Senior Secondary

COMPULSORY PART

Oxford Mathematics for the New Century

EXAM expert

Level 0 DSE Pack (Sample)

DSE Level 2+

- DSE Junior Sec Foundation Topics Supplement
- DSE A(1) Algebra Practice
- DSE A(1) All-round Practice

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Contents

Name: _____ Class: _____ ( )

DSE *Topics Supplement*

More Support

1 Laws of Integral Indices, Expansion and Factorization of Polynomials Junior Sec Foundation Topics

Key Review

(a) Laws of Integral Indices

Let m and n be integers and $a, b \neq 0$.

(i) $a^0 = 1$

(ii) $a^{-n} = \dfrac{1}{a^n}$

(iii) $a^m \cdot a^n = a^{m+n}$

(iv) $\dfrac{a^m}{a^n} = a^{m-n}$

(v) $(a^m)^n = a^{mn}$

(vi) $(ab)^n = a^n b^n$

(vii) $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$

(b) Factorization

(i) e.g. $abx + aby + abz$

$= ab(x + y + z)$ ◀ Take out common factors.

(ii) e.g. $ax + ay + bx + by$

$= a(x + y) + b(x + y)$ ◀ Group the terms.

$= (x + y)(a + b)$

(iii) $a^2 - b^2 \equiv (a + b)(a - b)$

(iv) $a^2 + 2ab + b^2 \equiv (a + b)^2$

(v) $a^2 - 2ab + b^2 \equiv (a - b)^2$

(vi) e.g. $x^2 - 4x + 3$

$= (x - 1)(x - 3)$

Cross-method

x	-1	
x	-3	
$-x$	$-3x$	$= -4x$

$5x^2 - xy - 4y^2$

$= (5x + 4y)(x - y)$

$5x$	$+4y$	
x	$-y$	
$4xy$	$-5xy$	$= -xy$

Exercise 1A Conventional Questions

Laws of Integral Indices

Simplify the following expressions and express the answers with positive indices. **[Nos. 1–8]**

1. $\dfrac{a^9}{(a^{-4})^2}$

2. $\dfrac{m^{10}n^{-8}}{m^5}$

Exam Reference
HKDSE 2012 (Paper 1) Q1

3. $\dfrac{y^{13}}{x^{-2}y^7}$

4. $\dfrac{(m^{-5}n)^4}{m^{-9}}$

Exam Reference
HKDSE 2020 (Paper 1) Q1

5. $\dfrac{a^5}{(a^4b^{-6})^3}$

Exam Reference
HKDSE 2015 (Paper 1) Q1

6. $(\alpha\beta^2)(\alpha^{-1}\beta^3)^4$

Exam Reference
HKDSE 2021 (Paper 1) Q1

7. $\dfrac{(x^3y^4)^2}{x^{-5}y^6}$

Exam Reference
HKDSE 2022 (Paper 1) Q1

8. $\dfrac{a^{25}b^{-8}}{(a^7b^{-1})^5}$

Exam Reference
HKDSE 2013 (Paper 1) Q1

Factorization of Polynomials

9. Factorize

(a) $a^2b - ab^2$,

(b) $a^2b - ab^2 + 3a - 3b$.

10. Factorize

(a) $7r^2 - 21rs$,

(b) $7r^2 - 21rs - rs^2 + 3s^3$.

Exam Reference
HKDSE 2018 (Paper 1) Q3

11. Factorize

(a) $x^2 + 4x + 4$,

(b) $x^2 + 4x + 4 - 25y^2$.

12. Factorize

(a) $4x^2 + 12xy + 9y^2$,

(b) $4x^2 + 12xy + 9y^2 - 4x - 6y$.

Exam Reference
HKDSE 2017 (Paper 1) Q3

13. Factorize

(a) $16c^2 - 8c + 1$,

(b) $(c + d)^2 - 16c^2 + 8c - 1$.

Exam Reference
HKDSE 2022 (Paper 1) Q4

14. Factorize

(a) $m^2 - 18mn + 81n^2$,

(b) $2m - 18n - m^2 + 18mn - 81n^2$.

Exam Reference
HKDSE 2021 (Paper 1) Q3

15. Factorize

(a) $49a^2 - 16b^2$,

(b) $49a^2 - 16b^2 + 20b - 35a$.

Exam Reference
HKDSE 2013 (Paper 1) Q3

16. Factorize

(a) $r^3 - r^2s + 11r^2$,

(b) $r^3 - r^2s + 11r^2 - 4r + 4s - 44$.

Exam Reference
HKDSE 2015 (Paper 1) Q4

17. Factorize

(a) $\alpha^2 - \alpha - 12$,

(b) $\alpha^5 - \alpha^4 - 12\alpha^3$.

Exam Reference
HKDSE 2020 (Paper 1) Q2

18. Factorize

(a) $2a^2 + 7a - 4$,

(b) $ab^2 + 4b^2 + 2a^2 + 7a - 4$.

Exam Reference
HKDSE 2014 (Paper 1) Q2

19. Factorize

(a) $u^2 - 6uv + 5v^2$,

(b) $u^2 - 6uv + 5v^2 - 5u + 5v$.

20. Factorize

(a) $3m + 9n$,

(b) $m^2 - mn - 12n^2$,

(c) $m^2 - mn - 12n^2 - 3m - 9n$.

Exam Reference
HKDSE 2016 (Paper 1) Q4

21. Factorize

(a) $a^2 + 2a + 1$,

(b) $c^2 - 10c + 25$,

(c) $a^2 + 2a + 1 - c^2 + 10c - 25$.

