

Welsh Joint Education Committee

General Certificate of Education
Ordinary Level
Examination Papers

IN

Arithmetic and Algebra

1954—1960

*PUBLISHED UNDER SPECIAL ARRANGEMENT
WITH THE WELSH JOINT EDUCATION COMMITTEE*

LONDON:
THE EDUCATIONAL SUPPLY ASSOCIATION,
LTD.

Successors to
RELFE BROTHERS (1924) LTD.

Welsh Joint Education Committee

General Certificate of Education
Ordinary Level
Examination Papers

IN

Arithmetic and Algebra

1954—1960

*PUBLISHED UNDER SPECIAL ARRANGEMENT
WITH THE WELSH JOINT EDUCATION COMMITTEE*

LONDON:
THE EDUCATIONAL SUPPLY ASSOCIATION,
LTD.

Successors to
RELFE BROTHERS (1924) LTD.

WELSH JOINT EDUCATION COMMITTEE
GENERAL CERTIFICATE OF EDUCATION
GENERAL CERTIFICATE EXAMINATION, 1954

ORDINARY LEVEL

ARITHMETIC

(2½ Hours)

[Answer ALL questions from Section A and FOUR from Section B.
Logarithms must NOT be used in Questions 1 and 2.]

SECTION A

1. (i) Find the value of $(3\frac{1}{3} + 2\frac{1}{6}) \div (3\frac{2}{5} - 1\frac{3}{4})$.
(ii) Express 12 cwt. 70 lb. as an exact decimal of a ton.
(iii) Express 0.82 metres in feet and inches to the nearest tenth of an inch.

[1 metre = 39.37 in.]

2. (i) The length of a rectangular plot of area 31,752 sq. ft. is twice its breadth. Find the number of yards of fencing required to enclose it.

(ii) Find the rate per cent. per annum if the simple interest on £360 for $2\frac{1}{2}$ years is £40 10s.

(iii) An agent collected some rents for a landlord, retained 5 per cent. as commission, and paid the remainder, £133, to the landlord. How much was agent's commission?

3. (i) A rectangular lawn 80 ft. by 35 ft. contains a circular flower bed of radius 7 ft. The grass only is to be treated with fertilizer at the rate of $1\frac{1}{3}$ oz. per sq. yd. Find the number of pounds of fertilizer required.

[$\pi = 3\frac{1}{7}$.]

(ii) A rectangular tank 12 ft. long by 8 ft. wide contains 2,000 gal. of water. Find the depth of the water in the tank to the nearest inch.

[1 cu. ft. = 6.23 gal.]

SECTION B

[Answer any FOUR questions from this section.]

4. The total rateable value of a town is £880,000. Find the amount produced by a penny rate.

The expenditure on Public Health services is £319,000. What rate in the £ must be levied in order to obtain this sum?

The total rate for the town is 21s. 3d. in the £. Find the rateable value of a house of which the occupier pays £31. 17s. 6d. in rates. How much does this occupier contribute towards the Public Health services?

5. (i) A man borrows £120 and agrees to repay a fixed sum of £40 at the end of each subsequent year. If interest of 5 per cent. is charged each year on the sum owing at the beginning of that year, find how much remains unpaid at the end of the third year. Give your answer correct to the nearest penny.

(ii) An article for sale has a marked price of £2. 17s. 6d. A shopkeeper can allow a discount of 10 per cent. of the marked price and still make a profit of 15 per cent. of the cost price. Find the cost price.

6. A man invests a sum of £1,825 in shares costing 18s. 3d. each. How many does he obtain?

When the price has risen to 19s. he sells out and re-invests the proceeds in a government 4 per cent. stock at 95. How much stock does he acquire, and what is the annual income derived after deducting income tax at 9s. in the £?

7. (i) A train starts from a terminus at 1.52 p.m. and passes a station 72 miles away at 3.10 p.m. Find the average speed in miles per hour correct to one decimal place.

It was found that, for the whole journey of 120 miles, the average speed was 50 m.p.h. Find the average speed over the last 48 miles correct to one decimal place.

(ii) At 10 a.m. a cyclist starts to cycle from A to B, a distance of 40 miles. He rides at 8 m.p.h., resting for $1\frac{1}{2}$ hrs. after riding 12 miles. At noon a second cyclist starts to ride from B to A at 10 m.p.h. Find graphically when and where they meet.

8. (i) A field is in the shape of a triangle ABC . Given $AB=180$ yds., $AC=205$ yds., $\angle BAC=50^\circ$, find its area in acres correct to three significant figures.

[1 acre = 4,840 sq. yds.]

(ii) $PQRS$ is a rectangular plate in which $PQ=15$ in., $QR=10$ in. It is held in a vertical plane with PQ inclined to the horizontal at 25° , and with Q, R, S , lower than P . Calculate the depth of R below P to the nearest tenth of an inch.

9. A, B , and C are three villages. B is 5 miles from A in a direction $N. 33^\circ W.$, and C is 3 miles from A in a direction $S. 22^\circ W.$ Calculate in miles, correct to three significant figures, the distance between B and C .

X is the nearest point to A on a straight road connecting B with C . Find by calculation the direction of a footpath running directly from A to X .

GENERAL CERTIFICATE EXAMINATION, 1954

ORDINARY LEVEL

ALGEBRA

($2\frac{1}{2}$ Hours)

[Answer ALL questions from Section A and FOUR from Section B.]

SECTION A

1. (i) Simplify $2(3a^3-4b^3)-3(a^2-b^3)$ and find its value when $a=-1$, $b=-2$.

(ii) Solve the equation

$$\frac{3x-4}{6} - \frac{x-1}{4} = \frac{1}{3}.$$

(iii) When an expression E is divided by $x+2$ the quotient is $2x-3$ and the remainder is 9. Find E and express your result in its simplest form.

2. (i) Factorize completely

(1) $2x^2+3x-2$; (2) a^4-16b^4 .

(ii) If $p = \frac{q+1}{5q-2}$ express q in terms of p .

(iii) The average of a set of n numbers is a . Another number x is added to the set, and the average is increased by 2. Find x in terms of a and n .

3. (i) Given that y varies directly as x^2 and that $y=6$ when $x=2$, find the value of y when $x=4$.

(ii) Simplify $\frac{3x+y}{2x-2y} - \frac{2x-y}{3x-3y}$.

(iii) ABC is an isosceles triangle with $AB=AC=5$ in. $BC=4.54$ in.; BE is the perpendicular from B to AC . Calculate the angle BAC and the length of BE .

SECTION B

[Answer any FOUR questions from this section.]

4. (i) Prove that the equation

$$\frac{3}{x+6} - \frac{1}{2x+5} = \frac{1}{4}$$

reduces to the equation $2x^2-3x-6=0$.

Solve this equation, giving each root correct to two decimal places.

- (ii) Solve the simultaneous equations

$$3x^2-12y^2=8; \quad x-2y=2.$$

5. (i) Without using tables,

(1) find the values of $(81)^{\frac{1}{4}}$, $(\frac{1}{4})^{-\frac{1}{4}}$;

(2) solve the equation $2^x=32$.

(ii) Use logarithm tables to find the fifth root of 0.0606.

(iii) The expression $2x^3+ax^2+bx-2$ is exactly divisible by $x+1$, and $x-2$. Find the values of a and b . Also find the remaining factor.

6. The distance from a man's house to the nearest village is $2\frac{1}{2}$ miles by road, and 2 miles by a footpath across fields. The time taken by the man to reach the village, cycling along the road, is 25 min. less than the time he takes to walk across the fields. If he cycles 7 m.p.h. faster than he walks, find his rate of walking.

7. Draw the graph of $y=\frac{2}{5}x(3-x)(3+x)$ from $x=-3$ to $x=+3$. Take 1 in. as unit for both x and y .

From the graph estimate the value of x for which y has a maximum value. Also use the graph to obtain the positive roots of the equation $x^3-9x+5=0$.

8. (i) Find the number of integers from 81 to 378 (both numbers inclusive) which are multiples of 3, and determine their sum.

(ii) Having given that 25, x , 16 are the first three terms of geometric progression consisting of positive terms, find the value of x .

Write down an expression for the sum of the first eight terms, and evaluate it as accurately as the tables will allow.

9. (i) The straight line whose equation is $y=mx+c$ passes through the points (2, 1), (-3, -2). Find the value of m and deduce the angle the line makes with the positive direction of the axis of x .

(ii) From a point on a level road leading directly towards a tower the elevation of the top of the tower is 25° ; from another point on the road 100 ft. nearer, the elevation is 32° . Find the height of the tower to the nearest foot.

