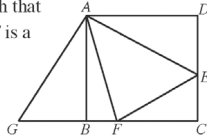# Features of this Book

Exam Question Type

Common question types in public examinations are included to familiarize students with the question formats of all topics.

③ In the figure, $ABCD$ is a square. CB is produced to G such that $\angle BGA = 60°$. E is a point on CD such that $AE = AG$. If F is a point on BC such that $\angle AFB = 75°$, then $\angle AEF =$

☞ Example 10.3 (p.90)

A. 30°.   **B.** 45°.

C. 60°.   **D.** 75°.

(Chapter 10 p.82)

③ An inverted right circular conical vessel ADE containing some water is held vertically as shown in the figure. The depth (AP) of the water is 12 cm and the radius (CP) of the water surface is 9 cm. The height (AQ) of the vessel is 20 cm.

☞ Example 13.7 (p.132)

(a) Find the capacity of the vessel in terms of π.

(b) Find the curved surface area of the vessel in terms of π.

(c) If water is poured into the vessel such that the depth of the water is increased to 16 cm, find the area of the wet curved surface of the vessel in terms of π.
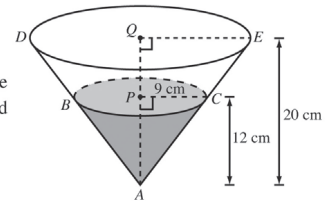
(Chapter 13 p.122)

Revision Notes

Definitions, concepts and formulae are clearly stated to help students conduct effective revision.

D. Coordinate Geometry of Straight Lines

1. Suppose $P(x_1, y_1)$ and $Q(x_2, y_2)$ are two points in a rectangular coordinate plane.

   (a) The distance between P and Q is given by the **distance formula**:
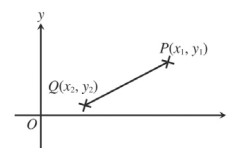
   $$PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

   (b) The **slope** m of the straight line PQ is:

   $$m = \frac{y_2 - y_1}{x_2 - x_1} \text{ (where } x_1 \neq x_2)$$

   e.g. $A(1, 4)$ and $B(5, 7)$ are two points.

   $$AB = \sqrt{(5 - 1)^2 + (7 - 4)^2} = \sqrt{4^2 + 3^2} = \sqrt{25} = \underline{\underline{5}}$$

   Slope of the straight line $AB = \dfrac{7 - 4}{5 - 1} = \underline{\underline{\dfrac{3}{4}}}$

(Chapter 14 p.149-150)

Worked Examples and Exam Tips

Examples include common question types in public examinations. Common mistakes made by candidates in past public examinations are shown in the 'Exam Tip'.

Example 3.4 A sum of \$25 000 is deposited in a bank at an interest rate of 5% per annum. Find the interest received after 3 years if interest is compounded monthly, correct to the nearest dollar.

Try HKDSE 2015 Paper 2 Q10

A. \$29 037   B. \$28 941

C. \$4037   D. \$3941

Solution Interest received after 3 years

$$= \$\left[25\,000 \times \left(1 + \frac{5\%}{12}\right)^{3(12)} - 25\,000\right]$$

$$= \$4037, \textit{cor. to the nearest dollar}$$

∴ The answer is **C**.

Exam Tip

Pay attention to the question. We need to find the interest, instead of the amount.

(Chapter 3 p.26)

Example 6.1 Simplify $\dfrac{p^3}{(p^2 q^{-4})^2}$ and express your answer with positive indices.

Try HKDSE 2016 Paper 1 Q1

Solution

$$\frac{p^3}{(p^2 q^{-4})^2} = \frac{p^3}{p^{2 \times 2} q^{-4 \times 2}}$$

$$= \frac{p^3}{p^4 q^{-8}}$$

$$= \frac{p^{3-4}}{q^{-8}}$$

$$= \frac{p^{-1}}{q^{-8}}$$

$$= \underline{\frac{q^8}{p}}$$

Exam Tip

It is wrong to write $(p^2 q^{-4})^2 = p^2 q^{-4 \times 2}$.

◄ $\dfrac{a^m}{a^n} = a^{m-n}$

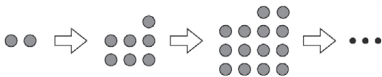◄ $a^{-n} = \dfrac{1}{a^n}$

(Chapter 6 p.48)

Practices and Exercises

Example-oriented questions are provided to consolidate students' knowledge and emphasize techniques learnt in the worked examples.

37. In the figure, the 1st pattern consists of 2 dots. For any positive integer n, the $(n + 1)$th pattern is formed by adding $(2n + 3)$ dots to the nth pattern. Find the number of dots in the 10th pattern.
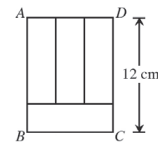

A. 100

B. 102

C. 108

D. 119

☞ Example 1.4

(Chapter 1 p.9)

Practice 8.5 In the figure, the rectangle $ABCD$ is divided into four identical rectangles. Find the area of the rectangle $ABCD$.
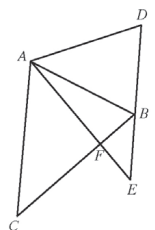
☞ Exercise 8: 41, 42

A. 80 cm²

B. 96 cm²

C. 108 cm²

D. 120 cm²

(Chapter 8 p.69)

15. In the figure, B is a point on DE. AE and BC intersect at F. It is given that $AB = AD$, $BC = DE$ and $\angle BAD = \angle EBF$.

(a) Prove that $\triangle ABC \cong \triangle ADE$.

(b) If $AC \parallel DE$, prove that

   (i) $\triangle ACF \sim \triangle EBF$,

   (ii) $\triangle ABD \sim \triangle EAD$.

