الامتياز في التحصيلي

100%
Series

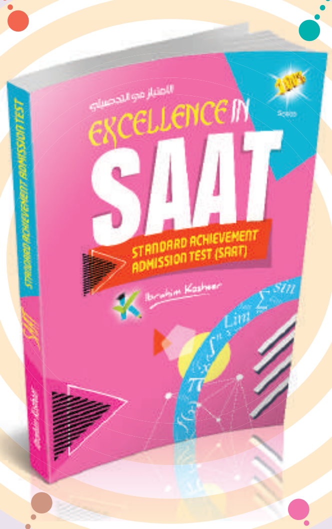
EXCELLENCE IN SAAT

STANDARD ACHIEVEMENT ADMISSION TEST (SAAT)

Ibrahim Kosheer

BOOK PARTS

1. ALGEBRA
2. GEOMETRY
3. TRIGONOMETRY
4. LIMITS, DERIVATIVES AND INTEGRATIONS
5. STATISTICS AND PROBABILITY
6. EXPERIMENTAL TESTS



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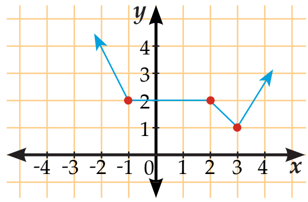
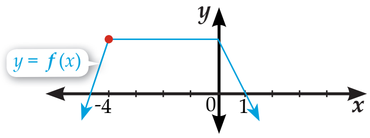
6 Increasing, Decreasing, Constant functions and Extreme values

1 The function repesented graphically in the opposite figure is increasing in the interval:



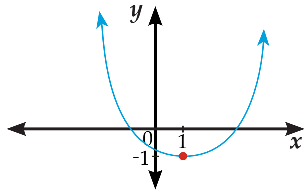
Ⓐ $(3, \infty)$ Ⓑ $(1, 3)$ Ⓒ $(1, \infty)$ Ⓓ $(-\infty, -2)$

2 In the opposite figure; the function $f(x)$ is decreasing in the interval:



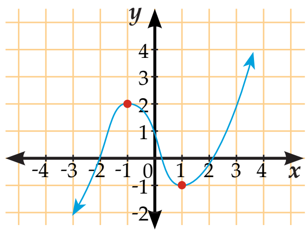
Ⓐ $(0, \infty)$ Ⓑ $(1, \infty)$ Ⓒ $(-\infty, -4)$ Ⓓ $(-4, 0)$

3 What is the interval in which the represented function in the opposite figure is increasing?



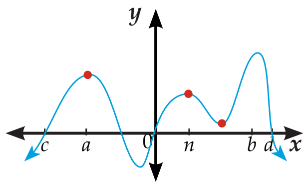
Ⓐ $(0, \infty)$ Ⓑ $(1, \infty)$ Ⓒ $(-\infty, 1)$ Ⓓ $(-1, \infty)$

4 From the opposite figure: the local maximum value is:



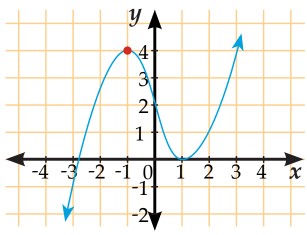
Ⓐ 4 at $x = 3$ Ⓑ 5 at $x = 4$ Ⓒ -1 at $x = 1$ Ⓓ 2 at $x = -1$

5 In the opposite figure: the value of $f(a)$ in the interval $[c, d]$ is:



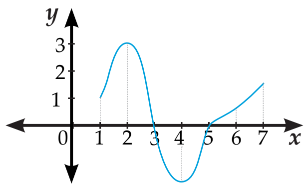
Ⓐ absolute minimum. Ⓑ local minimum. Ⓒ local maximum. Ⓓ absolute maximum.

