Numbers – 2022 O Level Math D 4024

1. Nov/2022/Paper_4024/11/No.1

(a) The temperature was −2 °C.
The temperature decreases by 8 °C.

Find the temperature after this change.

..... °C [1]

(b) On another day, the temperature increases from −5 °C to 3 °C.

Work out the increase in temperature.

..... °C [1]

2. Nov/2022/Paper_4024/11/No.2

Find 45% of $1.20 .

$ ..... [2]

3. Nov/2022/Paper_4024/12/No.3

Write these fractions in order of size, starting with the smallest.

$\frac{11}{12}$ $\frac{4}{5}$ $\frac{27}{30}$ $\frac{13}{15}$

..... , ... , ... , ... [2]

smallest

4. Nov/2022/Paper_4024/11/No.5

(a) Write 306.248

(i) correct to 2 decimal places,

..... [1]

(ii) correct to 2 significant figures.

..... [1]

(b) By writing each number correct to 1 significant figure, estimate the value of

$$9.37^2 - \sqrt[3]{1046} .$$

..... [2]

5. Nov/2022/Paper_4024/11/No.6

(a) Write $4 \times 4 \times 4 \times 4 \times 4$ as a power of 4.

..... [1]

(b) Simplify $\left(\sqrt{5}\right)^2$.

..... [1]

(c) Simplify $\left(2x^3\right)^4$.

..... [1]

6. Nov/2022/Paper_4024/11/No.7

(a) Work out $\frac{7}{8} - \frac{3}{4}$.

..... [1]

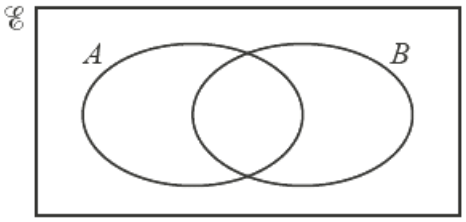
(b) Work out $1\frac{3}{5} \div \frac{4}{7}$.

Give your answer as a mixed number in its lowest terms.

..... [2]

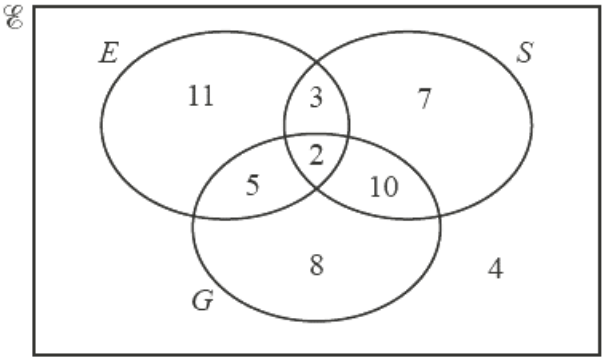
7. Nov/2022/Paper_4024/11/No.9

(a) In the Venn diagram, shade the region represented by $A \cap B$.



[1]

(b) This Venn diagram shows information about the number of students who study English (E), Spanish (S) and German (G).



(i) Find the number of students who study English and German but not Spanish.

..... [1]

(ii) Find $n(G \cup S)'$.

..... [1]

8. Nov/2022/Paper_4024/11/No.10

(a) Write the number $320\,000\,000$ in standard form.

..... [1]

(b) Evaluate $\dfrac{2\times10^{-3}}{4\times10^{9}}$.

Give your answer in standard form.

..... [2]

9. Nov/2022/Paper_4024/11/No.11

(a) Write 120 as a product of its prime factors.

..... [2]

(b) $315 = 3^2 \times 5 \times 7$

Use this information to find the smallest integer value of n, such that $315n$ is a square number.

..... [1]

10. Nov/2022/Paper_4024/11/No.18

b is directly proportional to the square of a.
When $a = 3$, $b = 18$.

Find b when $a = 5$.

$b =$ ..... [2]

11. Nov/2022/Paper_4024/12/No.1

(a) Work out $80 \div 0.02$.

..... [1]

(b) Evaluate $\sqrt[3]{1000}$.

..... [1]

12. Nov/2022/Paper_4024/12/No.2

(a) Put **one** pair of brackets into this calculation to make it correct.

$$4 + 4 \times 4 - 4 = 4$$

[1]

(b) Work out $-6 \times (-3 + 7)$.

