HKDSE Exam Question Distribution

Paper 1

	Sample Paper			Practice Paper			DSE 2012			DSE 2013		
Topics	**A(1)**	**A(2)**	**B**	**A(1)**	**A(2)**	**B**	**A(1)**	**A(2)**	**B**	**A(1)**	**A(2)**	**B**
Number System and Estimation						17*				8(E)		
Percentages	4			4			4(E)					
Formulas and Polynomials	2, 3			2, 3			2, 3			2, 3		
More about Polynomials		10			10			13*(E)			12*(E)	
Equations	5			5		17*	5			4		
Functions and Graphs								13*(E)			12*(E)	17(E)
Rates, Ratios and Variations		11, 12(E)			11, 12(E)			11			11, 13*(E)	
Sequences and Series			15			19*(E)			19*(E)			19*(E)
Indeices, Exponential and Logarithmic Functions	1		17	1		19*(E)	1		19*(E)	1		19*(E)
Inequalities and Linear Programming						19*(E)	6		19*(E)	5		19*(E)
Transformation, Symmetry and 3-D Figures												
Straight Lines and Rectilinear Figures										7		
Basic Properties of Circles	7		19*(E)	7	14*		8(E)					
Mensuration	6						9	12(E)			13*(E)	
Coordinates, Locus and Equations of Straight Lines	8(E)	13(E)	19(E)*	6(E), 8				14*(E)	17*	6	14*	
Equations of Circles					14*			14*(E)	17*		14*	
Basic Trigonometry												
Applications of Trigonometry			18(E)			18(E)			18(E)			18(E)
Permutation and Combination			16*			16*			16*			16*
Probabilities			16*		13*(E)	16*			16*		10*	16*
Statistics	9(E)	14(E)		9(E)	13*(E)	15(E)	7(E)	10(E)	15(E)	9	10*	15(E)

Remarks: 1. Non-foundation questions are underlined.
2. Integrated questions are labelled by *.
3. Questions requiring 'explain your answer' are indicated by (E).

19. The total weight of the wastes $W(n)$ (in thousand tonnes) produced by a city in the nth year since the beginning of 2011 is given by $W(n) = 2ab^{2n}$, where n is a positive integer, a and b are positive constants. It is found that the total weights of the wastes in 2011 and 2012 are 50 820 thousand tonnes and 61 492.2 thousand tonnes respectively.

(a) (i) Find a and b.

(ii) Express, in terms of n, the total weight of the wastes produced by the city in the first n years since the beginning of 2011. Hence, find the total weight of the wastes produced by the city in the first 5 years since the beginning of 2011. (Give the answer correct to the nearest thousand tonnes.)

(iii) The remaining space of the landfill at the end of 2010 can hold 1 000 000 thousand tonnes of wastes. In which year will the landfill be full?

(8 marks)

(b) At the beginning of 2016, an incinerator starts to operate. Let $B(m)$ thousand tonnes be the total weight of the wastes handled by the incinerator in the mth year since its operation, where m is a positive integer. It is given that $B(m) = 5ab^m$. Assume that the residue after incinerating can be neglected. Will the landfill be full in 2021? Explain your answer.

(4 marks)

Answers written in the margins will not be marked.

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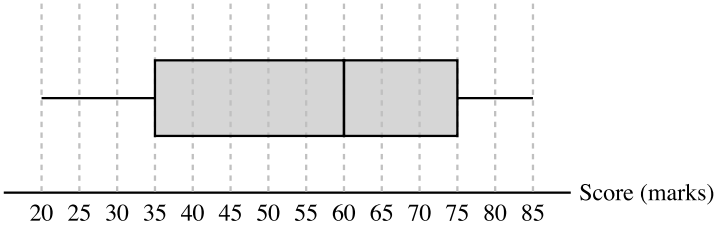
SECTION B (35 marks)

15. The box-and-whisker diagram below shows the distribution of the scores (in marks) of the students of a class in a test. James gets the highest score while John gets the lowest score in the test. The standard scores of James and John in the test are 2.4 and –2.8 respectively.



