EmSAT Math Achieve 2018

Total Time for Test: 60 questions**:** 2 hours

EmSAT Math Achieve is a computer-based test and has 3 major sections - Algebra, Geometry, and Statistics. Test sections, questions, and options are randomized. Sections and subsections of the test are timed by the computer. Test takers can see how much time they have throughout the test.

Section 1: Algebra

- Interpret the structure of expressions
- Write expressions in equivalent forms to solve problems
- Perform arithmetic operations on polynomials
- Understand the relationship between zeros and factors of polynomials
- Use polynomial identities to solve problems
- Rewrite rational functions
- Create equations that describe numbers or relationships
- Understand solving equations as a process of reasoning and explain the reasoning
- Solve equations and inequalities in one variable
- Solve systems of equations
- Represent and solve equations and inequalities graphically
- Understand the concept of a function and use function notation
- Interpret functions that arise in applications in terms of the context
- Analyze functions using different representations
- Build a function that models a relationship between two quantities
- Build new functions from existing functions
- Construct and compare linear and exponential models and solve problems
- Interpret expressions for functions in terms of the situation they model
- Extend the domain of trigonometric functions using the unit circle
- Model periodic phenomena with trigonometric functions
- Prove and apply trigonometric identities
- Extend the properties of exponents to rational exponents
- Use properties of rational and irrational numbers.
- Reason quantitatively and use units to solve problems
- Perform operations with complex numbers
- Represent and model with vector quantities.
- Perform operations on vectors.
- Perform operations on matrices and use matrices in applications

Sample Question 1

Answer: C

What is the solution set of the the following equation?

ماهي مجموعة الحل للمعادلة التالية؟

$$4^{x^2+4x} = 2^{-6}$$

A. $\{-1, 3\}$

B. $\{1, -3\}$

C. $\{-1, -3\}$

D. $\{1, 3\}$

Sample Question 2

Answer: C

Identify the quadrant when the sum of the complex numbers $3+2i$ and $6-4i$ is graphed.

في أي ربع بياني سنرسم حاصل جمع الأعداد المركبة $3+2i$ و $6-4i$؟

A. I

B. III

C. IV

D. II

Sample Question 3

Answer: C

Write the expression below in simplest form. اكتب التعبير أدناه بأبسط صورة

$$\sqrt{-300}$$

A. $12i\sqrt{5}$

B. $5i\sqrt{12}$

C. $10i\sqrt{3}$

D. $3i\sqrt{10}$

Sample Question 4

Answer: B

Solve.

حل المعادلة التالية :

$$y^2 - 3y = 9$$

A. $\frac{3 \pm 3i\sqrt{5}}{2}$

B. $\frac{3 \pm 3\sqrt{5}}{2}$

C. $\frac{-3 \pm 3\sqrt{5}}{2}$

D. $\frac{3 \pm 3i\sqrt{3}}{2}$

Sample Question 5

Answer: 1078

For her phone, Halima pays a monthly fee of 18 AED and she pays an additional 5 fils per minute of use.

The least she has been charged in a month is 71.90 AED.

What is the minimum number of minutes she has used on her phone in a month?

تدفع حليمة لهاتفها شهرياً رسوم بمقدار 18 درهماً، وتدفع 5 فلس لكل دقيقة اضافية استخدمتها.

أقل مبلغ تم تسجيله لها في شهرٍ ما هو 71.90 درهماً.

ما الحد الأدنى من الدقائق التي استخدمتها حليمة في هاتفها لهذا الشهر؟

Minimum number of minutes used: ☐ أقل عدد من الدقائق المستخدمة:

Section 2: Geometry

• Experiment with transformations in the plane • Understand congruence in terms of rigid motions • Prove geometric theorems • Understand similarity in terms of similarity transformations • Prove theorems involving similarity • Define trigonometric ratios and solve problems involving right triangles	• Apply trigonometry to general triangles • Understand and apply theorems about circles • Translate between the geometric description and the equation for a conic section • Use coordinates to prove simple geometric theorems algebraically • Explain volume formulas and use them to solve problems • Visualize relationships between two-dimensional and three-dimensional objects

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Sample Question 1

Answer: B

Which equation represents a circle whose center is $(3, -1)$ and whose radius is $\sqrt{6}$?

أيّ المعادلات التّالية توضح دائرة مركزها $(3, -1)$ ونصف قطرها $\sqrt{6}$ ؟

A. $(x+3)^2+(y-1)^2=6$

B. $(x-3)^2+(y+1)^2=6$

C. $(x-3)^2+(y+1)^2=36$

D. $(x+3)^2+(y-1)^2=36$

Sample Question 2

Answer: 44

A company sells dates in boxes of two different sizes: the regular box and the family box.

The length of the family box has been increased by 15%, the height has been increased by 25%, and the width remains the same as compared to the regular size box as compared to the regular size box.

What is the percentage of increase in the volume from the regular box to the family box?

Round your answer to the nearest percent.

تبيع شركة ما، تمور في صناديق بحجمين مختلفين: الحجم العادي والعائلي.

طول صندوق الحجم العائلي يزداد بنسبة 15% وارتفاعه بـ 25% عن مقاييس الصندوق العادي وبقي عرضه كما هو.

ماهي نسبة الزيادة في الحجم من العادي إلى العائلي؟

قرّب اجابتك لأقرب نسبة.

