and 6. If the $\triangle$ is scalene, as ABC, let fall the perpendicular BD on AC, and let $BD=a$, and $AD=x$. Then $AB=\sqrt{a^2+x^2}$; put $p+x=\sqrt{a^2+x^2}$; then $p^2+2px+x^2=a^2+x^2$; $\therefore x \frac{a^2-p^2}{2p}=\frac{a^2}{2p}-\frac{p}{2}$. Now, a, p, and x must be all whole numbers. If $a=8$, $p=4$, $x=\frac{6}{8}-2=6$, and $AB=p+x=10$, or, if $p=2$, $x=15$, and $p+x=17$; $\therefore$ when $a=8$, $AD=6$, and $DC=15$ $\therefore AB=10$, $BC=17$, and $AC=21$. These numbers admit of two constructions. Make $DF=AD$, and join BF, then the side of the $\triangle BFC$ will be $FB=10$, $BC=17$, and $CF=9$. In the latter case, the perimeter is 36, in the other case 48. To give a scalene $\triangle$ answering the first conditions of the question, 8 is the least value of a or perpendicular; but it will not produce a $\triangle$ of the least perimeter. Suppose $a=12$, then $x=\frac{144}{2p}-\frac{p}{2}$, the greatest value of p that will make x a whole number is 8; then $x=5$, $AB=x+p=13$. Next greater value of p is 6; $\therefore x=9$, and $x+p=15=BC$; $\therefore AC=14$, and perimeter $=42$. Then the least perimeter of a scalene $\triangle$, when the perpendicular falls within, is 42, the sides being 13, 14, and 15. When the perpendicular falls without, the sides must be 13, 15, and 4, and perimeter 32.

3. First the side of $\triangle = a = \sqrt{\frac{640}{\sqrt{3}}} = 19{\cdot}2225$. Put $BB=x$, and perpendicular $BD=y$; then $\frac{a+x}{2}y=240$; but $y=\sqrt{a^2-\left(\frac{a-x}{2}\right)^2}$ $\therefore \frac{a+x}{2}\sqrt{a^2\left(\frac{a+x}{2}\right)^2}=240$, and $x^4-ca^2x^2=8a^3x=3a^4=-960^2$. Substituting the value of a and solving, $x=7{\cdot}0714=BB$, and height of trapezium $=18{\cdot}249$. Secondly, let fall the $\perp$ OE on AC, then $OE=170\div 19{\cdot}2225=8{\cdot}8432$; AO or $CO=\sqrt{OE+EC}=\sqrt{(8{\cdot}8432^2+9{\cdot}611125^2)}=13{\cdot}0605$; $OB^1=19{\cdot}2225-13{\cdot}0605=6{\cdot}162$; then $CO:OB^1::AC:B^1B^1=9{\cdot}0692$.

4. The length of an arc of $10'$, when rad. $=1$, is $\cdot 0029089$: $\therefore$ $\cdot 0029089:160::1:55004$, the required distance.

5. $x^4=mx+ny$, and $y^4\ nx+my$,

$x^4+y^4=(m+n).(x+y)$ (1)

$x^4-y^4=(m-n).(x-y)$ (2)

Multiplying cross-ways, we obtain,

$(m+n).(x^5+x^4y-y^4x-y^5)=(m-n).(x^5-x^4y+y^4x-y^5)$;

$\therefore 2nx^5+2mx^4y-2my^4x-2ny^5.2-ny^5=0$;

Put $x=yz$, and divide by $2ny^5$,

$$Z^5-1=\frac{m}{n}(z^4-z)=0, \quad . \quad . \quad . \quad (3)$$

Whence $z=1$; $\therefore x=y-{}^3\sqrt{m+n}$; divide (3) by $z-1$;

$$Z^4+Z^3+Z^2+Z+1=\frac{m}{n}(Z^3+Z^2+Z)=0;$$

$$\therefore Z^4+\frac{m+n}{n}(Z^3+Z^2+Z)+1=0,$$

$$\left(Z^2+\frac{1}{Z^2}\right)+\frac{m+n}{n}\left(Z+\frac{1}{z}\right)+\frac{m+n}{n}=0,$$

$$\left(Z+\frac{1}{Z}\right)^2+\frac{m+n}{n}\left(Z+\frac{1}{Z}\right)=2-\frac{m+n}{n};$$ hence $Z+\frac{1}{z}$ may be found; thence z or $\frac{x}{y}$; call this c, then $x=cy$. Substitute these values in (1) and (2), and we get the values of x and y.

6. $xy+zw=444$ (A); $xz+yw=180$ (B);

$zw+yz=156$ (C); $xyzw=5184$ (D).

