

First Semester

Applied Mathematics  
(الرياضيات التطبيقية)

(Questions)



حاضر ☐

غائب ☐



سَلْطَنَةُ عُمَانِ  
وَزَارَةُ التَّربِيَةِ وَالتَّعْلِيمِ

ختم المركز

امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

للعام الدراسي ١٤٣٥/١٤٣٦ هـ - ٢٠١٤ / ٢٠١٥ م

الدور الأول - الفصل الدراسي الأول

- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

- تنبيه : المادة: الرياضيات التطبيقية.
- الأسئلة في ( ١٠ ) صفحات.

#### تعليمات وضوابط التقدم للامتحان:

- يتم الالتزام بالإجراءات الواردة في دليل الطالب لأداء امتحان شهادة دبلوم التعليم العام.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (○) وفق النموذج الآتي:  
س - عاصمة سلطنة عمان هي:  
○ القاهرة ○ الدوحة  
● مسقط ○ أبوظبي
- ملاحظة: يتم تظليل الشكل (●) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.
- الحضور إلى اللجنة قبل عشر دقائق من بدء الامتحان للأهمية.
- إبراز البطاقة الشخصية لمراقب اللجنة.
- يمنع كتابة رقم الجلوس أو الاسم أو أي بيانات أخرى تدل على شخصية الممتحن في دفتر الامتحان، وإلا ألغى امتحانه.
- يحظر على الممتحنين أن يصطحبوا معهم بمركز الامتحان كتباً دراسية أو كراسات أو مذكرات أو هواتف محمولة أو أجهزة النداء الآلي أو أي شيء له علاقة بالامتحان كما لا يجوز إدخال آلات حادة أو أسلحة من أي نوع كانت أو حقائب يدوية أو آلات حاسبة ذات صفة تخزينية.
- يجب أن يتقيد المتقدمون بالزي الرسمي (الدشداشة البيضاء والمصر أو الكمة للطلاب والدارسين والزي المدرسي للطالبات واللباس العماني للدارسات ) ويمنع النقاب داخل المركز ولجان الامتحان.
- لا يسمح للمتقدم المتأخر عن موعد بداية الامتحان بالدخول إلا إذا كان التأخير بعذر قاهر يقبله رئيس المركز وفي حدود عشر دقائق فقط.

صحيح ● غير صحيح ○  
✓ ✗ ○ ● ○

مُسَوَّدَة، لا يتم تصحيحها

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**Instructions:**

1. Programmable calculators are **not** allowed.
2. A list of formulae is provided on the final pages.

**Question 1****(28 marks)**

There are 14 multiple-choice items worth two marks each.  
Shade in the **correct** answer for each of the following items.

- 1) In an arithmetic sequence, if  $u_1 = 9$ ,  $d = 3$ , then  $u_2$  equals :
 

<input type="checkbox"/> 3	<input type="checkbox"/> 6
<input type="checkbox"/> 9	<input type="checkbox"/> 12
  
- 2) In a geometric sequence where  $u_4 = 27$  and  $u_5 = -81$ , the common ratio equals:
 

<input type="checkbox"/> -3	<input type="checkbox"/> $-\frac{1}{3}$
<input type="checkbox"/> $\frac{1}{3}$	<input type="checkbox"/> 3
  
- 3) In a geometric series  $u_n = 5 \cdot 2^{n-1}$ , if  $S_n = 635$ , then the value of  $n$  equals:
 

<input type="checkbox"/> 2	<input type="checkbox"/> 5
<input type="checkbox"/> 7	<input type="checkbox"/> 10
  
- 4) If 1 euro buys 50.631 Thailand baht, how many baht can be bought for 1000 euro?
 

<input type="checkbox"/> 0.050631	<input type="checkbox"/> 1050.631
<input type="checkbox"/> 5631	<input type="checkbox"/> 50631

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## Question 1 continued

- 5) If you want to buy 520 euro worth of travellers cheques ,what will it cost in Norwegian kroner if 1 Norwegian kroner = 0.11740 euro (approximately)?
- ☐ 2.25 ☐ 61.05
- ☐ 4429.3 ☐ 4473.6
- 6) What are the monthly repayments on a loan of \$3000 at 5% p.a. simple interest over 3 years (approximately)?
- ☐ 83 ☐ 96
- ☐ 450 ☐ 1150
- 7) How much has been borrowed if a rate of 6% p.a. simple interest results in an interest charge of \$1500 after 15 months?
- ☐ 2250 ☐ 13500
- ☐ 20000 ☐ 24000
- 8) If an event is certain to happen, then its chance of happening is equal to:
- ☐ 0% ☐ 1%
- ☐ 50% ☐ 100%
- 9) A coin and a die are tossed simultaneously. The probability of getting both a tails and a 6 equals:
- ☐  $\frac{1}{12}$  ☐  $\frac{1}{3}$
- ☐  $\frac{2}{3}$  ☐  $\frac{11}{12}$

