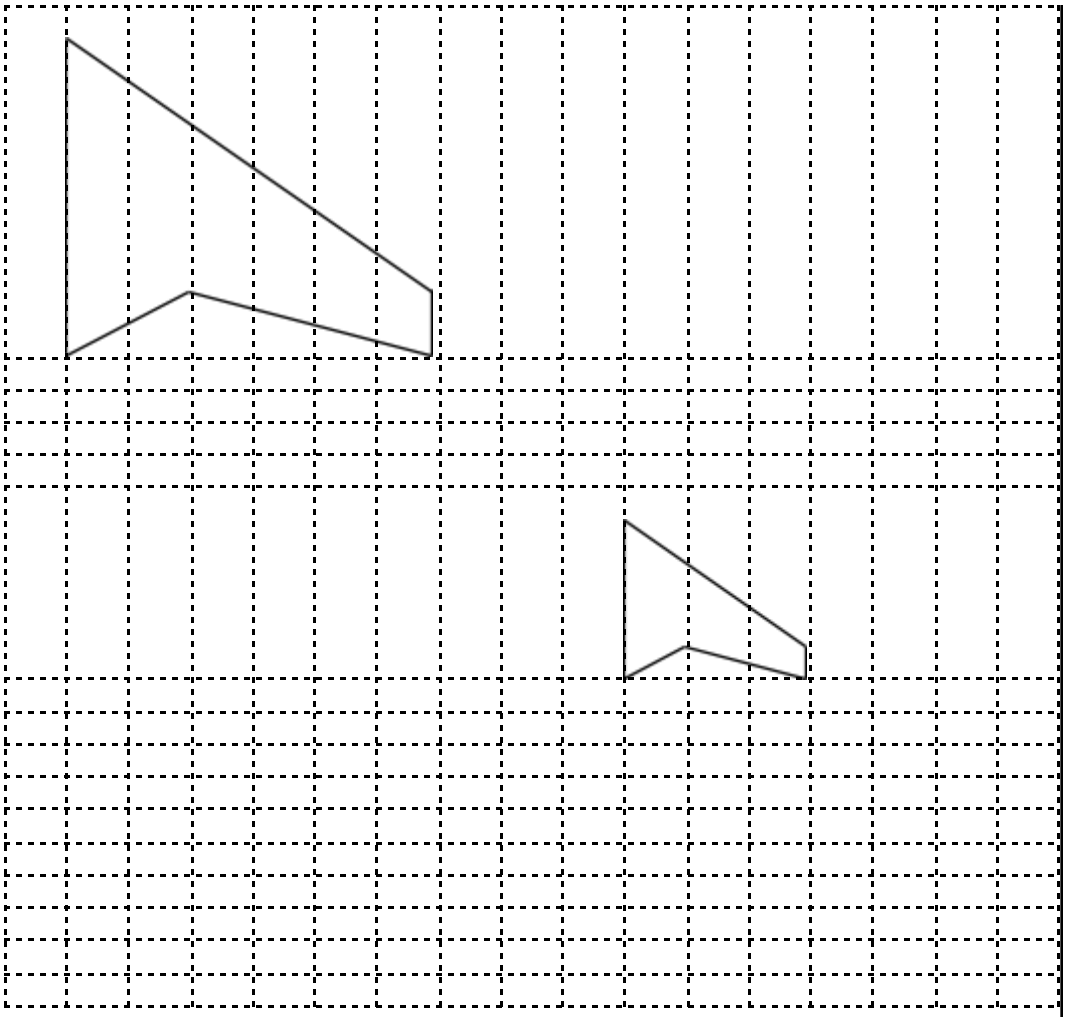
4N Prelims P1 2020

Marking Scheme

Question	Solution	Marks
1	$\frac{190-6.203}{0.0502}$ $= \frac{200-6}{0.05}$ $= 3880$	M1 [at least two numbers estimated to 1 s.f. correctly] A1
2	$1\frac{4}{9} = 1.4444\ldots..$ $\frac{\pi}{2} = 1.5707\ldots..$ $\sqrt{2} = 1.4142\ldots..$ 150% = 1.5 1.42 $\sqrt{2}$ smallest 1.42, $1\frac{4}{9}$, 150%, $\frac{\pi}{2}$ largest	B2 [1 mark for every two numbers in the correct position.]
3	$y = kx^2$, where k is a constant. Sub $y = 45$, $x = 3$ $45 = k(3)^2$ $45 = 9k$	

