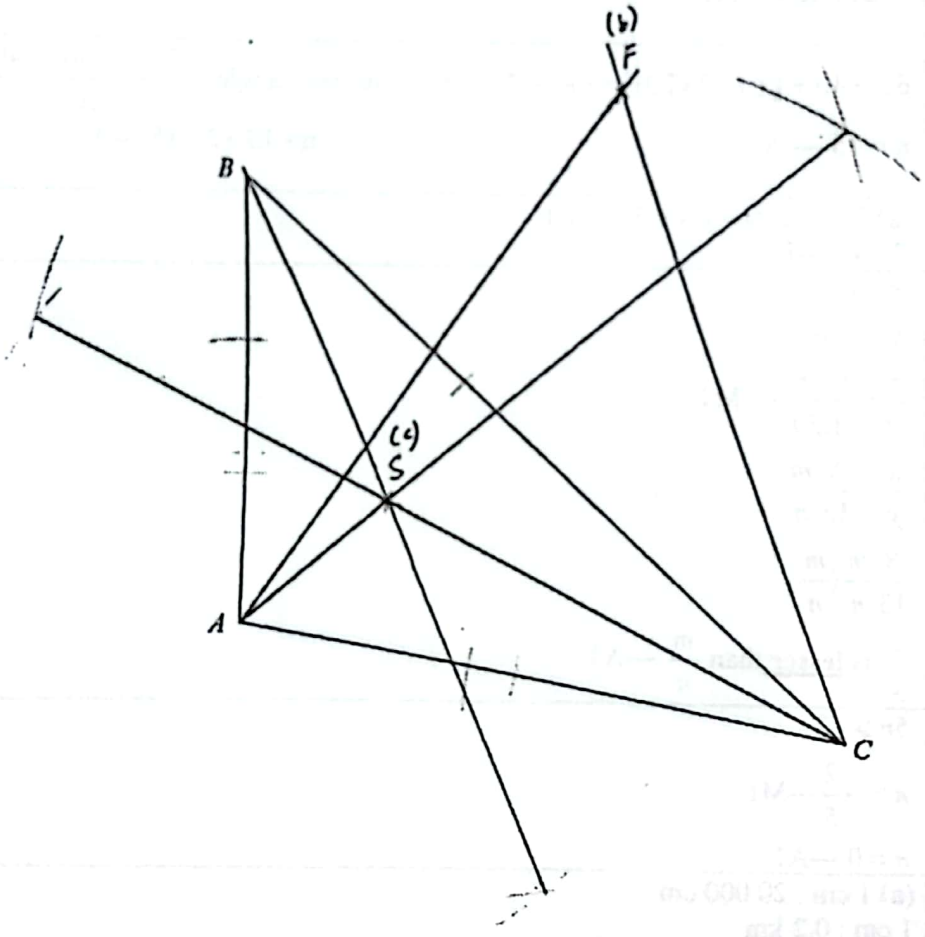
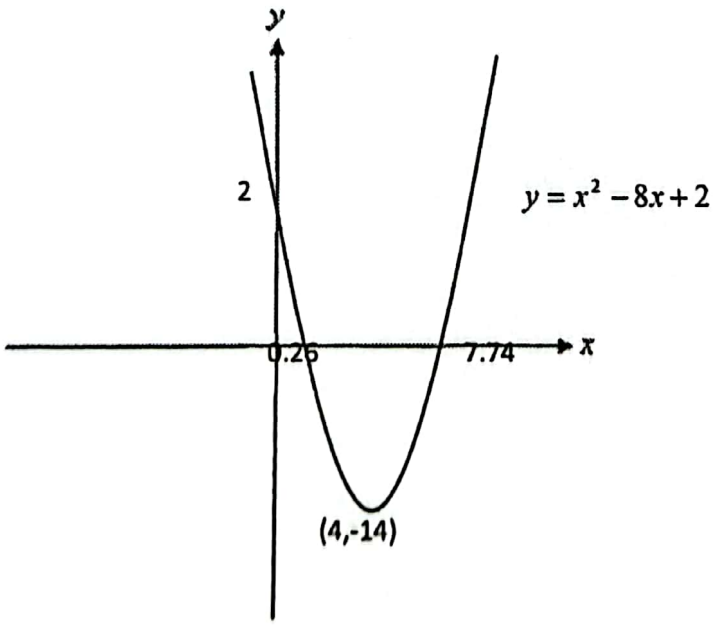
2022 Prelim 4E5N EM P1 Marking Scheme