Exam Reference
HKDSE 2019 (Paper 1) Q4

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DSE *Topics Supplement*

1 Laws of Integral Indices, Expansion and Factorization of Polynomials Junior Sec Foundation Topics

Exercise 1B MC Questions

Laws of Integral Indices

1. $5^{400} \cdot 16^{100} =$

A. 10^{400}.

B. 10^{500}.

C. 80^{400}.

D. 80^{500}.

Exam Reference
HKDSE 2016 (Paper 2) Q1

2. $\dfrac{4^{341}}{6^{682}} =$

A. $\left(\dfrac{2}{3}\right)^{341}$.

B. $\left(\dfrac{3}{2}\right)^{341}$.

C. $\dfrac{1}{3^{682}}$.

D. $\left(\dfrac{2}{3}\right)^{682}$.

Exam Reference
HKDSE 2017 (Paper 2) Q2

3. $(-7^{102})^3\left(\dfrac{1}{7}\right)^{305} =$

A. -7.

B. $-\dfrac{1}{7^{200}}$.

C. $\dfrac{1}{7^{200}}$.

D. 7.

4. $(3a^4)^{-3} =$

A. $\dfrac{1}{9a^{64}}$.

B. $\dfrac{1}{9a^{81}}$.

C. $\dfrac{1}{27a}$.

D. $\dfrac{1}{27a^{12}}$.

Exam Reference
HKDSE 2014 (Paper 2) Q1

5. $(2x^{-5})^4 =$

A. $\dfrac{2}{x}$.

B. $\dfrac{1}{2x}$.

C. $\dfrac{16}{x^{20}}$.

D. $\dfrac{1}{16x^{20}}$.

6. $3^n \cdot 4^n =$

A. 7^n.

B. 12^n.

C. 64^n.

D. 81^n.

7. $27^x \cdot 3^y =$

A. 3^{3x+y}.

B. 3^{3xy}.

C. 81^{x+y}.

D. 81^{xy}.

8. $(5x)^2 \cdot x^5 =$

A. $5x^7$.

B. $10x^{10}$.

C. $25x^7$.

D. $25x^{10}$.

Exam Reference
HKDSE Sample Paper (Paper 2) Q1

9. $\dfrac{(4x^6)^3}{4x^9} =$

A. 3.

B. $3x$.

C. $16x^2$.

D. $16x^9$.

Exam Reference
HKDSE 2019 (Paper 2) Q2

10. $\dfrac{(2a^4)^6}{2a^{-2}} =$

A. $6a^{12}$.

B. $32a^{12}$.

C. $6a^{26}$.

D. $32a^{26}$.

Exam Reference
HKDSE 2012 (Paper 2) Q1

11. $\dfrac{4\alpha}{(2\alpha^{-1})^{-3}} =$

A. $\dfrac{\alpha}{2}$.

B. $\dfrac{2}{\alpha^2}$.

C. $\dfrac{32}{\alpha^2}$.

D. $\dfrac{32}{\alpha^3}$.

Exam Reference
HKDSE 2020 (Paper 2) Q1

12. $(25 \cdot 125^{n+3})^2 =$

A. 5^{6n+10}.

B. 5^{6n+22}.

C. 5^{12n+10}.

D. 5^{12n+36}.

Exam Reference
HKDSE 2013 (Paper 2) Q1

13. $\dfrac{27^{4n+1}}{9^{6n+1}} =$

A. 3.

B. 4.

C. 3^n.

D. 3^{-n}.

Exam Reference
HKDSE 2018 (Paper 2) Q1

14. $\dfrac{6^{2n} \cdot 49^n}{7^n} =$

A. 42^{2n}.

B. 42^{3n}.

C. 252^n.

D. 252^{2n}.

Exam Reference
HKDSE 2021 (Paper 2) Q1

15. $\dfrac{16^{3n+4}}{(8^{n+1})^3} =$

A. 2.

B. 2^{3n+5}.

C. 2^{3n+7}.

D. 2^{9n+13}.

Exam Reference
HKDSE 2022 (Paper 2) Q2

Expansion of Polynomials

16. $x^4(3x + x) =$

A. $4x^5$.

B. $3x^6$.

C. $4x^6$.

D. $3x^8$.

Exam Reference
HKDSE Practice Paper (Paper 2) Q1

17. $2a \cdot a(2a + a) =$

A. $4a^3 + a$.

B. $6a^3$.

C. $4a^4$.

D. $6a^4$.

18. $(2a + a + a)(b + b + 2b + b) =$

A. $20ab$.

B. $4a + 5b$.

C. $4a^3b^4$.

D. $9a^3b^4$.

19. $(3x^2 - 5x + 1) - 3(x^2 + 2x - 2) =$

A. $x - 5$.

B. $-11x + 7$.

C. $6x^2 + x - 5$.

D. $6x^2 - 11x + 7$.

20. $(x - 1)(x^2 - x + 1) =$

A. $x^3 - 1$.

B. $(x - 1)^3$.

C. $x^3 - x^2 - x - 1$.

D. $x^3 - 2x^2 + 2x - 1$.

Exam Reference
HKDSE 2019 (Paper 2) Q1

21. $(a + 3b)(a - 3b - 4) =$

A. $a^2 - 9b^2 + 4a - 12b$.

B. $a^2 - 9b^2 - 4a - 12b$.

C. $a^2 - 3b^2 + 4a - 12b$.

D. $a^2 - 3b^2 - 4a - 12b$.

22. $(3x - 2)(x^2 + 2x - 4) =$

A. $3x^3 + 4x^2 - 16x + 8$.

B. $3x^3 + 4x^2 - 16x - 8$.

C. $3x^3 + 4x^2 + 8x + 8$.

D. $3x^3 + 4x^2 + 8x - 8$.

23. $(x^2 - 6x - 3)(5 - 2x) =$

A. $-2x^3 + 7x^2 + 36x - 15$.

B. $-2x^3 - 7x^2 - 36x - 15$.

C. $-2x^3 + 17x^2 - 24x - 15$.

D. $-2x^3 - 17x^2 + 24x - 15$.

24. $(3a - b)^2 - (3a + b)^2 =$

A. 0.

B. $-2b^2$.

C. $-6ab$.

D. $-12ab$.

Exam Reference
HKDSE 2012 (Paper 2) Q2

25. $(4a + 3b)^2 - (4a - 3b)^2 =$

A. $24ab$.

B. $48ab$.

C. $32a^2$.

D. $18b^2$.

Factorization of Polynomials

26. $\alpha^2 - \alpha - \beta^2 - \beta =$

A. $(\alpha + \beta)(\alpha + \beta - 1)$.

B. $(\alpha + \beta)(\alpha - \beta + 1)$.

C. $(\alpha + \beta)(\alpha - \beta - 1)$.

D. $(\alpha - \beta)(\alpha - \beta - 1)$.

Exam Reference
HKDSE 2022 (Paper 2) Q1

27. $vx - wx - wz + wy + vz - vy =$

A. $(v + w)(x + y - z)$.

B. $(v + w)(x - y + z)$.

C. $(v - w)(x + y - z)$.

D. $(v - w)(x - y + z)$.

Exam Reference
HKDSE 2013 (Paper 2) Q3

28. $ac - bc + ab - c^2 =$

A. $(b + c)(a - b)$.

B. $(b + c)(a - c)$.

C. $(b - c)(c - a)$.

D. $(b - c)(b - a)$.

29. $9 - (4x - 5y)^2 =$

A. $(3 + 4x + 5y)(3 - 4x - 5y)$.

B. $(3 + 4x + 5y)(3 - 4x + 5y)$.

C. $(3 + 4x - 5y)(3 - 4x - 5y)$.

D. $(3 + 4x - 5y)(3 - 4x + 5y)$.

Exam Reference
HKDSE 2016 (Paper 2) Q3

30. $h^2 - k^2 - 3h - 3k =$

A. $(h + k)(h - k + 3)$.

B. $(h + k)(h - k - 3)$.

C. $(h - k)(h + k + 3)$.

D. $(h - k)(h + k - 3)$.

Exam Reference
HKDSE 2014 (Paper 2) Q2

31. $p^2 - 2p - 4q^2 + 4q =$

A. $(p + 2q)(p - 2q - 2)$.

B. $(p + 2q)(p - 2q + 2)$.

C. $(p - 2q)(p + 2q - 2)$.

D. $(p - 2q)(p + 2q + 2)$.

Exam Reference
HKDSE 2018 (Paper 2) Q3

32. $3m^2 + 7mn + 4n^2 - m - n =$

A. $(m - n)(3m - 4n + 1)$.

B. $(m - n)(3m + 4n + 1)$.

C. $(m + n)(3m - 4n - 1)$.

D. $(m + n)(3m + 4n - 1)$.

Exam Reference
HKDSE 2017 (Paper 2) Q1

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DSE *Topics Supplement*

More Support

2 Formulae, Identities, Equations, Inequalities, Rate and Ratio

Junior Sec **Foundation Topics**

Key Review

(a) Formulae

(i) A formula is an equality showing the relation among variables.

e.g. $P = 2(\ell + w)$, where P is the subject of the formula.

(ii) We can make ℓ the subject of the above formula as follows:

$$P = 2(\ell + w)$$
$$\frac{P}{2} = \ell + w$$
$$\ell = \frac{P}{2} - w$$

(b) Identities

(i) For an equation, if any value of the variable can satisfy the equation, then the equation is called an identity.

To indicate that an equation is an identity, we can use the identity symbol '≡' to replace the equal sign '=' in the equation.

e.g. $3(x - 1) \equiv 3x - 3$

(ii) e.g. Consider the identity $x^2 + Ax + 2 \equiv x^2 - 3x + B$.

Comparing like terms on both sides, $A = -3$ and $B = 2$.

(c) Equations

(i) e.g. $3x + 7 = 0$ ← a linear equation in one unknown

(ii) e.g. $\begin{cases} x + 2y = 1 \\ 3x - y = 10 \end{cases}$ ← simultaneous linear equations in two unknowns

By the method of substitution or the method of elimination, $x = 3$ and $y = -1$.

(d) Inequalities

(i) If $a > b$ and $b > c$, then $a > c$.

(ii) If $a > b$, then $a + c > b + c$ and $a - c > b - c$.

(iii) (1) If $a > b$ and c is a positive number, then $ac > bc$ and $\frac{a}{c} > \frac{b}{c}$.

(2) If $a > b$ and c is a negative number, then $ac < bc$ and $\frac{a}{c} < \frac{b}{c}$.

The above properties are still true when the inequality signs '>' and '<' are replaced by '≥' and '≤' respectively.

(e) Rate and Ratio

(i) A rate is a comparison of two quantities of different kinds by division. It has a unit.

e.g. 70 words/minute, 40 m/s.

(ii) **(1)** The ratio of a quantity a to another quantity b of the same kind can be written as $a : b$ or $\frac{a}{b}$.

A ratio has no units.

(2) If $k \neq 0$, then $a : b = a \times k : b \times k$ and $a : b = \frac{a}{k} = \frac{b}{k}$.

(3) If $a : b = x : y$, then $\frac{a}{b} = \frac{x}{y}$.

(4) If a given quantity P is divided into two parts in the ratio $a : b$,

then the two parts are $P \times \frac{a}{a+b}$ and $P \times \frac{b}{a+b}$ respectively.

Exercise 2A Conventional Questions

Formulae

In each of the following, make x the subject of the formula. **[Nos. 1–2]**

1. $\frac{4x - A}{5} = A + 2$

Exam Reference
HKDSE 2012 (Paper 1) Q2

2. $\frac{8 - 5x}{y} = 9$

Exam Reference
HKDSE 2021 (Paper 1) Q2

In each of the following, make a the subject of the formula. **[Nos. 3–4]**

3. $\dfrac{ab-2c}{a+3}=3$

Exam Reference
HKDSE 2015 (Paper 1) Q2

4. $\dfrac{4b-a}{a}=k$

Exam Reference
HKDSE 2017 (Paper 1) Q1

In each of the following, make b the subject of the formula. **[Nos. 5–6]**

5. $7(2a+b)=5b+6$

Exam Reference
HKDSE 2019 (Paper 1) Q1

6. $b = d(a - bk)$

Exam Reference
HKDSE 2016 (Paper 1) Q2

In each of the following, make n the subject of the formula. **[Nos. 7–8]**

7. $\frac{m-1}{4} = \frac{n-3}{5}$

Exam Reference
HKDSE 2018 (Paper 1) Q1

8. $\frac{1}{m} - \frac{4}{n} = 3$

Exam Reference
HKDSE 2013 (Paper 1) Q2

9. Consider the formula $6p - 5 = 4(p + 2q)$.

(a) Make p the subject of the above formula.