GENERAL CERTIFICATE OF EDUCATION
SUMMER EXAMINATION, 1955

ORDINARY LEVEL
ARITHMETIC

(2½ Hours)

[Answer ALL questions from Section A and FOUR from Section B. Logarithms must NOT be used in Questions 1 and 2.]

SECTION A

1. (i) Express as a single fraction in its lowest terms the sum of $1\frac{3}{4} \div 1\frac{1}{6}$, $1\frac{3}{4} - 1\frac{1}{6}$, and $1\frac{3}{4} \times 1\frac{1}{6}$.
(ii) Express 1 ft. $1\frac{1}{2}$ in. as a fraction, in its lowest terms of 2 ft. $5\frac{1}{4}$ in.
(iii) Find the prime factors of 1,960 and of 1,210. Hence, or otherwise, find the square root of $1,960 \times 1,210$.
2. (i) A man sold 1 gross of eggs, the first dozen at $6\frac{1}{2}$ d. each, the next score at $5\frac{3}{4}$ d. each, and the remainder at $4\frac{1}{2}$ d. each. How much did he receive altogether?
(ii) A man buys an article for £5 8s. 4d. and sells it for £6 1s. 4d. Express his profit as a percentage of the cost price.
(iii) Find in square metres, correct to three significant figures, the area of a rectangle 5 m. 36 cm. long and 3 m. 5 cm. wide.
3. (i) Express 9 sq. in. as an exact decimal of 1 sq. ft.
(ii) Find in miles per hour the average speed of a cyclist who covers 88 yds. in 15 sec.
(iii) Using the equality 1 in. = 2.54 cm., calculate, correct to three significant figures, the length in metres of a cricket pitch (i.e. 22 yds.).

SECTION B

[Answer any FOUR questions from this section.]

4. (i) 1,000 c.c. of salt solution of density 1.1 gm./c.c. is diluted with an equal *weight* of water of density 1 gm./c.c. Find, correct to three significant figures, the density of the new solution.

(ii) A candidate, told to find $8\frac{1}{3}$ per cent. of £16, produced the answer £1 5s. Find the percentage by which his answer differs from the correct result.

5. (i) Find the difference between the simple interest and the compound interest on £800 for 3 years at $2\frac{1}{2}$ per cent. per annum.

(ii) How much money must be spent on $4\frac{1}{2}$ per cent stock at 110 to receive an income of £99 per annum?

6. A gas-holder consists of a hollow cylinder of metal of height 54 ft. closed at the top [assume this closure to be a flat circle of radius 42ft.], with the open bottom under water. Ignoring the thickness of the metal, find, to the nearest shilling, the value of the gas contained when the top is 30 ft. above the water inside. Take 1,000 cu. ft. as equivalent to 5 therms, each therm to cost 1s. $7\frac{1}{2}$ d., and π to be $3\frac{1}{7}$.

The gas and water are now drawn off and the outside of the holder is painted. How many gallon tins are required if 1 pint of paint covers 60 sq. ft.?

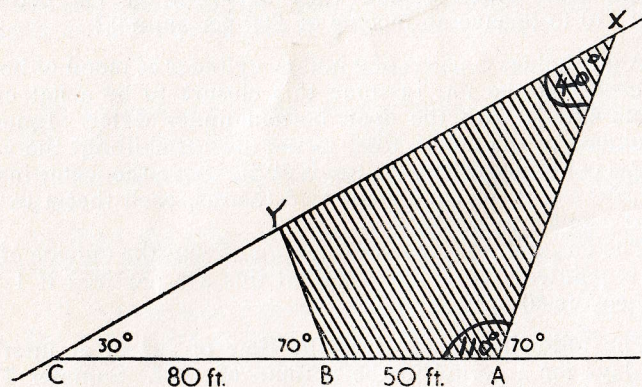
7. The following table gives the time of sunset at intervals of five days for a period in the autumn of 1954. Summer Time ended on the morning of October 3.

	p.m.		p.m.
Sept. 17	7.11	Oct. 17	5.4
22	7.0	22	4.53
27	6.49	27	4.43
Oct. 2	6.38	Nov. 1	4.34
7	5.27	6	4.26
12	5.15		

Lighting-up time was half-an-hour after sunset, except during Summer Time, when it was one hour after sunset. Using 1 in. to represent 10 days on one axis and 30 min. on the other, draw a graph showing lighting-up time on each day during the period.

8. A ship *S* is 12.5 nautical miles S. 50° E. from a lighthouse *L*. She is to steam at 8 knots directly to a harbour *H* which is 4.0 nautical miles N. 40° E. from *L*. Calculate, as accurately as the tables permit, the bearing of her course, and how long she will take to reach the harbour.

9. The figure shows the section of a hillside which slopes at 30° to the horizontal. The shaded portion represents the section of the rock to be removed to make a railway cutting with sides inclined at 70° to the horizontal. The horizontal base of the cutting is 50 ft. from A to B and, produced, cuts the hillside at C, 80 ft. from B. Calculate, as accurately as the tables permit, the area of the shaded portion.



GENERAL CERTIFICATE OF EDUCATION
SUMMER EXAMINATION, 1955

ORDINARY LEVEL

ALGEBRA

(2½ Hours)

[Answer ALL questions from Section A and FOUR from Section B.]

SECTION A

1. (i) Find the values when $a=1$, $b=-3$ of

(1) $(a-b)^3$; (2) a^3-b

(ii) Simplify $(2a+b)^2-(3a+b)(a-2b)$.

- (iii) Solve the equation

$$\frac{3x-1}{4} - \frac{x+4}{6} = 2.$$

2. (i) Divide $6x^3-5x^2-8x+3$ by $2x-3$.

(ii) Factorize (1) $2x^2-x-15$,

(2) $x^2-3x+2y-6$.

(iii) Given that $y=ax+bx^2$, where a , b are constants, and that $y=4$ when $x=2$ or 4 , find y when $x=6$.

3. (i) A grocer buys oranges at x for a shilling and sells them at y pence each. What is his profit per cent. on his outlay?

(ii) If $T=2\pi \sqrt{\frac{h^2+k^2}{gh}}$,

find an expression for k in terms of the other letters.

(iii) AOB is a triangle right-angled at O . $OA=2.5$ in., $OB=3.5$ in. OB is produced beyond B to C so that $\angle BAC=10^\circ$. Calculate the length of BC .

SECTION B

[Answer any FOUR questions from this section.]

4. (i) There is a path x ft. wide round a rectangular lawn which measures 60 ft. by 40 ft. Show that the area of the path is $(4x^2+200x)$ sq. ft.

If this area is 1,100 sq. ft. find x .

- (ii) Solve the equations

$$x^2+2y^2+3y=24, \quad x-2y+3=0.$$

5. (i) Factorize $2x^3+5x^2-14x-8$.

- (ii) Without using tables, find

(1) the value of $\frac{x}{y}$ when $x=3 \times 10^6$, $y=5 \times 10^{-3}$,

giving the answer in the form $a \times 10^n$ where a , n are whole numbers and a is less than 10;

(2) the values of $(125)^{\frac{2}{3}}$ and $(8)^{-\frac{2}{3}}$.

(iii) Use logarithms to find the radius of a circle of area 1 sq. ft. Take $\log \pi = 0.4971$, and give the answer in inches to the nearest tenth.

6. (i) A man walks at 4 miles per hour and runs at 8 miles per hour. If he takes 12 minutes to reach the railway station one mile away, how far does he run?

(ii) A piece of straight wire 1 yd. long is bent to form a triangle ABC in which $AB=AC$. The distance of A from BC is 1 ft. Find the lengths of the sides of the triangle in inches.

7. Taking 1 in. as the unit on each axis, draw, in the same figure, the graphs for values of x from $\frac{1}{2}$ to 4 of

$$(i) \ y = \frac{4}{x} \quad (ii) \ y = 6 - \frac{3x}{2}$$

For what range of values of x is $\frac{4}{x}$ less than

$$\left(6 - \frac{3x}{2} \right)$$

What equation is satisfied by the values of x at the points of intersection of the two graphs?

8. Of the series (i) 4, 6, 10,...

(ii) 4, 6, 9,...

(iii) 4, 6, 8,...

one is an arithmetical progression, one a geometric progression, and the other is neither of these.

State which is which, and find expressions, each in as simple a form as possible, for the n th term and the sum of the first n terms of each of the two progressions.