..... [1]

13. Nov/2022/Paper_4024/12/No.3

Write 7.54×10^{-4} as an ordinary number.

..... [1]

14. Nov/2022/Paper_4024/12/No.6

(a) Work out $\frac{11}{15} - \frac{2}{3}$.

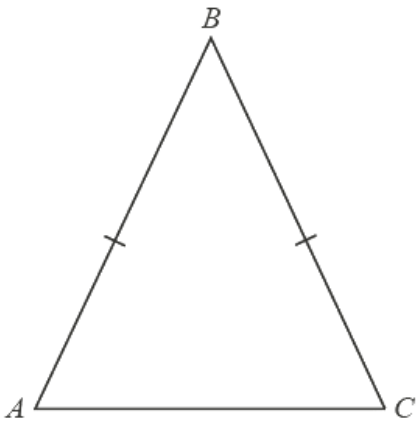
..... [1]

(b) Work out $\frac{3}{10} \div 6$.

Write your answer as a fraction in its simplest form.

..... [2]

15. Nov/2022/Paper_4024/12/No.8



NOT TO SCALE

ABC is an isosceles triangle with $AB = BC$.
The ratio $A\hat{B}C : B\hat{A}C = 2 : 5$.

Find $A\hat{B}C$.

$A\hat{B}C =$ ..... [2]

16. Nov/2022/Paper_4024/12/No.9

By writing each number correct to 1 significant figure, estimate the value of

$$\frac{47.5 + 36.1}{64.9 \div 17.7}.$$

..... [2]

17. Nov/2022/Paper_4024/12/No.10

(a) Write 420 as the product of its prime factors.

..... [2]

(b) Given that $1512 = 2^3 \times 3^3 \times 7$, find the highest common factor of 420 and 1512.

..... [1]

18. Nov/2022/Paper_4024/12/No.13

Sophie cycles 2600 metres in 12 minutes.

Work out Sophie's average speed in kilometres per hour.

..... km/h [3]

19. Nov/2022/Paper_4024/12/No.18

x is directly proportional to the square of $(y+1)$.
When $y = 2$, $x = 45$.

Find x when $y = 4$.

$x =$ ..... [2]

20. Nov/2022/Paper_4024/21/No.1

(a) Abid works in an office for 5 days each week.
Each day he works from 08 15 until 12 40 and then from 13 30 until 17 00.

Work out the total time Abid works in one week.
Give your answer in hours and minutes.

..... hours ..... minutes [2]

(b) Abid earns $14.20 per hour.
He is given a pay increase of 5%.

Calculate the amount Abid earns per hour after the increase.

$ ..... [2]

(c) Each month Abid divides his earnings between rent, bills and savings.
He uses 20% of his earnings for rent.
He uses $\frac{3}{8}$ of his earnings for bills.
The rest of his earnings are savings.

Find the ratio rent : bills : savings.
Give your answer in its simplest form.

..... : ..... : ..... [3]

(d) Abid invests \$2400 in a savings account for 4 years.
The account pays simple interest at a rate of r% per year.
At the end of 4 years he receives a total of \$153.60 in interest.

Calculate the value of r.

$r =$ ..... [2]

(e) Abid invests some money in a different savings account.
This account pays compound interest at a rate of 1.4% per year.
At the end of 5 years there is \$1822.38 in the account.

Calculate the amount of money Abid invests in this account.

\$ ..... [3]

21. Nov/2022/Paper_4024/22/No.1

(a) Hala travels from London to Marseille by train.
She must change trains in Paris.

The journey from London to Paris takes 2 hours 28 minutes.
The journey from Paris to Marseille takes 3 hours 30 minutes.

The local time in Marseille and in Paris is 1 hour ahead of the local time in London.

(i) Complete the timetable for Hala's journey.

	Local time
London depart	.....
Paris arrive	1650

	Local time
Paris depart	1931
Marseille arrive	.....

[2]

(ii) Work out how long Hala waits in Paris before the train to Marseille departs.

.....hours ..... minutes [1]

(b) The exchange rate between dollars ($) and pounds (£) is $1 = £0.75$.
The exchange rate between dollars ($) and euros (€) is $1 = €r$.

