Math scheme to 2022 Sec 4/5 Express Prelim P1		
1	$\$2912.50 - \$2500 = \$412.50$ $412.50 = \dfrac{2500 \times 3 \times T}{100}$ $T = \dfrac{412.50 \times 100}{2500 \times 3}$ $T = 5.5 years$	M1 – show $\dfrac{412.50 \times 100}{2500 \times 3}$ A1
2	*Using Pythgoras Theorem,* $PQ = \sqrt{19.5^2 + 12.2^2}$ $PQ = \sqrt{529.09}$ $PQ = 23.00195644$ $PQ = 23.0\ cm (3 s.f.)$	M1 – show either $\sqrt{19.5^2 + 12.2^2}$ or $\sqrt{529.09}$ A1
3	$96 \times 0.5h = 48km$ $120 - 48 = 72km$ $av\ speed = \dfrac{72km}{1.25h}$ $av\ speed = 57.6km/h$	M1 – show 72km or 1.25h A1
4a	$\dfrac{3}{7} = \dfrac{12}{28}$ $total\ number\ of\ balls = 28$ $28 - 12 - 6 = 10\ white\ balls$	B1
4b	*let the number of yellow balls added be x.* $\dfrac{6+x}{28+x} = \dfrac{7}{18}$ $18(6+x) = 7(28+x)$ $108 + 18x = 196 + 7x$ $18x - 7x = 196 - 108$ $11x = 88$ $x = 8$	B1

5	$\dfrac{5x}{3}-\dfrac{3(x+4)}{2}$ $=\dfrac{2\times 5x}{6}-\dfrac{3\times 3(x+4)}{6}$ $=\dfrac{10x}{6}-\dfrac{(9x+36)}{6}$ $=\dfrac{10x-9x-36}{6}$ $=\dfrac{x-36}{6}$	M1 – form common denominator A1
6a	$x+x-1+x-2+x-3+x-4=19\times 5$ $5x-10=95$ $5x=105$ $x=\dfrac{105}{5}$ $x=21$	B1
6b	p, p^3, p^5 *are negative integers.* p^2, p^4 *are positive integers.* *The ascending order is* p^5, p^3, p, p^2, p^4. p *is the median, instead of* p^3.	} } either statement B1 } }B1
7	*Volume of a cuboid* $= 3\times 2\times 2$ $=12cm^3$ *Total Volume of cube* $= 12\times 6174$ $=74088cm^3$ *Length of the cube* $=\sqrt[3]{74088}$ $=42cm$	M1 – find total volume of cube A1
8	$510\times\dfrac{100-13.2}{100}$ $=\$442.68$ OR $510\times\dfrac{13.2}{100}$ $=67.32$ $510-67.32=\$442.68$	M1 – show 86.8% of \$510 A1 M1 – show 13.2% of \$510 A1

<table>
<tr><td>9a</td><td>$\frac{6}{5} \times \frac{2}{15x} = 3$
$\frac{12}{75x} = 3$
$12 = 225x$
$x = \frac{4}{75}$ or $0.0533\ (3s.f)$</td><td>B1</td></tr>
<tr><td>9b</td><td>$3p - 4(6p - 8q)$
$= 3p - 24p + 32q$
$= -21p + 32q$</td><td>M1 – expansion of -4(6p-8q)
A1</td></tr>
<tr><td>10</td><td><table><tr><th>Favourite drink</th><th>Sector angle</th></tr><tr><td>Fruit juice</td><td>108°</td></tr><tr><td>Soft drink</td><td>162°</td></tr><tr><td>Coffee</td><td>90°</td></tr></table></td><td>B1 each
(deduct 1 mark overall for no unit)