	$\frac{45}{9} = k$ $k = 5$ $\therefore y = 5x^2$ Sub $x = \frac{1}{2}$, $y = 5\left(\frac{1}{2}\right)^2$ $y = 1.25$	M1 A1
4(a) **4(b)**	Sub n = 53 into $5 - 3n$, 53rd term = $5 - 3(53)$ $= -154$ nth term = $7 + 4(n-1)$ $= 7 + 4n - 4$ $= 4n + 3$	 B1 B1 ACCEPT: $7 + 4(n-1)$
5(a) **5(b)**	$\frac{3^2}{3^5} \times 3^7$ $= 3^{-3} \times 3^7$ $= 3^4$ $4^x = 16^{-3}$ $4^x = (4^2)^{-3}$ $4^x = 4^{-6}$ $\Longrightarrow x = -6$	 B1 B1
6		

		
		B2 [Bl – any two to four lines drawn to correct scale factor]
7	No of members in 2019 = $\frac{1026}{108} \times 100$ $= 950$ **OR** 108% □ 1026 1% □ $\frac{1026}{108}$	M1 A1 **OR** M1

	100% $\square$ $\frac{1026}{108}\times 100$ $= 950$ Therefore, no of members in 2019 = 950	 A1
8	Length line CD = $\sqrt{[2-(-3)]^2+[-1-(-6)]^2}$ $= \sqrt{50}$ = 7.0711 (5 s.f.) = 7.07 units (3 s.f.)	M1 A1
9(a) **9(b)**	$2a^2+10b+12$ $= 2(a^2+5b+6)$ $2p^2-p-3$ $= (2p-3)(p+1)$	 B1 B2 **OR** M1 – frame, A1 - answer
10	Area of rectangle = 16×10 = 160 cm^2 Area of smaller sector = $\frac{40}{360}\times\pi(10)^2$ $= \frac{100\pi}{9}$ cm^2 / 34.907 cm^2 (5s.f.) Area of larger sector = $\frac{40}{360}\times\pi(16)^2$ $= \frac{256\pi}{9}$ cm^2 / 89.361 cm^2 (5 s.f.)	 M1 M1 [any area of sector correctly found]

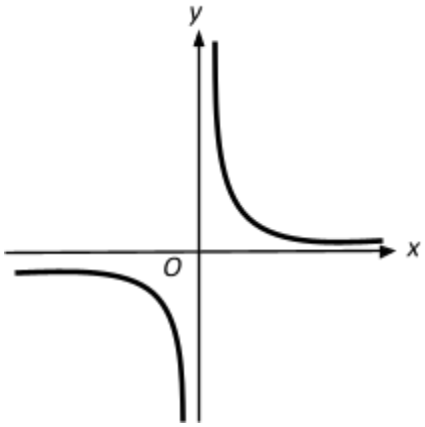
	Total area $= 160 + \frac{100\pi}{9} + \frac{256\pi}{9}$ $= 284.27$ (5 s.f.) $= 284$ cm^2 (3 s.f.)	 A1
11(a)	Map : Actual 1 : 125 000 1 cm : 1.25 km 3.5 cm : 4.375 km Actual length of path = 4.375 km	 B1
11(b)	Map : Actual 1 cm : 1.25 km 1^2 cm^2 : 1.25^2 km^2 1 cm^2 : 1.5625 km^2 $\frac{8}{1.5625}$ cm^2 : 8 km^2 5.12 cm^2 : 8 km^2 Area of water body on map = 5.12 cm^2	 M1 A1
12	Sum of interior angle of hexagon $= (6-2)\times 180°$ $= 720°$ $x° + x° + 100° + 140° + (x+30)° + 90° = 720°$ $3x° + 360° = 720°$ $3x° = 720° - 360°$ $3x° = 360°$ $x° = \frac{360°}{3}$ $x° = 120°$	 M1 M1 A1