(b) If the value of q is increased by 1, write down the change in the value of p.

Exam Reference
HKDSE 2014 (Paper 1) Q5

10. Consider the formula $A = 3x + B(2 - x)$.

(a) Make x the subject of the above formula.

(b) Suppose $B = 1$. If the value of A is decreased by 2, write down the change in the value of x.

Identities

11. If a and b are constants such that $(x + a)(x - 2) + b \equiv x^2 + 3x - 7$, find the values of a and b.

12. Let $p = 2x^2 + ax + b$, where a and b are constants. When $x = -2$ and $x = 1$, the values of p are the same. If $2x^2 + ax + b \equiv (mx + 4)(x + n)$, where m and n are constants, find the values of a, b, m and n.

Exam Reference
HKDSE 2016 (Paper 1) Q14(a)

Equations

13. Let x and y be two numbers. The sum of x and y is 150 while the product of 3 and x is $2y$. Find x.

Exam Reference
HKDSE 2022 (Paper 1) Q2

14. In a bookstore, the prices of a fiction book and a non-fiction book are \$60 and \$75 respectively. On a certain day, the number of fiction books sold is 4 times the number of non-fiction books sold and the sum of money for the books sold is \$3 150. Find the total number of books sold that day.

Exam Reference
HKDSE 2017 (Paper 1) Q4

15. In a fitness centre, there are 240 members. The number of female members is twice the number of male members. Find the difference between the number of male members and the number of female members.

Exam Reference
HKDSE 2016 (Paper 1) Q5

16. The number of pens owned by Jack is 6 times that owned by Tom. If Jack gives 8 of his pens to Tom, the number of pens owned by Jack becomes twice that owned by Tom. Find the total number of pens owned by them.

Exam Reference
HKDSE 2021 (Paper 1) Q5

17. Nancy has 115 photos of various artists. She divides the photos into 5 piles with the same number of photos. In each pile, the number of photos of male artists is 1 less than twice that of female artists. Find the number of photos of female artists owned by Nancy.

Exam Reference
HKDSE 2012 (Paper 1) Q5

18. ABC is a right-angled triangle, where $AB = 8$ cm, $BC = (5 - 2d)$ cm and $AC = (7 - 2d)$ cm. If AC is the hypotenuse of the triangle, find d.

Exam Reference
HKDSE 2019 (Paper 1) Q3

19. The price of 5 cupcakes and 6 fruit tarts is \$210. The price of 3 cupcakes and 8 fruit tarts is \$192. Find the price of a cupcake.

Exam Reference
HKDSE 2013 (Paper 1) Q4

Inequalities

20. (a) Solve the inequality $\frac{8x-3}{2} \geq 3(x+3)$.

(b) Write down the least integer satisfying the inequality in **(a)**.

21. (a) Solve the inequality $\frac{15x+6}{8} \geq 3x-7$.

Explain **(b)** How many positive integers satisfy the inequality in **(a)**? Explain your answer.

22. **(a)** Solve the inequality $1 - \frac{1-x}{2} < 2(x+4)$.

(b) Write down all the negative integers satisfying the inequality in **(a)**.

Rate and Ratio

23. If a and b are non-zero numbers such that $5(2a + b) = 2(7b - a)$, find $a : b$.

24. It is given that $x : (y - 2) = 2 : 3$.

(a) Express y in terms of x.

(b) If $3x + 7y = 68$, find the values of x and y.

25. Let p, q and r be non-zero numbers such that $\frac{p}{q} = \frac{4}{5}$ and $2p = 3r$. Find $\frac{2q + 5r}{p + 2q}$.

Exam Reference
HKDSE 2020 (Paper 1) Q4

26. The ratio of the number of bags owned by Irene to the number of bags owned by Ada is 5 : 3. If Irene gives 3 of her own bags to Ada, they will have the same number of bags. Find the total number of bags owned by them.

Exam Reference
HKDSE Practice Paper (Paper 1) Q5

27. In a farm, the ratio of the number of cows to the number of pigs is 3 : 5. If 40 cows and 90 pigs are sold, then the ratio of the number of cows to the number of pigs is 2 : 3. Find the original number of cows in the farm.

Exam Reference
HKDSE 2019 (Paper 1) Q7

28. A robot travels from area X to area Y at an average speed of 12 m/min and then the robot travels from area Y to area Z at an average speed of 24 m/min. It is given that the robot travels 1.5 km in 80 minutes for the whole journey. How long does the robot take to travel from area X to area Y?

Exam Reference
HKDSE 2018 (Paper 1) Q9

29. John drives from city A to city B in $(x + y)$ hours with an average speed of 71 km/h. His average speeds in the first x hours and the remaining y hours are 65 km/h and 80 km/h respectively.

(a) Find the value of $\frac{x}{y}$.

Explain **(b)** If John drives for 8 hours in total, is the distance travelled in the first x hours less than 320 km? Explain your answer.

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DSE *Topics Supplement*

2 Formulae, Identities, Equations, Inequalities, Rate and Ratio

Junior Sec **Foundation Topics**

Exercise 2B MC Questions

Formulae

1. If $n(2-m) = m(m-2n)$, then $n =$

A. m. **B.** $2m$.

C. $\frac{m+2}{m^2}$. **D.** $\frac{m^2}{m+2}$.

Exam Reference HKDSE 2021 (Paper 2) Q2

2. If $\frac{a}{x-2} = \frac{b}{x}$, then $x =$

A. $\frac{2b}{a-b}$. **B.** $\frac{2a}{a+b}$.

C. $\frac{2b}{b-a}$. **D.** $\frac{2a}{b-a}$.

Exam Reference HKDSE 2018 (Paper 2) Q2

3. If $\frac{p}{x} - \frac{q}{y} = 1$, then $y =$

A. $\frac{px}{q+x}$. **B.** $\frac{px}{q-x}$.

C. $\frac{qx}{p+x}$. **D.** $\frac{qx}{p-x}$.

Exam Reference HKDSE 2022 (Paper 2) Q5

Identities

4. If m and n are constants such that $x^2 + mx \equiv (x-1)(x+n) + 5$, then $m =$

A. 3. **B.** 4.

C. 5. **D.** 6.

Exam Reference HKDSE 2022 (Paper 2) Q3

5. If h and k are constants such that $(x+7)(x+h) \equiv (x-1)^2 + k$, then $k =$

A. –64. **B.** –7.

C. 7. **D.** 64.

Exam Reference HKDSE 2020 (Paper 2) Q7

6. If p and q are constants such that $x(x-p) + q \equiv (x+3)(x+q) - 4$, then $p =$

A. –5. **B.** –4.

C. 4. **D.** 5.

Exam Reference HKDSE 2015 (Paper 2) Q5

7. If a and b are constants such that $a(x+1)^2 + b(x+1) \equiv ax(x-2) + 9$, then

A. $a = 3$ and $b = 6$.

B. $a = 3$ and $b = 12$.

C. $a = -3$ and $b = 6$.

D. $a = -3$ and $b = 12$.

Exam Reference HKDSE 2014 (Paper 2) Q3

Equations

8. If $5\alpha + 2\beta = 14$ and $3\alpha + 8\beta = -12$, then $\alpha + \beta =$

A. –7. **B.** –1.

C. 1. **D.** 7.

Exam Reference HKDSE 2015 (Paper 2) Q3

9. If $3p - 2q = 9p + 10q = 8$, then $p =$

A. 2. **B.** 3.

C. –1. **D.** –2.

Exam Reference HKDSE 2016 (Paper 2) Q5

10. Let a be a constant. Solve the equation $(x-a)(x-7a) = (5a-x)(x-7a)$.

A. $x = 3a$

B. $x = 5a$

C. $x = a$ or $x = 5a$

D. $x = 3a$ or $x = 7a$

Exam Reference HKDSE 2022 (Paper 2) Q4

11. The price of 4 footballs and 3 basketballs is \$2 550. If the prices of 3 footballs and 2 basketballs are the same, find the price of a football.

A. \$300 **B.** \$350

C. \$400 **D.** \$450

Exam Reference HKDSE 2014 (Paper 2) Q8

12. Roy cycles for 5 hours. His average speed for the first 2 hours and the last 3 hours are 8 km/h and 6 km/h respectively. Find his average speed for the 5 hours.

A. 2 km/h **B.** 6.8 km/h
C. 7 km/h **D.** 7.2 km/h

Exam Reference
HKDSE 2012 (Paper 2) Q11

13. The cost of 1 kg of tea X is \$50 higher than the cost of 1 kg of tea Y. If 4 kg of tea X and 6 kg of tea Y are mixed, the cost of 1 kg of the mixture is \$220. Find the cost of 1 kg of tea X.