9. (i) A , B , and C are three points marked on a map in a straight line. From the map it is found that the horizontal distances of A from B and C are 130 and 280 yds. respectively, while the heights above sea-level of A , B , and C are 200, 250, and 300 ft. What would be the angle to the horizontal of a line joining the points on the ground corresponding to A and C on the map?

Can you say whether C would be visible from A ? Explain your answer.

(ii) In a triangle PQR , $PQ=6$ in., $PR=5$ in., and the cosine of angle P is -0.2588 . The perpendicular from Q to PR meets PR at T . Sketch the figure, and calculate the lengths of QT and RT .

GENERAL CERTIFICATE OF EDUCATION

SUMMER EXAMINATION, 1956 ✓

ORDINARY LEVEL

ARITHMETIC

(2½ Hours)

[Answer ALL questions from Section A and FOUR from Section B. Logarithms must NOT be used in Questions 1 and 2.]

SECTION A

1. (i) Find the prime factors of 792 and of 1,764. Hence, or otherwise, express as single fractions in their lowest terms

$$(1) \ \frac{792}{1,764}, \quad \text{and} \quad (2) \ \frac{1}{792} - \frac{1}{1,764}.$$

(ii) Calculate the square root of 948.64.

(iii) Express 27 yds. 1 ft. 6 in. as an exact decimal of $\frac{1}{4}$ mile.

2. (i) From an unearned income of £153, income tax at 8s. 6d. in the £ is deducted. How much is left?

(ii) A consignment of bricks weighing 17 tons 5 cwt. is divided into three parts whose weights are in the ratio 3:5:7. What is the weight of each part?

(iii) One c.c. of mercury weighs 13.6 gm. Find the weight of 18.3 c.c. of mercury.

3. A race track 440 yds. long has two straight sides, each 110 yds. long, joined by two equal semicircular ends. Calculate:

- (i) the radius of each end semicircle, if $\pi = \frac{22}{7}$,
- (ii) the length of the track in metres, correct to the nearest whole number, if 1 in. = 2.54 cm.,
- (iii) the average speed, over a mile, of a runner who covers the four laps in 78, 76, 80, and 88 secs. respectively. Give the answer correct to the nearest $\frac{1}{10}$ m.p.h.

SECTION B

[Answer any FOUR questions from this section.]

4. One day the rainfall was $\frac{1}{10}$ in. How many gallons of water, correct to three significant figures, fell on a 34-acre field? 1 acre = 4,840 sq. yds.; 1 cu. ft. = 6.23 gal. ~~727 in cu. yds~~

One year the field grows 81,600 lb. of wheat. If this yield is a national average, estimate, correct to three significant figures, the number of tons grown on the $2\frac{1}{2}$ million acres of wheat-producing land in the United Kingdom.

5. (i) Electricity may be paid for quarterly in one of two ways: either a fixed charge of £1 5s. in addition to $1\frac{1}{10}$ d. for every unit used or a charge of $2\frac{1}{4}$ d. for each unit used for power, and 6d. for each unit used for light. At the beginning and end of a quarter, a man's meters register 3,728 and 3,965 units for power, and 982 and 1,024 units for light. Find to the nearest penny how much is saved by adopting the cheaper method.

(ii) A man with £1,850 to invest is undecided whether to lend it to a building society at 4 per cent. per annum simple interest, or to purchase $4\frac{1}{2}$ per cent. stock at 111. Find how much more income would be obtained annually from one investment than from the other.

6. (i) Teas at 1s. 6d. a quarter lb. and 1s. 9d. a quarter lb. are mixed in the ratio 5 to 2 by weight, and the blend is sold at 1s. 10d. a quarter lb. What is the profit per cent. on the outlay?

(ii) By selling screws at 50 for 4s. a man makes a profit of 20 per cent. of their cost to him. How many does he offer for the same money during a sale, when he is prepared to lose 20 per cent. of the cost price?

7. A motorist starting at 10 a.m. with 3 gal. of petrol in the tank, drives at 28 m.p.h. until 12.30 p.m. After a stop for lunch he adds 1 gal. of petrol to the tank and at 2 p.m. resumes his journey at 24 m.p.h. If the petrol consumption at these speeds is 40 miles per gallon, draw a graph showing the amount of petrol in the tank against the time, and use it to estimate, as nearly as possible, the time at which he runs out of petrol. Take 1 in. to represent $\frac{1}{2}$ gal. on one axis and 1 hour on the other, and show all the calculations you make.

8. (i) A and B are two observers on horizontal ground, B being 176 yds. from A . An aeroplane climbing in a straight line at a speed of 350 m.p.h. passes directly over A and B at an interval of 1.1 sec. Calculate the angle of elevation of the plane's path.

(ii) A man walks in a straight line from P to Q , a distance of 300 yds. He then turns through 40° and walks another 300 yds. straight to R . Calculate the distance of R from P .

9. A vertical flagstaff stands on top of a conical mound which slopes at 40° to the horizontal. When the sun's elevation is 60° , the shadow of the pole reaches 36 ft. down the side of the mound. Calculate the height of the flagpole.

The top of the mound is 32 ft. above the surrounding level ground. Calculate the area of the surface of the mound. The curved surface of a cone has an area $\frac{1}{2}(\text{circumference of base}) \times \text{slant height}$.

GENERAL CERTIFICATE OF EDUCATION
SUMMER EXAMINATION, 1956

ORDINARY LEVEL

ALGEBRA

(2½ Hours)

[Answer ALL questions from Section A and FOUR from Section B.]

SECTION A

1. (i) Simplify each of the following:

(1) $3a^2b \times 6ab^3 \div 2ab^2$

(2) $2(2a + b) - 3(a - 2b)$

(3) $(ax - ay) \div a$

(4) $\frac{px + py}{x + y}$.

(ii) Solve the equations

$3x - 2y = 15,$

$5x + 7y = 25.$

2. (i) Express as a single fraction $\frac{2}{a} + \frac{3}{2b}$.

(ii) If a pound is worth d dollars or f francs, what is the value in dollars of x francs?(iii) If y varies as the square of x and $y = 100$ when $x = 5$, find the value of y when $x = 3$.

3. (i) Factorize :

(1) $3x^2 - 7x - 6,$

(2) $27 - 3x^2.$

(ii) Solve the equation $2x^2 - 6x = 3$, giving the roots correct to two decimal places.(iii) A clock face is rectangular in shape, the minute divisions being marked on the perimeter of a rectangle $ABCD$. AB is horizontal and 6 in. long, BC vertical and 4 in. long. The hour figure 12 is marked at the mid-point of AB and 3 at the mid-point of BC . Calculate the distances from B of the divisions corresponding to the hour figures 1 and 2.

SECTION B

[Answer any FOUR questions from this section.]

4. (i) Solve the equation

$$\frac{5x}{2x+3} = \frac{x}{6} + 1.$$

(ii) A boy usually cycles to school, a distance of 3 miles, at 12 m.p.h. One day he had a puncture after cycling part of the way and walked the remainder pushing his cycle at 3 m.p.h. In consequence the journey took 10 minutes longer than usual. How far from school did the puncture occur?

5. (i) Find a and b so that $x^3 - ax - b$ may be exactly divisible by $(x-1)(x+2)$.(ii) If $y = \frac{x}{x+1}$ and $x = \frac{z-1}{z}$, express y in terms of z .(iii) Find by use of logarithms the value of $\sqrt[3]{(a^2)}$ when $a = 0.816$.
0.816² = answer

6. A trapezium has a perimeter of 40 in. Of the two parallel sides the longer is four times the length of the shorter, and they are 8 in. apart. The two non-parallel sides are equal to one another. Find the lengths of the sides.

7. Draw the graph of $y = 3x^2 - 4x + 2$ for values of x from -2 to $+3$, taking 1 in. = 1 unit on the x -axis, and 1 in. = 5 units on the y -axis. From your graph estimate the least value of y .In the same figure draw also the graph of $y = 2x + 4$. For what range of values of x is $3x^2 - 4x + 2$ less than $2x + 4$?

8. (i) Find the sum of 100 terms of the arithmetical progression, 5, 5.1, 5.2,

(ii) Find x and y so that 8, x , y , 125 may be four terms in geometrical progression.(iii) The sum of £1,000 was placed in a bank and left to accumulate at 3 per cent. per annum compound interest. Write down an expression for the amount at the end of n years and show that after 25 years the amount will exceed £2,000.

$$(ii) \frac{T_4}{T_1} = \frac{125}{8} = \frac{a r^3}{a} = r^3$$

9. A and B are two points on a coast line, A being 5 miles north-west of B . A steamer passes, and when it is due north of A its bearing from B is N. 25° W. What is then its distance from B ?

