	Solution	Marks	Remarks
1.	$\dfrac{m^9}{(m^3n^{-7})^5} = \dfrac{m^9}{m^{15}n^{-35}}$	1M	for $(a^p b^q)^r = a^{pr}b^{qr}$
	$= \dfrac{n^{35}}{m^{15}m^{-9}}$	1M	for $a^{-p} = \dfrac{1}{a^p}$
	$= \dfrac{n^{35}}{m^6}$.	1A	
		……... (3)	
2.	$\dfrac{4a+5b-7}{b} = 8$		
	$4a+5b-7 = 8b$	1M	
	$-3b = 7-4a$	1M	for putting b on one side
	$b = \dfrac{4a-7}{3}$.	1A	or equivalent
		……... (3)	
3.	The required probability $= \dfrac{3+2+1}{4\times 5}$	1M + 1M	1M for the nominator 1M for the denominator
	$= \dfrac{3}{10}$.	1A	or 0.3
		……... (3)	
4.(a)	$x^3 + x^2y - 7x^2$		
	$= x^2(x+y-7)$.	1A	
4.(b)	$x^3 + x^2y - 7x^2 - x - y + 7$		
	$= x^2(x+y-7) - x - y + 7$	1M	for using (a)
	$= (x+y-7)[x^2 - (x+y-7)]$	1M	for factorization
	$= (x-1)(x+1)(x+y-7)$.	1A	or equivalent
		……... (4)	
5.(a)	$\dfrac{7-3x}{5} \le 2(x+2)$,		
	$7-3x \le 10x+20$		
	$x \ge -1$	1A	
	$4x - 13 > 0$		
	$x > \dfrac{13}{4}$	1A	$x > 3.25$
	Thus, the required solution is $x > \dfrac{13}{4}$.	1A	
5.(b)	4	1A	
		……... (4)	
6.(a)	Let $\$x$ be the selling price of the book.		
	$\dfrac{x-250}{250} = 20\%$	1M	for percentage profit $= \dfrac{p-c}{c}$
	$x = 300$.		
	Thus, the selling price of the book is $300 .	1A	u–1 for missing unit

6.(b)	Let $\$y$ be the marked price of the book.		
	$y(1-25\%)=x$	1M	
	$y=400.$		
	Thus, the marked price of the book is $\$400$.	1A	u–1 for missing unit
		……... (4)	
7.	Let a be the number of apples owned by Ada and b be that owned by Billy.		
	$\begin{cases} a=4b \\ a-12=b+12 \end{cases}$	1M	for both equations
	Solving, $a=32$ and $b=8.$	1A + 1A	1A for each value
	Thus, the total number of apples owned by them is 40 .	1A	
		……... (4)	
8.	$\angle CAD=\angle CBD=25°$	1M	$\angle$s in the same segment
	$\because AB=AD$	1M	
	$\therefore \angle BAD=180°-2\times 58°=64°.$		
	$\angle BDC=\angle BAC=64°-25°=39°$	1A	
	$\because BC=CE$		
	$\therefore \angle BEC=\dfrac{180°-58°}{2}=61°.$	1M	
	$\angle ABE=61°-\angle BAE=22°.$	1A	u–1 for missing unit
		……... (5)	
9.(a)	Let $x°$ be the required angle.	1M	
	$\pi\times 12^2\times\dfrac{x}{360°}=30\pi$	1M	for $\pi r^2\times\dfrac{\theta}{360°}=A$
	$x=75.$		
	Thus, the angle of the sector is $75°$.	1A	
9.(b)	The required perimeter $=2\pi\times 12\times\dfrac{75}{360}+2\times 12$	1M + 1M	1M for the arc length 1M for the radii
	$=(24+5\pi)$ cm.	1A	in terms of π u–1 for missing unit
		……... (5)	
10.(a)	Let a and b be two constants.		
	$\begin{cases} a+10b=10600 \\ a+6b=9000 \end{cases}$	1M	
	Solving, $a=6600$ and $b=400.$	1M	
	Thus, the required income = $6600+20\times 400=\$14\,600.$	1M + 1A	u–1 for missing unit
		……... (4)	
10.(b)	Let N be the number of handbags sold in a month such that her income is $\$18\ 000$.		
	$N=\dfrac{18000-6600}{400}=28.5$	1M	
	Since 28.5 is not an integer, it is not possible that the income is $\$18\ 000$.	1A	
		……... (2)	
11.(a)	$f(2)=(2-2)^2(2+h)+k=-5$	1M	for remainder and factor theorems
	$f(3)=(3-2)^2(3+h)+k=0$		
	$h=2$ and $k=-5$	1A + 1A	
		……... (3)	