(a) Find the mean of the distribution. (2 marks)

(b) A student claims that the standard scores of at least half of the students in the test are positive. Do you agree? Explain your answer. (2 marks)

Answers written in the margins will not be marked.

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Page total

14. The figure shows the graph of the straight line $ax + by + 1 = 0$. Which of the following is/are true?

I. $b < 0$

II. $a > 0$

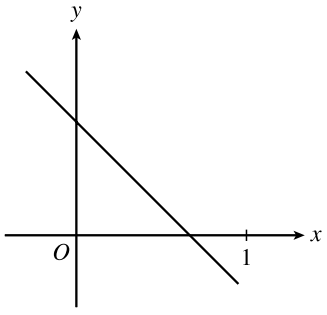
III. $a < -1$

A. I only

B. I and II only

C. I and III only

D. II and III only



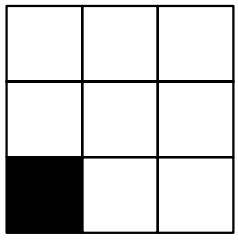
15. In the figure, a square is divided into nine smaller identical squares and one of them is shaded. If one of the eight remaining squares is shaded, how many ways are there such that the resulting figure has reflectional symmetry?

A. 1

B. 2

C. 4

D. 8



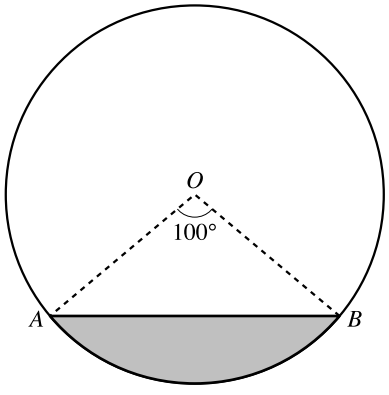
16. In the figure, the area of the shaded region is 3 cm^2. If $\angle AOB = 100°$, where O is the centre of the circle, find the radius of the circle correct to 0.01 cm.

A. 2.80 cm

B. 2.81 cm

C. 2.82 cm

D. 2.83 cm



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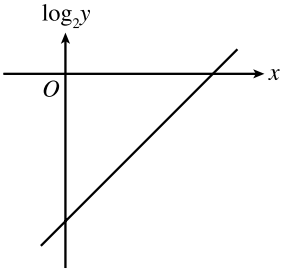
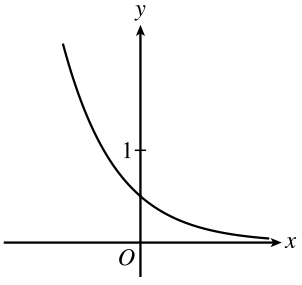
33.

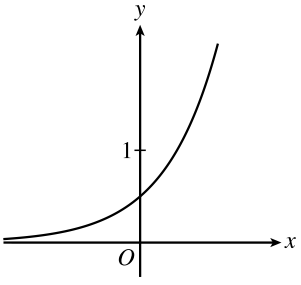


The figure above shows the linear relation between x and $\log_2 y$. Which of the following graphs may represent the relation between x and y?

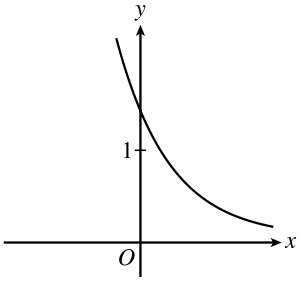
A.



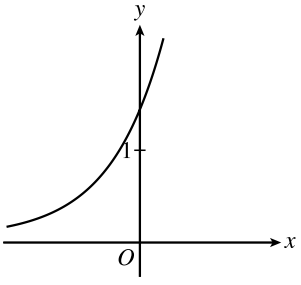
B.