If the steamer later passes due north of B at a distance of 8 miles from B , find its distance and bearing from A at that moment.

GENERAL CERTIFICATE OF EDUCATION

SUMMER EXAMINATION, 1957

ORDINARY LEVEL

ARITHMETIC

($2\frac{1}{2}$ Hours)

[Answer ALL questions from Section A and FOUR from Section B. Logarithms must NOT be used in Questions 1 and 2.]

SECTION A

1. (i) Simplify $5\frac{1}{4} \times 2\frac{1}{3}$, $5\frac{1}{4} \div 2\frac{1}{3}$, and $5\frac{1}{4} - 2\frac{1}{3}$. $pc = y$.

(ii) Make out a bill for the following purchases: 4 eggs at 5s. 6d. a dozen; 15 lb. plums at 5 lb. for 1s. 6d.; and 6 oz. bacon at 4s. 8d. per lb.

(iii) Find the average weight of six loads, three weighing 15 cwt. 78 lb. each, two weighing 11 cwt. 9 lb. each, and one weighing 12 cwt. 38 lb.

2. (i) On a map drawn to the scale of 1:12,672, two points are 1.6 in. apart. Calculate, correct to the nearest yard, the distance between the corresponding places on the ground.

(ii) A cycle costing £15. 2s. 6d. is sold for £17. 12s. 11d. Express the profit as a percentage of the cost price.

(iii) The total rateable value of all the properties in a town is $1\frac{3}{4}$ million pounds. What rate in the pound, correct to the nearest penny, must be levied to collect $1\frac{1}{4}$ million pounds?

3. The distance by rail from Newport to Paddington is 133.6 miles. A train is scheduled to leave Newport at 5.19 p.m. on its non-stop run to Paddington at an average speed of 54.9 m.p.h. One day the train arrives on time, having taken 4 min. 28 sec. to traverse the Severn Tunnel, which is 4.33 miles long.

(i) Find, correct to the nearest $\frac{1}{10}$ m.p.h., the amount by which the average speed in the tunnel exceeds the average speed for the whole journey.

(ii) Calculate, correct to the nearest minute, the time at which the train is due at Paddington.

(iii) The second-class fare from Newport to Paddington is £1 1s. 1d. Express this fare in pence per mile, correct to three significant figures.

SECTION B

[Answer any FOUR questions from this section.]

4. (i) A telescope is mounted in a building whose walls, forming the curved surface of a circular cylinder of height 16 ft., are surmounted by a domed roof in the shape of a hemisphere of the same radius as the cylinder. If the area of the floor is 616 sq. ft., find the volume of the building.

[A hemisphere of radius r has a volume of $\frac{2}{3}\pi r^3$. Take $\pi = 3\frac{1}{7}$ and neglect the thickness of the walls.]

(ii) An empty rectangular tank, open at the top, weighs 34 lb. 1 oz. Its base is 1 ft. 6 in. long and 1 ft. 4 in. wide, and its height is 1 ft. 3 in. Neglecting the metal used in overlapping, find the weight of 1 sq. ft. of the sheet metal of which the tank is made.

5. (i) A man borrows 2 million francs. A year later he pays 200,000 francs, of which part is the year's interest at $4\frac{1}{2}$ per cent. and the remainder is to reduce the debt. After a further year he pays another 200,000 francs, of which part is the $4\frac{1}{2}$ per cent. interest on the reduced debt and the remainder is to reduce the debt still further. How much does he owe after the second payment?

(ii) A man spends £2,310 in buying $4\frac{3}{8}$ per cent. stock. If his annual income from the stock is £105, how much did he pay for each £100 of stock?

6. (i) 1 c.c. of aluminium weighs 2.65 gm. Find, in ounces, correct to three significant figures, the weight of 1 cu. in. [1 in. = 2.54 cm., 1 lb. = 453.6 gm.]

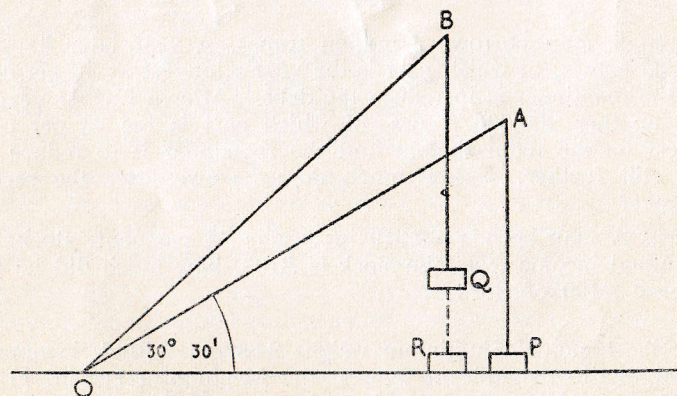
(ii) A clock, set to the correct time at noon on Monday, shows the time as 11.57 at noon on Tuesday. What is the correct time, to the nearest second, when the clock shows 3.30 on Wednesday afternoon?

7. Draw a graph to show the income-tax paid on taxable incomes up to £250 in a year when the regulations were as follows: the first £100 of taxable income is taxed at the rate of 2s. 6d. in the £ and the remainder at 5s. in the £. Use 1 in. to represent £50 of taxable income and £5 of tax.

(i) Use the graph to find the taxable income of a man who pays £40 tax.

(ii) A man with a total income of £720, all earned, finds his taxable income by deducting the total of the following from his total income: two-ninths of earned income; £210 personal allowance; £170 children's allowance. Use the graph to find the income-tax he pays.

8. A load hangs from a crane whose jib, OA , is 40 ft. long. When the elevation of the jib is $30^\circ 30'$ the load just touches the ground at P . The jib is then raised to the position OB , when the load is at Q , where $BQ = AP$. Calculate, correct to the nearest inch, the length of chain which must be let out until the load touches the ground at R , which is 8 ft. 3 in. nearer to O than P is.



9. Two observers A and B , 1,250 yds. apart, observe a tower whose foot T is at the same level as themselves, and find $\angle TAB = 64^\circ 15'$ and $\angle TBA = 50^\circ 45'$. Calculate the length of TB in yards, and the area of $\triangle ATB$ in acres. [1 acre = 4,840 sq. yds.]

If B is north-east of A and T is further north than A , what is the bearing of T from each observer?

GENERAL CERTIFICATE OF EDUCATION

SUMMER EXAMINATION, 1957

ORDINARY LEVEL

ALGEBRA

(2½ Hours)

[Answer ALL questions from Section A and FOUR from Section B.]

SECTION A

1. (i) Given that $s = ut + \frac{1}{2}ft^2$, calculate the value of s when $u = 80$, $t = 2.5$, and $f = -32$.

(ii) Divide $1 - 3x + 9x^2 - 14x^3$ by $1 - 2x$.

(iii) Copy and complete the statement
 $x^2 + 7x + \dots = (x + \dots)^2$.

(iv) Factorize:

(1) $xy - 2ay + 3bx - 6ab$,

(2) $x^2 + 3bx - 4b^2$.

2. Solve the equations

(i) $\frac{2}{3}(x - 5) - \frac{1}{2}(x - 3) = 1$,

(ii) $\begin{cases} 2x + 4y + 1 = 0 \\ 5x - 3y - 4 = 0 \end{cases}$

(iii) $3x^2 + 4x = 2$, giving the roots correct to two decimal places.

3. (i) If y varies inversely as x , and, when $x=30$, $y=20$, find the value of y when $x=25$.

(ii) A ladder 30 ft. long rests against a vertical wall, with the foot of the ladder on the horizontal ground 10 ft. away from the foot of the wall. What angle does the ladder make with the ground?

From the foot of the ladder the angle of elevation of a window sill in the wall is $56^\circ 20'$. Find the height of the window sill above the ground, and find also the height of the top of the ladder above the window sill.

SECTION B

[Answer any FOUR questions from this section.]

4. (i) 600 tickets were sold for a concert, some at 2s. 6d. each and the others at 4s. The total sum raised was £93. 12s. How many tickets were sold at 4s.?

(ii) Find the values of p and q if
 $2p + 3q = 1$ and $p^2 - 2q^2 = 7$.

5. (i) Express each of the numbers 64, 2, 1, and $\frac{1}{2}$ as a power of 8.