Hala changes £250 into euros.
She receives €290.

Calculate the value of r.

$r =$ ..... [3]

(c) **(i)** Josef books a holiday for 3 people.
The holiday costs $420 per person.
Josef pays a deposit of 20% of the total cost of the holiday.

Calculate the amount Josef pays as the deposit.

$ ..... [2]

(ii) Josef pays a total of $85.68 for airport parking for 8 days.
This price includes a reduction of 15% of the full price for booking early.

Calculate the full price for airport parking for 1 day.

$ ..... [3]

22. Nov/2022/Paper_4024/22/No.4

(a) $\mathscr{E} = \{x : x \text{ is an integer } 10 \leqslant x \leqslant 40\}$
$P = \{x : x \text{ is a multiple of } 6\}$
$Q = \{x : x \text{ is a square number}\}$

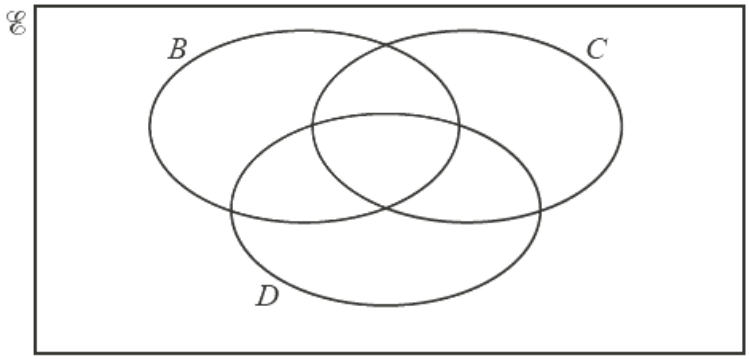
(i) Write down the elements of $P \cup Q$.

..... [1]

(ii) Find $n(P' \cap Q)$.

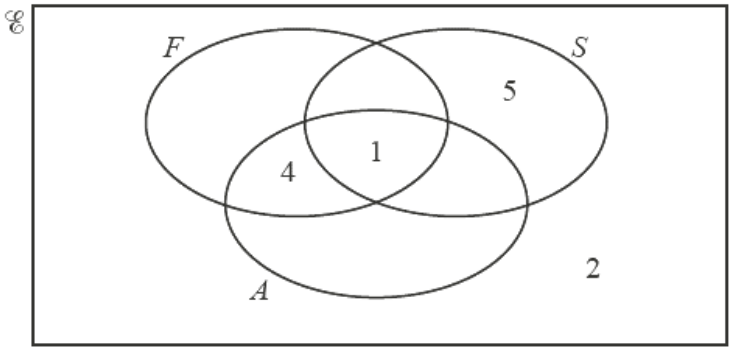
..... [1]

(b) Use set notation to describe the shaded region in the Venn diagram.



..... [1]

(c) In a college, students can study French (F), Spanish (S) and Arabic (A).
A group of 25 students are asked which languages they study.
Some of the results are shown in the Venn diagram.



(i) All students who study both Arabic and Spanish also study French.
7 students study French only.
8 students study Arabic.

Use this information to complete the Venn diagram.

[2]

(ii) Two of the 25 students are selected at random.

Find the probability that they both study Spanish only.

..... [2]

(iii) Three of the students are selected at random from those who study French.

Find the probability that only one of them also studies Arabic.

..... [3]

23. Nov/2022/Paper_4024/22/No.5(b _ c)

(b) A machine makes five-cent coins.
It makes 720 coins per minute.
The machine operates for 24 hours per day.

Calculate the total value, in dollars, of the coins made by the machine in 300 days.
Give your answer in standard form, correct to 3 significant figures.

$ ..... [3]

(c) The diameter of a five-cent coin is 21.2 mm, correct to the nearest 0.1 mm.
The diameter of a ten-cent coin is 17.9 mm, correct to the nearest 0.1 mm.
Marlon makes a line of 10 five-cent coins and a line of 10 ten-cent coins.

Calculate the upper bound of the difference between the lengths of the two lines.

..... mm [3]

24. June/2022/Paper_4024/11/No.1

(a) Write down the value of the 5 in the number 253 624.

..... [1]

(b) The crowd at a sports event is exactly 35 687.