6 from the opposite figure: the local minimum value of the function $f(x)$ is:



Ⓐ 4 Ⓑ 2 Ⓒ 0 Ⓓ -1

7 In the opposite figure: the function $f(x)$ in the interval $(2 , 4)$ is:

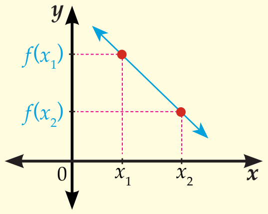


Ⓐ Increasing. Ⓑ Decreasing. Ⓒ constant. Ⓓ oscillating.

the function

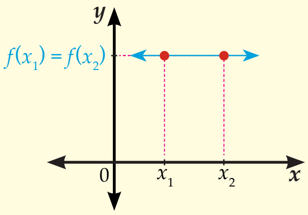
Decreasing

If $x_1 < x_2$ then $f(x_1) < f(x_2)$



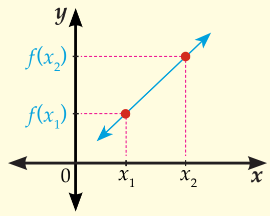
constant

If $x_1 < x_2$ then $f(x_1) = f(x_2)$

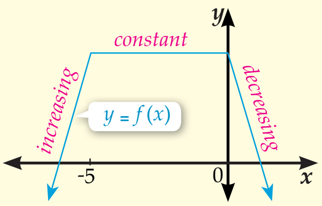


Increasing

If $x_1 < x_2$ then $f(x_1) > f(x_2)$



Example:



$f(x)$ is increasing in (-∞, -5)

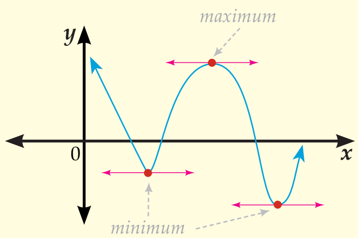
$f(x)$ is constant in (-5, 0)

$f(x)$ is decreasing in (0, ∞)

Attention:

The function can't be described as increasing or decreasing about a point, therefore we use the two brackets (,) when the increasing and decreasing intervals are determined.

Extreme values



The points where the function changes its behaviour (increasing or decreasing) forming a top or a bottom, are called critical points.

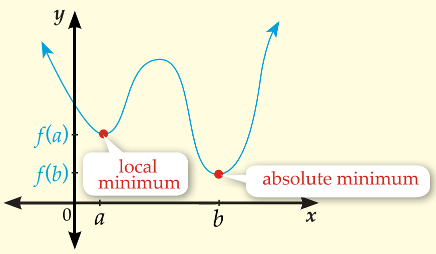
minimum values

absolute minimum

Existence of local minimum value for the function, if it was the smallest value for the function in its domain.

local minimum

Existence of a value for the function which is less than all the other values in the interval of its domain.



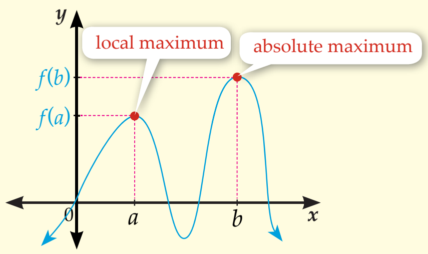
maximum values

absolute maximum

Existence of local maximum value for the function, if it was the greatest value for the function in its domain.

local maximum

Existence of a value for the function which is greater than all the other values in the interval of its domain.



1 (A)

The function is increasing in the interval (3, ∞)

2 (A)

The function $f(x)$ is decreasing in the interval (0, ∞)

3 (B)

The interval is increasing in the interval (1, ∞)

4 (D)

The function has a local maximum value at $x = -1$ which equals 2

5 (C)

$f(a)$ is a local maximum value in the interval $[a, d]$

as it represents a top but isn't the highest top, so it won't be absolute maximum value.