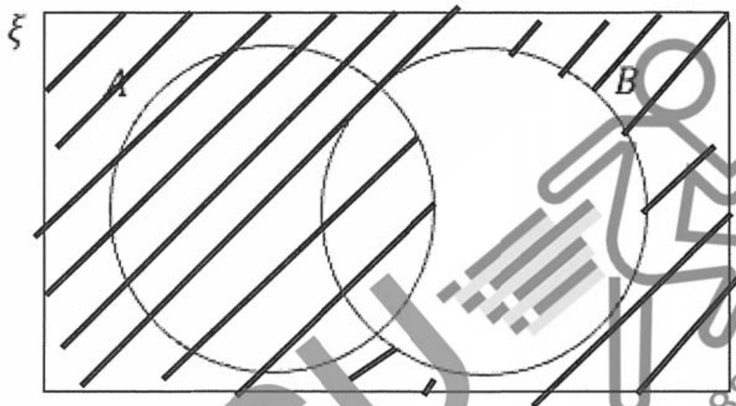
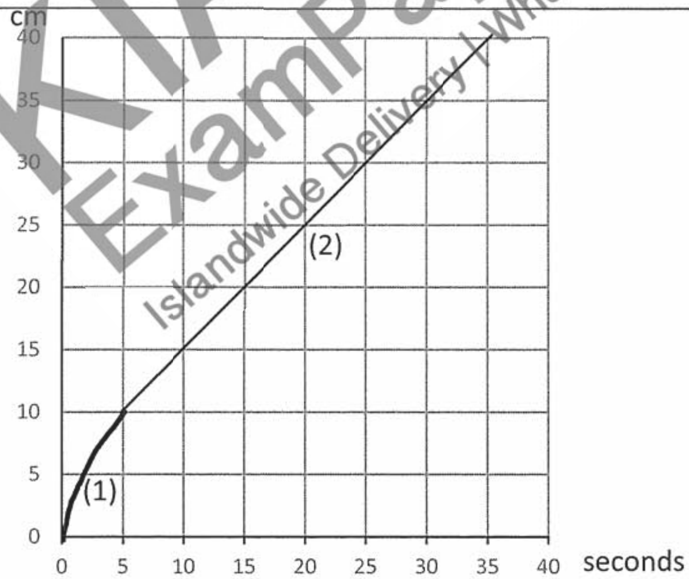
Max: B3</td></tr>
<tr><td>11</td><td>$interior\ angle\ of\ hexagon = \frac{(6-2)180}{6}$
$= 120°$

$exterior\ angle\ of\ n-sided\ polygon = \frac{120°}{5} = 24°$
$number\ of\ sides = \frac{360}{24}$
$n = 15$

or
$interior\ angle\ of\ n-sided\ polygon = 180 - 24 = 156°$
$(n-2)180 = 156n$
$180n - 350 = 156n$
$24n = 360$
$n = \frac{360}{24}$
$n = 15$</td><td>M1 – finding interior angle

M1 - $\frac{360}{24}$

A1</td></tr>
</table>

12a		B1
12bi	$n(P \cap R) = 1$	B1
12bii	$P \cap Q = \varnothing$ or { }	B1
13a	$\frac{1}{7} \times 35 = 5sec$	B1
13b		B1 – (1) t = 0 to t = 5: 0 – 10 cm B1 – (2) for last 30 s: 10 – 40 cm 1) Award 0 m for (1) if Q13a is wrong 2) Award 1 m for (2) if (2) start at 10 cm and end at 40 cm at 35 s
14	$5308.23 = P\left(1 + \frac{\frac{2.4}{4}}{100}\right)^{10}$ $P = 5308.23 \div \left(1 + \frac{\frac{2.4}{4}}{100}\right)^{10}$ $P = 4999.999$ $P = 5000(nearest\ dollar)$	M1 – r= 0.6 & n = 10 A1