C.



D.



34. If $a + \log_2 b = a^2 + \log_2 b^3 - 10 = 3$, then $b =$

A. 4.

B. $\frac{1}{2}$.

C. $\frac{1}{2}$ or 16.

D. -1 or 4.

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Top 15 Question Types

Among the DSE Exam Papers (2013, 2012, Practice Papers (PP), Sample Papers(SP)), the top 15 question types are summarized as follows:

Question Type 1 Laws of indices

Example:

Simplify $\frac{(x^{-1}y^3)^8}{x^{-5}y^7}$ and express your answer with positive indices.

Solution:

$$\frac{(x^{-1}y^3)^8}{x^{-5}y^7} = \frac{x^{-8}y^{24}}{x^{-5}y^7}$$
$$= \frac{y^{24-7}}{x^{8-5}}$$
$$= \frac{y^{17}}{x^3}$$

Different forms of the selected question types are included with reference to DSE exam papers.

DSE reference
- 2013 (I Q1)
- 2013 (II Q1)
- 2012 (I Q1)
- 2012 (II Q1)
- PP (I Q1)
- PP (II Q1)
- SP (I Q1)
- SP (II Q1)

First, practice the corresponding questions in DSE exam papers. Then try the similar questions in this Mock Exam Power Pack.

	Mock 1		Mock 2		Mock 3		Mock 4		Mock 5		Mock 6	
	I	II	I	II	I	II	I	II	I	II	I	II
Try	Q1	Q1	Q1	Q1	Q1	Q1	Q1	Q1	Q1	Q1	Q1	Q1

Example:

Express $\frac{3+4i}{1-2i}$ in the form $a+bi$.

Display	Key-in sequence
	(3 + 4 SHIFT ENG)
	÷ (1 − 2 SHIFT ENG) EXE
−1	SHIFT EXE (The real part)
2	(The imaginary part)

$\therefore \quad \frac{3+4i}{1-2i} = -1+2i$

02 Quadratic Formula

For the quadratic equation $ax^2 + bx + c = 0$, $a \neq 0$, the solutions are given by the quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

Program Editing

Step 1: MODE MODE MODE 1 [PRGM mode]

Step 2: **P1** or **P2** or **P3** or **P4**

Step 3: **Lbl 0: ? → A: ? → B: ? → C: B^2 − 4AC → D: D = 0 ⇛**
Goto 1: D > 0 ⇛ Goto 2: Lbl 2: (− B − $\sqrt{\ }$ D) ÷ (2A) → X:
X ◢ Lbl 1: (− B + $\sqrt{\ }$ D) ÷ (2A) → X: X

Step 4: AC MODE MODE MODE 2

Program Execution

Step 0: MODE MODE MODE 2 [RUN mode]
You may skip this step if you are already in RUN mode.

Step 1: MODE 1 [COMP mode]

Useful Formulas

Junior Secondary

1. Estimation, Approximation and Errors

(a) Absolute error = estimated value − exact value

(b) Maximum absolute error
= largest possible uncertainty of an estimation or a measurement

(c) $$\text{Relative error} = \frac{\text{Maximum absolute error}}{\text{Measured value}} \text{ or}$$
$$= \frac{\text{Absolute error}}{\text{Exact value}}$$

(d) Percentage error = Relative error × 100%

2. Percentages

(a) $$\text{Percentage change} = \frac{\text{New value} - \text{Original value}}{\text{Original value}} \times 100\%$$

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

(ii) New value = Original value × (1 − Percentage decrease)

(c) Profit and loss

$$\text{Percentage change} = \frac{\text{Selling price} - \text{Cost price}}{\text{Cost price}} \times 100\%$$

If the percentage change > 0, then there is a profit.

If the percentage change < 0, then there is a loss.