6 (C)

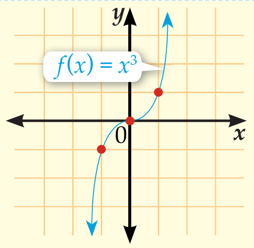
The function $f(x)$ has a local minimum value which equals 0

7 (B)

The function $f(x)$ is decreasing in the interval (2, 4).

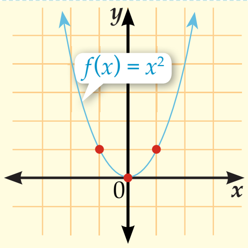
Cubic function

$f(x) = x^3$



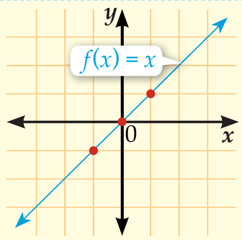
Quadratic function

$f(x) = x^2$



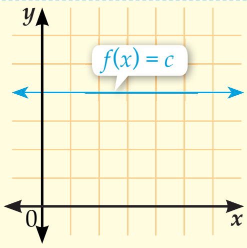
Linear function

$f(x) = x$



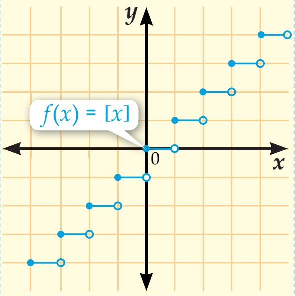
Constant function

$f(x) = c$
where c is a real number



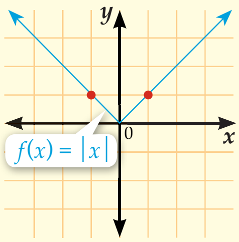
Step function

$f(x) = [x]$
and defined as the largest integer less than or equal x.
Ex: $[-4] = -4$, $[-1.5] = -2$



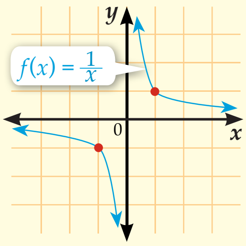
Absolute value function

$f(x) = |x|$



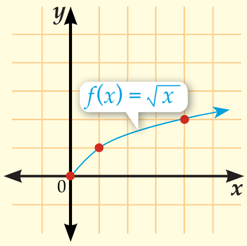
Reciprocal function

$f(x) = \frac{1}{x}$, $x \neq 0$



Square root function

$f(x) = \sqrt{x}$, $x \geqslant 0$



Geometrical Transformations

- Horizontal shifting $f(x - h)$
  - $h < 0$ to the left
  - $h > 0$ to the right
- Vertical shifting $f(x) + k$
  - $k < 0$ downwards
  - $k > 0$ upwards

Reflection on the two axis

on y-axis

The curve of the function $g(x) = f(-x)$ is a reflection to the curve of the function $f(x)$ about y-axis

on x-axis

The curve of the function $g(x) = -f(x)$ is a reflection to the curve of the function $f(x)$ about x- axis

Notice the difference

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

Shifting the curve of the function $f(x) = \sqrt{x}$ one unit to right followed by reflection on x-axis, then make a translation two units upward.

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

Shifting to the curve of the function $f(x) = \sqrt{x}$ a unit to the right and two units upwards, then reflection on x-axis.

1 (B)

The absolute value function, its range is related to the number which added out of the scale, so the range is $[3, \infty)$

2 (D)

$g(x) = -\sqrt{x + 2} - 3$

3 (A)

The function $f(x) = [x]$ is defined as the largest integer less than or equal x.
$\therefore [-2.6] = -3$

4 (C)

$g(x) = |x + 3|$

5 (C)

$f(x) = |x + 4| - 3$

6 (A)

The parent function to the function in the graph is $f(x) = x^2$

7 (D)