15a	$\angle ABC = \angle ADE$ (*given*) $\frac{AB}{AD} = \frac{6}{15} = \frac{2}{5}$ $\frac{BC}{DE} = \frac{9}{22.5} = \frac{2}{5}$ *Since two pairs of corresponding sides are in the same ratio and one pair of corresponding included angles is the same,* $\triangle ACB$ *and* $\triangle AED$ *are similar.* OR	M1 – must show the same ratio and common **<u>included</u>** angle A1 – statement must be stated
	$\angle ABC = \angle ADE$ (*given*) $\angle BAC = \angle DAE$ (*common angle*) *Since two pairs of corresponding angles are the same,* $\triangle ACB$ *and* $\triangle AED$ *are similar.*	M1 – must show the two **<u>pairs of</u>** angles A1 – statement must be stated
15b	$\frac{AC}{AE} = \frac{AB}{AD}$ $\frac{AC}{20} = \frac{6}{15}$ $AC = \frac{6}{15} \times 20$ $AC = 8cm$ $CD = 15 - 8$ $CD = 7cm$	M1 AG1
16a	$x^2 - (x+y)(x-y)$ $= x^2 - (x^2 - y^2)$ $= y^2$	M1- show the expansion A1
16b	$1288073407^2 - 1288073405 \times 1288073409$ $= 1288073407^2 - (1288073407 - 2) \times (1288073407 + 2)$ $= 4$	B1

17	$p = \frac{k}{q^2}$ $k = pq^2$ $new\ p = \frac{pq^2}{(5q)^2}$ $new\ p = \frac{pq^2}{25q^2}$ $new\ p = \frac{1}{25}p$ $\frac{1}{25}p - p = -\frac{24}{25}p$ $\%change = -\frac{24}{25} \times 100$ $= -96\%$	M1 – either show k = pq^2 or $25q^2$ A1
18	$\left(\frac{36a^2}{b^4}\right)^{-\frac{3}{2}}$ $= \left(\frac{b^4}{36a^2}\right)^{\frac{3}{2}}$ $= \left(\sqrt{\frac{b^4}{36a^2}}\right)^3$ $= \left(\frac{b^2}{6a}\right)^3$ $= \frac{b^6}{216a^3}$	M1 – apply fractional index, either square root or cube all terms A1
19a	$\frac{44.72km}{1h} = \frac{44.72 \times 1000}{1 \times 60 \times 60}$ $= \frac{559}{45}$ $= 12\frac{19}{45}\ or\ 12.4(3sf)$	B1
19bi	$\frac{300}{25} = 12cm$	B1

19bii	$\frac{mass\ of\ smaller\ cone}{mass\ of\ larger\ cone}=\left(\frac{1}{25}\right)^3$ $\frac{mass\ of\ smaller\ cone}{7200}=\frac{1}{15625}$ $mass\ of\ smaller\ cone=\frac{1}{15625}\times 7200$ $=0.4608g\ or\ 0.461g(3sf)$	M1 - $\left(\frac{1}{25}\right)^3$ A1
20	$24.249=\frac{1}{2}\times 7\times 8\times \sin\angle ABC$ $\angle ABC=\sin^{-1}\left(\frac{24.249}{\frac{1}{2}\times 7\times 8}\right)$ $\angle ABC=60.001°$ $obtuse\ \angle ABC=180-60.001=119.999°$ *Appling cosine rule,* $AC=\sqrt{7^2+8^2-2(7\times 8\times \cos 119.999)}$ $AC=\sqrt{168.998}$ $AC=12.999$ $AC=13.0\ (3sf)cm$	M1 – applying Area of Triangle, show sin-1 M1 - Find obtuse M2 – apply cosine rule A1
21a	$LCM=2^3\times 3\times 5$ $=120\ minutes$ $=2\ hours$ $Time\ =\ 09\ 00\ \ or\ 9am$	M1 A1
21b	$HCF\ =12\ =\ 2^2\times 3$ $smallest\ possible\ value\ of\ x\ =\ 2\times 2^2\times 3=24$	M1 A1
22a	$3a^2+4b-6a-2ab$ $=3a^2-2ab-6a+4b$ $=a(3a-2b)-2(3a-2b)$ $=(a-2)(3a-2b)$	M1 A1