A. \$200 **B.** \$230
C. \$240 **D.** \$250

Exam Reference
HKDSE 2016 (Paper 2) Q13

Inequalities

14. If $a > b$ and $c > 0$, which of the following must be true?

I. $a^2 > ab$

II. $c - a > c - b$

III. $\frac{a}{\sqrt{c}} > \frac{b}{\sqrt{c}}$

A. I only **B.** III only
C. I and II only **D.** II and III only

Exam Reference
HKDSE 2014 (Paper 2) Q6

Rate and Ratio

15. If m and n are non-zero numbers such that $\frac{4n-3m}{m+8n} = \frac{1}{5}$, then $m : n =$

A. 9 : 2. **B.** 4 : 3.
C. 3 : 4. **D.** 2 : 9.

Exam Reference
HKDSE 2012 (Paper 2) Q9

16. If α and β are non-zero numbers such that $\frac{2\alpha-\beta}{\beta-\alpha} = \frac{1}{7}$, then $\frac{2\beta-\alpha}{2\alpha-\beta} =$

A. $\frac{1}{22}$. **B.** $\frac{8}{15}$.
C. $\frac{15}{8}$. **D.** 22.

Exam Reference
HKDSE 2021 (Paper 2) Q11

17. If x and y are non-zero numbers such that $(4x + 3y) : (3x - 4y) = 3 : 2$, then $x : y =$

A. 1 : 6. **B.** 1 : 18.
C. 6 : 1. **D.** 18 : 1.

Exam Reference
HKDSE 2016 (Paper 2) Q11

18. Let a, b and c be non-zero numbers. If $3a = b$ and $a : c = 2 : 3$, then $(2a + b) : (b + c) =$

A. 9 : 10. **B.** 10 : 9.
C. 5 : 9. **D.** 9 : 5.

Exam Reference
HKDSE 2018 (Paper 2) Q10

19. Let a, b and c be non-zero numbers. If $a : b = 4 : 9$ and $3a = 2c - 7b$, then $b : c =$

A. 3 : 25. **B.** 25 : 3.
C. 6 : 25. **D.** 25 : 6.

Exam Reference
HKDSE 2022 (Paper 2) Q12

20. It is given that $7a : 9b : 8c = 5 : 9 : 6$, where a, b and c are positive numbers. Which of the following is true?

A. $a < b < c$ **B.** $b < c < a$
C. $a < c < b$ **D.** $c < a < b$

Exam Reference
HKDSE 2014 (Paper 2) Q12

21. If a, b and c are non-zero constants such that $a(x + 1) + b(4x - 7) \equiv c(x - 1)$, then $a : b =$

A. 2 : 3. **B.** 3 : 2.
C. 3 : 5. **D.** 5 : 3.

Exam Reference
HKDSE 2021 (Paper 2) Q6

22. The costs of tea of brand P and brand Q are \$100/kg and \$300/kg respectively. If a kg of tea of brand P and b kg of tea of brand Q are mixed so that the cost of the mixture is \$180/kg, then $a : b =$

A. 1 : 3.
B. 2 : 3.
C. 3 : 2.
D. 4 : 1.

Exam Reference
HKDSE 2019 (Paper 2) Q12

Name: _____ Class: _____ ( )

DSE *Topics Supplement*

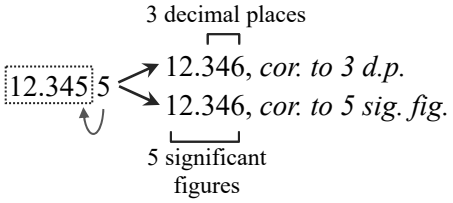
More Support

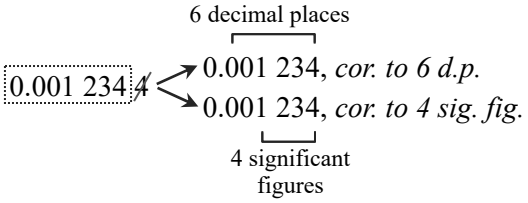
3 Approximation and Errors, Percentages

Junior Sec **Foundation Topics**

Key Review

(a) Approximation





e.g. Round off 0.007 650 1 to:

2 significant figures	3 significant figures	4 significant figures	5 decimal places
0.007 7	0.007 65	0.007 650	0.007 65

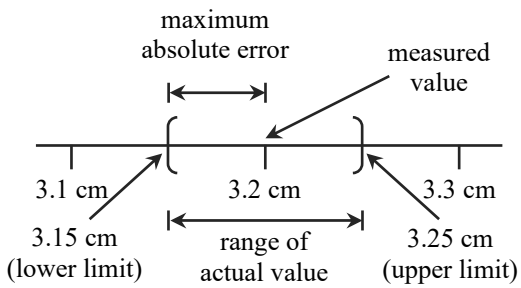
e.g.

	Round up 765.432	Round down 765.432	Round off 765.432
to the nearest integer	766	765	765
to the nearest ten	770	760	770

(b) Errors

(i)	**Absolute error**	Difference (taking the positive value) between the approximate value and the actual value
(ii)	**Maximum absolute error (or Maximum error)**	$\frac{1}{2}\times$ scale interval on a measuring tool
(iii)	**Lower limit**	Measured value − maximum absolute error
(iv)	**Upper limit**	Measured value + maximum absolute error
(v)	**Range of actual value**	Lower limit ≤ actual value < upper limit
(vi)	**Relative error**	$\frac{\text{Absolute error}}{\text{Actual value}}$ (in estimation)
		$\frac{\text{Maximum absolute error}}{\text{Measured value}}$ (in measurement)
(vii)	**Percentage error**	Relative error × 100%

e.g. The length of a stamp is measured as 3.2 cm correct to the nearest 0.1 cm.



Maximum absolute error = $\frac{1}{2}\times 0.1$ cm = 0.05 cm

Relative error = $\frac{0.05}{3.2}$ = 0.015 625

Percentage error = 0.015 625 × 100% = 1.562 5%

(c) Percentages

(i) A is k% more than B. $\Rightarrow$ $A = B(1 + k\%)$ ← $A(1 - k\%) = B$ ✗, $P(1 + k\%) = Q$ ✗

P is k% less than Q. $\Rightarrow$ $P = Q(1 - k\%)$

(ii) New value = original value $\times (1 + r\%)$ ← r% is the percentage increase.

$$\text{Percentage increase} = \frac{\text{new value} - \text{original value}}{\text{original value}} \times 100\%$$

(iii) New value = original value $\times (1 - r\%)$ ← r% is the percentage decrease.

$$\text{Percentage decrease} = \frac{\text{original value} - \text{new value}}{\text{original value}} \times 100\%$$

(iv) $$\text{Percentage change} = \frac{\text{new value} - \text{original value}}{\text{original value}} \times 100\%$$ ← can be positive or negative

(v)

Profit = selling price − cost price	Loss = cost price − selling price
$\text{Profit \%} = \frac{\text{profit}}{\text{cost price}} \times 100\%$	$\text{Loss \%} = \frac{\text{loss}}{\text{cost price}} \times 100\%$
Selling price = cost price $\times$ (1 + profit %)	Selling price = cost price $\times$ (1 − loss %)

(vi)

Discount = marked price − selling price	$\text{Discount \%} = \frac{\text{discount}}{\text{marked price}} \times 100\%$
Discount = marked price $\times$ discount %	Selling price = marked price $\times$ (1 − discount %)

(vii)

	Simple interest	***Compound interest***
Interest	$I = \frac{PRT}{100}$	$I = A - P$
Amount	$A = P + I$	$A = P\left(1 + \frac{R}{100}\right)^n$

I: Interest
A: Amount
P: Principal
R%: Interest rate per period
T: Period of time in years
n: Number of periods of time

(viii) If a quantity N is increased by x% and then decreased by y%,

final value of $N = N(1 + x\%)(1 - y\%)$

$$\text{overall percentage change} = \frac{\text{final value} - \text{original value}}{\text{original value}} \times 100\%$$

Exercise 3A Conventional Questions

Approximation and Errors

1. **(a)** Round off 819.247 3 to the nearest ten.

(b) Round down 819.247 3 to 1 significant figure.

(c) Round up 819.247 3 to 3 decimal places.

Exam Reference
HKDSE 2018 (Paper 1) Q3

2. **(a)** Round down 1 412.085 to 2 decimal places.

(b) Round off 1 412.085 to the nearest hundred.

(c) Round up 1 412.085 to 2 significant figures.

Exam Reference
HKDSE 2020 (Paper 1) Q3

3. Round off 0.061 435 8 to

(a) 1 decimal place,

(b) 1 significant figure,

(c) 4 decimal places,

(d) 4 significant figures.

4. Paul, Tom and Ken have \$38.2, \$53.7 and \$46.6 respectively.

(a) By rounding down the amount that each person has to the nearest dollar, estimate the total amount that they have.