Solution by J. W. Henstridge.—Multiply A by xy, B by xz, and C by yz; subtract each in turn from D, and solve the quadratics; then $xy=432$ or 12 (E), $xz=144$ or 36 (F), $yz=108$ or 48 (G). Comparing (F) and (G), (first values), $Z=\frac{144}{x}=\frac{108}{y}$; $\therefore y=\frac{3}{4}x$, substitute in (E), (first value), $x^2=576$, $\therefore x=24$; whence $y=18$; $z=6$; $w=2$. Comparing 2nd values of F and G, &c., we get $x=18$; $y=24$; $z=2$; $w=6$. Comparing 1st value of F with 2nd of G, we get $x=36$; $y=12$; $z=4$; $w=3$. Comparing 2nd value of F with 1st of G, $x=12$; $y=36$; $z=3$; $w=4$. Again, by taking 2nd value of E and working as before,

$$x=\pm 4;\ y=\pm 3;\ z=\pm 36;\ w=\pm 12$$

$$x=\pm 3;\ y=\pm 4;\ z=\pm 12;\ w=\pm 36$$

$$x=\pm 6;\ y=\pm 2;\ z=\pm 24;\ w=\pm 18$$

$$x=\pm 2;\ y=\pm 6;\ z=\pm 18;\ w=\pm 24$$

$\therefore x=24,\ 18,\ 36,\ 12,\ 4,\ 3,\ 6,\ 2$

$y=18,\ 24,\ 12,\ 36,\ 3,\ 4,\ 2,\ 6$

$z=6,\ 2,\ 4,\ 3,\ 36,\ 12,\ 24,\ 18$

$w=2,\ 6,\ 3,\ 4,\ 12,\ 36,\ 18,\ 24.$ All these values may be considered negative; therefore, there are sixteen possible answers.

7. Let D and d be the diameters of a shilling and sovereign, T and t their thickness; then $\frac{p}{4}D^2\ T$, $\frac{p}{4}\ d^2\ t$ are the magnitudes of shilling and sovereign; also $m\ D=nd$: and $p\ T=qt$. If x shillings $=y$ sovereigns in bulk, $xD^2T=yxd^2\ t=\frac{m^2}{n^2}\cdot\frac{p}{q}\cdot D^2\ T$; $\therefore xn^2q=ym^2p$; $\therefore x:y::m^2p;n^2\ q$; $\therefore$ the value of silver; value of gold $::m^2\ p$; $20\ n^2\ q$.

8. $26^2\times 14\times$ nat. sin. $56°\ 35'\times\frac{1}{6}\times 62\frac{1}{2}=82286{\cdot}5225$ lbs. $=$ pressure on $\triangle$ whose base coincides with the surface $26\times 14\times$ nat. sin. $56°\ 35'\times\frac{1}{3}\times 62\frac{1}{2}=164573{\cdot}045=$ pressure on $\triangle$ whose vertex coincides with the surface.

If the plane of the immersed parallelogram were $\perp$ to the surface of the fluid, the pressures on triangles would be, $26\times 14\times 62\frac{1}{2}\times\frac{1}{6}=98583\frac{1}{3}$ lbs., and $26\times 14\times 62\frac{1}{2}\times\frac{1}{3}=1971{\cdot}66\frac{2}{3}$ lbs.

9. $80\ x=50\ (20-x)+10\,(40-x)$; $\therefore x=10$ feet.

2. CORRECT SOLUTIONS RECEIVED.

J. W. Henstridge, Collins Bay, solved 2, 3, 4, 5, 6, 7, 8, 9; John Anderson, Clarendon, P. Q., 4, 6, and 7; E. E. Fraser, West Essa, 4, 7 and 9; S. White, 7, 8, 9; D. Drimmie, Flesherton, 5 and 9; R. M. Pascoe, Bowmanville, 9; W. G. Stewart, P.M., Hilly Grove P.O., 4 and 5 in the February number of the Journal.

Send solutions of the following questions to A. Doyle, Ottawa:

1. For a lease of certain profits for 7 years. A makes two offers, either to pay $600 fine and $1,200 per annum, or $6,800 fine, without any rent. B bids $2,600 fine and $800 per annum. C offers $800 fine and $1,600 per annum. Which is the best offer? and what is the difference at 5 per cent. compound interest?

2. $x^x+y=y^4$ and $y^x+y=x$. Find x and y.

3. A wheel has 248 teeth, and a pinion to it has 13; how many revolutions must each wheel make before the same two teeth meet together again?

4. What angle did the meridian form with the line which denoted mean time, on the 1st of July last, when the angle, formed by the hour and minute hands of a watch, was first trisected, after twelve o'clock?

5. The radius of a semicircular plane immersed in a fluid is 27 inches, and coincides with the surface; at what distance below the surface must a horizontal cord be drawn, so that the pressure which it sustains may be greater than that in any other cord drawn parallel to it?

V. Ontario Education at the Centennial.

1. AN EDUCATIONAL MUSEUM AT THE PERMANENT CENTENNIAL EXHIBITION.

We are much gratified to state that the managers of the Permanent Exhibition have resolved to make education one of the leading features of the Exhibition. Mr. Biddle, the president of the Exhibition Company, convened a meeting of the leading educationalists from all countries exhibiting at the Centennial, when it was resolved to devote a large space to education, it being considered that the progress of arts and manufactures depends upon the progress of education. After considerable discussion it was recommended that a similar plan be adopted as that so successfully carried out in Canada, by forming an educational museum. It is proposed that this museum will contain specimens of all the necessary books, maps, apparatus, school furniture, &c., suitable for the different grades of schools. These are to be selected by a Committee of Educationalists. In addition to the museum there will be a collection of school material from the different publishers and manufacturers, which will be scientifically arranged. The company have wisely resolved to place the control of education matters in the hands of experienced educators. The following gentlemen were appointed a committee to prepare the necessary plans and scheme for its success: The Hon. Mr. Wickersham, State Superintendent of Schools, Pennsylvania; Professor Apgar, State Superintendent of Schools, Trenton, N.J.; Dr. S. P. May, Education Department, Toronto, Canada. The company is to be congratulated on the formation of a committee of such experienced gentle-