(ii) Find x in terms of a and b when

$$\frac{x-3b}{2a} = \frac{x-2a}{3b}.$$

(iii) Find the value of a if the remainders when $x^3 + 2x^2 - ax - 10$ is divided by $x-2$ and by $x+1$ are the same. Find also what this remainder is.

6. In the quadrilateral $ABCD$ the angles A and B are right angles and $AB=20$ in., $BC=17$ in., $AD=7$ in. P is a point in AB , and PQ , drawn at right angles to AB , cuts DC at Q . If $AP=x$ in. and $PQ=y$ in., show that $y=7+\frac{1}{2}x$.

Find and solve an equation for x if PQ bisects the area $ABCD$.

7. Calculate the value of $x^3 - 4x + 1$ for values of x at intervals of one-half from $x = -2\frac{1}{2}$ to $x = 2\frac{1}{2}$, and hence draw the graph of $x^3 - 4x + 1$ for this range of values of x . Take an inch to represent one unit on the x -axis and two units on the y -axis. Use your graph to answer these questions, marking it to show how your answers are obtained.

(i) Has $x^3 - 4x + 1$ a minimum value in the range? If so, what is it and what is the corresponding value of x ?

(ii) What is the approximate value of the negative root of the equation $x^3 = 4x - 1$?

8. (i) How many terms are there in the arithmetic progression 10, 13, 16, ..., 1,000, and what is their sum?

(ii) The first two terms of a geometric progression are $2\frac{1}{2}$, $3\frac{1}{3}$. Find the third term. Write down an expression for the sum of the first ten terms of this progression, and evaluate the expression, using logarithms.

$\frac{T_2}{T_1} = \frac{ar}{a} = \frac{3\frac{1}{3}}{2\frac{1}{2}} = \frac{10}{3} \times \frac{2}{5} = \frac{4}{3}$

9. (i) Referred to perpendicular axes Ox and Oy , A and B are the points (0,2) and (6, 5) respectively. Sketch the figure and calculate (1) the gradient of AB , (2) the equation of the line AB .

(ii) In the triangle ABC , $AB=3$ ft., $AC=5$ ft., and $BC=7$ ft. Show that $\cos A = -0.5$ and deduce the magnitude of $\angle A$. Find also the area of the triangle.

$\text{3rd term} = T_2 \times r = \frac{10}{3} \times \frac{4}{3}$

GENERAL CERTIFICATE OF EDUCATION
SUMMER EXAMINATION, 1958

ORDINARY LEVEL

(2½ Hours)

ARITHMETIC

[Answer ALL questions from Section A and FOUR from Section B. The working by which you arrive at your results should appear on the right-hand page of your answer book. Logarithms must NOT be used in Section A.]

SECTION A.

1. (i) Find the cost of 3 tons 6 cwt. of coal at £8 7s. 6d. per ton.
(ii) A drum holds 8 kg. 16 gm. of powder. How many bottles, each holding 48 gm., can be filled from the drum?
(iii) Express $(4\frac{1}{4} - 1\frac{1}{3}) \times (1\frac{1}{7} + \frac{2}{5})$ as a single fraction in its lowest terms.
(iv) Find the prime factors of 5,544. Hence, or otherwise, find the value of $\sqrt{(5,544/\pi)}$, taking π to be $\frac{22}{7}$.
2. (i) A container is three-fifths full of wheat. When 8 bushels are added, the container is five-sevenths full. How many more bushels must be added to fill the container?
(ii) A rectangular block, 5.6 cm. wide and 4.8 cm. deep, has a volume of 198 c.c. Calculate its length, correct to three significant figures.
(iii) On Wednesday, 7th August, 1957, the Caledonian Express covered the 401 mile run from Glasgow to London in the record time of 6 hr. 27 min. Calculate its average speed in miles per hour, correct to three significant figures.
3. A merchant bought 1 cwt. of bananas for 5 guineas. He sold 54 lb. at 1s. 6d. per lb., threw away some which were bad, and sold the remainder at 1s. 3d. per lb. If he received a total of £6. 16s. for the bananas, calculate:

- (i) the profit per cent. on the transaction, correct to the nearest whole number;
- (ii) the number of bananas bought, if their average weight was $3\frac{1}{2}$ oz.;
- (iii) the weight of bananas thrown away.

SECTION B

[Answer any FOUR questions from this section.]

4. A square sheet of thin metal, of side 1 m., provides material for twelve cylindrical containers, each of radius 5.4 cm. and height 13.6 cm. Each cylinder, which is to be closed at both ends, requires an extra 18 sq. cm. of metal for developing. What area of the sheet is left?

How many of these containers can be completely filled from a can containing 3 gallons of liquid?

[Take $\log \pi$ to be 0.4972 and 1 pint to equal 568 c.c.]

5. Between 1930 and 1940 the population of a town increased by 6 per cent. Between 1940 and 1950 the population decreased by $2\frac{1}{2}$ per cent. of its value in 1940, and between 1950 and 1960 it is expected to increase by $6\frac{2}{3}$ per cent. of its value in 1950. If the population was 127,200 in 1940, what is it expected to be in 1960?

Calculate the population in 1930, and express the total expected in the thirty years as a percentage of this.

6. (i) A man has bought his house, borrowing the money from a Building Society. At the beginning of one year he owes the Society £2,244, on which he pays 5 per cent. interest. During the year he also pays £55 to reduce the debt, £23. 18s. for repairs, and rates at 16s. 3d. in the pound, the rateable value of his house being £52. How much per week is the total of these payments?

(ii) A paste is made by mixing powder with water, their volumes being in the ratio 5:2. The volume of paste is only nine-tenths of the volume of the constituents, but the weight remains unaltered. If 1 cu. ft. of powder weighs $69\frac{1}{2}$ lb. and 1 cu. ft. of water weighs $62\frac{1}{2}$ lb., calculate the weight of 1 cu. ft. of paste.

7. The connexion between the frequency and the wavelength of wireless signals is given by the formula: frequency in kilocycles

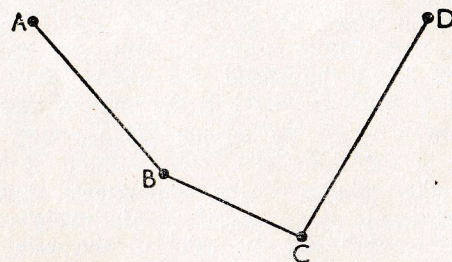
per sec. = $\frac{300,000}{\text{wavelength in metres.}}$ Draw a graph to convert wavelength to frequency for signals in the medium wave band, from 200 to 600 m. Take 1 in. to represent 100 m. and 200 kilocycles per sec. Use your graph to find the frequency of the Scottish Regional transmission (371 m.), and also to answer the following question.

On a wireless set on which the pointer moves 1.2 in. for every 100 m. change in wavelength, how far must the pointer be moved to change from one West Regional transmission to the other? Their frequencies are 1,052 and 1,457 kilocycles per sec.

8. (i) Q is 500 yds. from P on a bearing S. 50° W., and R is 200 yds. from P on a bearing N. 40° W. Calculate the distance and bearing of R from Q .

(ii) A vertical flagstaff stands on level ground, and a man observes it through a theodolite placed 5 ft. 6 in. above the ground some distance away. The angle of elevation of the top is 25° , and the angle of depression of the bottom is 3° . Calculate the height of the flagstaff.

9. AB , BC , and CD are three rods fastened together at B and C , and fastened at A and D to two points at the same horizontal level. AB is 8 ft. long and is inclined at 50° to the horizontal; BC is 6 ft. long and is inclined at 25° to the horizontal; CD is 10 ft. long. Calculate the depth of C below AD , the inclination of CD to the horizontal, and the distance AD .



GENERAL CERTIFICATE OF EDUCATION
SUMMER EXAMINATION, 1958

ORDINARY LEVEL

(2½ Hours)

ALGEBRA

[Answer ALL questions from Section A and FOUR from Section B.]

SECTION A

1. (i) Find the value of $3pq^3$ when $p=5$ and $q=-2$.
(ii) Express as single fractions:

(1) $\frac{x+1}{3} + 2 - \frac{5-x}{6}$;

(2) $\frac{2}{y} + \frac{3y-2x}{xy}$.

- (iii) Solve the equation

$$\frac{3p-2}{2p+5} = \frac{1}{2}.$$

2. (i) Factorize $2x^2 - 7x - 15$.

- (ii) Divide $6x^3 - x^2 - 14x + 3$ by $2x - 3$.

- (iii) Given that $\frac{3x-y}{2x+y} = \frac{4}{5}$, find the value of $\frac{x}{y}$.