$g(x) = -(x - 5)^2$

14 Matrices

1 In the matrix $\begin{bmatrix} -1 & 3 & 5 \\ 0 & -2 & 4 \\ 6 & 2 & -7 \end{bmatrix}$, the element $a_{3\times 2}$ is:

Ⓐ 4 Ⓑ -2 Ⓒ 0 Ⓓ 2

2 If A, B are two matrices of dimensions 5×3, then the order of matrix A-B is:

Ⓐ 3×5 Ⓑ 5×3 Ⓒ 2×3 Ⓓ 3×3

3 If $A=\begin{bmatrix} -1 & 0 \\ 2 & 3 \end{bmatrix}$, $B=\begin{bmatrix} 0 & -4 \\ 1 & 5 \end{bmatrix}$, then $3A$-B equals:

Ⓐ $\begin{bmatrix} -3 & -4 \\ 7 & 14 \end{bmatrix}$ Ⓑ $\begin{bmatrix} -3 & 4 \\ 5 & -4 \end{bmatrix}$ Ⓒ $\begin{bmatrix} -3 & 4 \\ 5 & 4 \end{bmatrix}$ Ⓓ $\begin{bmatrix} 2 & -3 \\ 5 & 4 \end{bmatrix}$

4 If the dimensions of matrix AB is 5×8, and the order of matrix A is 5×6, then the order of matrix B is:

Ⓐ 6×8 Ⓑ 8×6 Ⓒ 6×5 Ⓓ 5×8

5 What is the dimensions of the matrix resulted from the following multiplication process: $\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \\ j & k & i \end{bmatrix} \cdot \begin{bmatrix} 7 \\ 4 \\ 6 \end{bmatrix}$

Ⓐ 1×4 Ⓑ 3×3 Ⓒ 4×1 Ⓓ 4×3

6 The result of multiplication: $\begin{bmatrix} 4 & 0 & -2 \end{bmatrix} \cdot \begin{bmatrix} 2 & -1 \\ -3 & 0 \\ 0 & 4 \end{bmatrix}$ equals:

Ⓐ $\begin{bmatrix} 8 & -12 \end{bmatrix}$ Ⓑ $\begin{bmatrix} 8 & -4 \\ 0 & 0 \\ 0 & -8 \end{bmatrix}$ Ⓒ $\begin{bmatrix} 8 \\ -12 \end{bmatrix}$ Ⓓ The multiplication is undefind

7 The value of c, which make the matrix $\begin{bmatrix} -6 & 3 \\ c & 4 \end{bmatrix}$ doesn't have a multiplicative inverse is:

Ⓐ 8 Ⓑ 6 Ⓒ 2 Ⓓ -8

8 The multiplicative inverse of the matrix $\begin{bmatrix} 6 & -3 \\ -1 & 0 \end{bmatrix}$ is:

Ⓐ $\begin{bmatrix} -2 & 1 \\ \frac{1}{3} & 0 \end{bmatrix}$ Ⓑ $\begin{bmatrix} 0 & -1 \\ \frac{-1}{3} & -2 \end{bmatrix}$ Ⓒ $\begin{bmatrix} -2 & 3 \\ \frac{1}{3} & 0 \end{bmatrix}$ Ⓓ $\begin{bmatrix} 2 & 3 \\ 1 & 6 \end{bmatrix}$

9 If $\begin{bmatrix} 14 & -3 \\ 3t & 0 \end{bmatrix} = \begin{bmatrix} -7r & -3 \\ 15 & 0 \end{bmatrix}$, then the values of r & t respectively are:

Ⓐ -2 , 5 Ⓑ 2 , -5 Ⓒ 5 , -3 Ⓓ -7 , 5

10 The result of $2\begin{bmatrix} 3 & 5 \\ -6 & 0 \end{bmatrix} + 4\begin{bmatrix} 9 & -1 \\ 2 & 3 \end{bmatrix}$ equals:

Ⓐ $\begin{bmatrix} 36 & 9 \\ 4 & 0 \end{bmatrix}$ Ⓑ $\begin{bmatrix} 42 & 6 \\ 4 & 0 \end{bmatrix}$ Ⓒ $\begin{bmatrix} 42 & 6 \\ -4 & 12 \end{bmatrix}$ Ⓓ $\begin{bmatrix} 39 & -6 \\ -4 & 12 \end{bmatrix}$