Write this number correct to the nearest ten.

..... [1]

25. June/2022/Paper_4024/11/No.3

The table shows the average monthly temperatures, in °C, in Vladivostok.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
−12	−8	−2	5	10	14	18	20	16	9	−1	−9

(a) Find the difference between the highest and lowest of these temperatures.

..... °C [1]

(b) In February, the average temperature in Yakutsk is 37 °C below that in Vladivostok.

Find the average temperature in Yakutsk in February.

..... °C [1]

26. June/2022/Paper_4024/11/No.6

Write down

(a) a prime number between 10 and 15,

..... [1]

(b) an irrational number between 10 and 15.

..... [1]

27. June/2022/Paper_4024/11/No.8

Work out.

(a) $\frac{2}{3} - \frac{3}{5}$

..... [1]

(b) $\frac{3}{5} \div \frac{2}{3}$

..... [1]

28. June/2022/Paper_4024/11/No.9

Write these lengths in order of size, starting with the smallest.

32 000 cm 3300 mm 3.1 km 34 m

....., ..., ..., ... [2]

smallest

29. June/2022/Paper_4024/11/No.12

By writing each number correct to 1 significant figure, estimate the value of

$$\frac{0.28 \times 37.4}{77.8}.$$

..... [2]

30. June/2022/Paper_4024/11/No.14

(a) Write 0.000 863 in standard form.

..... [1]

(b) The table below shows the approximate area of some deserts.

Desert	Area in km^2
Antarctica	1.4×10^7
Arabian	2.3×10^6
Gobi	1.3×10^6
Kalahari	9.0×10^5
Sahara	9.0×10^6

(i) Write down the name of the desert with the largest area.

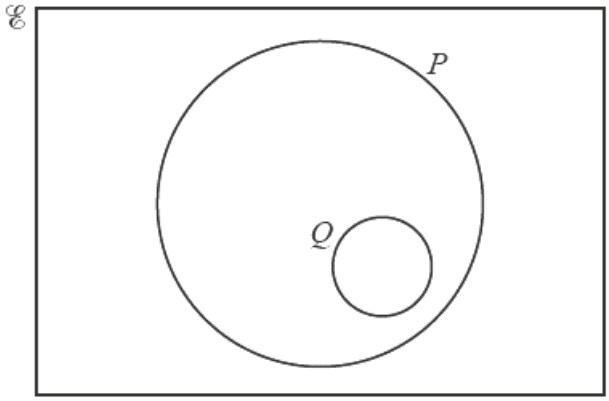
..... [1]

(ii) Calculate the **total** area of the Arabian and Kalahari deserts.
Give your answer in standard form.

..... km^2 [2]

31. June/2022/Paper_4024/11/No.18

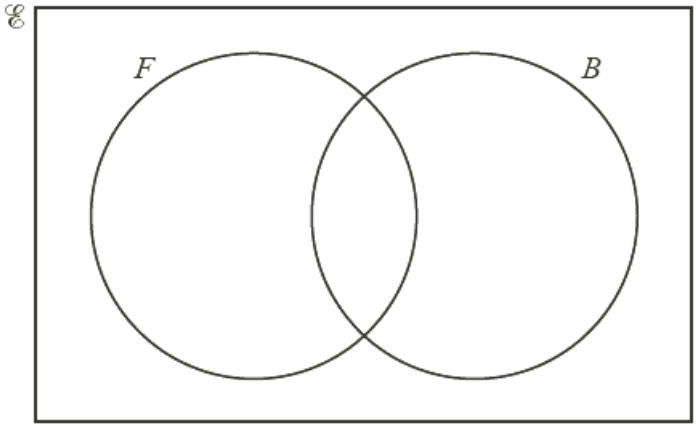
(a) In the Venn diagram, shade the region represented by $P \cap Q'$.



[1]

(b) A club has 32 members.
14 of the members are female and 18 of the members are male.
5 of the females have black hair.
6 of the males have black hair.

$\mathscr{E}$ = {members of the club}
F = {females}
B = {members with black hair}



Complete the Venn diagram to show this information. [2]

32. June/2022/Paper_4024/11/No.21

y is inversely proportional to $(x+1)^2$.