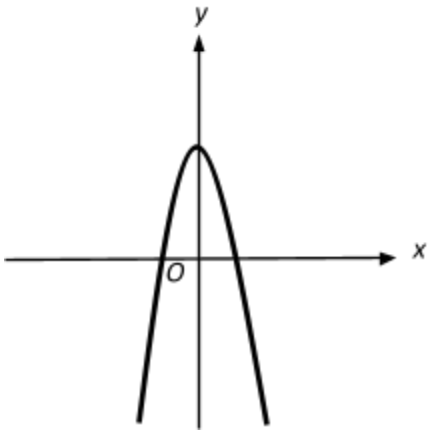
13(a)	acceleration = gradient of speed time graph acceleration = $\frac{50-8}{20-0}$ acceleration = 2.1 m/s^2 **OR** $a = \frac{v-u}{t}$ $a = \frac{50-8}{20}$ $a = 2.1$ m/s^2	B1 **OR** B1
13(b)	Total distance = Area under the graph $2500 = (T-20)(50)$ $T - 20 = 50$ $T = 70$	M1 A1
14(a)	Area of semicircle = $\frac{1}{2}\pi r^2$ $162\pi = \frac{1}{2}\pi r^2$ $162 = \frac{1}{2}r^2$ $\frac{162}{\left(\frac{1}{2}\right)} = r^2$ $324 = r^2$ $r = \sqrt{324}$ $r = 18$ cm Therefore, diameter = 18×2 = 36 cm.	M1

14(b)	1 cm = 0.01 m 1^2 cm^2 = 0.01^2 m^2 1 cm^2 = 0.0001 m^2 1800 cm^2 = 0.0001×1800 = 0.18 m^2	 B1
15(a)	Total decrease in temp = $800 - (-55)$ = 855°C Rate of decrease = $\frac{855}{15}$ = 57 °C / min	 B1
15(b)	320 s = $\frac{320}{60}$ = $5\frac{1}{3}$ min Temp decrease = $5\frac{1}{3} \times 57$ = 304°C Temp of metal block = $800 - 304$ = 496°C	 M1 [ACCEPT: their (a) answer × 57] A1
16	Payment offer = $\frac{8}{100} \times 5000 + 220 \times 24$ = \$5680 %tage increase = $\frac{5680 - 5000}{5000} \times 100\%$ = 13.6%	 M1 M1 A1

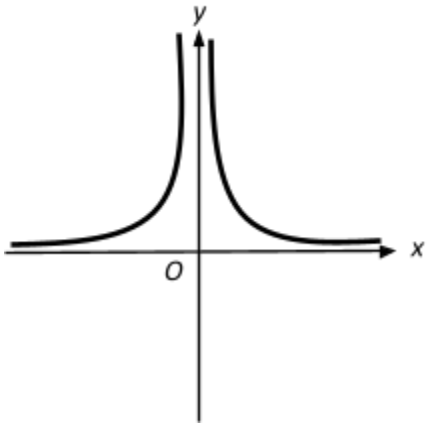
17(a)	$-4.25 < x \leq -3$	B1
17(b)	$y < 6y - 65$ $y - 6y < -65$ $-5y < -65$ $y > \frac{-65}{-5}$ $y > 13$	 M1 A1
17(c)	Smallest prime number = 17	B1
18(a)	Area of triangle TSR $= \frac{1}{2}(6)(7)\sin 95°$ = 20.920 cm^2 (5 s.f.) = 20.9 cm^2 (3 s.f.)	M1 A1
18(b)	$\frac{6}{10} = \frac{9.6}{EC}$ $6EC = 96$	M1