Explain **(b)** The three people want to order three dishes with prices \$45, \$48 and \$42 for lunch. Paul claims that they will not have enough money to pay for the lunch. Do you agree? Use the result of **(a)** to explain your answer.

5. The expenditures of Joseph in a certain month are shown below.

Item	Rent	Food	Clothing	Transport	Miscellaneous
Expenditure	\$8 500	\$2 550	\$1 829	\$513	\$1 284

(a) By rounding up the expenditure of each item to the nearest \$100, estimate the total expenditure of Joseph in that month.

Explain **(b)** The salary of Joseph in that month is \$20 000. If Joseph saves the rest after deducting the total expenditure from the salary in that month, can he save more than \$5 000 in that month? Use the result of **(a)** to explain your answer.

6. A bottle of apple juice is termed acceptable if its volume is measured as 200 mL correct to the nearest mL.

(a) Find the least possible volume of an acceptable bottle of apple juice.

Explain **(b)** Is it possible that the total volume of 120 acceptable bottles of apple juice is measured as 23.9 L correct to the nearest 0.1 L? Explain your answer.

Exam Reference
HKDSE 2017 (Paper 1) Q9

7. **(a)** The weight of a small pack of red beans is measured as 80 g correct to the nearest g. Let the actual weight of the small pack of red beans be W g. Find the range of values of W.

Explain **(b)** The weight of a large pack of red beans is measured as 5.0 kg correct to the nearest 0.1 kg. Someone claims that the large pack of red beans can be packed into 61 small packs such that the weight of each small pack is measured as 80 g correct to the nearest g. Do you agree? Explain your answer.

8. The length and the width of a rectangular cardboard are measured as 5.4 cm and 2.6 cm respectively, correct to the nearest 0.1 cm.

(a) Find the percentage error of the measured length correct to the nearest 0.01%.

(b) Find the relative error in calculating the perimeter of the rectangular cardboard.

Percentages

9. A plant is sold at a discount of 15% on its marked price. The selling price of the plant is $765.

(a) Find the marked price of the plant.

(b) After selling the plant, the percentage profit is 25%. Find the cost of the plant.

Exam Reference
HKDSE 2019 (Paper 1) Q5

10. In a class, the number of girls is 30% more than the number of boys. The difference of the number of boys and the number of girls is 9. Find the number of girls in the class.

Exam Reference
HKDSE 2020 (Paper 1) Q5

11. A toy is sold at a discount of 10% on its marked price. After selling the toy, the profit is \$21 and the percentage profit is 50%. Find the marked price of the toy.

Exam Reference
HKDSE 2022 (Paper 1) Q5

12. The marked price of a chair is higher than its cost by \$260. The chair is sold at a discount of 20% on its marked price. After selling the chair, the percentage profit is 45%. Find the marked price of the chair.

Exam Reference
HKDSE 2021 (Paper 1) Q6

13. The marked price of a bag is 50% above its cost. A loss of \$35 is made by selling the bag at a discount of 45% on its marked price. Find the marked price of the bag.

Exam Reference
HKDSE 2018 (Paper 1) Q7

14. The price of tablet A is 40% less than that of tablet B. The price of tablet B is 40% more than that of tablet C. The price of tablet A is \$2 520.

(a) Find the price of tablet B.

Explain **(b)** Which tablet has the lowest price? Explain your answer.

Exam Reference
HKDSE 2012 (Paper 1) Q4

15. Ivan has 75 stamps. The number of stamps owned by Jack is 20% more than that owned by Ivan.

(a) Find the number of stamps owned by Jack.

Explain **(b)** If Jack gives a certain number of his stamps to Ivan, will they have the same number of stamps? Explain your answer.

16. The total number of red balls and blue balls in a box is 85. The number of red balls is 30% less than that of blue balls. Find the difference of the number of blue balls and the number of red balls.

Exam Reference
HKDSE 2016 (Paper 1) Q5

17. The total number of books owned by Iris and Ada is 270. The number of books owned by Iris is 25% more than that owned by Ada.

(a) Find the number of books owned by Ada.

(b) The number of books owned by Bob is 60% less than that owned by Iris. Find the difference of the numbers of books owned by Ada and Bob.

18. In a bookshop, books are sold at a discount of 20% on their marked prices. Members of the bookshop can enjoy a further 5% discount on reduced prices. Helen is a member of the bookshop and she pays \$182.4 for a book. Find the marked price of the book.

19. The marked price of a mobile phone is \$3 000. The mobile phone is now sold at a discount of 10% on its marked price.

(a) Find the selling price of the mobile phone.

(b) If the percentage loss is 20%, find the cost of the mobile phone.

Exam Reference
HKDSE 2014 (Paper 1) Q6

20. A dress is sold at a discount of 30% on its marked price. The selling price of the dress is \$168.

(a) Find the marked price of the dress.

(b) If the cost of the dress is \$120, find the percentage profit.

21. John has \$120. The amount of money that Tom has is 40% more than the amount of money that John has.

(a) Find the total amount of money that they have.

Explain **(b)** The marked price of a video game disc is \$350. The video game disc is now sold at a discount of 20% on its marked price. If John and Tom want to buy the video game disc, will they have enough money to buy the video game disc? Explain your answer.

22. The cost of a camera is \$2 800. If the camera is sold at a discount of 20% on its marked price, then the percentage profit is 40%.

(a) Find the marked price of the camera.

Explain **(b)** If the camera is sold at a discount of 35% on its marked price, will a loss be made? Explain your answer.

Exam Reference
HKDSE 2015 (Paper 1) Q6

23. Cathy deposits \$8 000 into a bank at an interest rate r% per annum.

(a) Find the interest received after 7 months when $r = 3$.

(b) If Cathy receives a simple interest of \$135 after 9 months, find the value of r.

24. A sum of \$10 000 is deposited at an interest rate of 6% per annum for 1.5 years, compounded monthly. Find the amount received, correct to the nearest dollar.

Name: _____ Class: _____ ( )

DSE *Topics Supplement*

3 Approximation and Errors, Percentages Junior Sec Foundation Topics

Exercise 3B MC Questions

Approximation and Errors

1. 0.065 321 =

A. 0.06 (correct to 1 significant figure).

B. 0.065 (correct to 2 decimal places).

C. 0.065 3 (correct to 3 significant figures).

D. 0.065 32 (correct to 4 decimal places).

Exam Reference HKDSE 2016 (Paper 2) Q4

2. 0.015 151 4 =

A. 0.015 (correct to 4 decimal places).

B. 0.015 1 (correct to 4 decimal places).

C. 0.015 2 (correct to 4 significant figures).

D. 0.015 15 (correct to 4 significant figures).

Exam Reference HKDSE 2015 (Paper 2) Q4

3. $\sqrt{2\,016}$ =

A. 44.8 (rounded up to 3 significant figures).

B. 44.9 (correct to 3 decimal places).

C. 44.900 (correct to 5 significant figures).

D. 44.90 (rounded down to 2 decimal places).

Exam Reference HKDSE 2017 (Paper 2) Q4

4. If $0.02468 < y < 0.02474$, which of the following is true?

A. $y = 0.024$ (correct to 2 significant figures)

B. $y = 0.024$ (correct to 2 decimal places)

C. $y = 0.0247$ (correct to 3 significant figures)

D. $y = 0.0247$ (correct to 3 decimal places)

Exam Reference HKDSE 2019 (Paper 2) Q6

5. It is given that n is a real number. If n is rounded down to 3 significant figures, then the result is 789. Find the range of values of n.

A. $788 < n \leq 789$

B. $788.5 \leq n < 789$

C. $789 < n \leq 789.5$

D. $789 \leq n < 790$

Exam Reference HKDSE 2022 (Paper 2) Q6

6. If $r = 4.56$ (correct to 2 decimal places), find the range of values of r.

A. $4.55 \leq r < 4.57$

B. $4.55 < r \leq 4.57$

C. $4.555 \leq r < 4.565$

D. $4.555 < r < 4.565$

Exam Reference HKDSE 2021 (Paper 2) Q5

7. The length and the width of a rectangle are measured as 15 cm and 12 cm correct to the nearest cm respectively. Let x cm^2 be the actual area of the rectangle. Find the range of values of x.

A. $166.75 \leq x < 193.75$

B. $166.75 < x \leq 193.75$

C. $179.5 \leq x < 180.5$

D. $179.5 < x \leq 180.5$

Exam Reference HKDSE 2014 (Paper 2) Q11

8. In $\triangle ABC$, the lengths of AB, AC and BC are measured as 5 cm, 5 cm and 8 cm respectively. If the three measurements are correct to the nearest cm, find the least possible perimeter of $\triangle ABC$.

A. 15 cm

B. 16.5 cm

C. 19.5 cm

D. 21 cm

Exam Reference HKDSE Sample Paper (Paper 2) Q15

9. The weight of a bag of coffee beans is measured as 15 kg correct to the nearest kg. If the bag of coffee beans is divided into n packs such that the weight of each pack is measured as 125 g correct to the nearest g, find the greatest possible value of n.

