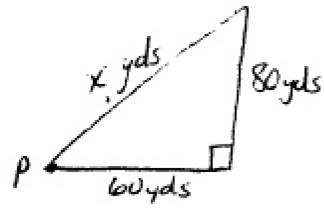
① $6+3q=27$
$3q=21$
$q=7$ $\boxed{B}$

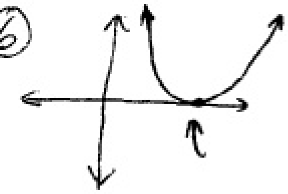
② 

$60^2+80^2=x^2$
$x=100$ yds
$100\text{yds}=300$ ft
$\boxed{C}$

③ $7x+2y=50$
$+\ 6x-2y=2$
$13x=52$
$x=4$
$3(4)-y=1 \quad y=11$
x+
15

④ units digit of powers of 7
cycles 7, 9, 3, 1
7^{2000} ends in 1
units digit of powers of 8
cycles 8, 4, 2, 6
8^{2000} ends in 6
$1+6=7$ $\boxed{C}$

⑤ For $\frac{1}{x}$, $x \neq 0$
For $\sqrt{x+2}$, $x \geq -2$
$[-2,\infty)$ except zero
$[-2,0) \cup (0,\infty)$
$\boxed{A}$

⑥ 
tangent x-axis shows one double roo
real, rational, equal
$\boxed{A}$

⑦ $606_7 = 7^2\cdot 6+6=300$
$1560_7=7^3\cdot 1+7^2\cdot 5+7\cdot 6=630$
$300=2^2\cdot 3\cdot 5^2$
$630=2\cdot 3^2\cdot 5\cdot 7$
GCF $=2\cdot 3\cdot 5$
$=30$
$30=4\cdot 7+2=42_7$ $\boxed{D}$

⑧ midpoint is $\left(\frac{6+-10}{2}, \frac{-3+1}{2}\right)$
$=(-2,-1)$
midpoint between $(6,-3)$ and $(-2,-1)=\left(\frac{6-2}{2}, \frac{-3-1}{2}\right)=(2,-2)$
$\boxed{A}$

⑨ Let $y=x^{1/3}$
$y+y^2=6$
$y^2+y-6=0$
$(y-2)(y+3)=0$
$y=2$, $y=-3$
$\rightarrow x^{1/3}=2$
$x=8$
$x^{1/3}=-3$
$x=-27$
$8+-27=-1$
$\boxed{B}$

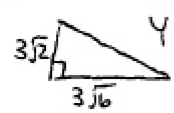
⑩ Rewrite as
$y^2-x^2=4$
hyperbola
$\boxed{C}$

⑪ $126000=2^4\cdot 3^2\cdot 5^3\cdot 7$
Even, not multiples of 6 must have a factor of 2 and must NOT have a factor of 3
$\underset{2\text{'s}}{4}\cdot\underset{5\text{'s}}{4}\cdot\underset{7\text{'s}}{2}=32$ $\boxed{E}$

⑫ $(x^2-8x)^2-8(x^2-8x)=x^2-8x$
$x^4-16x^3+64x^2-8x^2+64x-x^2+8x=0$
sum of roots $=-\left(\frac{-16}{1}\right)=16$ $\boxed{C}$

⑬ $3*4=9+1-(9+\frac{1}{2})+(9+\frac{1}{4})+\cdots+(9+\frac{1}{64})-(9+\frac{1}{128})$
$=1-\frac{1}{2}+\frac{1}{4}-\cdots-\frac{1}{128}=\frac{85}{128}$ $\boxed{C}$

⑭ $X=\frac{s^2\sqrt{3}}{4}=\frac{36\sqrt{3}}{4}=9\sqrt{3}$



$Y=(3\sqrt{2})(3\sqrt{6})(\frac{1}{2})=\frac{9\sqrt{12}}{2}=\frac{9\cdot 2\sqrt{}}{2}$
$=9\sqrt{3}$

$Z=\frac{1}{2}\begin{vmatrix}1 & -2 & 0\\ 2 & 3 & \frac{7}{3}-6\sqrt{3}\end{vmatrix}=\frac{1}{2}\big(3-\frac{14}{3}+12\sqrt{3}+4-\frac{7}{3}+$
$=\frac{1}{2}(18\sqrt{3})=9\sqrt{3}$ $\quad X=Y=Z$ $\boxed{D}$

⑮ $2\left(1000+\dfrac{\frac{4}{5}\cdot 1000}{1-\frac{1}{5}}\right)-1000$

9000 ft. $\boxed{D}$

⑯ $z=\sqrt{p+z}$
$z^2=p+z$
$z^2-z=p$

$z-1=\sqrt{q-(z-1)}$
$(z-1)^2=q-z+1$
$z^2-2z+1=q-z+1$
$z^2-2z=q-z$
$z^2-z=q$

$z^2-z=p$

$p=q$ $\boxed{C}$

(17) $\frac{1}{3+\sqrt{2}+i}\cdot\frac{(3+\sqrt{2})-i}{(3+\sqrt{2})-i} = \frac{3+\sqrt{2}-i}{(3+\sqrt{2})^2-i^2} = \frac{3+\sqrt{2}-i}{12+6\sqrt{2}}$