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## Question 1 continued

- 10) A card is drawn randomly from 9 cards labeled 1 through 9. The probability of picking a card with number 7 or an even number equals:

☐  $\frac{3}{9}$

☐  $\frac{5}{9}$

☐  $\frac{6}{9}$

☐  $\frac{7}{9}$

- 11) If  $P(A) = \frac{1}{4}$ ,  $P(B) = \frac{3}{4}$  and  $P(B|A) = \frac{1}{2}$ , then  $P(A|B) =$

☐  $\frac{1}{2}$

☐  $\frac{1}{8}$

☐  $\frac{1}{6}$

☐  $\frac{1}{3}$

- 12) For all  $x \in R$ , if  $p: x < 5$ , then  $\neg p$  is:

☐  $x < 5$

☐  $x > 5$

☐  $x \leq 5$

☐  $x \geq 5$

- 13) One of the following is a logical contradiction:

☐  $\neg p \vee \neg p$

☐  $p \vee p$

☐  $p \vee \neg p$

☐  $\neg p \wedge p$

- 14) The **contrapositive** of the statement "if  $x > 10$ , then  $x > 6$ " is:

☐ if  $x > 6$ , then  $x > 10$

☐ if  $x \leq 10$ , then  $x \leq 6$

☐ if  $x \leq 6$ , then  $x \leq 10$

☐ if  $x > 6$ , then  $x \leq 10$

## Extended Questions

Write your answer for each of the three questions in the space provided.  
Be sure to show all your work and the correct units where applicable.

### Question 2

**(14 marks)**

- 15) List the first three terms for the sequence:  $u_n = 3^{n+1}$ . [3 marks]

- 16) Find the sum of  $2 + 2\left(\frac{1}{2}\right) + 2\left(\frac{1}{4}\right) + 2\left(\frac{1}{8}\right) + \dots$  to 8 terms. [4 marks]

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## Question 2 continued

17) Write the **converse** and the **inverse** of the following implication:

"If  $x > 5$  then  $x^2 > 25$ "

[2 marks]

18) Construct a truth table for  $(p \wedge q) \vee \neg p$

[3 marks]

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## Question 2 continued

- 19) Show that  $\frac{p \Rightarrow q}{p}$  is a valid argument.

[2 marks]

## Question 3

(14 marks)

- 20) How many times per year can interest be compounded if it is:

a. Half-yearly?

[2 marks]

b. Quarterly?

[2 marks]

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### Question 3 continued

21) If a truck was purchased for \$300000 and depreciates at 25% p.a. each year:

a. Find the future value of the truck after 5 years. [5 marks]

b. By how much has it depreciated? [2 marks]

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### **Question 3 continued**

- 22) How much does Ahmed need to deposit into an account to collect \$70000 at the end of 4 years if the account is paying 6% p.a. compounded monthly? [3 marks]

### **Question 4**

**(14 marks)**

- 23) Consider two archers shoot simultaneously. What are the possible outcomes? [4 marks]

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## Question 4 continued

- 24) In a school of 320 students, 85 students play tennis, 200 students play hockey, and 60 students play both sports.
- a. Display the data in a Venn diagram. [3 marks]
- b. A student is randomly selected. Determine the probability that the student plays at least one of the sports. [4 marks]

## Question 4 continued

25) A sample space consists of four possible events: A, B, C and D, where

$$P(A) = 5P(B) = 5P(C) = 5P(D). \text{ Find } P(A).$$

[3 marks]

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[ End of Examination ]

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## List of Formulae (2 sheets)

### Sequences and Series

- If  $u_n$  is an arithmetic sequence, then:

$$u_n = u_1 + (n - 1)d$$

- The sum  $S_n$  of the first  $n$ th terms in an arithmetic sequence:

$$S_n = \frac{n}{2} (u_1 + u_n)$$

$$S_n = \frac{n}{2} (2u_1 + (n - 1)d)$$

- If  $u_n$  is a geometric sequence, then:

$$u_n = u_1 r^{n-1}$$

- The sum  $S_n$  of the first  $n$ th terms in a geometric sequence:

$$S_n = \frac{u_1(r^n - 1)}{r - 1}$$

$$S_n = \frac{u_1(1 - r^n)}{1 - r}$$

### Financial Mathematics

- Cost in currency =  $\frac{\text{foreign currency bought}}{\text{selling exchange rate}}$
- Currency bought =  $\frac{\text{foreign currency sold}}{\text{buying exchange rate}}$
- Cost of travellers cheques =  $\frac{\text{amount of foreign currency}}{\text{selling exchange rate}} \times 101 \%$
- Simple interest  $I = C \times r \times n$
- Compound Interest  $A = C \times \left(1 + \frac{r}{100}\right)^n$
- Periodic repayment =  $\frac{\text{principal} + \text{interest}}{\text{number of repayments}}$
- Total interest earned = final balance – principal