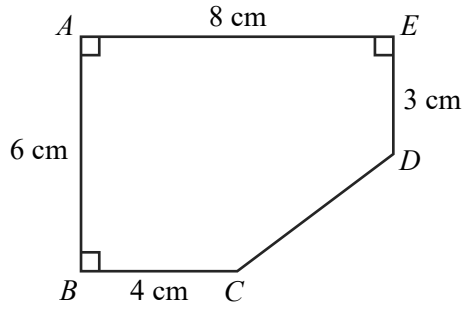
A. 116
B. 120
C. 123
D. 124

Exam Reference
HKDSE 2015 (Paper 2) Q14

10. The weight of a bag of seeds is measured as 100 g correct to the nearest g. If the bag of seeds is divided into n packs such that the weight of each pack is measured as 4.0 g correct to the nearest 0.5 g, find the greatest possible value of n.

A. 25
B. 26
C. 27
D. 28

11. In the figure, $ABCDE$ is a pentagon, where all the measurements are correct to the nearest cm. Let S cm^2 be the actual area of $ABCDE$. Find the range of values of S.



A. $31.25 < S < 52.25$
B. $35.25 \leq S < 49.25$
C. $38.25 \leq S < 45.25$
D. $40.61 \leq S < 43.41$

Exam Reference
HKDSE 2020 (Paper 2) Q14

Percentages

12. The total number of books owned by Ivy and Joey is 69. If the number of books owned by Ivy is 30% more than that owned by Joey, then the number of books owned by Ivy is

A. 30.
B. 33.
C. 36.
D. 39.

Exam Reference
HKDSE 2014 (Paper 2) Q9

13. The number of candies owned by Christine is 20% more than that owned by Amy. The number of candies owned by Amy is 20% less than that owned by Jane. If the total number of candies owned by three of them is 138, then the number of candies owned by Amy is

A. 40.
B. 48.
C. 50.
D. 60.

Exam Reference
HKDSE 2016 (Paper 2) Q10

14. Jason sells two mobile phones for \$3 600 each. He gains 20% on one and loses 20% on the other. After the two transactions, Jason

A. loses \$300.
B. loses \$400.
C. gains \$300.
D. gains \$400.

Exam Reference
HKDSE 2013 (Paper 2) Q10

15. Rochelle sells bike A and bike B for \$1 200 and \$1 600 respectively. She loses 40% on bike A and gains 100% on bike B. After the two transactions, Rochelle

A. loses \$2 080.
B. has no gain and no loss.
C. gains \$720.
D. gains \$2 080.

16. Bernia buys a music player for \$3 000. She then sells the music player to Jacky at a loss of 10%. At what price should Jacky sell the music player in order to have a profit of 10%?

A. \$2 430
B. \$2 970
C. \$3 000
D. \$3 240

Exam Reference
HKDSE Practice Paper (Paper 2) Q10

17. The marked price of a camera is 50% higher than the cost. If the camera is sold at a discount of 20% on its marked price, then the profit is \$600. Find the selling price of the camera.

A. \$4 500
B. \$4 000
C. \$3 600
D. \$3 000

18. The cost of a car is k% lower than its selling price. After selling the car, the percentage profit is 60%. Find k.

A. 30
B. 37.5
C. 42.5
D. 60

Exam Reference
HKDSE 2020 (Paper 2) Q9

19. The costs of coffee A and coffee B are \$250/kg and \$160/kg respectively. A trader mixes 2 kg of coffee A with 3 kg of coffee B. If he sells the mixture for \$245/kg, then the profit per cent is

A. 20%.
B. 25%.
C. 27%.
D. 28%.

20. Mr Chan spends \$500 on buying a box of biscuits which contains 40 small packs of biscuits. If he sells each small pack of biscuits for \$18, find the percentage profit.

A. 44%
B. 45%
C. 48%
D. 52%

21. Kent buys 10 gold coins for \$3 000 each. He sells 4 of them at a profit of 40% and the rest of them for \$2 700 each. On the whole, he

A. loses 10%.
B. loses 20%.
C. gains 10%.
D. gains 20%.

22. If the value of a flat is decreased by 30% and then increased by 80%, find the percentage change in the value of the flat.

A. −76%
B. −50%
C. 26%
D. 50%

Exam Reference
HKDSE 2015 (Paper 2) Q9

23. If the number of students is decreased by 25% and then decreased by 20%, find the percentage change in the number of students.

A. −40%
B. −45%
C. −55%
D. −60%

24. If the base radius and the height of a right circular cylinder are increased by 20% and k% respectively so that its volume is increased by 116%, then k =

A. 20.
B. 30.
C. 40.
D. 50.

Exam Reference
HKDSE 2014 (Paper 2) Q10

25. In a school, 55% of the students are boys. If 60% of the boys and 50% of the girls are the only child in the families, find the percentage of students who are the only child in the families.

A. 54.5%
B. 55.5%
C. 56.5%
D. 57.5%

Exam Reference
HKDSE 2012 (Paper 2) Q8

26. In a group, 76% of the people own pets. It is given that 40% of the people in the group are women and 70% of the women own pets. If k% of the men in the group own pets, then k =

A. 48.
B. 50.
C. 72.
D. 80.

Exam Reference
HKDSE 2021 (Paper 2) Q9

27. In a company, 40% of the staff are male. If 70% of the male staff and 65% of the female staff wear glasses, find the percentage of staff who do not wear glasses in the company.

A. 33%
B. 49%
C. 51%
D. 67%

28. A sum of \$30 000 is deposited at an interest rate of 5% per annum for 2 years, compounded quarterly. Find the interest, correct to the nearest dollar.

A. \$3 135
B. \$3 128
C. \$3 075
D. \$3 000

Exam Reference
HKDSE 2022 (Paper 2) Q11

29. A sum of \$25 000 is deposited at an interest rate of 3% per annum for 4 years, compounded monthly. Find the amount, correct to the nearest dollar.

A. \$28 000
B. \$28 138
C. \$28 175
D. \$28 183

Exam Reference
HKDSE 2019 (Paper 2) Q11

30. A sum of \$$x$ is deposited at an interest rate of 8% per annum for 1 year, compounded quarterly. If the amount received is \$7 452, find the value of x, correct to the nearest integer.

A. 5 477
B. 6 884
C. 6 886
D. 6 900

31. Samson buys a flat and takes a mortgage loan of \$1 000 000 from a bank at an interest rate of 2.4% per annum, compounded monthly. He repays the bank in monthly instalments of \$25 000. Find the outstanding balance after his first instalment.

A. \$976 950
B. \$977 000
C. \$998 400
D. \$999 000

32. The simple interest on a sum of money at r% per annum for 3 years is equal to the compound interest on half of the same sum of money at 6% per annum for 3 years compounded quarterly. Find the value of r, correct to 3 significant figures.

A. 3.18
B. 3.25
C. 3.26
D. 6.50

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *Algebra Practice*

Target for DSE Level 2+

Set 1

Marks: / 14

1. Simplify $\frac{y^{-8}}{(x^2y^{-5})^3}$ and express your answer with positive indices. (3 marks)

2. Make S the subject of the formula $T(2S - 7) = T - S$. (3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

Page total

3. Factorize

(a) $4a - 12b$,

(b) $a^2 - 8ab + 15b^2$,

(c) $a^2 - 8ab + 15b^2 + 12b - 4a$.

(4 marks)

4. There are some apples and oranges in a box. The number of apples is 50% less than that of oranges. The cost of each apple is \$4 and the cost of each orange is \$3. If the total cost of apples and oranges in the box is \$1 250, find the total number of apples and oranges. (4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Page total

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *Algebra Practice*

Target for DSE Level 2+

Set 2

Marks: / 14

1. Simplify $\frac{h^{11}}{h^4k^{-9}}$ and express your answer with positive indices. (3 marks)

2. Make q the subject of the formula $\frac{p-2q+3r}{2q}=4$. (3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

Page total

3. Factorize

(a) $25c^2 - 16d^2$,

(b) $10c - 8d + 25c^2 - 16d^2$.

(3 marks)

4. Leo has 30 marbles. The number of marbles owned by Maria is 20% more than that owned by Leo. The number of marbles owned by Noel is 25% less than that owned by Maria.

(a) Find the number of marbles owned by Noel.

Explain (b) If Maria gives a certain number of her marbles to Noel, will they have the same number of marbles? Explain your answer.

(5 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Page total

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *Algebra Practice*

Target for DSE Level 2+

Set 3

Marks: / 14

1. Simplify $t^{-9}\left(\frac{s^5}{t^2}\right)^6$ and express your answer with positive indices. (3 marks)

2. Make n the subject of the formula $m(np - q) = 3n$. (3 marks)

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Page total

3. Factorize

(a) $16h^2 + 40hk + 25k^2$,

(b) $16h^2 + 40hk + 25k^2 - 20h - 25k$.

