pi \times r^3 (= 343\pi$ **or** $1077.566 \ldots)$ For a complete process to find r, e.g. $r = \sqrt[3]{343}$ or $r = 7$ For a process to find the curved surface area e.g. $\frac{3}{4} \times 4 \times \pi \times "7"^2 (= 147\pi$ **or** $461.81 \ldots)$ For a process to find the complete surface area, e.g. $147\pi + (\pi \times "7"^2)$ 616 cm^2	

Question	Answer	Mark	Mark scheme	Additional guidance
14	7.52 **and** 7.80	B1	For one correct bound for mass or length e.g. 10.65 to 10.75 **or** 10650 to 10750 **or** 14.05 to 14.15 etc.	
		P1	For a correct process to find a bound for the volume, e.g. $14.05 \times 12.65 \times 7.75 (= 1377.42 \ldots)$ e.g. $14.15 \times 12.75 \times 7.85 (= 1416.23 \ldots)$	
		P1	For a process to find a bound for density, e.g. [mass LB] $\div 1416.23 \ldots (= 7.519 \ldots)$ **or** [mass UB] $\div 1377.42 \ldots (= 7.8044 \ldots)$	Accept 7.50 to 7.53 and 7.79 to 7.81
		A2	For both correct bounds $7.519\ldots$ **and** $7.804\ldots$ in $\mathrm{g/cm^3}$	Award max 4 marks if answers are not converted from kg to g

END