(d) Selling price = Cost price × (1 + Profit percentage)

or

= Cost price × (1 − Loss percentage)

(e) $$\text{Discount percentage} = \frac{\text{Marked price} - \text{Selling price}}{\text{Marked price}} \times 100\%$$

(f) Selling price = Marked price × (1 − Discount percentage)

17. (a) $b = a + 2$ 1A

(1)

(b) The equation of L:

$y - 0 = (\tan 45°)(x - 0)$

$y = x$ 1M

The equation of C:

$(x - a)^2 + (y - b)^2 = b^2$ 1M

$x^2 - 2ax + a^2 + y^2 - 2by + b^2 = b^2$

$x^2 + y^2 - 2ax - 2by + a^2 = 0$

Substituting $y = x$ into the equation of C,

$x^2 + x^2 - 2ax - 2bx + a^2 = 0$ 1M

$2x^2 - 2(a + b)x + a^2 = 0$

$\therefore$ The x-coordinate of the mid-point of PQ

$= \dfrac{-\dfrac{-2(a+b)}{2}}{2}$ 1M

$= \dfrac{a+b}{2}$

$= \dfrac{a + (a + 2)}{2}$ (by (a))

$= a + 1$

$\therefore$ The coordinates of the mid-point of PQ

$= \underline{\underline{(a + 1, a + 1)}}$ 1A

Alternative Solution

Equation of L:

$y - 0 = (\tan 45°)(x - 0)$

$y = x$ 1M

The equation of the straight line passing through the centre of C and perpendicular to L:

$y - b = \dfrac{-1}{1}(x - a)$ 1M

Substituting $y = x$ into $y - b = \dfrac{-1}{1}(x - a)$,

$x - b = -(x - a)$ 1M

$2x = a + b$

$x = \dfrac{a+b}{2}$ 1M

$= \dfrac{a + a + 2}{2}$ (by (a))

$= a + 1$

$\therefore$ The coordinates of the mid-point of PQ

$= \underline{\underline{(a + 1, a + 1)}}$ 1A

(5)

18. (a) In ΔTAC,

$\dfrac{TC}{AC} = \tan 18°$

$AC = \underline{\underline{\dfrac{h}{\tan 18°}}}$ m 1A

In ΔTBC,

$\dfrac{TC}{BC} = \tan 22°$

$BC = \underline{\underline{\dfrac{h}{\tan 22°}}}$ m 1A

In ΔABC, by the cosine formula,

$AB^2 + BC^2 - 2(AB)(BC)\cos 35° = AC^2$

$\left[\begin{array}{l} 800° + \dfrac{h^2}{\tan^2 22°} \\ -2(800)\left(\dfrac{h}{\tan 22°}\right)\cos 35° \end{array}\right] = \dfrac{h^2}{\tan^2 18°}$ 1M

$\left[\begin{array}{l} \left(\dfrac{1}{\tan^2 22°} - \dfrac{1}{\tan^2 18°}\right)h^2 \\ -2(800)\left(\dfrac{\cos 35°}{\tan 22°}\right)h + 800^2 \end{array}\right] = 0$ 1M

$\therefore$ $h \approx 168.1318$ or -1137.6110 (rejected)

$h = \underline{\underline{168}}$ *(cor. to the nearest integer)* 1A

(5)

(b) Let P be the point on AB such that the $CP \perp AB$, then CP is the shorest distance between C and AB. $\angle TPC$ is the greatest angle of elevation of T from Jenny when she walk from A to B. 1M

In ΔBCP,

$\dfrac{CP}{BC} = \sin 35°$

$CP = \dfrac{h \sin 35°}{\tan 22°}$ 1M

$\tan \angle TPC = \dfrac{TC}{CP}$

$= \dfrac{h}{\dfrac{h \sin 35°}{\tan 22°}}$ 1M

$= \dfrac{\tan 22°}{\sin 35°}$

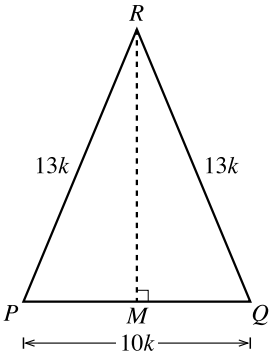
$\angle TPC = 35.2°$ *(cor. to 3 sig. fig.)* 1A

$\therefore$ $18° \leq$ Angle of elevation $\leq 35.2°$ 1A

(5)

22. A

In the figure, M is a point on PQ such that $RM \perp PQ$ and k is a non-zero constant.



