D 1. $2^{\frac{1}{m}} = 2^{\frac{4}{3}}; m = \frac{3}{4}$

D 2. $\frac{(n+1)!}{(n-2)!n} = \frac{(n+1)(\cancel{n})(n-1)\cancel{(n-2)!}}{\cancel{(n-2)!}\,\cancel{n}} = n^2 - 1$

C 3. $\left(y^2 + \frac{1}{y^2}\right)10$ would be the constant term. $\frac{10!}{5!5!}\left(y^2\right)^5\left(\frac{1}{y^2}\right)^5$ which is 252

D 4. $3^{-6}\left(3^{2x}\right) = 3^2\left(3^{2y}\right); 2x - 6 = 2 + 2y; x - y = 4$

$2^{-2}\left(2^{4x}\right) = 2^4\left(2^{-6y}\right); -2 + 4x = 4 - 6y; 2x + 3y = 3$.

Solve the system $x - y = 4$ and $2x + 3y = 8$. This gives $x = 3, y = -1$ so $x + y = 2$.

D 5. Find a_1 when $a_3 = 26 - 20 = 6$ and $a_4 = 22 - 20 = 2$. $r = \frac{a_4}{a_3} = \frac{1}{3}$;

$6 = a_1\left(\frac{1}{3}\right)^2; a_1 = 54; 74°C$

D 6. $\frac{1}{(1+i)^4} + \frac{1}{(1-i)^3} = a + bi$; $\frac{1}{(1+i)^4} = \frac{1}{\left((1+i)^2\right)^2} = -\frac{1}{4}$; $\frac{1}{(1-i)^3} = \frac{1}{(1-i)^2(1-i)} = -\frac{1}{4} + \frac{i}{4}$.

$-\frac{1}{4} + -\frac{1}{4} + \frac{i}{4} = -\frac{1}{2} + \frac{i}{4}, b = \frac{1}{4}$.

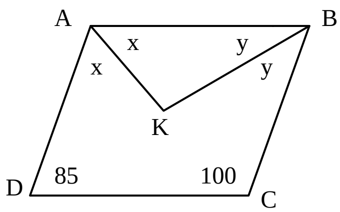
B 7. $2160 = (n-2)180; n = 14; \frac{n(n-3)}{2} = \frac{14(11)}{2} = 77$

A 8. $\frac{2^{n+1} - 2^{n-1}}{2^{2n} - 2^{2n-2}} = \frac{2^n(2^1 - 2^{-1})}{2^{2n}\left(2^0 - 2^{-2}\right)} = \frac{1}{2^n} \bullet \frac{\frac{3}{2}}{\frac{3}{4}} = \frac{1}{2^n} \bullet 2 = 2^{1-n}$

A 9. $P(x) = x^3 - 6x^2 + Bx + C$ has roots $1 + 5i$ and $1 - 5i$. Find the quadratic for those two roots: sum of roots = 2 = $-\frac{b}{a}$; product of roots = 26 = $\frac{c}{a}$. Therefore the quadratic is $x^2 - 2x + 26 = 0$. Using long division of polynomials, After the 2nd step, you get that $-26 + B - 8 = 0$ making B 34. And $C + 104 = 0$ making C -104. Adding these gives -70.

B 10. Since 1 is the first row, then the 12th row would be $(a+b)^{11}$. First term is found by $\binom{11}{0}$ so the 7th term would be $\binom{11}{6}$ which is $\frac{11!}{6!5!}$ which is 462.

B 11.

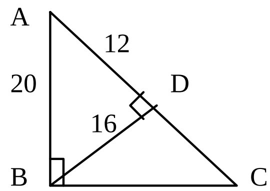


Sum of the angles in the quad is 360.

$m\angle CAB + m\angle ABD = 175; x + y = \frac{175}{2},$

$m\angle K = 180 - \frac{175}{2} = 92.5$

D 12.



Using Pythagorean triples, AD=12 and using altitude to the hypotenuse theorems ;

let $AC = x; 20 = \sqrt{12 \bullet x}$, $400 = 12x; x = \frac{100}{3}$.

D 13. $\begin{bmatrix} -1 & 3 \\ 4 & 2 \end{bmatrix}^{-1} = \frac{1}{-14}\begin{bmatrix} 2 & -3 \\ -4 & -1 \end{bmatrix} = \begin{bmatrix} -\frac{2}{14} & \frac{3}{14} \\ \frac{4}{14} & \frac{1}{14} \end{bmatrix}; \begin{bmatrix} -\frac{2}{14} & \frac{3}{14} \\ \frac{4}{14} & \frac{1}{14} \end{bmatrix} \bullet \begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} -\frac{1}{7} & \frac{4}{7} \\ \frac{2}{7} & -\frac{1}{7} \end{bmatrix}$

C 14. We want $P(2)$.

A 15. The slope is -3 passing through $(3,-8)$. $f(x) = -3x + 1$

C 16. Domain: Denominator cannot be equal to zero so that eliminates ± 3. Numerator: $\sqrt{x+2} \ge 0$ making $x \ge -2$. Putting the critical points on the number line and testing zones makes the domain $[-2,3) \cup (3,\infty)$.