(Chapter 10 p.95)

Advice

With reference to the examination reports of past public examinations, common mistakes made by candidates in past public examinations are clearly illustrated to help students avoid making the same mistakes in their coming HKDSE examinations.

Advice

Do not confuse 'polynomials' with 'equations'.

e.g. Simplify $(12 - 2x^2) + (2x)(x - 3)$.

$(12 - 2x^2) + (2x)(x - 3) = 0$
$12 - 2x^2 + 2x^2 - 6x = 0$
$12 - 6x = 0$
$x = \underline{2}$ ✗

A polynomial is NOT an equation.

$(12 - 2x^2) + (2x)(x - 3)$
$= 12 - 2x^2 + 2x^2 - 6x$
$= \underline{-6x + 12}$ ✔

(Chapter 4 p.36)

Advice

1. Do not write an '=' sign at the beginning of a solution and make sure to express the answer with positive indices as required in the question.

   e.g. Simplify $\dfrac{a^3 b^2}{a^5}$ and express the answer with positive indices.

   $= a^{3-5} b^2$
   $= \underline{a^{-2} b^2}$ ✗

   Remember to write the expression before simplification. The answers should be expressed with positive indices.

   $\dfrac{a^3 b^2}{a^5} = a^{3-5} b^2$
   $= a^{-2} b^2$
   $= \underline{\dfrac{b^2}{a^2}}$ ✔

(Chapter 6 p.50)

Solutions

Full solutions of the exercise can be obtained by scanning the QR code provided.

Chapter 12

Solutions

Exercise 12

Scan the QR code for full solutions.

In this exercise, unless otherwise stated, give the answers correct to 3 significant figures if necessary.

Section A(1)

1. Without using a calculator, find the value of each of the following expressions.

   (a) $\cos 30° + \sin 60°$

   (b) $(\sin^2 45° - 1) \tan 45°$

   (c) $\dfrac{\sin^2 45°}{\tan 45° - \cos^2 30°}$

   (d) $\dfrac{\cos^2 45° - 1}{3 \tan^2 30°}$

   (e) $\sin^2 47° + \sin 43° \cos 47°$

   (f) $\dfrac{\sin 33° \cos 57°}{\sin^2 57°} - \dfrac{1}{\cos^2 33°}$

(Chapter 12 p.116)

Contents

Chapter 3 Percentages

Exam Question Type

① The number of members in group *A* is 30% more than that in group *B*, while the number of members in group *B* is 30% less than that in group *C*. It is known that there are 420 members in group *B*.

   (a) Find the number of members in group *A*.

   (b) Which group has the greatest number of members? Explain your answer.

② The marked price of a T-shirt is $300. The T-shirt is sold at a discount of 30%.

   (a) Find the selling price of the T-shirt.

   (b) If the T-shirt is sold at a profit of 40%, find the cost price of the T-shirt.

③ A sum of $25 000 is deposited in a bank at an interest rate of 5% per annum.

   Find the interest received after 3 years if interest is compounded monthly, correct to the nearest dollar.

   A. $29 037   **B.** $28 941   **C.** $4037   **D.** $3941

Revision Notes

A. Percentage Change

1. Percentage Increase

Increase = New value – Original value

$$\textit{Percentage increase} = \frac{\text{Increase}}{\text{Original value}} \times 100\%$$

New value = Original value × (1 + Percentage increase)

e.g. If 40 is increased by 5%, then the new value = 40 × (1 + 5%) = $\underline{\underline{42}}$

> **Exam Tip**
> Percentage increase CANNOT be negative.

2. Percentage Decrease

Decrease = Original value – New value

$$\textit{Percentage decrease} = \frac{\text{Decrease}}{\text{Original value}} \times 100\%$$

New value = Original value × (1 – Percentage decrease)

e.g. If 50 is decreased by 10, then the percentage decrease = $\frac{10}{50} \times 100\% = \underline{\underline{20\%}}$

---

percentage increase　百分增加　　　　percentage decrease　百分減少

2. Salaries Tax

Employees have to pay **salaries tax** to the Government. Salaries tax is charged on the **net chargeable income** at progressive rates.

Net chargeable income = Total income – **Deductions** – **Allowances**

The table below shows the tax rate for the year 2016/17.

Net Chargeable Income	Rate
On the first $40 000	2%
On the next $40 000	7%
On the next $40 000	12%
On the remaining	17%

e.g. The net chargeable income is $84 000.   ◄ $84 000 = $(40 000 + 40 000 + 4000)

Tax on Net Chargeable Income (2016/17)

Net Chargeable Income	Rate	Salaries Tax
On the first $40 000	2%	$40 000 × 2% = $800
On the next $40 000	7%	$40 000 × 7% = $2800
On the next $40 000	12%	$4000 × 12% = $480
On the remaining	17%	

Salaries tax = $(800 + 2800 + 480) = $4080

Worked Examples

Example 3.1 The number of members in group A is 30% more than that in group B, while the number of members in group B is 30% less than that in group C. It is known that there are 420 members in group B.

Try HKDSE 2012 Paper 1 Q4

(a) Find the number of members in group A.

(b) Which group has the greatest number of members? Explain your answer.

Solution (a) Number of members in group $A = 420 \times (1 + 30\%) = \underline{546}$

(b) Let x be the number of members in group C.

$$x(1 - 30\%) = 420$$

$$x = \frac{420}{1 - 30\%}$$

$$x = 600$$

∴ Group C has the greatest number of members.

Exam Tip

(a) 'A is $x\%$ more than B' means that $A = B(1 + x\%)$.

(b) 'C is $y\%$ less than D' means that $C = D(1 - y\%)$.

salaries tax　薪俸稅　　　net chargeable income　應課稅入息實額　　　deduction　稅項扣除　　　allowance　免稅額