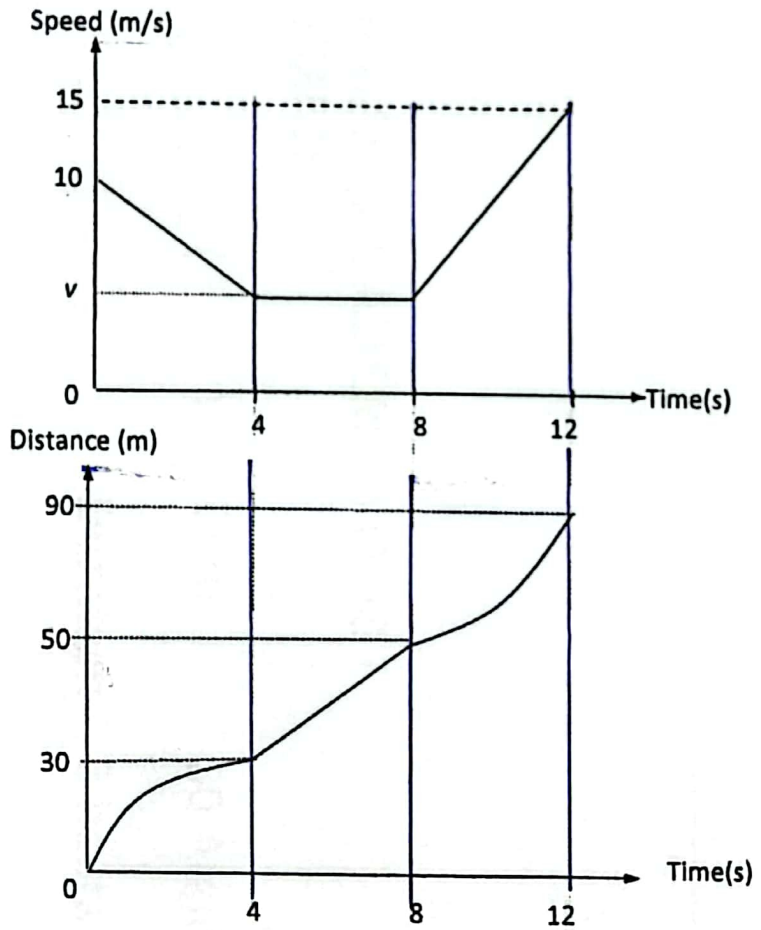
Q	Solution
1	(a) $9430\times10^{9}=9.43\times10^{12}$ ---B1 (b) $7.6\times9.43\times10^{12}$ $=7.1668\times10^{13}$ = 71 668 000 million kilometres ---B1
2	100% → \$25 000 70% → $\frac{70}{100}\times\$25000$ = \$17500 ---M1 Final price = $\frac{98}{100}\times\$17500$ = \$17 150 ---A1
3	$60+40+[(n-2)(20)]=360$ ---M1 or Remaining angles$=\frac{360°-60°-40°}{20°}=13$ ---M1 n = 15 --- A1 n= 13 +2= 15 ---A1
4	(a) $35-6n$ or $-6n+35$ ---B1 (b) 45 ---B1
5	$x=0.8m$ $y=1.3n$ $\frac{x}{y}=\frac{0.8m}{1.3n}$ --- M1 $\frac{x}{y}=\frac{8}{13}\frac{m}{n}$ $\frac{8}{13}\frac{m}{n}<\frac{m}{n}$ $\frac{x}{y}$ is lesser than $\frac{m}{n}$ ---A1
6	$5n>-2$ $n>-\frac{2}{5}$---M1 $n=0$ ---A1
7	(a) 1 cm : 20 000 cm 1 cm : 0.2 km Distance on map : $\frac{0.2}{1}\times3=15$ cm---B1 (b) 1 cm : 0.2km 1 cm^2 : $(0.2)^2$ km^2---M1 1 cm^2 : 0.04 km^2 Actual area of lake: $0.04\times150=6$ km^2 ---A1

8	$3x + 2y = 5$ -----(1) $2x - y = 8$ -----(2) (2)$\times 2$, $4x - 2y = 16$ ---(3)—M1 for using substitution or elimination method (3) +(1), $4x + 3x = 16 + 5$ $7x = 21$ $x = 3$ ---A1 Sub $x = 3$ into (2), $y = -2$ ---A1
9	((a) $\tan \angle CAB = \frac{12}{11+5} = \frac{12}{16} = \frac{3}{4}$ ---B1 (b) $\sin \angle CDB = \frac{12}{13}$ ---B1 (c) $\cos \angle ADB = -\cos \angle CDB$ $= -\frac{5}{13}$ --B1
10	$\frac{1}{x-2} + \frac{x}{x^2-3x+2}$ $= \frac{1}{x-2} + \frac{x}{(x-1)(x-2)}$ ---M1 for factorising denominator $= \frac{(x-1)+x}{(x-1)(x-2)}$ ---M1 $= \frac{2x-1}{(x-1)(x-2)}$ ---A1
11	(a) $\angle AXM = \angle CXD$(vert. opp. angles) $\angle AMX = \angle CDX$(alt. angles) } B2 for all the two statements seen or B1 for either one pair of angles identified with correct reason ΔAMX is similar to ΔCDX(AA Similarity Test) (b) area of triangle AMX : area of triangle CDX $3^2 : 4^2$ 9: 16 ---B1
12	(a) { 1, 4, 8, 10, 14 } --- B1 (b) 10 --- B1 (c) $P' \cap Q$ ---B1