(3 marks)

4. The marked price of a pair of shoes is $350. The pair of shoes is now sold at a discount of 20% on its marked price.

(a) Find the selling price of the pair of shoes.

(b) If the percentage profit is 40%, find the profit.

(5 marks)

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Page total

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *Algebra Practice*

Target for DSE Level 2+

Set 4

Marks: / 14

1. Simplify $\frac{(pq^{-3})^4}{p^7}$ and express your answer with positive indices. (3 marks)

2. Make u the subject of the formula $5v = \frac{4-3v}{2u+1}$. (3 marks)

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Page total

3. Factorize

(a) $t^2 + 7t - 18$,

(b) $t^2 + 7t - 18 + s^3t + 9s^3$.

(3 marks)

4. The selling price of a sofa is \$4 500. The sofa is sold at a discount of 10% on its marked price.

(a) Find the marked price of the sofa.

(b) If the cost of the sofa is 20% lower than the marked price, find the percentage profit.

(5 marks)

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Page total

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *Algebra Practice*

Target for DSE Level 2+

Set 5

Marks: / 14

1. Simplify $\dfrac{m^3n^{25}}{(mn^4)^6}$ and express your answer with positive indices. (3 marks)

2. Consider the formula $7 + 2C = \dfrac{C - 3D}{4}$.

   (a) Make D the subject of the above formula.

   (b) If $C + 3D = -4$, find the values of C and D.

   (4 marks)

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3. Factorize

(a) $m^2 - 16m + 64$,

(b) $m^2 - 16m + 64 - 9n^2$.

(3 marks)

4. In a test, the score of Daisy is 25% lower than that of Eric while the score of Eric is 25% higher than that of Fanny. The score of Eric is 80.

(a) Find the score of Daisy.

Explain (b) Between Daisy and Fanny, whose score is lower? Explain your answer.

(4 marks)

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Page total

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *Algebra Practice*

Target for DSE Level 2+

Set 6

Marks: / 14

1. Simplify $\frac{(c^6d)^3}{c^{-5}d^7}$ and express your answer with positive indices. (3 marks)

2. Make k the subject of the formula $\frac{3k+7}{k-6} = h$. (3 marks)

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Page total

3. Factorize

(a) $5x^2 - 16xy + 3y^2$,

(b) $5x^2 - 16xy + 3y^2 - 3x + 9y$.

(3 marks)

4. The cost of a television is \$2 800. If the television is sold at a discount of 30% on its marked price, then the percentage profit is 15%.

(a) Find the marked price of the television.

Explain (b) A salesperson claims that if the television is sold at a discount of 40% on its marked price, there can still be a profit. Do you agree? Explain your answer.

(5 marks)

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Page total

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *Algebra Practice*

Target for DSE Level 2+

Set 7

Marks: / 14

1. Simplify $\frac{a^8b^6}{(a^5b^{-4})^2}$ and express your answer with positive indices. (3 marks)

2. Make A the subject of the formula $\frac{B}{8} = 5 - \frac{6}{A}$. (3 marks)

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3. Factorize

(a) $p^5 - 3p^2q + 9p^2$,

(b) $p^5 - 3p^2q + 9p^2 - 36 + 12q - 4p^3$.

(4 marks)

4. The cost of a handbag is \$1 020. The handbag is sold and the percentage loss is 10%.

(a) Find the selling price of the handbag.

Explain (b) If the handbag is sold at a discount of 15% on its marked price, does the marked price of the handbag exceed \$1 000? Explain your answer.

(4 marks)

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Page total

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *Algebra Practice*

Target for DSE Level 2+

Set 8

Marks: / 14

1. Simplify $\dfrac{(u^{-4}v^3)^5}{u^9v^{-8}}$ and express your answer with positive indices. (3 marks)

2. Consider the formula $2x - 3y = 4(y - 3x + 6)$.
   (a) Make y the subject of the above formula.
   (b) If the value of x is decreased by 4, how will the value of y be changed?
   (4 marks)

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3. Factorize

(a) $49u^2 - 14uv + v^2$,

(b) $14u - 2v + 49u^2 - 14uv + v^2$.

(3 marks)

4. The marked price of a coffee machine is \$1 539. The marked price of the coffee machine is 35% higher than the cost.

(a) Find the cost of the coffee machine.

Explain (b) The owner wants to sell the coffee machine at a profit of 20%. Can the selling price of the coffee machine be lower than \$1 350? Explain your answer.

(4 marks)

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Page total

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *Algebra Practice*

Target for DSE Level 2+

Set 9

Marks: / 20

1. Simplify $\frac{(xy^{-3})^4}{x^{-2}}$ and express your answer with positive indices. (3 marks)

2. Make x the subject of the formula $\frac{5-4x}{y}=3$. (3 marks)

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Page total

3. Factorize

(a) $\alpha^2 - 2\alpha - 8$,

(b) $\alpha^4 - 2\alpha^3 - 8\alpha^2$.

(3 marks)

4. (a) Round up 613.678 9 to the nearest hundred.

(b) Round down 613.678 9 to 2 decimal places.

(c) Round off 613.678 9 to 2 significant figures.

(3 marks)

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5. (a) Find the range of values of x which satisfy both $6(x + 3) \geq 4x + 8$ and $3x + 4 < 0$.

(b) Write down the greatest integer satisfying both inequalities in (a).

(4 marks)

6. The marked price of a doll is $ 495. The doll is sold at a discount of 40% on its marked price.

(a) Find the selling price of the doll.

(b) If the marked price of the doll is 65% above its cost, is there a profit or loss when the doll is sold? Explain your answer.

(4 marks)

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End of Practice

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *Algebra Practice*

Target for DSE Level 2+

Set 11

Marks: / 20

1. Simplify $\dfrac{m^9}{(2m^4n)^{-3}}$ and express your answer with positive indices. (3 marks)

2. Make c the subject of the formula $kc = 4(3a - b + c)$. (3 marks)

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3. Factorize

(a) $25a^2 - 9b^2$,

(b) $25a^2 - 9b^2 + 10a - 6b$.

(3 marks)

4. (a) Round up 179.362 to the nearest integer.

(b) Round down 179.362 to 1 decimal place.

(c) Round off 179.362 to 2 significant figures.

(3 marks)

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5. (a) Solve the inequality $\frac{19+2x}{3} \geq 3(2x-5)$.

(b) Find the number of integers satisfying both inequalities $\frac{19+2x}{3} \geq 3(2x-5)$ and $4-3x<1$.

(4 marks)

6. The marked price of a handbag is \$600. The handbag is sold at a discount of 4% on its marked price.

(a) Find the selling price of the handbag.

(b) A profit of \$76 is made by selling the handbag. Someone claims that the profit percent in selling the handbag is less than 15%. Do you agree? Explain your answer.

(4 marks)

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End of Practice

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *Algebra Practice*

Target for DSE Level 2+

Set 13

Marks: / 21

1. Simplify $(\alpha^2\beta)(\alpha^{-3}\beta^5)^4$ and express your answer with positive indices. (3 marks)

2. Make x the subject of the formula $\dfrac{4x}{x+y} = 9a$. (3 marks)

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Page total

3. Factorize

(a) $6m^2 - 7mn + 2n^2$,

(b) $6m - 3n - 6m^2 + 7mn - 2n^2$.

(3 marks)

4. (a) Find the range of values of x which satisfy both $\frac{5(x-2)}{4} - 5 < 3(x+1)$ and $x - 2 \leq 0$.

(b) How many negative integers satisfy both inequalities in (a)?

(4 marks)

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5. Sally is 10% heavier than Teddy and Roy is 10% lighter than Sally. It is given that Teddy's weight is 63 kg.

(a) Find the weight of Sally.

(b) Someone claims that the weights of Teddy and Roy are the same. Do you agree? Explain your answer.

(4 marks)

6. In a shop, there are two types of coffee beans *A* and *B*. The price rates of coffee beans *A* and *B* are \$30/kg and \$45/kg respectively. Some coffee beans *A* and *B* are mixed. The mixture is 2 000 g by weight and its price is \$78. Find the weight of coffee beans *A* in the mixture. (4 marks)

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End of Practice

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *Algebra Practice*

Target for DSE Level 2+

Set 15

Marks: / 22

1. Simplify $\frac{a^{15}}{b}\left(\frac{b^{-5}}{a^3}\right)^4$ and express your answer with positive indices. (3 marks)

2. Consider the formula $\beta = \frac{1}{5}(2\alpha + 9)$.

   (a) Make α the subject of the formula.

   (b) If the value of β is increased by 2, write down the change in the value of α.

   (3 marks)

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Page total

3. Factorize

(a) $4t^3 - 12st^2$,

(b) $s^2t - 3s^3 - 4t^3 + 12st^2$.

(4 marks)

4. Consider the compound inequality

$$\frac{8x+7}{3} - x > 2(x+1) \text{ or } x - 1 > 0 \text{ ..... (*).}$$

(a) Solve (*).

(b) Write down the least positive integer satisfying (*).