- (iv) Solve the equation $\frac{1}{2x-1} = 1 - \frac{x+1}{2}$.

3. (i) The angles of a triangle are $(2x-3y)^\circ$, $(x+3y)^\circ$, and $(2x+6y)^\circ$. If the first two angles are equal prove that the third angle is a right angle.

- (ii) A path goes straight up a hillside. The first part, AB , is 350 yards long and slopes at 12° to the horizontal, while the remainder, BC , is 150 yards long, and slopes at 28° to the horizontal. How far from A horizontally is C , and how far is it above A ?

SECTION B

[Answer any FOUR questions from this section.]

4. P is a point on a circle of centre O and radius b . T is a point on the tangent to the circle at P and PT is of length t . OT is cut by the circle at X , and XT is of length x .

Prove that $x = \sqrt{(b^2 + t^2)} - b$.

By rearranging this formula deduce the value of t in terms of b and x and calculate t when $b = 40$, $x = 18$.

5. (i) a and b are numbers such that when

$$x^3 - 3x^2 + ax + b$$

is divided by $x - 1$ the remainder is 1, and when it is divided by $x - 2$ the remainder is 2. Find a and b .

(ii) Find the value of $\frac{ac}{b^2}$ when $a = 2.4 \times 10^3$, $b = 4 \times 10^{-2}$, $c = 3 \times 10^5$, giving the answer in the form $n \times 10^p$ where n is between 1 and 10 and p is a whole number. *standard form*
n=no., p=power

(iii) Use logarithms to evaluate x given that $x^4 = 0.6857$.

6. (i) In an experiment, values of x and y were found to correspond as in this table

$x = 2.0$	3.0	5.0	8.0
$y = 4.75$	3.2	1.9	1.2

On squared paper plot values of y against values of $1/x$. What law connecting x and y is suggested by the result?

(ii) Solve the equations

$$x - 2y = -1; \quad x^2 + 2y^2 - 5y = 7.$$

7. Draw the graph of the function $2x^2 + 5x - 2$ for values of x from -4 to 1 taking 1 in. as the unit on the axis of x and as 2 units on the axis of y .

Use your graph to answer the questions

(i) For what range of values of x is the value of the function negative?

(ii) What is the minimum value of the function, and what is the corresponding value of x ?

(iii) For what values of x is $2x^2 + 5x$ equal to 3 ?

8. (i) The first of a series of numbers in arithmetic progression is 2, the last is 8, and the sum of the numbers is 50. How many numbers are there in the series?

(ii) The first term of a geometric progression is 8, and the fourth term is 27. What is the fifth term?

(iii) The lengths of the sides of a triangle form a geometric progression. The shortest side is 3 in. and the perimeter is 12 inches. Find the length of the longest side, correct to 1 place of decimals.

9. A parallelogram has sides 6 in. and 8 in. long and the longer diagonal is 11 in. Calculate

(i) the angles of the parallelogram;

(ii) the length of the other diagonal;

(iii) the area of the parallelogram.

SUMMER EXAMINATION 1959

ORDINARY LEVEL

ARITHMETIC

(2½ Hours)

Answer ALL questions from Section A and FOUR from Section B. The working by which you arrive at your results should appear on the right-hand page of your answer book.

Logarithms must NOT be used in Section A.

SECTION A

1. (i) A joint of beef cost 15s. 4½d. when the price was 6s. per lb. What was its weight in lb. and oz.?

(ii) Six dozen tins of tomato juice, each weighing 7½ oz., are packed into a crate weighing 3 lb. 5 oz. Find the total weight of the package.

(iii) Simplify $(3\frac{3}{4} - 1\frac{2}{3}) \div 2\frac{1}{2}$.

(iv) Find without using tables the exact square roots of $1\frac{9}{16}$ and 8.5849.

2. (i) A rectangular metal plate of uniform thickness weighs 252 gm. Find its thickness in millimetres if its length and breadth are 12.5 cm. and 7.5 cm. respectively, and 1 c.c. of the metal weighs 8.4 gm.

(ii) A map is drawn on a scale of 5 in. to the mile. Find the Representative Fraction of the map, i.e., the ratio of a length on the map to the actual length represented by it, expressed as a fraction in its lowest terms.

(iii) Copper could be bought for £213. 10s. per ton on Oct. 1st, 1958. On Oct. 16th the price per ton was £241. 5s. Find, correct to two significant figures, the percentage increase in the cost in this time.

3. An electricity board charges householders for electricity supplies according to the number of rooms in the house. Each quarter, 14 units per room in the house are charged at $5\frac{1}{4}d.$ per unit, and for units in excess of this number the charge is $1d.$ per unit.

(i) Find the total cost of the electricity for a quarter in which 1,620 units are used in a six-roomed house.

(ii) In an eight-roomed house the cost of the electricity in one quarter was £9. 3s. $10d.$ How many units were used?

SECTION B

Answer any FOUR questions from this section.

4. A block of 110 flats is to be built at a cost of £207,000. The yearly cost of maintenance is estimated to be £6,000, and the rates will amount to £2,700. What average yearly rent must be charged for one of these flats if 6 per cent. profit on the building cost is to be made after the maintenance cost and rates have been met?

If 20 of the flats can be let at £234 per annum, and 45 more at £208 per annum, and the rest are let at equal rents, what should this rent be to fulfil the same conditions as before?

5. (i) The rain water falling on a flat roof of area 320 sq. ft. runs into a covered water-butt in the form of a circular cylinder of diameter 3 ft. placed with its axis vertical. By what amount, in inches, correct to three significant figures, would the depth of water in the butt be increased by a rainfall of 0.36 in.? [Take $\pi = 3.142$ or $\log \pi = 0.4971$.]

(ii) A fire extinguisher is in the shape of a right circular cone of base radius 12 in. and perpendicular height 35 in. Find the total external surface area including the base, giving your answer in square inches as a multiple of π .

[The area of the curved surface of a cone = $\pi \times$ base radius $\times$ slant height.]

6. (i) A shopkeeper marks goods for sale at a price 50 per cent. higher than he pays for them. In a sale he allows a discount of 10 per cent. from the marked price. What percentage profit does he make on articles then sold?

(ii) A man buys 240 5s. shares at 9s. $6d.$ each. If a dividend of $12\frac{1}{2}$ per cent. on the shares is declared, calculate how much the man receives, and express the dividend as a percentage, correct to two significant figures, of the amount paid for the shares.

7. Draw a graph to show the simple interest on £100 at 5 per cent. per annum for periods up to 73 days (one-fifth of a year). Take 1 inch to represent 10 days, and 1 inch to represent half-a-crown.

Using the graph, write down (i) the interest for 28 days, (ii) the least number of days for which the interest would yield 16s. $6d.$

Calculate the number of days for which the interest on £100 at 5 per cent. per annum would be equal to the interest on £200 for 19 days at the same rate. Find, from the graph, what this interest is.

Use the graph also to find the interest on £50 at 7 per cent. for 60 days, explaining how you do so.

8. OA and OB are the tangents from O to a circle. OA is 10 in. long and $\angle AOB = 76^\circ$. Calculate

- (i) the radius of the circle;
- (ii) the length of the chord AB .
- (iii) the distance of O from the nearest point of the circle;
- (iv) the length of the minor arc AB .

9. $ABCD$ is a field with straight sides. AB is 250 yd., AD 100 yd., and the angle A is 110° . The sides BC and CD are equal in length and the angle C is a right angle. Calculate the length DB to the nearest yard and the area of the field in acres.

[1 acre = 4,840 sq. yd.]

SUMMER EXAMINATION 1959

ALGEBRA

(2½ Hours)

Answer ALL questions from Section A and FOUR from Section B.

SECTION A

1. (i) If
- $a=1$
- ,
- $b=2$
- ,
- $c=-3$
- , find the value of
- $4b^2-3ac$
- .

(ii) Simplify $\frac{2a^4b^5c^2}{(-2abc)^3}$

- (iii) Express
- $\frac{2a-3}{6a} \cdot \frac{a-2}{4a}$
- as a fraction in its lowest terms.

(iv) Solve the equation $\frac{2x-7}{3} - \frac{x-8}{5} = \frac{2}{3}$

2. (i) Factorize:

(1) $ab+2a-3b-6$;

(2) $5a^2-125b^2$.

- (ii) Multiply
- $2x_2-5x-1$
- by
- $3x-2$
- .

(iii) Given that $y=a\sqrt{x}+bx$, where a and b are constants and that $y=16$ when $x=4$, and also that $y=33$ when $x=9$, find the values of a and b , using only the positive values of $\sqrt{x}$.