$= \frac{3+\sqrt{2}-i}{6(2+\sqrt{2})}\cdot\frac{(2-\sqrt{2})}{(2-\sqrt{2})} = \frac{6+2\sqrt{2}-2i-3\sqrt{2}-2+i\sqrt{2}}{6\cdot(4-2)} = \frac{4-\sqrt{2}}{12}+\frac{\sqrt{2}-2}{12}i$ $\boxed{A}$

(18) degree A = 3 degree B = 3
degree C = 1 (π is a constant)
degree D = 5 $\boxed{E}$

(19) $\left(\sqrt{35+14\sqrt{6}}\right)^2 = \left(\sqrt{x}+\sqrt{y}\right)^2$

$35+14\sqrt{6} = x+y+2\sqrt{xy}$

$35 = x+y$ $14\sqrt{6} = 2\sqrt{xy}$

$294 = xy$ $2\sqrt{294} = 2\sqrt{xy}$

$x=14,\ y=21$ $21-14=7$ $\boxed{D}$

(20) $y = \frac{kx}{p^2}$

$30 = \frac{10k}{9}$

$k = 27$

$46 = \frac{27x}{13^2}$

$x \doteq 287.93$ $\boxed{C}$

(21) 30% of 24 = 7.2 gallons of alcohol
7.2 gallons is to be 8% of new solution

$\frac{7.2}{8} = \frac{x}{100} \Rightarrow 720 = 8x \Rightarrow x = 90$

90 total gallons of new solution
$90-24 = 66$ $\boxed{B}$

(22) $1+2i \Rightarrow (1,2)$

$3-i \Rightarrow (3,-1)$

$d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{(3-1)^2+(-1-2)^2}$

$= \sqrt{4+9} = \sqrt{13}$ $\boxed{D}$

(23) k is a multiple of 5, +1, $\Rightarrow$ 1, 6, 11, 16, 21, … $\Rightarrow$ also multiple of 5, −4
multiple of 6, +2, $\Rightarrow$ 2, 8, 14, 20, 26, … $\Rightarrow$ " " " 6, −4
multiple of 7, +3 $\Rightarrow$ 3, 10, 17, 24, 31, … $\Rightarrow$ " " " 7, −4
1st number which is all three is 206 $(5\cdot42-4,\ 6\cdot35-4,\ 7\cdot30-4)$
next number is $206 + (5\cdot6\cdot7) = 416$ $4+1+6 = 11$ $\boxed{D}$

(24) B is incorrect $\Rightarrow$ one diagonal contains triangular numbers $\Rightarrow$ A, C, D are true $\boxed{B}$

(25) sequence is 12 written in bases 10 through 2
missing term is 12_{10} in base 3 = 110 $\boxed{B}$

(26) $\log\frac{mn^3}{p^2q} = \log m + \log n^3 - \log p^2 - \log q$

$= \log m + 3\log n - 2\log p - \log q$

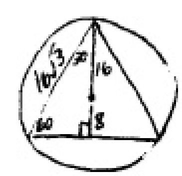
$= W+3X-2Y-Z$ $\boxed{B}$

(28) $P(\text{both blue}) = \frac{6}{15}\cdot\frac{5}{14} = \frac{1}{7}$

$P(\text{~~both~~ not both blue}) = 1-\frac{1}{7} = \frac{6}{7}$

odds: $\frac{\text{favorable}}{\text{unfavorable}} = \frac{6}{1} = 6:1$

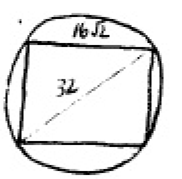
(27)



$\frac{s}{2}\sqrt{3} = 16+8 = 24$

$s = 16\sqrt{3}$

$P_\Delta = (16\sqrt{3})3 = 48\sqrt{3} = \sqrt{6912}$



$32 = s\sqrt{2}$

$s = 16\sqrt{2}$

$P_\square = (16\sqrt{2})4 = 64\sqrt{2} = \sqrt{8192}$

$8192-6912 = 1280$ $\boxed{A}$

(29)

p	q	~p	* ∨	~q	↔	↔	q ∧ ~p
T	T	F	F	F	T	F	F
T	F	F	T	T	T	F	F
F	T	T	T	F	F	F	T
F	F	T	T	T	F	T	F

Statement equivalent to $\sim(p \vee q)$ $\boxed{E}$

(30) $x^3+1+1-(x+x+x) = 0$

$x^3-3x+2 = 0$

$(x-1)(x^2+x-2) = 0$

$(x-1)(x-1)(x+2) = 0$

$x = 1, -2$ 2 distinct solutions C