

MATHEMATICS.

Solutions to Examination Papers in last number.

PASS.

1. The rates are as 91 : 81.

3. Since every £90 invested produces £1½ income every half year, i.e., every £60 invested produces £1, therefore the second income is greater than the first by one-sixtieth of the first, or one-sixty first of the second; hence the difference required is equal to £457 10s. ÷ 61, which is equal to £7 10s.

4. (1). $acx^2 + adx - bcx - bd$

$$\begin{aligned} & \frac{a^2 x^2 - b^2}{cx(ax-b) + d(ax-b)} \\ &= \frac{a^2 x^2 - b^2}{(cx+d)(ax-b)} \\ &= \frac{(ax+b)(ax-b)}{(ax+b)(ax-b)} \\ &= \frac{cx+d}{ax+b} \end{aligned}$$

$$\begin{aligned} (2). & \frac{x^2+3x+2}{x^2+2x+1} \times \frac{x^2+5x+4}{x^2+7x+12} \\ &= \frac{(x+1)(x+2)(x+1)(x+4)}{(x+1)(x+1)(x+3)(x+4)} \\ &= \frac{x+2}{x+3} \end{aligned}$$

$$(3). \left(\frac{y}{x}\right)^{\frac{3}{2}}$$

5. (1).

$$\begin{array}{r|rrrr} 3 & 1 & 0 & 0 & 0 & -1 & 10 & -10 \\ -4 & & 3 & 9 & 15 & & 15 & \\ 2 & & & -4 & -12 & -20 & -20 & \\ & & & & 2 & 6 & 10 & 10 \\ \hline & & & & & 1 & 3 & 5 & 5 \end{array}$$

∴ $x^3 + 3x^2 + 5x + 5$ is the quotient required.

(2).

$$\begin{array}{r|rrrr} 2 & 6 & -23 & 0 & +22 & -16 \\ 5 & & 15 & -20 & & 10 \\ 8 & & & 24 & -32 & 16 \\ \hline & & & & 3 & -4 & +2 \end{array}$$

∴ $3x^2 - 4x + 2$ is quot. req'd.

6. (1). $(1+x)^{\frac{1}{3}} + (1-x)^{\frac{1}{3}} = 2^{\frac{1}{3}}$

Raise each side to the third power; thus

$$2 + 3(1-x^2)^{\frac{1}{3}} \times 2^{\frac{1}{3}} = 2$$

whence $x = \pm 1$.

(2) $x = 144, y = 216$.

(3). Divide the first equation through by $9yz$, the second by $8x$, &c., and we have

$$\frac{1}{y} + \frac{1}{z} = \frac{7}{9} \quad (a)$$

$$\frac{1}{z} + \frac{1}{x} = \frac{1}{8} \quad (b)$$

$$\frac{1}{x} + \frac{1}{y} = \frac{1}{3} \quad (c)$$

Add (a) and (b) and subtract (c)

$$\begin{aligned} \therefore \frac{2}{z} &= \frac{7}{9} + \frac{1}{8} - \frac{1}{3} = \frac{41}{72} \\ \therefore z &= \frac{144}{41} \end{aligned}$$

$$\text{Similarly } x = -\frac{144}{23}, y = \frac{144}{71}$$

7. (1). 8 hrs. after the second messenger starts, and after going 38 miles,

(2).

Let x = rate of walking up hill, in miles per hr.

“ y = “ “ on level, “ “
 “ z = “ “ down hill, “ “

$$\therefore \frac{5}{x} = \text{No. hrs. req'd to go 5 m. up hill.}$$

$$\frac{4}{y} = \text{“ “ “ “ 4 m. on level.}$$

$$\frac{6}{z} = \text{“ “ “ “ 6 m. down hill.}$$