3. (i) Solve the equation
- $4x^2=7$
- , giving the answer correct to two decimal places.

(ii) If $\frac{f}{g} = \frac{2P-W}{4P+W}$ find an expression for P in terms of the other letters.(iii) ABC is a triangle in which $BC=5''$, $\angle ACB=90^\circ$, and $\angle ABC=35^\circ$. D is a point on BC , between B and C , such that $AD=4''$. Calculate the angle ADC and the length of DC .

SECTION B

Answer any FOUR questions from this section.

4. (i) Solve the equations

$2x-y=2.$

$4x^2-2xy+y^2=12.$

(ii) The total force, P lb. wt., exerted by the wind on a given area is directly proportional to the square of the speed, V miles per hour, at which the wind is blowing. Find the percentage decrease in P if V decreases by 20 per cent.

5. (i) With the help of the Remainder Theorem, factorize
- $3x^3-10x^2+9x-2$
- .

- (ii) Find, without using tables, the values of

$27^{\frac{1}{3}}; 12^0; 2^{-\frac{1}{3}} \times 2^{-\frac{2}{3}}.$

- (iii) Use logarithms to find
- x
- if
- $x^{\frac{4}{3}}=0.8$
- .

6. A tank can be filled by a tap A in 8 minutes longer than it takes to fill it by using another tap B . If the time taken to fill the tank by using tap B is t minutes and the time taken to fill the tank with both taps running together is $7\frac{1}{2}$ minutes, obtain an equation in t and solve it.7. Using the same axes, draw the graphs of $y=\frac{12}{x}$ and $y=15-\frac{5x}{2}$ for values of x between $\frac{1}{2}$ and 6, taking 1 in. as unit on the x -axis and 1 in. as 5 units on the y -axis. Use your graphs to find the range of values of x for which $15-\frac{5x}{2}$ is greater than $\frac{12}{x}$. Write down, and simplify, the equation which is satisfied by the values of x at the points of intersection of the two graphs.

8. (i) The 6th term of an arithmetic progression is 39 and the 12th term is 21. Find the first term, the common difference, and the sum of the first 20 terms.

(ii) The 5th term of a geometric progression is 32 and the 2nd term is 4. Find the first term and the common ratio.

(iii) Find the sum of the first 10 terms of a geometric progression whose first term is 2 and whose common ratio is $\frac{6}{5}$, using logarithms to evaluate your answer.

9. $ABCD$ is a quadrilateral, with AC as one diagonal, having the following dimensions:

$AB=3''$, $BC=2\frac{1}{2}''$, $CD=4''$, $\angle ACD=60^\circ$, and $\angle ADC=70^\circ$. Calculate

- (i) the length of AC ;
- (ii) the size of the angle ABC ;
- (iii) the area of the triangle ABC .

SUMMER EXAMINATION, 1960

ORDINARY LEVEL

ARITHMETIC

($2\frac{1}{2}$ Hours)

Answer ALL questions from Section A and FOUR from Section B. The working by which you arrive at your results should be shown. Logarithms must NOT be used in Section A.

SECTION A

I. (i) Rose bushes are offered for sale at 4s. 9d. each, or 55s. per dozen. If a man buys 60 bushes, how much cheaper is the cost when reckoned at the dozen rate than when reckoned at the rate per bush?

(ii) Express $(2\frac{1}{4} - 1\frac{2}{3}) \div 1\frac{2}{5}$ as a single fraction in its lowest terms.

(iii) Find the value of $0.3 \times 70 \div \sqrt{0.04}$.

2. (i) Express 3150 as the product of its prime factors. What is the smallest whole number by which 3150 may be multiplied to give a perfect square?

(ii) A car driver who was overtaken by a second car estimated that 10 seconds after the second car had passed him it was 100 yards ahead. If he was driving at 33 m.p.h. what speed did his estimate attribute to the second car, to the nearest mile per hour?

(iii) A building society pays $3\frac{1}{2}$ per cent. per annum to members who lend it money. How much interest would be received in a year by a member who had lent £480?

3. A room is 18 ft. long, $13\frac{1}{2}$ ft. wide, and 12 ft. high. Calculate

- (i) the area of the floor in sq. ft.,
- (ii) the total area of the four walls in sq. ft.,
- (iii) the cost of covering the floor completely with carpet costing £3. 5s. per sq. yd.,
- (iv) the cost of the paint needed to cover the walls if it is bought in tins costing 9s. 6d. each, 1 tin being sufficient for 200 sq. ft.

[Neglect doors and windows.]

SECTION B

Answer FOUR questions from this section.

4. In a certain year the income tax paid by a married man without children was calculated as follows: Two-ninths of the total income plus a further sum of £240 were free of tax. The remainder of the income was called the taxable income and the first £50 of this was taxed at 2s. 3d. in the pound. On the next £150 the rate was 4s. 9d. in the pound; on the next £150 the rate was 6s. 9d., and on any further taxable income the full rate of 8s. 6d. was payable.

Calculate the tax paid by a married man without children whose income for the year was £1530. Express the tax as a percentage of the total income to the nearest whole number.

5. (i) A vessel in the shape of a circular cylinder whose axis is vertical contains water. The radius of the cylinder is 2 in. A sphere whose radius is 1 in. is lowered carefully into the water and is entirely immersed. Find how much the water level rises.

[The volume of a sphere is $\frac{4}{3}\pi \times$ the cube of the radius. If you use a value for π take it to be 3.14.]

(ii) Another measuring cylinder contains 250 c.c. of water and when 10 equal spherical marbles are immersed in the water the level of water rises to the 335 c.c. mark. Using logarithms, and taking $\log \pi = 0.4971$, calculate the radius of ONE of these marbles.

6. (i) By selling an article for £8 15s. a tradesman made a profit of 40 per cent. on his cost price. If he had sold the article for £6 10s. would he have gained or lost, and by what percentage of his outlay?

(ii) An assortment of biscuits is made by mixing them in the ratio of 5 lb. costing 1s. 6½d. per lb., 3 lb. costing 2s. 2d. per lb., and 1 lb. costing 2s. 8d. If 20 per cent. profit is made on the cost of the biscuits, find the selling price of a 7 lb. tin of the assortment, allowing 1s 6d. for the tin.

7. A train leaves a station *A* at noon and travels steadily at a speed of 35 miles per hour towards *B*, 90 miles away. In a travel graph, plot the positions of the train at noon and at 2 p.m. Take 2 in. to represent 1 hr., and 1 in. to represent 10 miles. Complete the graph and read from it the time at which the train reaches *B*.

A second train leaves *B* at 12.48 p.m. and travels non-stop to *A* at steady speed, arriving at 2.36 p.m. Draw its travel graph, and read from it the distance of this train from *B* after 1 hour's travel. Deduce the speed of this train in m.p.h.

At what time and how far from *A* do the two trains pass one another?

C is a station midway between *A* and *B*. Which train passes through *C* first, and how many minutes then elapse before the other train passes *C*?

[Record your answers clearly and indicate in your diagram how they are obtained.]

8. A ladder, 16 ft. long, rests with its foot on level ground and its upper end at the top of a vertical wall 12 ft. high. What angle does the ladder make with the ground?

The ladder is now adjusted so that it makes an angle of 65° with the ground, its upper end projecting over the top of the wall. Calculate how much the foot of the ladder has been moved nearer to the wall and what length of the ladder projects beyond the wall, each to the nearest inch.

How much nearer to the wall than before is the middle point of the ladder?

9. *A* and *B* are two observation posts on a straight stretch of coast. *B* is 5 miles due east of *A*. A lightship *L* bears N 13° E from *B* and N 55° E from *A*. Calculate the distance *AL*.

Y is a buoy which is 2 miles north of *L*. Calculate the distance *AY*.

SUMMER EXAMINATION, 1960

ORDINARY LEVEL

ALGEBRA

(2½ Hours)

Answer ALL questions from Section A and FOUR from Section B.

SECTION A

1. (i) If $y = ax^2 + \frac{b}{x} - c$, find the value of y when $x = -2$, $a = 5$, $b = -4$, $c = 3$.

(ii) Simplify $\frac{7a^2b^2 - 14ab^3}{7ab}$.

(iii) Factorise $x^2 - ax - 5(x - a)$.

(iv) Solve the equations $2x + 5y = 8$
 $2x - 2y = -7$.

2. (i) Express $\frac{x^2-3}{3x} - \frac{x^2-5}{5x}$ as a fraction in its lowest terms.