Third-order determinants:

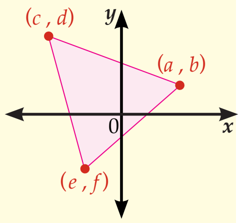
They are determinants of order 3 × 3

$$\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix}$$

The area of the thiangle:

The area of the triangle whose vertices coordinate is (a, b), (c, d), (e, f) is the absolute value of A.

as: $A = \frac{1}{2}\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ e & f & 1 \end{vmatrix}$



To evaluate the determinant of 3 × 3 matrix:

1. Repeat the 1st and 2nd columns to the right.
2. Find the sum of products of the main diagonal elements and its parallel diagonals, name it s_1.
3. Find the sum of the products of the secondary diagonal elements and its parallel diagonals, name it s_2.
4. Find out $s_1 - s_2$ (that is the value of the determinant).

$$\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} \begin{matrix} a & b \\ d & e \\ g & h \end{matrix}$$

$$\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} \begin{matrix} a & b \\ d & e \\ g & h \end{matrix}$$

Cramer's rule:

If $\underline{C}$ is the coefficients matrix of the system $\begin{cases} ax + by = m \\ fx + gy = n \end{cases}$ as $\underline{C} = \begin{bmatrix} a & b \\ f & g \end{bmatrix}$

then the solution of the system is: $x = \dfrac{\begin{vmatrix} m & b \\ n & g \end{vmatrix}}{|\underline{C}|}$ and $y = \dfrac{\begin{vmatrix} a & m \\ f & n \end{vmatrix}}{|\underline{C}|}$ that if $|C| \neq 0$

When $|\underline{C}| = 0$, then the system has no unique solution.

1 D

$$\begin{vmatrix} 4 & 1 & 3 \\ -2 & 3 & 6 \\ 0 & 5 & -1 \end{vmatrix} \begin{matrix} 4 & 1 \\ -2 & 3 \\ 0 & 5 \end{matrix}$$

$= (-12 + 0 - 30) - (2 + 120 + 0)$

$= -164$

2 C

(The area of the triangle)

$A = \frac{1}{2}\begin{vmatrix} 0 & 0 & 1 \\ -2 & 8 & 1 \\ 4 & 12 & 1 \end{vmatrix}$

$= \frac{1}{2}\begin{vmatrix} 0 & 0 & 1 \\ -2 & 8 & 1 \\ 4 & 12 & 1 \end{vmatrix} \begin{matrix} 0 & 0 \\ -2 & 8 \\ 4 & 12 \end{matrix}$

$= \frac{1}{2}[(-24) - (32)]$

$= \frac{1}{2}(-56) = -28$

We take the absolute value

$|-28| = 28$

3 A

$$\begin{vmatrix} 4 & -1 & 1 \\ 4 & 5 & 3 \\ -2 & 0 & 0 \end{vmatrix} \begin{matrix} 4 & -1 \\ 4 & 5 \\ -2 & 0 \end{matrix}$$

$= (0 + 6 + 0) - (-10 + 0 + 0)$

$= 6 + 10 = 16$

4 B

$A = \frac{1}{2}\begin{vmatrix} 2 & 4 & 1 \\ -2 & 4 & 1 \\ 0 & -2 & 1 \end{vmatrix}$

$= \frac{1}{2}\begin{vmatrix} 2 & 4 & 1 \\ -2 & 4 & 1 \\ 0 & -2 & 1 \end{vmatrix} \begin{matrix} 2 & 4 \\ -2 & 4 \\ 0 & -2 \end{matrix}$

