

ARITH. PRIZE 1942

1. Work out (correct to 5 significant figures)

$$\frac{1}{7} \left\{ \frac{1}{7} - 1 \right\} \frac{1}{1.2} (.02)^2 + \frac{1}{7} \left\{ \frac{1}{7} - 1 \right\} \left\{ \frac{1}{7} - 2 \right\} \frac{1}{1.2.3} (.02)^3 + \frac{1}{7} \left\{ \frac{1}{7} - 1 \right\} \left\{ \frac{1}{7} - 2 \right\} \left\{ \frac{1}{7} - 3 \right\} \frac{1}{1.2.3.4} (.02)^4$$

2. A runs x yards in r secs. and beats B over the same course by y yards. If A runs at a speed n yards per sec. more than his previous speed, by how many seconds will he beat B over a course of z yards.

3. Trisect a given $\triangle ABC$ by straight lines drawn through a given point K in the side BC.

4. Draw the graph of speed and time:-

Miles per hour	35.8	36.4	33.7	26	16.6	9.2	6	13	25
Time by clock	12.42	1.06	1.36	2.00	2.13	2.42	3.12	3.48	4.12
Time on x axis	1 inch = 1 hour								
Speed on y axis	1 inch = 10 mph.								

From graph find rate at which speed decreases at 1.42

From graph find distance gone between 2.18 and 3.30

5. Find to the nearest penny the Compound Interest on £340 for 4 years at 4%.

On a certain sum of money at 4% Comp.Int. the Interest for the 4th year exceeds that for 1st year by £10.

Find the amount at end of the 3rd year.

$$6. \quad \frac{y^2 - z^2}{b - c} = \frac{yz}{x} \quad \frac{z^2 - x^2}{c - a} = \frac{zx}{y}$$

Eliminate c from above equations and find z in terms of other letters.

7. P and Q are the middle points of 2 adjacent arcs AB, AC of a circle. PQ is joined and cuts chords AB, AC at X and Y. Prove $\triangle AXY$ isosceles.

8. (a) Draw the graph of $y = \tan x$ from 0° up to 60° horizontal scale 1 inch = 10° vertical scale 2 inches = 1 unit.

(b) with exactle the same origin, axes and scales draw graphs of $y = \sqrt{\tan x}$ and $y = (\tan x)^2$ and use the figure to solve $\sqrt{\tan x} = (\tan x)^2 = \frac{3}{10}$

9. (a) Find the radius of the base of a solid circular cylinder whose height is 10 in. and whose total surface area is 66 sq. inches.

(b) A solid pyramid has square base ABCD and vertex V. The height of pyramid is 5 inches and the total area of its surface is 48 sq. inches. Find length of AB and VA.

10. One circle touches another internally at P. AB a chord of the larger touches the smaller at C. PA, PB cut the small circle at X, Y respectively. CX, CY, CP are joined.

Prove (1) 2 lines in the figure are equal.

(2) $YB \cdot XP = CY^2$