Percentage of increase in volume ☐ نسبة الزيادة في الحجم

Sample Question 3

Answer: 55.5

In the picture below, *MATH* is a rectangle, $GB = 4.6$, $MH = 6$ and $HT = 15$.

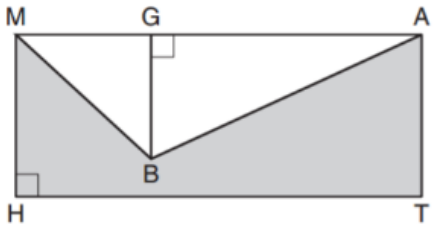
What is the area of the polygon *MBATH*?

Round your answer to the nearest tenth.

في الشكل أدناه، (*MATH*)هو مستطيل الشكل $GB = 4.6$, $MH = 6$ و $HT = 15$.

ماهي مساحة المضلع *MBATH* ؟

قرّب اجابتك لأقرب جزء من عشرة.



Area = ☐ المساحة

Sample Question 4

Answer: 12.5

Triangle ABC is similar to triangle DEF. The lengths of the sides of $\triangle ABC$ are 5, 8, and 11.

What is the length of the shortest side of $\triangle DEF$, if its perimeter is 60?

المثلث ABC مماثل للمثلث DEF.

أطوال أضلاع المثلث $\triangle ABC$ هي 5، 8، 11

ماهو طول أقصر ضلع للمثلث $\triangle DEF$، اذا كان محيطه هو 60؟

Length = ☐ الطول

Sample Question 5

Answer: C

If $m\angle A = 35$, $b = 3$, and $a = 4$, how many different triangles can be constructed?

إذا كان $m\angle A = 35$, $b = 3$, $a = 4$، كم عدد المثلثات المختلفة التي يمكن رسمها؟

A. one right triangle, only — مثلث واحد فقط قائم الزاوية

B. two triangles — مثلثان

C. one obtuse triangle, only — مثلث واحد فقط منفرج الزاوية

D. no triangles can be constructed — لا يمكن بناء أي مثلث

Section 3: Statistics

• Summarize, represent, and interpret data on a single count or measurement variable • Summarize, represent, and interpret data on two categorical and quantitative variables • Interpret linear models • Understand and evaluate random processes underlying statistical experiments • Make inferences and justify conclusions from sample surveys, experiments and observational studies	• Understand independence and conditional probability and use them to interpret data • Use the rules of probability to compute probabilities of compound events in a uniform probability model • Calculate expected values and use them to solve problems • Use probability to evaluate outcomes of decisions

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Sample Question 1

Answer: A

Identify the **statistical data type** for the following variable: a medal won at the Olympics (gold, silver, bronze, or none).

حدد **المعيار الاحصائي** للمتغير التالي: ميدالية تم الفوز بها بالأولمبية (الذهبي، الفضي، البرونزي، لا شيء).

A. Nominal إسمي

B. Ordinal معيار ترتيبي

C. Interval فترات

D. Ratio نسب

Sample Question 2

Answer: 59

Here are scores of 20 students on an algebra test.

فيما يلي درجات 20 طالباً في اختبار الجبر.

Score	0	20	40	60	80	100	الدرجة
Frequency	3	1	2	4	8	2	التكرار

Find the mean of this data set.

أوجد المتوسط الحسابي لمجموعة البيانات

Mean: ☐ المتوسط الحسابي:

Sample Question 3

Answer: A

Ahmed and Hamad play tennis each week.

The probability that Ahmed wins the first match against Hamad is $\frac{2}{3}$.

What is the probability that Ahmed wins **exactly** three of the next four matches against Hamad?

يلعب أحمد وحمد كرة التنس كل أسبوع.

احتمالية أن يفوز أحمد المباراة الأولى ضد حمد هو $\frac{2}{3}$ (مباراتان من أصل ثلاث).

ماهي احتمالية ان يفوز أحمد ثلاث مباريات **بالضبط** في الأربع مباريات القادمة ضد حمد؟

A. $\frac{32}{81}$

B. $\frac{32}{243}$

C. $\frac{16}{243}$

D. $\frac{8}{81}$

Sample Question 4

Answer: 1.28

The average rainfall for the years since 2005 is given in the table below.

يبين الجدول أدناه معدل سقوط المطر للسنوات منذ 2005.

Year	2005	2006	2007	2008	السنة
Amount in cm	1.345	1.408	1.537	1.580	الكمية بالسم

In 2010, there was 2.956 cm of rainfall.

في 2010، كانت كمية سقوط المطر 2.956 سم.

How much more rain fell than predicted by the table above?

ماهي كمية المطر المتساقط أكثر من المتوقع في الجدول أعلاه؟

Round your answer to the nearest hundredth.

قرب اجابتك لأقرب جزء من مائة.

Amount: ☐ الكمية

Commented [EMA1]: غير متأكدة: أعتقد أن كمية سقوط المطر بالسنتمتر المكعب وليس السنتيمتر

Sample Question 5

Answer: C

The heights of boys in a grade 10 class are normally distributed with a mean of 168 cm and a standard deviation of 2.5 cm.

In which range do 95% of the heights approximately fall?

يعتبر توزيع أطوال الطلاب في الصف 10 توزيعاً معيارياً، بمتوسط مقداره 168 سم وانحراف معياري 2.5 سم.

ماهو المدى الذي تقع فيها 95% من الأطوال تقريباً؟

A. 160.5 - 168 cm

B. 160.5 - 175.5 cm

C. 163 - 173 cm

D. 163 - 175.5 cm

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