Given that $y = 2$ when $x = 3$, find y when $x = 9$.

$y =$ ..... [2]

33. June/2022/Paper_4024/12/No.1

Work out.

(a) $\frac{2}{3} + \frac{1}{6}$

..... [1]

(b) 0.4×0.2

..... [1]

34. June/2022/Paper_4024/12/No.4

(a) The temperature inside Luke's house is 18 °C.
The temperature outside his house is −3 °C.

Find the difference between these temperatures.

..... °C [1]

(b) Luke's thermometer measures the temperature correct to the nearest degree.
At midnight, the thermometer measures the temperature outside as −6 °C.

Find the upper bound of the temperature outside at midnight.

..... °C [1]

35. June/2022/Paper_4024/12/No.6

Kabir invests $250 in a savings account.
The account pays simple interest at a rate of 1.5% per year.

Calculate the total amount of interest he will receive at the end of 4 years.

$ ..... [2]

36. June/2022/Paper_4024/12/No.10

A bag contains red balls, blue balls and green balls.
The ratio red : blue = 3 : 8 .
The ratio green : blue = 2 : 5 .

Work out the fraction of the balls that are blue.

..... [3]

37. June/2022/Paper_4024/12/No.12

(a) Write 0.002 035 61 correct to 3 significant figures.

..... [1]

(b) By writing each number correct to 1 significant figure, estimate the value of

$$\frac{\sqrt{3.93}\times 63.7}{0.425}.$$

..... [2]

38. June/2022/Paper_4024/12/No.13

(a) Evaluate $\left(\sqrt{9} \times \sqrt[3]{64}\right)^2$.

..... [2]

(b) Write down an irrational value of n that satisfies this inequality.

$4.5 \leqslant n \leqslant 5.5$

..... [1]

39. June/2022/Paper_4024/12/No.14

(a) Write these numbers in order of size, starting with the smallest.

$2000 \qquad 0.002 \qquad 2\times10^{-4} \qquad 2\times10^{-2}$

..... , ... , ... , ... [1]

smallest

(b) This is a calculation using numbers in standard form.

$a\times10^{-7}\div5\times10^{b}=4\times10^{-16}$

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [2]

40. June/2022/Paper_4024/12/No.15

y is directly proportional to $(x-1)^2$.
When $x = 5$, $y = 32$.

Find the value of y when $x = -2$.

$y =$ ..... [2]

41. June/2022/Paper_4024/12/No.19

(a) $\mathscr{E} = \{a, b, c, d, e, f, g, h, i, j\}$
$P = \{a, e, i\}$
$Q = \{f, g, h, i, j\}$
$R = \{c, d, e, f, g\}$

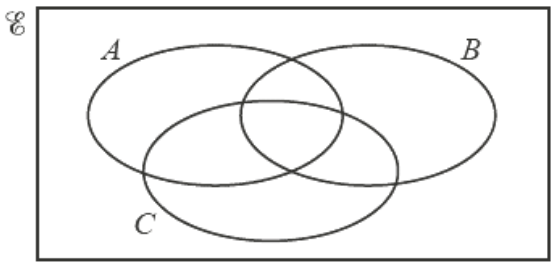
(i) Find $P \cup Q$.

..... [1]

(ii) Find $n(P' \cap (Q \cup R))$.

..... [1]

(b)



Use set notation to describe the shaded subset in the Venn diagram.

..... [1]

42. June/2022/Paper_4024/21/No.1

(a) In 2020, the running cost for Frederick's car was \$5200.

28% of the running cost was spent on insurance.

$\frac{3}{25}$ of the running cost was spent on maintenance.

\$740 of the running cost was spent on tax.

The remainder of the running cost was spent on petrol.

(i) Calculate the amount Frederick spent on petrol.

\$ ..... [3]

(ii) In 2021, the tax increased by 1.5%.

Calculate the tax in 2021.

\$ ..... [2]

(b) In January, the cost of petrol is \$2.20 per litre.

(i) Find the cost of 38.7 litres of petrol.

\$ ..... [1]

(ii) The average amount of petrol Frederick's car uses is 7 litres per 100 km.
In January, he spends \$215.60 on petrol.

Calculate the number of kilometres he drives in January.