$= \frac{1}{2}[(8 + 0 + 4) - (0 - 4 - 8)]$

$= \frac{1}{2}(12 + 12) = 12$

5 B

$$\begin{bmatrix} -3 & 4 \\ 2 & -5 \end{bmatrix}$$

6 C

$\because |C| = \begin{vmatrix} 1 & 1 \\ 1 & -1 \end{vmatrix} = (-1) - (1) = -2$

$\therefore x = \dfrac{\begin{vmatrix} 5 & 1 \\ 1 & -1 \end{vmatrix}}{-2} = \dfrac{-6}{-2} = 3$

7 D

$\because |C| = \begin{vmatrix} 3 & 6 \\ -1 & -2 \end{vmatrix} = -6 - (-6) = 0$

$\therefore$ The system has no unique solution.

8 A

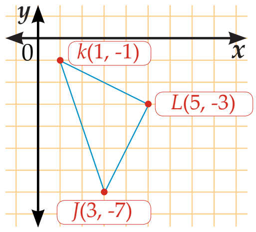
Property:

* The determinant whose all elements under or above the main diagonal are zeros, the determinant is called the triangular from.
* The value of the determinant in the triangular form equals the product of the elements of its main diagonal.

$\begin{vmatrix} 3 & -2 & 5 \\ 0 & 7 & -6 \\ 0 & 0 & 2 \end{vmatrix} = 2(7)(3) = 42$

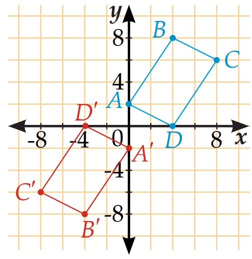
6 Rotation, Dilation and Tiling

1 What is the image of the point J resulted from rotation of ΔJKL with an angle of the measure 270?



Ⓐ (-3, -7) Ⓑ (-7, 3) Ⓒ (-7, -3) Ⓓ (7, -3)

2 The opposite figure shows the quadrilateral $ABCD$ and its image $A'B'C'D'$ by rotation around the origin point, what is tnemeasure of the angle of rotation.



Ⓐ 90° Ⓑ 180° Ⓒ 270° Ⓓ 360°

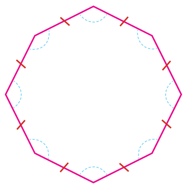
3 What is the image of the point $P(4 , 5)$ by rotation with an angle 90° around the origin point?

Ⓐ (-5, 4) Ⓑ (5, 4) Ⓒ (-4, -5) Ⓓ (5, -4)

4 What is the value of the rotational symmetry of the regular hexagon?

Ⓐ 720° Ⓑ 180° Ⓒ 120° Ⓓ 60°

5 What is the order of the rotational symmetry for the opposite figure?



Ⓐ 135° Ⓑ 45° Ⓒ 8 Ⓓ 6

6 If the scale factor of dilation is $k = -3$, then the dilation is:

Ⓐ enlargement Ⓑ congruent Ⓒ reduction Ⓓ translation

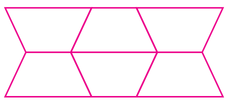
7 If $Q'R'$ is the image QR by a dilation of scale factor K, and $QR = 6cm$, $Q'R' = 8cm$, then the scale factor of the dilation K equals:

Ⓐ 2 Ⓑ $\frac{3}{4}$ Ⓒ 1.5 Ⓓ $\frac{4}{3}$

8 Which of the following polygons is not suitable for tiling in the plane?

Ⓐ regular decagon Ⓑ regular hexagon Ⓒ square Ⓓ equilateral tridangle

9 Tiling in the opposite figure, is called:



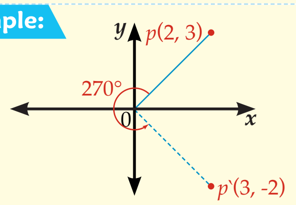
Ⓐ regular Ⓑ semi regular Ⓒ consistent Ⓓ inconsistent

Rotation:

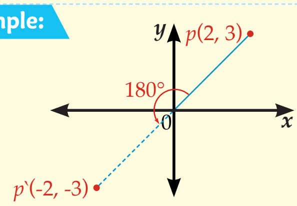
It is a geometric transformation, in which each point in the figure rotates by a certain angle and direction around a fixed point called the centre of the rotation.

rotation by angle 270°	rotation by angle 180°	rotation by angle 90°
$(x, y) \rightarrow (y, -x)$	$(x, y) \rightarrow (-x, -y)$	$(x, y) \rightarrow (-y, x)$

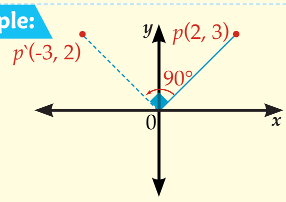
example:



example:



example:



* Rotation by the angle 360° a round origin returns the figure to its original position.

The order of the rotational symmetry:

It is the number of times in which the shape and its image are congruent during its rotation from 0° to 360°

Example:

The square:
(The order of the rotational symmetry = 4),
(The value of symmertry 90°)

value of symmetry:

It is the measure of the smallest angle by whic the shape rotate till it becomes congruent to itself.

$$\text{value of symmetry} = \frac{360°}{\text{the order of symmetry}}$$

Dilation:

It is a geometric transfomation enlarges or reduces the shape by a certain reduction.

$$\text{scale factor of dilation} = \frac{\text{The image length}}{\text{The original length}} = r$$

The value of r	$\lvert r \rvert > 1$	$\lvert r \rvert = 1$	$0 < \lvert r \rvert < 1$
type of dilation	enlargment	congruence	reduction

Tiling:

It is a covering of the plane by one shape or a group of shapes.

consistent	semiregular	regular
If at all vertices the same arrangements for shapes and angles	We use two or more than regular polygons	We use one regular polygon

* In tiling, the sum of measures of the total angles around and vertex equals 360°.

1 (C)

Rotation by the angle 270° changes the point

$(x, y) \rightarrow (y, -x)$

$\therefore J(3, -7) \rightarrow J`(-7, -3)$

2 (B)

Rotation by the angle 180° changes the point

$(x, y) \rightarrow (-x, y)$

$C(8, 6) \rightarrow C`(-8, -6)$

3 (A)

Rotation by the angle 90° changes the point

$(x, y) \rightarrow (-y, x)$

$P(4, 5) \rightarrow P`(-5, 4)$

4 (D)

The order of rotional symmetry for the regular hexagon equals 6 Therefore, value of symmetry

$= \frac{360°}{6} = 60°$

5 (C)

The order of the rotational symmetry for the regular octagon equals 8.

6 (A)

If $\lvert r \rvert > 1$, then the dilation is enlargement.

$\lvert -3 \rvert = 3 > 1$

7 (D)

$\because k = \frac{Q`R`}{QR} = \frac{8}{6} = \frac{4}{3}$

8 (A)

Since the measure of the interior angle for decagon equals

$\frac{180°(10 - 2)}{10} = \frac{180(8)}{10} = 144°$

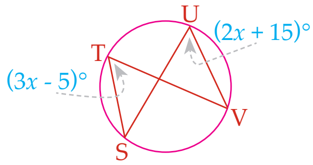
and since 144° isn't a factor of 360°, then the decagon can't be used for tiling the plane.

9 (C)

This tiling consists of a trapezium and it is an irregular polygon, then the tiling is consistent: as it contains the arrangement of the same shapes and same angles at all vertices.