C 17. $\log_8(x^2-1) - \log_8(7x-11) = 0$, $\log_8 \frac{x^2-1}{7x-11} = 0; x^2 - 1 = 7x - 11, x^2 - 7x + 10 = 0;$ making $x = 2,5$. $\left|r^2 - s^2\right| = \left|4 - 25\right| = 21$.

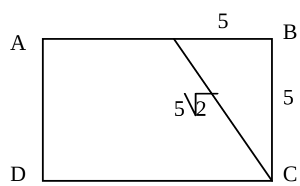
D 18. Since we want the numerator determinants when solving for *y*, replace the constants in the *y* column of the determinants. Find the value using either minors or the diagonal method. $\begin{vmatrix} 3 & -7 & 2 \\ 1 & 16 & -4 \\ 2 & 14 & -1 \end{vmatrix} = 133$

D 19. $\frac{3-2x}{\sqrt{2x}-3}=\sqrt{2x}-2$. Since this can be a proportion, cross multiply. This gives $3-2x=2x-5\sqrt{2x}+6$. Isolate the root and square both sides: $4x+3=5\sqrt{2x}, 16x^2+24x+9=50x, 16x^2-26x+9=0$. Solving gives the roots $\frac{1}{2}$ and $\frac{9}{8}$. Both of these work so the sum is $\frac{13}{8}$.

E 20. $x^2+9x+\frac{81}{4}+y^2-8y+16=-4+\frac{81}{4}+16;\ \left(x+\frac{9}{2}\right)^2+\left(y-4\right)^2=\frac{129}{4};$
$r=\frac{\sqrt{129}}{2}; C=\sqrt{129}\pi$

C 21. $\left(x+3\right)^2=8y-16; \frac{1}{8}(x+3)^2+2=y;$ vertex $\left(-3,2\right)$, $\frac{1}{4p}=\frac{1}{8}$, $p=2$, focus $\left(-3,4\right)$

B 22.



Area of rectangle is 12(5)=60.
Area AECD = a Rectangle - $a\Delta CBE$.
$=60-\frac{1}{2}\bullet 5\bullet 5=47\frac{1}{2}$.

$$\frac{a\Delta CBE}{a\square AECD}=\frac{\frac{25}{\cancel{2}}}{\frac{95}{\cancel{2}}}=\frac{25}{95}=\frac{5}{19}$$

D 23. Let E be the point where the altitude from A intersects BC. The slope of BC = $\frac{5}{2}$ making the slope of AE $-\frac{2}{5}$. Equation of line AE is $2x+5y=4$.

B 24. $\log_{128}8-\log_2 0.25+\log_3\frac{1}{81}+\log_9\sqrt{27}=\frac{3}{7}+2-4+\frac{3}{4}=-\frac{23}{28}$.

C 25. $4y-x-3xy\le 0; -x-3xy\le -4y; x+3xy\ge 4y;\ x\left(1+3y\right)\ge 4y; x\ge\frac{4y}{1+3y}$.

E 26. $\left(\sqrt[3]{3}-\sqrt[3]{5}\right)\left(\sqrt[3]{9}+\sqrt[3]{15}+\sqrt[3]{25}\right)$ is the factored form of the different of cubes.
$\left(3-5\right)=-2$.

D 27. $lw\bullet wh\bullet lh=\left(lwh\right)^2$

D 28. $(x+y)^2 = 90, (x-y)^2 = 30$; expanding each gives the system $\begin{cases} x^2 + 2xy + y^2 = 90 \\ x^2 - 2xy + y^2 = 30 \end{cases}$

solving this gives $x^2 + y^2 = 60, y0 = 2xy = 30, -2xy = -30, xy = 15$.

$x^2 - xy + y^2 = 60 - 15 = 45$

C 29. There are 4 ways to place QU in the sequence: there are ${}_3P_3$ ways to arrange the other 3 letters. There are then 2 ways of arranging Q and U since the order is not important.

$\frac{4 \bullet {}_3P_3 \bullet {}_2P_2}{{}_5P_5} = \frac{4 \bullet 2 \bullet 6}{120} = \frac{2}{5}$

B 30. $16x^2 + 9y^2 - 96x + 72y + 144 = 0$; $16\left(x^2 - 6x + 9\right) + 9\left(y^2 + 8y + 16\right) = 144$;

$\frac{(x-3)^2}{9} + \frac{(y+4)^2}{16} = 1$; center $(3,-4)$, focus $\left(3,-4 \pm \sqrt{7}\right)$,

vertices $(3,0),(3,-7),(0,-4),(6,-4)$, Eccentricity = $\frac{c}{a} = \frac{\sqrt{7}}{4}$, major axis length 8, minor axis length 6, area 12π

F	I.	Center is (3, 4)
F	II.	Eccentricity is $\frac{\sqrt{7}}{3}$
T	III.	Major axis has length 8.
T	IV.	(3, 0) is a vertex.
T	V.	The area is 12π.