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## Probability

- Addition Rule:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

- Conditional Probability:

$$P(A \text{ given } B) = P(A|B) = \frac{P(A \cap B)}{P(B)}$$

- Multiplication Rule:

$$P(A \cap B) = P(A|B) \times P(B) \text{ or } P(B|A) \times P(A)$$

- Independent Rule:

A and B are independent events if:

$$P(A|B) = P(A)$$

$$P(B|A) = P(B) \text{ or } P(A \cap B) = P(A) \times P(B)$$

- Mutually Exclusive Rule:

A and B are Mutually Exclusive events if:

$$P(A \cap B) = 0$$

## End of Formulae

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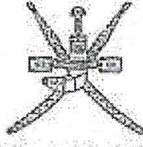
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First Semester

Applied Mathematics  
(الرياضيات التطبيقية)

(Answers)





**SULTANATE OF OMAN  
MINISTRY OF EDUCATION  
GENERAL EDUCATION DIPLOMA  
BILINGUAL PRIVATE SCHOOLS**

First Semester – First Session

2014 / 2015

اجابة امتحان دبلوم التعليم العام للمدارس الخاصة ثنائية اللغة

للعام الدراسي ٢٠١٤ / ٢٠١٥ م

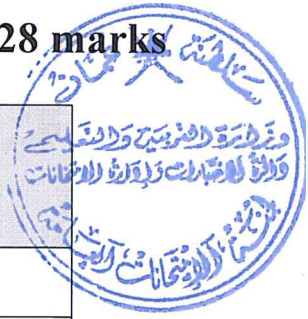
الدور الأول – الفصل الدراسي الأول



***Marking Guide***

**Applied Mathematics – Bilingual Private Schools**

**Question One: Multiple –Choice: Each item carries 2 marks = 28 marks**



Item	Answer	Taxonomy	Page
1	12	Knowledge	401
2	-3	Application	406
3	7	Reasoning	415
4	50631	Knowledge	423
5	4473.6	application	426
6	96	application	429
7	20000	Reasoning	428
8	100%	Knowledge	454
9	$\frac{1}{12}$	Application	470
10	$\frac{5}{9}$	Application	482 - 483
11	$\frac{1}{6}$	Reasoning	485
12	$x \geq 5$	Knowledge	497
13	$\neg p \wedge p$	Application	503
14	if $x \leq 6$ , then $x \leq 10$	Application	509

## Extended Responses

### Question Two:

[ 14 marks]



Q. #	Answer	Marks	Page / Taxonomy																									
15	The first term = $u_1 = 3^{1+1} = 3^2 = 9$ The second term = $u_2 = 3^{2+1} = 3^3 = 27$ The third term = $u_3 = 3^{3+1} = 3^4 = 81$	1 1 1	400 Knowledge																									
16	The series is a geometric:  Common ratio $r = \frac{u_2}{u_1} = \frac{2(\frac{1}{2})}{2} = \frac{1}{2}$  $S_8 = \frac{u_1(1 - \frac{1}{2}^8)}{(1 - \frac{1}{2})}$  $S_8 = \frac{2(1 - \frac{1}{256})}{(\frac{1}{2})}$  $S_8 = 4\left(\frac{255}{256}\right) = \frac{255}{64} \approx 3.98$	1  1  1  1	407+419 Application																									
17	The converse : if $x^2 > 25$ then $x > 5$  The inverse : if $x \leq 5$ then $x^2 \leq 25$	1  1	508 - 509 Knowledge																									
18	<table border="1"><tr><th><math>p</math></th><th><math>q</math></th><th><math>\neg p</math></th><th><math>p \wedge q</math></th><th><math>(p \wedge q) \vee \neg p</math></th></tr><tr><td>T</td><td>T</td><td>F</td><td>T</td><td>T</td></tr><tr><td>T</td><td>F</td><td>F</td><td>F</td><td>F</td></tr><tr><td>F</td><td>T</td><td>T</td><td>F</td><td>T</td></tr><tr><td>F</td><td>F</td><td>T</td><td>F</td><td>T</td></tr></table>	$p$	$q$	$\neg p$	$p \wedge q$	$(p \wedge q) \vee \neg p$	T	T	F	T	T	T	F	F	F	F	F	T	T	F	T	F	F	T	F	T	3 marks:	503 Application
$p$	$q$	$\neg p$	$p \wedge q$	$(p \wedge q) \vee \neg p$																								
T	T	F	T	T																								
T	F	F	F	F																								
F	T	T	F	T																								
F	F	T	F	T																								
19	<table border="1"><tr><th><math>p \Rightarrow q</math></th><th><math>\wedge</math></th><th><math>p</math></th><th><math>\Rightarrow</math></th><th><math>q</math></th></tr><tr><td>T</td><td>T</td><td>T</td><td>T</td><td>T</td></tr><tr><td>F</td><td>F</td><td>T</td><td>T</td><td>F</td></tr><tr><td>T</td><td>F</td><td>F</td><td>T</td><td>T</td></tr><tr><td>T</td><td>F</td><td>F</td><td>T</td><td>F</td></tr></table> <p style="text-align: center;"><math>p \Rightarrow q</math></p> <p>So, the argument <math>\frac{p}{q}</math> is valid</p>	$p \Rightarrow q$	$\wedge$	$p$	$\Rightarrow$	$q$	T	T	T	T	T	F	F	T	T	F	T	F	F	T	T	T	F	F	T	F	2 marks	512 Reasoning
$p \Rightarrow q$	$\wedge$	$p$	$\Rightarrow$	$q$																								
T	T	T	T	T																								
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### Question Three:

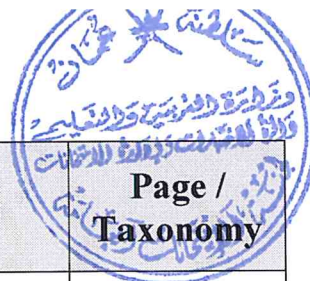
[ 14 marks]

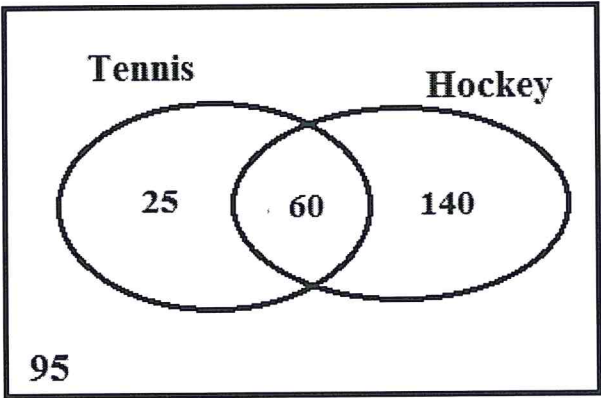


Q. #	Answer	Marks	Page / Taxonomy
20	a) 2 b) 4	2 2	knowledge 432
21	<p>a) <math>A = C \times \left(1 + \frac{r}{100}\right)^n</math>  <math>= 300000 \times (1 - 0.25)^5</math>  <math>= 300000 \times (0.75)^5</math>  <math>\approx \\$71191.4</math></p> <p>b)  Depreciation = <math>\\$300000 - \\$71191.4</math>  <math>= \\$228808.6</math></p>	<p>1 1+1+1 1</p> <p>1 1</p>	<p>444 Application</p>
22	<p>Given that <math>A = 70000</math>  <math>r = \frac{6}{12} = 0.5</math>  <math>n = 4 \times 12 = 48</math>  Using <math>A = C \times \left(1 + \frac{r}{100}\right)^n</math>  <math>70000 = C \times \left(1 + \frac{0.5}{100}\right)^{48}</math>  <math>70000 = C \times (1.005)^{48}</math>  <math>C = \frac{70000}{(1.005)^{48}} \approx \\$55097</math>  So, \$ 55097 needs to be deposited.</p>	<p>0.5 0.5 0.5 0.5 1</p>	<p>436 Reasoning</p>

# Question Four:

[ 14 marks]



Q. #	Answer	Marks	Page / Taxonomy
23	H: hit , M: miss Possible outcomes are : H and H , H and M , M and H , M and M	1+ 1+ 1+ 1	473 Knowledge
24	<p>a)</p>  <p>b) The number of students play at least one of the sports = 25 + 60 + 140 = 225</p> <p>Let B : an event of a student is randomly selected.  <math>P(B) = \frac{225}{320} = 0.7</math></p>	<p>3 marks:</p> <ul style="list-style-type: none"> <li>• 1 mark for structure.</li> <li>• 1 mark for number of students in each sport.</li> <li>• 1 mark for labels.</li> </ul> <p>0.5+0.5+0.5 0.5 1+1</p>	482 Application
25	$P(A) + P(B) + P(C) + P(D) = 1$ Since $P(A) = 5P(B) = 5P(C) = 5P(D)$ $P(A) + \frac{1}{5}P(A) + \frac{1}{5}P(A) + \frac{1}{5}P(A) = 1$ $\frac{8}{5}P(A) = 1$ $P(A) = \frac{5}{8}$	<p>3 marks:</p> <p>0.5</p> <p>1</p> <p>0.5</p> <p>1</p>	455 Reasoning

End Of marking Guide