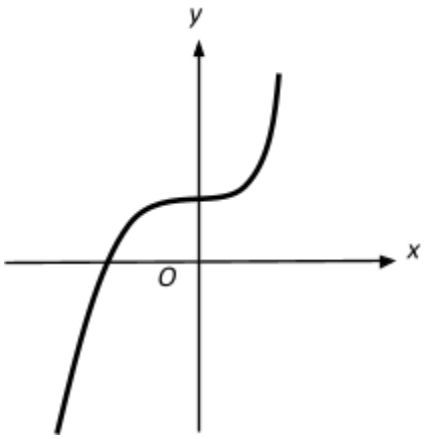
	$EC = \frac{96}{6}$ $EC = 16$ Therefore, $AB = EC = 16$ cm	 A1
19(a)	1. There are no options for those who do not exercise. 2. There is no specific time frame to consider for the survey. Should participants of survey consider no. of hours for one week, one month, one day of exercise? 3. Some non-integer options, e.g. 2.5h, are not available, so it is unclear which box the participants should fill in should they exercise for say 2.5h	 B1 (ACCEPT: any other feasible reason)
19(b)	Angle representing basketball = $126°$ $360° --> 600$ $1° --> \frac{600}{360}$ $126° --> \frac{600}{360} \times 126$ $= 210$ No. of students whose favourite sport is basketball = 210	M1 A1
20(a)(i)	P(letter S picked) = $\frac{3}{10}$	B1
20(a)(ii)	P(letters "N" and "G" not picked) = $\frac{8}{10}$ $= \frac{4}{5}$	 B1

20(b)	<u>Before SWISS added</u> P(letter S picked) = $\frac{3}{10}$	<u>After SWISS added</u> P(letter S picked) = $\frac{6}{15}$ $= \frac{2}{5}$	M1
	There will be a **<u>greater</u>** chance as **<u>probability of picking a letter S after SWISS is shuffled</u>** $\left(\frac{2}{5}\right)$ **<u>is larger than the probability of the letter S before SWISS is shuffled in</u>** $\left(\frac{3}{10}\right)$		A1
21	 $y = 2x^{-1}$ (A)		

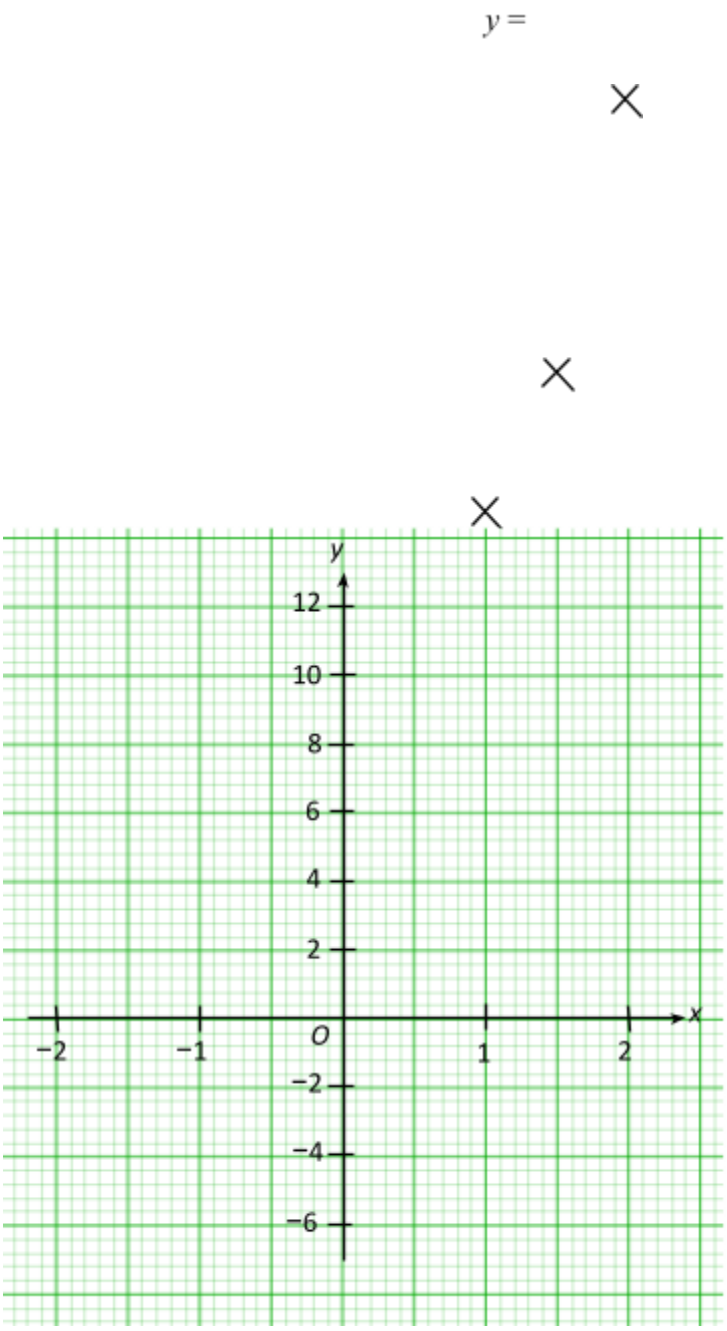


$y = -2x^2 + 3$ (E)