$PM = QM$ *(property of isos. Δ)*

Hence, we have $PM : PR = 5 : 13$

$\therefore \quad \cos\angle P = \dfrac{5}{13}$

Speedy Method

By cosine formula,

$(13k)^2 = (10k)^2 + (13k)^2 - 2(10k)(13k)\cos\angle P$

$100k^2 = 260k^2\cos\angle P$

$\cos\angle P = \dfrac{5}{13}$

23. B

For I,

$$\frac{\sin(90° - x)}{\cos x} = \frac{\cos x}{\cos x} = 1$$

$\therefore$ I is true.

For II,

when $x = 60°$, $\tan x - \tan(90° - x) = \tan 60° - \tan 30° > 0$.

$\therefore$ II may not be true.

For III,

x and $\dfrac{x}{2}$ are both acute angles and $x > \dfrac{x}{2}$,

hence $\tan x > \tan\dfrac{x}{2}$.

$\therefore$ III is true.

24. C

Let $P = (x, y)$.

$$PX^2 = 4PY^2$$

$$(x-0)^2 + (y-5)^2 = 4[(x-1)^2 + (y-0)^2]$$

$$x^2 + y^2 - 10y + 25 = 4(x^2 - 2x + 1 + y^2)$$

$$3x^2 + 3y^2 - 8x + 10y - 21 = 0$$

25. D

The equation of C in the general form is

$x^2 + y^2 - 2x - 2y - \dfrac{2}{3} = 0$.

For I, the centre of C is (1, 1).

$\therefore$ I is not true.

For II, the radius of $C = \sqrt{\left(\dfrac{-2}{2}\right)^2 + \left(\dfrac{-2}{2}\right)^2 - \left(-\dfrac{2}{3}\right)} = \sqrt{\dfrac{8}{3}}$

Distance between (1, 1) and (2, 2)

$= \sqrt{(2-1)^2 + (2-1)^2}$

$= \sqrt{2}$

$< \sqrt{\dfrac{8}{3}}$

Hence, (2, 2) lies inside C.

$\therefore$ II is true.

For III,

the slope of the line passing through (0, 0) and (1, 1)

$= \dfrac{1-0}{1-0}$

$= 1$

The slope of $AB = -1$

(line from centre to mid-pt. of chord $\perp$ chord)

$\therefore$ III is true.

26. A

Second number \ First number	2	3	4	5	6
2		1	2	3	4
3	1		1	2	3
4	2	1		1	2
5	3	2	1		1
6	4	3	2	1	

From the above table, the required probability $= \dfrac{8}{20} = \dfrac{2}{5}$

Speedy Method

P(difference is even)

$= P$(both odd or both even)

$= \dfrac{2}{5} \times \dfrac{1}{4} + \dfrac{3}{5} \times \dfrac{2}{4}$

$= \dfrac{8}{20}$

$= \dfrac{2}{5}$

27. B

Since the mode is 7, at least one of a and b is 7, say $a = 7$.

Since the median is 4.5, five numbers are smaller than or equal to 4.5 and they are 0, 1, 2, 3, 4.

Since the 5th datum is 4, the 6th datum must be 5,

we have $b = 5$.

$\text{Mean} = \dfrac{0 + 1 + 2 + 3 + 4 + 5 + 6 + 7 + 7 + 9}{10} = 4.4$