then since the discount is the excess of the principal sum over the present worth, we have

$$D = P - \frac{P}{1+rt} = \frac{Prt}{1+rt} = \frac{P.\,Prt}{P+Prt} = \frac{PI}{P+I}$$

$$\therefore \frac{1}{D} = \frac{P+I}{PI} = \frac{1}{I} + \frac{1}{P}$$

4. First income $= \frac{4}{96} \times £3360 = £140$

$$2d = \left(\frac{3}{82\frac{1}{2}} + \frac{8\frac{1}{2}}{164\frac{1}{2}}\right) \times \frac{94}{96} \times \frac{£3360}{2} = £145$$

5. (i) $\frac{7}{8}$ (ii) $\frac{ax+by}{ax-by}$ (iii) $2a\left(\frac{a^2+b^2}{a^2-b^2}\right)^2$

6. $2x^3-7x+3$.

8. (i) $0, -2+\sqrt{-1}, -2-\sqrt{-1}$.

(ii) $-4{\cdot}1, -{\cdot}7$.

(iii) $\sqrt{2}+1 = \left(\frac{\frac{1}{x}}{2-1}\right)^{-1}$

$$\therefore \left(\frac{\frac{1}{x}}{2-1}\right)^{-1} = \frac{1}{\sqrt{2}-1} = (\sqrt{2}-1)^{-1}$$

$$\therefore 2^{\frac{1}{x}} - 1 = \sqrt{2}-1.$$

$$\therefore 2^{\frac{1}{x}} = \sqrt{2} = 2^{\frac{1}{2}} \quad \therefore x = 2.$$

10. (i) $xy = a$ (1)

$x^4+y^4 = 14x^2y^2$ (2)

Add $2x^2y^2$ to each side of (2) and extract the sq. rt. and we have $x^2+y^2 = 4xy$, also from (1) $x^2+y^2 = a^2-2xy$.

$\therefore 6xy = a^2$ &c.

(ii) Simplifying the first eqn. we have

$(a^2+b^2)(x^2+y^2)+2(b^2-a^2)xy = 8a^2b^2$

hence substituting $2(a^2+b^2)$ for x^2+y^2 we have $(a^2+b^2)^2+(b^2-a^2)xy = 4a^2b^2$

$\therefore 2xy = 2a^2-2b^2$

Adding this to the 2d eqn. we get

$(x+y)^2 = 4a^2$ or $x+y = 2a$ (1)

similarly by subtraction we get

$(x-y)^2 = 4b^2$ or $x-y = 2b$ (2)

Adding and subtracting (1) and (2) we obtain $x = a+b$, $y = a-b$.

(iii) The first eqn. takes the form

$(x^2+y^2+2xy)(x^2+y^2-xy) = 1216$.

But $x^2+y^2 = 49-xy$, hence we have

$(49+xy)(49-2xy) = 1216$

$\therefore xy = 15$ (1)

Adding (1) to 2d eqn. gives $x+y = 8$ &c.

(iv) Multiply the eqns. tog'r and we have $x^4y^4z^4 = abc$ $\therefore xyz = \sqrt[4]{abc}$, then divide each eqn. by this last result.

11. ABC the triangle, AD perp. to BC, AE bisecting BAC, D being between E and C; then DAB+ABD = rt. ang. = DAC+DCA $\therefore$ ACB—ABC = BAD—CAD; but since BAE eq. EAC $\therefore$ BAE is greater than DAC by EAD $\therefore$ BAD is greater than DAC by twice EAD.

13. ABCD the quadl., AB eq. CD; join BD then since AB eq. CD $\therefore$ arc AB = arc CD. $\therefore$ ang. ADB eq. DBC $\therefore$ AD is parallel to BC.

ARITHMETIC.

SECOND CLASS, JULY, 1877.

1. Prove the rule for reducing a mixed circulating decimal to an equivalent vulgar fraction.

Find *accurately* what fraction

$\frac{5}{8}$ of $(\frac{7}{9}-.512)$ of $3.6\frac{7}{12}\frac{7}{3}$ ac.

is of 2.662601 acres.

2. Show how to find the L. C. M. of two or more numbers. Find the L. C. M. of 483 bushels; 472 bushels, 2 pecks; 258 bushels 3 pecks.

3. A merchant buys flannel at 32 cents per yard; at what profit per cent. must he sell it in order that the money he receives for 220 yards may be equal to his gain on $480 of outlay?

4. Three watches hang side by side, and