	$y = 2x^{-2}$ (B)  $y = 2x^3 + 3$ (C)	B1 for each correct equation matching the graph
22(a)	Angle $ACB = 180° - 70° - 70°$ $= 40°$ (isos triangle) Angle $ACD = 180° - 40°$ $= 140°$ (angle on a str line)	M1 A1 IGNORE: reasons

		OR Angle ACD $= 70° + 70°$ $= 140°$ (exterior angle of triangle)
22(b)	Angle $ABC = 180° - 70° - 90°$ $= 20°$ (angle sum of triangle) Angle $BAC = 180° - 20° - 140°$ $= 20°$ (angle sum of triangle) **OR** Angle $BAC = 90° - 70°$ $= 20°$ Since angle ABC = angle BAC for triangle ABC, this implies that $BC = AC$, thus making triangle ABC an isosceles triangle.	M1 [Both angle ABC and BAC found] A1
23(a)	Modal age = 47 years	B1
23(b)	Position $= \frac{20+1}{2}$ $= 10.5$ Median $= \frac{43+44}{2}$ $= 43.5$	M1 A1/B2
23(c)	$\frac{2}{3} \times 20$	

	= 13.333…. No of staff 35 years or older = 15 This statement is correct as more than 13/14 staff are 35 years old or older.	B1
24(a)		B1- Table of values with at least 4 points P2 C1

		
24(b)	Line drawn as shown above.	B1
24(c)	$x = 1.6$	B1 ACCEPT: 1.6 ± 0.1
25(a)	$\frac{x}{3} + \frac{2x+5}{4} = 5$ $\frac{4x}{12} + \frac{3(2x+5)}{12} = 5$ $\frac{4x+3(2x+5)}{12} = 5$ $\frac{4x+6x+15}{12} = 5$ $\frac{10x+15}{12} = 5$ $10x+15 = 60$ $10x = 60-15$ $10x = 45$ $x = \frac{45}{10}$ $x = 4.5$	M1 A1
25(b)	$x(p+a) = 9$ $xp + xa = 9$	 M1

	$xp = 9 - xa$ $p = \frac{9 - xa}{x}$ **OR** $x(p + a) = 9$ $p + a = \frac{9}{x}$ $p = \frac{9}{x} - a$	A1 M1 A1
25(c)	$5a + b = 13$ ---------eqn 1 $-4a + 3b = -18$ ---------eqn 2 **<u>By elimination</u>** eqn 1×3: $3(5a + b) = 3(13)$ $15a + 3b = 39$ ---------- eqn 3 $-4a + 3b = -18$ ---------- eqn 2 eqn 3 – eqn 2: $15a + 3b - (-4a + 3b) = 39 - (-18)$ $15a + 3b + 4a - 3b = 57$ $19a = 57$ $a = \frac{57}{19}$ $a = 3$ Sub $a = 3$ into eqn 1 $5(3) + b = 13$ $15 + b = 13$ $b = 13 - 15$	 M1 A1

	$b = -2$	A1
	OR	
25(c)	**<u>By substitution</u>**	
	From eqn 1, $5a + b = 13$ $b = 13 - 5a$ -------- eqn 3	M1
	Sub eqn 3 into eqn 2, $-4a + 3(13 - 5a) = -18$ $-4a + 39 - 15a = -18$ $-19a + 39 = -18$ $-19a = -18 - 39$ $-19a = -57$ $a = \frac{-57}{-19}$ $a = 3$	A1
	Sub $a = 3$ into eqn 3, $b = 13 - 5(3)$ $b = -2$	A1