13	(a) $\left(\frac{9}{x^4}\right)^{-\frac{1}{2}} = \frac{x^2}{3}$ ---B1 (b) $^{-14} = 2^k$ $^{4)} = 2^k$ ---M1 $k = 17$ ---A1
14	(a) (i) $k = 2 \times 3 \times 7^2 = 294$ ---B1 (ii) $n = 5 \times 11 = 55$ ---B1 (b) LCM $= 2^2 \times 5^2 \times 7$ ---M1 $= 700$ 700 min = 11 h 40 min Time = 18 10 hrs or 6.10pm ---A1
15	(a) $\frac{58+4x}{25+x} = 2.5$ ---M1 $116+8x = 125+5x$ $3x = 9$ $x = 3$ ---A1 (b) Median $= \frac{16^{th}+17^{th}\text{ person}}{2} = \frac{2+3}{2}$ $= 2.5$ ---B1 (c) $x = 10$ ---B1
16	(a) $2a^2 - 18$ $= 2(a^2-9)$ ---M1 or $(2a+6)(a-3)$ ---M1 $= 2(a+3)(a-3)$ ---A1 (b) $x^2+3x-28 = 0$ $(x-4)(x+7) = 0$ ---M1 for factorization $x = 4$ or -7 ---A1 for both answers
17	(a) Area of smaller circle $= \pi(2x)^2 = 4\pi x^2$ Area of bigger circle $= \pi(4x)^2 = 16\pi x^2$ } M1 for area of smaller or bigger circle Probability $= \frac{4\pi x^2}{16\pi x^2} = \frac{1}{4}$ ---A1 (b) Area of shaded region $= 16\pi x^2 - 4\pi x^2 = 12\pi x^2$ ---M1 Ratio $= 12\pi x : 4\pi x^2$ $= 3:1$ ---A1

18	Area of Circle = πx^2 Area of square = $4x^2$ Shaded region = $4x^2 - \pi x^2$ ---M1 $4x^2 - \pi x^2 = 8x$ ---M1 for forming eqn $4x^2 - \pi x^2 - 8x = 0$ $x(4x - \pi x - 8) = 0$---M1 $x = 0$ (rej) or $(4x - \pi x - 8) = 0$ $x = \frac{8}{4 - \pi}$---A1
19	(a) 133°(±1°) ---B1 (b) Labelling of the intersection of the two lines from the bearings as F ---B1 (c) Any two of the angle bisectors drawn and labelling of the intersection as S---B2 
20	(a)IQR = Q_3 - Q_1 = 74.5 - 61.5 = 13 Billy is <u>not correct/wrong.</u> [B1] 35 cm is the range not IQR. or IQR should be 13 cm not 35 cm. [B1]

	(b) Probability $= \frac{5}{20} \times \frac{7}{19} \times 2$ ---M1 $= \frac{7}{38}$ ---M1
21	(a) $PQ = \sqrt{(4-(-4))^2 + (4-(-2))^2}$ ---M1 $= \sqrt{100} = 10$ ---A1 (b) $grad = \frac{4-(-2)}{4-(-4)} = \frac{3}{4}$ ---M1 $4 = \frac{3}{4}(4) + c$ $c = 1$ Equation of line: $y = \frac{3}{4}x + 1$ ---A1 (c) $R(-1\frac{1}{3}, 0)$ or $R(-\frac{4}{3}, 0)$ ---B1
22	(a) $x^2 - 8x + 2$ $= (x-4)^2 - 4^2 + 2$ $= (x-4)^2 - 14$ $h = 4$ *o.e* [B1], $k = -14$ *o.e* [B1] (b) $x^2 - 8x + 2 = 0$ $(x-4)^2 - 14 = 0$ $(x-4)^2 = 14$---M1 $x = \sqrt{14} + 4$ *or* $-\sqrt{14} + 4$ $= 7.74$ *or* 0.26---A1 for both ans (c) 

	B1 for correct x and y intercepts B1 for correct shape and turning point (d) $x = 4$ ---B1
23	(a) $\frac{1}{2}(v + 10)(4) + 4v = 50$ ---M1 $6v = 30$ $V = 5$ ---A1 (b) Let s be speed at 9th second $\frac{15 - 5}{4} = \frac{s - 5}{9 - 8}$ --M1 or acceleration= $\frac{15 - 5}{4} = 2.5$ ---M1 $S = 7.5$ m/s ---A1 Speed = 5 +2.5 = 7.5m/s ---A1 (c)  B1, B1, B1(for each correct time segment)