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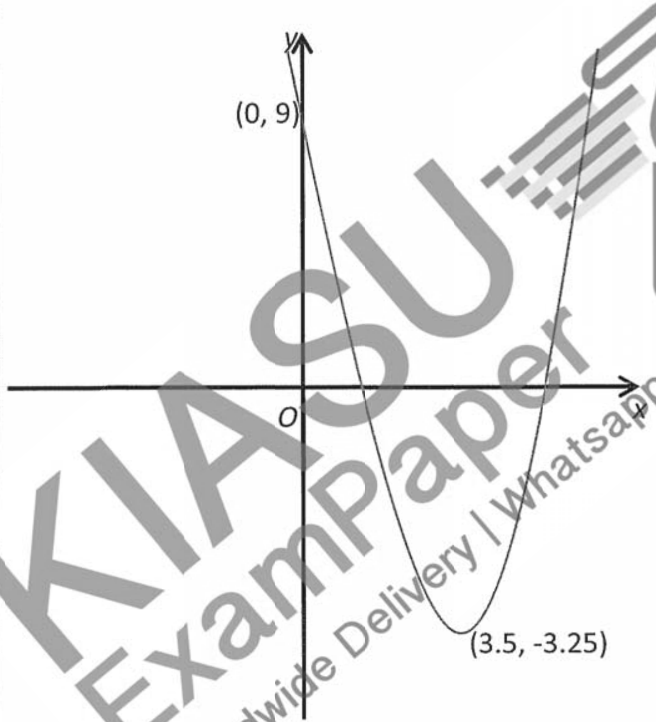
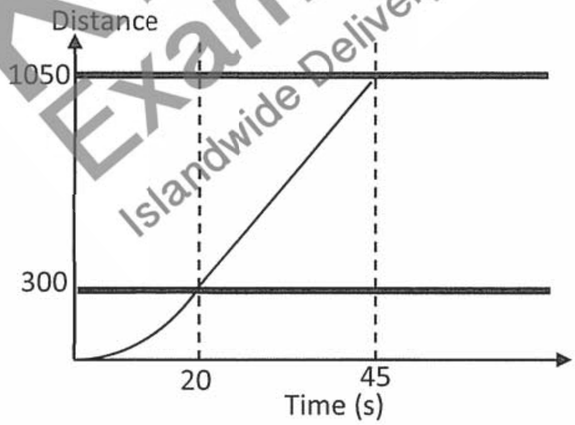
22b	$12x^2-25x+12=0$ $(4x-3)(3x-4)=0$ $4x-3=0 \text{ or } 3x-4=0$ $4x=3 \text{ or } 3x=4$ $x=\frac{3}{4} \text{ or } x=\frac{4}{3}$	M1 A2
23ai	$AB=\begin{pmatrix}250 & 250 & 100\\400 & 200 & 90\end{pmatrix}\begin{pmatrix}1\\1\\1\end{pmatrix}$ $AB=\begin{pmatrix}600\\690\end{pmatrix}$	B1 – 600 B1 – 690
23aii	*The elements in AB represent the total amount of flour, butter and sugar used in making a sponge cake and a butter cake respectively.*	B1
23bi	$D=\begin{pmatrix}20\\48\\15\end{pmatrix}$	B1
23bii	$E=\begin{pmatrix}2.5 & 2.5 & 1\\4 & 2 & 0.9\end{pmatrix}$	B1
24a	$9-7x+x^2=x^2-7x+9$ $=(x-3.5)^2-3.25$ $=-3.25+(x-3.5)^2$	B1 - -3.5 B1 - -3.25

24bi		C1 – shape and symmetric curve correct P1 – y-intercept And minimum point
24bii	x = 3.5	B1
25a	0	B1
25b	$Gradient = \frac{30}{20}$ $\frac{speed}{4} = \frac{3}{2}$ $speed = \frac{3}{2} \times 4$ $speed = 6m/s$	M1 - $\frac{3}{2}$ A1

25c	$1350 = \frac{1}{2}(25+k)30$ $2700 = (25+k)30$ $\frac{2700}{30} = 25+k$ $90 = 25+k$ $90-25 = k$ $k = 65$	M1 A1
	$\left(\frac{1}{2}\times 20\times 70\right)+(25\times 30)+\left(\frac{1}{2}\times(k-45)\times 30\right)=1350$ $300+750+15(k-45)=1350$ $15k=975$ $k=65$	M1 A1
25d		L1 - Correct label of the distances C1 – correct sketching of graph -1 m if graph is not proportional