(ii) Simplify $\frac{2x+6}{x-4} \times \frac{x^2-5x+4}{x^2-9}$.

(iii) Solve the equation $\frac{5x+6}{4} + x - \frac{2-x}{6} = 6$.

3. (i) If y varies inversely as the square of x and if $y=9$ when $x=2$, find y in the terms of x .

(ii) Solve the equation $4x^2-3x-2=0$, giving the answers correct to two decimal places.

(iii) ABC is a triangle in which $AB=2''$, $BC=1.328''$, and $\angle ABC=90^\circ$. D is a point on AC such that BD is perpendicular to AC and E is a point on AB such that DE is perpendicular to AB . Calculate the angle BAC and the lengths of AD and DE .

SECTION B

4. (i) A motorist travelled from a town A to a town B . He covered the first 22 miles at a steady speed of 22 m.p.h. and for the remainder of the journey he maintained a steady speed of 40 m.p.h. His average speed for the whole journey was 32 m.p.h. Find the distance between the towns.

(ii) If $\frac{3(3a-x)}{b} = \frac{2(2b-x)}{a}$, find an expression for x in terms of a and b .

5. (i) Show that x^2-x-6 and x^3-4x^2+x+6 have a common factor and completely factorise the second expression.

(ii) If $p=3 \times 10^8$ and $q=5 \times 10^{-3}$, express $\frac{p}{q^2}$ in the form $a \times 10^n$, where n is a whole number and a lies between 1 and 10.

(iii) Use logarithms to evaluate x correct to 3 significant figures, given that $x^5=(0.683)^3$.

6. A tradesman bought a number of yards of cloth for £55. He kept 3 yards, sold the remainder at 6s. 8d. per yard more than he gave, and received £5 more than he originally spent. How many yards of cloth did he buy?

7. Draw the graph of $y=x^2+4x$ for values of x between -5 and 1 , taking 1 in. as one unit on both axes. Use your graph (i) to write down the range of values of x for which the value of the expression x^2+4x is less than -2 , and (ii) by drawing a suitable straight line graph, to solve the equation $x^2+3x=3$.

8. (i) In an arithmetical progression the ratio of the 3rd term to the 7th term is 2:1 and the sum of the first 6 terms is 45. Find the first term and the common difference.

(ii) A machine was purchased on 1st January 1950 for £1000. During each year of its use, the value of the machine depreciates by 15% of its value at the beginning of the year. Write down an expression for the value of the machine on 1st January 1962 and evaluate this as accurately as the tables will allow.

9. Fig. 1 represents a framework of rods in which AX , CY are vertical and XY is horizontal. AB and BC are inclined at 48° and 64° to the vertical respectively; $AB=12$ ft., $BC=6$ ft., $CY=8$ ft. Calculate the lengths, in feet, of AC and AX , giving each answer correct to two decimal places.

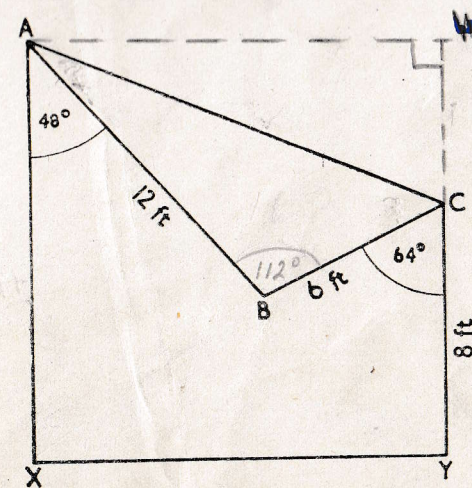
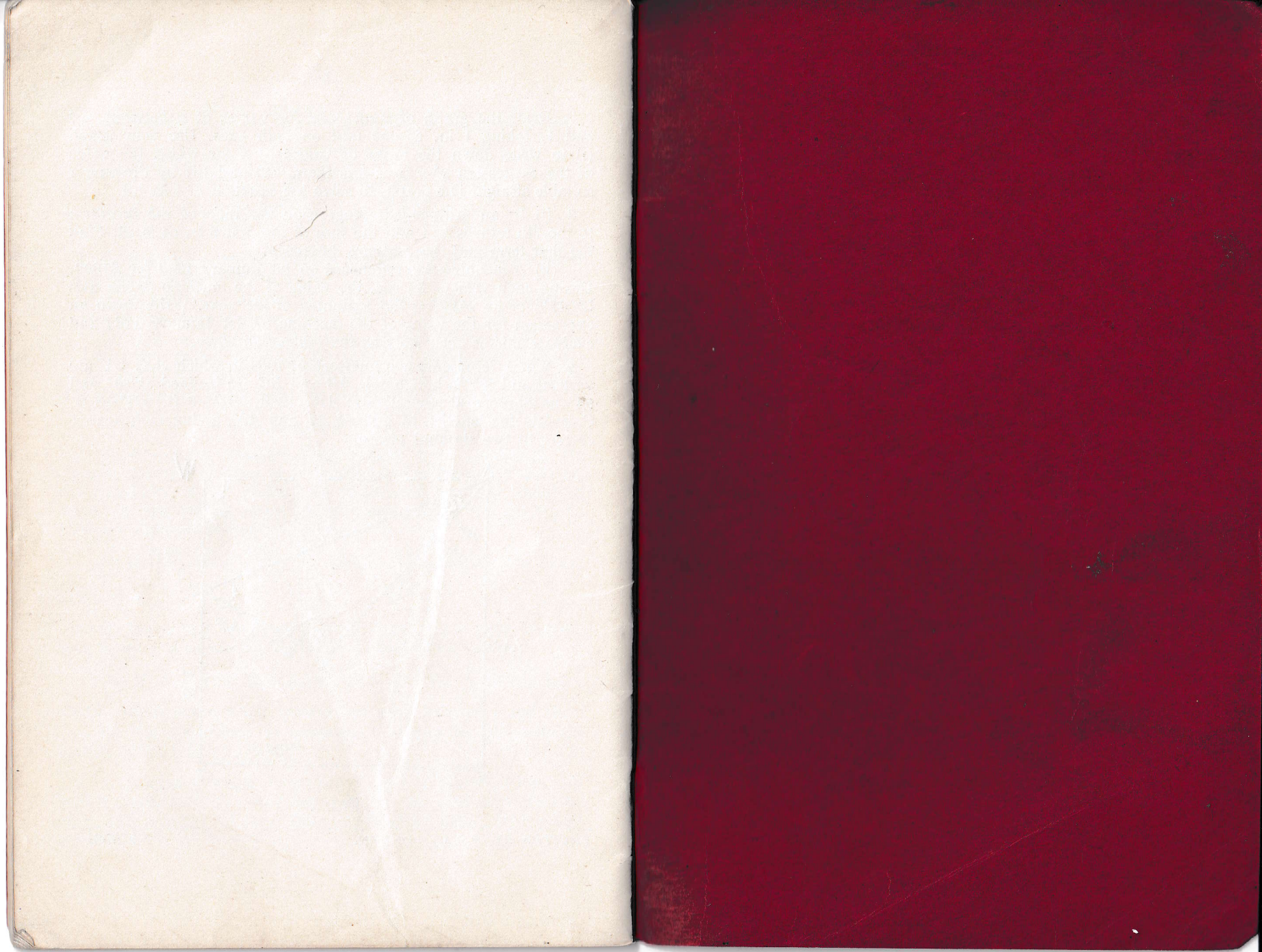


Fig. 1



Welsh Joint Education Committee Examination Series

Reprints of the actual questions set at the
Welsh Joint Education Committee Examinations,
published under special arrangement.

SCHOOL CERTIFICATE

AND G.C.E. (Ordinary Level)

	s.	d.
Arithmetic and Algebra	1	9
Biology	1	6
Chemistry	1	6
English Language	1	9
French	1	9
Geography	2	4
Geometry and Trigonometry	1	9
History	2	0
Latin	2	0
Physics	1	0
Welsh	1	9

When ordering please specify 'Welsh J.E.C.'

*Individual private orders should be accompanied by a
remittance sufficient to include postage.*

The Educational Supply Association Ltd. also publish under
special arrangement with the Oxford and Cambridge Locals
an extensive list of subjects.

THE EDUCATIONAL SUPPLY ASSOCLN LTD
PINNACLES, HARLOW, ESSEX.

Showroom: 233 SHAFTESBURY AVENUE, LONDON, W.C.2.

Successors to
RIPLEY BROS (1924) LTD.