11.(b)	$\mathrm{f}(x)=0$		
	$(x-2)^2(x+2)-5=0$		
	$(x^2-4x+4)(x+2)-5=0$		
	$x^3-2x^2-4x+3=0$		
	$(x-3)(x^2+x-1)=0$	1M	
	$x=3$ or $x=\dfrac{-1\pm\sqrt{5}}{2}$	1M	
	Thus, not all the roots of the equation $\mathrm{f}(x) = 0$ are integers. The claim is disagreed.	1A	
		……... (3)	
12.(a)	mean = 55 kg	1A	
	median = 52 kg	1A	
	range = 79 – 40 = 39 kg	1A	
		……... (3)	
12.(b)	Let a and b be the required weights.		
	$\dfrac{a+b+55\times 20}{22}=56$		
	$a+b=132$	1M	
	Note that $a = 80$ kg as the range is increased by 1 kg . Thus,	1M	
	the weight of each of these students is 80 kg and 52 kg .	1A + 1A	u–1 for missing unit
		……... (4)	
13.(a)	$AE=BF$ (given)		
	$AB=BC$ (properties of square)	1	with reasons
	$\angle ABE=\angle BCF=90°$ (properties of square)		
	$\Delta ABE\cong\Delta BCF$ (R.H.S.)	1	with reason
		……... (2)	
13.(b)	$\angle AEB=\angle BFC$ ($\Delta ABE\cong\Delta BCF$)	1	using (a)
	$\therefore \angle AEB=90°-\angle FBC$		
	$\therefore \angle BGE=180°-\angle GEB-\angle GBE$		
	$=180°-(90°-\angle GBE)-\angle GBE$	2	follow through
	$=90°.$		
	$\therefore$ ΔBGE is a right-angled triangle.		
		……... (3)	
13.(c)	Note that $CF = BE = 15$ cm	1M	
	$BG=\sqrt{15^2-9^2}=12$ cm .	1A	
		……... (2)	
14.(a)	(i) L passes through (–5, 11)	1M	
	Slope of L = $\dfrac{3}{4}$	1M	
	$L:\ 3x-4y+59=0.$	1A	
	(ii) Centre of C = $\left(h,\ \dfrac{3h+59}{4}\right)$	1M	using (a)(i)
	The required equation :		
	$(x-h)^2+\left[y-\left(\dfrac{3h+59}{4}\right)\right]^2=(h-4)^2+\left(\dfrac{3h+59}{4}-(-1)\right)^2$	1A	$(x-h)^2+(y-k)^2=r^2$