..... km [3]

(iii) In February, the cost of petrol increases to \$2.24 per litre.

Calculate the percentage increase in the cost of petrol from January to February.

..... % [2]

43. June/2022/Paper_4024/21/No.3

(a) The graph shows the cost, in dollars, of buying a length of fabric t metres long.

(i) Use the graph to find the cost of buying 3.8 m of fabric.

$ ..... [1]

(ii) Samira buys k metres of fabric.
She pays with a $20 note and receives $1.50 change.

Use the graph to find the value of k.

$k =$ ..... [2]

(b) Anita cuts 10 m of fabric into three lengths to make a blouse, a skirt and a dress.
The lengths of fabric needed to make the blouse, the skirt and the dress are in the ratio 6 : 8 : 11.

Find the length of the fabric that is cut to make the dress.

..... m [2]

(c) The upper bound for the area of a rectangular piece of fabric is $8.8125\ \text{m}^2$.
The width of the piece of fabric is 2.3 metres, correct to the nearest 0.1 m.
The length of the piece of fabric is d metres, correct to the nearest 0.1 m.

Find the value of d.

$d =$ ..... [3]

44. June/2022/Paper_4024/22/No.1

(a) In 2021, the cost of posting a letter was 84 cents.

(i) A company posts 1950 letters.

Find the cost, in dollars, to post these letters.

$ ..... [1]

(ii) In 2022, the cost of posting a letter is 96 cents.

Calculate the percentage increase in the cost of posting a letter.

..... % [2]

(b)

Cost of posting a letter is 96 cents
15% discount when monthly postage is more than $1000

Company *A* posts 1200 letters in one month.
Company *B* posts fewer letters than Company *A* in the same month.
Company *A* and Company *B* each pay the same amount to post their letters that month.

Find the number of letters Company *B* posts in that month.

..... [3]

(c) In 2022, the cost of posting a parcel with a mass of 1 kg or less is \$4.60 .
The cost increases by \$1.10 for each additional 0.5 kg.

Find the cost of posting a parcel with a mass of 3.5 kg.

\$ ..... [2]

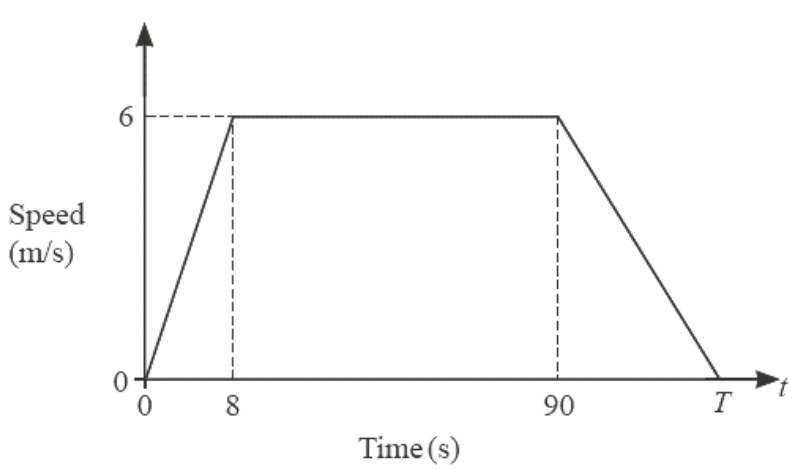
(d) The cost of posting parcels increases by 7.2%.
After the increase, the cost of posting a parcel is \$13.40 .

Calculate the original cost of posting this parcel.

\$ ..... [2]

45. June/2022/Paper_4024/22/No.7

(a)



The diagram shows the speed–time graph for a cyclist's journey.

(i) Calculate the acceleration of the cyclist during the first 8 seconds.

..... m/s^2 [1]

(ii) Describe the motion of the cyclist between $t = 8$ and $t = 90$.

..... [1]

(iii) The total distance travelled by the cyclist during the journey is 558 m.

Find the value of T.

$T =$ ..... [3]

(iv) Convert 6 m/s into km/h.

..... km/h [2]

(b) A car travels 352 km, correct to the nearest kilometre.
The time taken to travel this distance is 4.2 hours, correct to the nearest 0.1 hour.

Calculate the upper bound for the average speed of the car.

..... km/h [3]