(4 marks)

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5. Mandy owns 4 more books than Billy. If Billy gives 16 books to Mandy, the number of books owned by Mandy is 3 times the number of books owned by Billy. Find the total number of books owned by Mandy and Billy. (4 marks)

6. The alcohol content of wine *A* is 20% by volume, while that of wine *B* is 45%. A certain amount of wine *A* and wine *B* form a mixture. The volume of the mixture is 400 mL and the alcohol content is 30% by volume. Find the volume of wine *B* in the mixture. (4 marks)

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End of Practice

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *All-round Practice*

Target for DSE Level 2+ and 4+

Set 1

Marks: / 35

1. Simplify $(\alpha^2\beta^{-1})^{-2}(\alpha^3\beta)$ and express your answer with positive indices. (3 marks)

2. Factorize

   (a) $2m^2 + m - 1$,

   (b) $2m^5 + m^4 - m^3$.

   (3 marks)

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3. Simplify $\frac{3}{6x+1}+\frac{4}{3-8x}$. (3 marks)

4. (a) Round up 724.598 6 to the nearest ten.

(b) Round off 724.598 6 to 1 decimal place.

(c) Round down 724.598 6 to 3 significant figures.

(3 marks)

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5. Consider the compound inequality

$$x - 5 > \frac{9 - x}{4} \quad \text{or} \quad 3 - x > 4 \ \ldots\ldots\ldots\ldots\ (*).$$

(a) Solve (*).

(b) Write down the smallest positive integer satisfying (*).

(4 marks)

6. A bag contains n blue pens, $2n$ red pens and 15 black pens. If a pen is randomly drawn from the bag, then the probability of drawing a black pen is $\frac{5}{9}$. Find the total number of pens in the bag.

(4 marks)

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7. There are 975 students in a school. The number of boys is 5% less than the number of girls.

(a) Find the number of girls in the school.

(b) Find the ratio of the number of boys to the total number of students in the school.

(5 marks)

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8. Let $f(x) = 4x^2 - 20x - k$, where k is a constant. The equation $f(x) = 0$ has equal roots. Find

(a) k,

(b) the x-intercept(s) of the graph of $y = 81 - f(x)$.

(5 marks)

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9. In Figure 1, O is the centre of the semi-circle $ABCD$. BO and AC intersect at the point E. If $\angle BAC = 12°$ and $\angle CEO = 98°$, find $\angle ADC$.

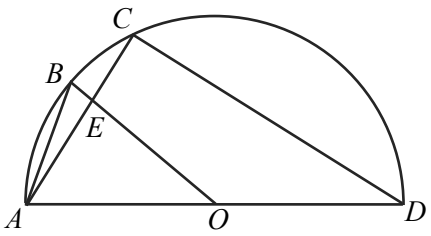

Figure 1

(5 marks)

END OF PRACTICE

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Page total

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *All-round Practice*

Target for DSE Level 2+ and 4+

Set 4

Marks: / 35

1. Simplify $\dfrac{(m^2n^{-4})^{-3}}{n^{-2}}$ and express your answer with positive indices. (3 marks)

2. Make α the subject of the formula $\dfrac{2\alpha\beta}{3-5\alpha} = 8$. (3 marks)

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Page total

3. Factorize

(a) $4h^2 - 4hk + k^2$,

(b) $4 - 4h^2 + 4hk - k^2$.

(3 marks)

4. (a) Find the range of values of y which satisfy both $5 - \frac{2(2y+5)}{7} < 7$ and $4 - y \geq 0$.

(b) How many negative integers satisfy both inequalities in (a)?

(4 marks)

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5. A shirt is sold at a discount of 15% on its marked price. The marked price of the shirt is $360.

(a) Find the selling price of the shirt.

(b) After selling the shirt, the percentage loss is 10%. Find the cost of the shirt.

(4 marks)

6. There are some people in a library originally, where the ratio of the number of males to the number of females is 8 : 11. If 12 males leave the library and 16 females enter the library, then the number of females is twice the number of males. Find the original total number of people in the library.

(4 marks)

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7. The coordinates of the points A and B are (4 , 3) and (−1 , −7) respectively. A is rotated anticlockwise about O through 90° to A', where O is the origin. B is translated rightwards by 4 units to B'.

(a) Write down the coordinates of A' and B'.

(b) Is AB perpendicular to $A'B'$? Explain your answer.

(4 marks)

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8. In Figure 1, D and E are points lying on AB and BC respectively. AE and CD intersect at the point F. It is given that $\angle BDC = \angle BEA$.

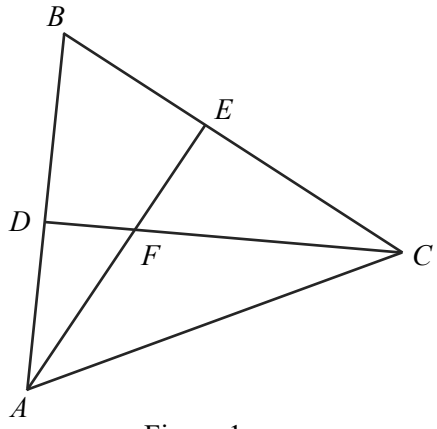

Figure 1

(a) Prove that $\triangle ABE \sim \triangle CBD$.

(b) If $\angle BAE = 28°$ and $\angle ABE = \theta$, express $\angle AFC$ in terms of θ.

(5 marks)

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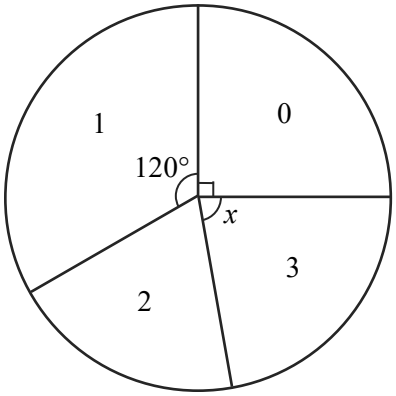
9. The pie chart below shows the distribution of the numbers of credit cards owned by a group of university students.



Distribution of the numbers of credit cards owned by the group of students

If a student is randomly selected from the group, then the probability that the selected student has 3 credit cards is $\frac{2}{9}$.

(a) Find x.

(b) If 49 students in the group have 2 credit cards each, find the total number of students in the group.

(c) Write down the mode and the mean of the above distribution.

(5 marks)

END OF PRACTICE

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Page total

Name: _____ Class: _____ ( ) Date: _____

DSE A(1) *All-round Practice*

Target for DSE Level 2+ and 4+

Set 7

Marks: / 35

1. Simplify $\frac{x^{-6}y^{7}}{(xy^{-3})^{-3}}$ and express your answer with positive indices. (3 marks)

2. Make a the subject of the formula $5 = \frac{b+3}{a} + \frac{2}{b}$. (3 marks)

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Page total

3. Factorize

(a) $m^2 - 5mn - 6n^2$,

(b) $m^2 - 5mn - 6n^2 - 2m + 12n$.

(3 marks)

4. The length of the hypotenuse of a right-angled triangle is $(9 - 5k)$ cm. If the lengths of the other two sides of the triangle are $(k + 24)$ cm and 21 cm, find k. (3 marks)

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5. (a) Find the range of values of x which satisfy both $\frac{4(2-x)}{3} \geq x - 9$ and $2(x + 1) < 3x + 2$.

(b) Find the number of integers satisfying both inequalities in (a).

(4 marks)

6. The marked price of a watch is higher than its cost by 50%. If the watch is sold at a discount of 30% on its marked price, then the profit is \$45. Find the marked price of the watch. (4 marks)

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7. The weight of a bag of coffee beans is measured as 2.5 kg, correct to the nearest 0.1 kg.

(a) Find the least possible weight of the bag of coffee beans.

(b) The bag of coffee beans is divided equally into 82 smaller packs. Someone claims that the weight of each pack can be measured as 29 g, correct to the nearest g. Do you agree? Explain your answer.

(5 marks)

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8. In Figure 1, O is the centre of the circle $ABCD$. BD and OC intersect at the point E. It is given that $CD = ED$ and $\angle BDC = 52°$.

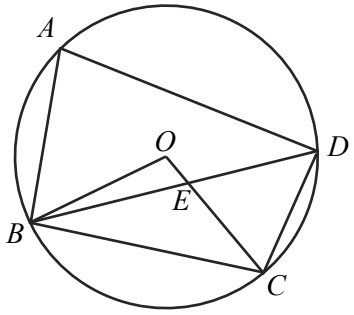

Figure 1

Find $\angle BOC$ and $\angle BAD$. (5 marks)

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9. The table below shows the distribution of the numbers of lottery tickets owned by a group of students.

Number of lottery tickets	0	1	2	3	4
Number of students	3	5	9	x	4

If a student is randomly selected from the group, then the probability that the selected student has at least 2 lottery tickets is $\frac{3}{4}$.

(a) Find x.

(b) Write down the mean, the median and the inter-quartile range of the above distribution.

(5 marks)

END OF PRACTICE

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