	$2x^2-4xh+2h^2+2y^2-3hy-59y+\frac{3481}{8}+\frac{9h^2}{8}+\frac{177}{4}h$		
	$=\frac{25h^2}{8}+\frac{125}{4}h+\frac{4225}{8}$	1M	follow through
	$2x^2+2y^2-4hx-(3h+59)y+13h-93=0.$		
		……... (6)	
14.(b)	Putting (26, 43) into the equation of C, we have $h=11$.	1M	using (a)(ii) or otherwise
	Centre of C = (11, 23)	1M	
	The required diameter = $2\sqrt{(11-4)^2+[23-(-1)]^2}=50.$	1A	
		……... (3)	
15.(a)	Let x marks be the required score.		
	$\frac{x-66}{12}=-0.5$	1M	
	$x=60$		
	The score of David in the Mathematics examination is 60 marks .	1A	
		……... (2)	
15.(b)	Note that $60=66-0.5\times 12$ and $49=52-0.3\times 10$.	1M	for $x=\mu+z\sigma$
	As $-0.3>-0.5$, he performs better in the Science examination than in the Mathematics examination. The claim is agreed.	1A	
		……... (2)	
16.(a)	The required probability = $\frac{C_2^5C_2^9}{C_4^{14}}$	1M	
	$=\frac{360}{1001}.$	1A	
		……... (2)	
16.(b)	The required probability = $1-\frac{C_1^5C_3^9+C_0^5C_4^9}{C_4^{14}}$	1M	for $p_2=1-p_1$
	$=\frac{5}{11}.$	1A	
		……... (2)	
17.(a)	$\mathrm{A}(1)+\mathrm{A}(2)+\mathrm{A}(3)+\cdots+\mathrm{A}(n)$		
	$=\frac{[-1+(4n-5)]n}{2}$	1M	
	$=2n^2-3n.$	1A	
		……... (2)	
17.(b)	$\log(\mathrm{B}(1)\mathrm{B}(2)\mathrm{B}(3)\cdots\mathrm{B}(n))$		
	$=\log(10^{\mathrm{A}(n)})$		
	$=\log(10^{2n^2-3n})$	1M	using (a)
	$=2n^2-3n.$		
	$2n^2-3n\geq 8000$		
	$(n-64)(2n+125)\geq 0$		
	$-\frac{125}{2}\leq n\leq 64$	1M	

	The greatest value of n is 64 .	1A ……... (3)	
18.(a)	$(-4k)^2-4(2)(3k^2+5)$		
	$=-8(k^2+5)$	1M	for discriminant
	Since $-8(k^2+5)<0$ for all real k , the equation $f(x)=0$ does not have real roots and the graph of $y=f(x)$ does not cut the x-axis.	1A	
		……... (2)	
18.(b)	$2x^2-4kx+3k^2+5$		
	$=2(x^2-2kx+k^2)+k^2+5$	1M	
	$=2(x-k)^2+k^2+5.$	1M	
	Thus, the required vertex $=(k,\ k^2+5)$.	1A ……... (3)	
18.(c)	Note that when S and T are nearest to each other, they coincide with the vertices of the graphs of $y=f(x)$ and $y=2-f(x)$ respectively.	1M	
	The coordinates of S is $(k,\ k^2+5)$ and that of T is $(k,\ -k^2-3)$.	1M	using (b)
	Thus, the y-coordinate of the midpoint of ST is 1.	1M	
	The perpendicular bisector of ST is $y-1=0$. The claim is disagreed.	1A	
		……... (4)	
19.(a)	(i) $AC=\sqrt{40^2+24^2-2(40)(24)\cos 80°}$	1M	cosine law
	≈ 42.92546446 ≈ 42.9 cm.	1A	to 3 sig. fig.
	(ii) $\cos\angle ACB=\dfrac{24^2+42.92546446^2-40^2}{2(24)(42.92546446)}$		or sine law
	$\angle ACB\approx 66.59081487°$ $\approx 66.6°.$	1A	to 3 sig. fig.
	(iii) The area of ΔABC and that of ΔABD are fixed.	1M	
	The area of $\Delta ACD=\dfrac{1}{2}AC^2\sin\angle CAD$	1M	
	When $\angle BCD$ increases from $105°$ to $145°$, $\angle CAD$ decreases from $103°$ to $23.2°$. The required area increases when $\angle BCD$ increases from $105°$ to $111.6°$ but decreases when it increases from $111.6°$ to $145°$.	2A	follow through
		……... (7)	
19.(b)	Let M be the projection of B onto CD and N be that of B onto the plane ACD .		
	$CM=AC\cos\angle ACD\approx 17.86278929$ cm	1M	
	$BM=\sqrt{BC^2-CM^2}\approx 16.02874788$ cm	1M	
	$\cos\angle BMA=\dfrac{AM^2+BM^2-AB}{2(AM)(BM)}$		
	$\angle BMA\approx 0.144202402°$	1M	
	$BN=BM\sin\angle BMA\approx 15.86121883$ cm	1A	

The required volume = $\frac{1}{3}\left(\frac{1}{2}AC^2\sin\angle CAD\right)BN \approx 3690\text{ cm}^3$.	1M + 1A
	……..... (6)