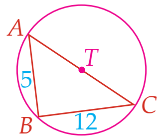
8 Circle (2)

1 In the opposite figure; find the value of x?



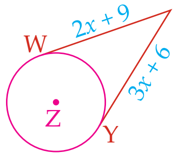
Ⓐ 30° Ⓑ 20° Ⓒ 15° Ⓓ 10°

2 What is the circumference of the circle in the opposite figure?



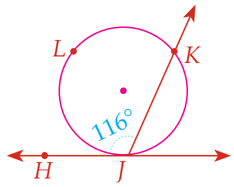
Ⓐ 13π Ⓑ 10π Ⓒ 13 Ⓓ 7.5

3 In the opposite figure; the value of x equals:



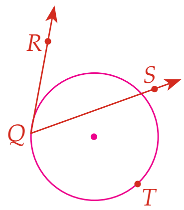
Ⓐ 9 Ⓑ 6 Ⓒ 4 Ⓓ 3

4 In the opposite figure; find $m\overset{\frown}{Jk}$?



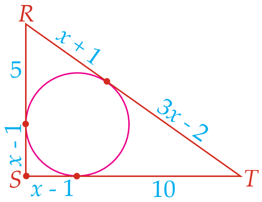
Ⓐ 232° Ⓑ 180° Ⓒ 128° Ⓓ 64°

5 In opposite figure; if $m\overset{\frown}{QTS} = 238°$, then find $m\angle RQS$?



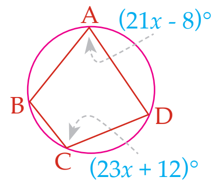
Ⓐ 61° Ⓑ 84° Ⓒ 119° Ⓓ 122°

6 In the opposite figure; A circle is inscribed in triangle RST, what is the perimeter of this triangle.



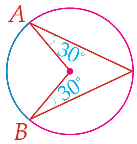
Ⓐ 33 unit. Ⓑ 36 unit. Ⓒ 37 unit. Ⓓ 40 unit.

7 In the opposite figure: what is the value of x?



Ⓐ 22 Ⓑ 12 Ⓒ 4 Ⓓ 3

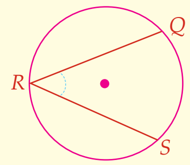
8 In opposite figure; the measure of the arc $\overset{\frown}{AB}$ equals:



Ⓐ 60° Ⓑ 80° Ⓒ 90° Ⓓ 120°

The inscribed angle:

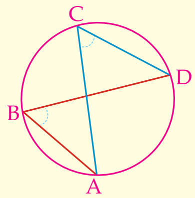
It is an angle whose vertex lies on the circle, and its sides contain two chords of the circle.



The measure of the inscribed angle:

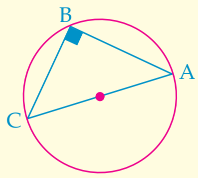
It is half the measure of the subtended arc. $m\angle QRS = \frac{1}{2}\, m\overset{\frown}{QS}$

- If two inscribed angles in a circle are subtended by the same arc or congruent arcs, then the two angles are congruent.



$\angle B \cong \angle C$

- The measure of the inscribed angle in a semicircle is equal 90°:



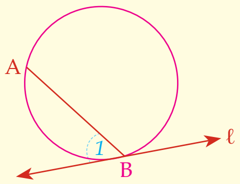
$m\angle B = 90°$

The tangent:

It is a straight line cuts the circle at one point.

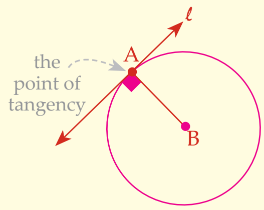
Angle of tangency:

It is subtended by a tangent and a chord of the circle, its measure equals half the measure of the opposite arc.

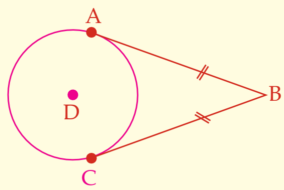


$m\angle 1 = \frac{1}{2}\, m\overset{\frown}{AB}$

- The tangent of the circle is perpendicular to the radius at the point of tangency: $\ell \perp AB$



- The two tangent-segments drawn to a circle from apoint outside it are congruent: $\overline{AB} \cong \overline{CB}$

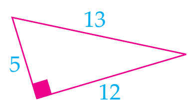


1 (B)

$3x - 5 = 2x + 15$

$x = 20$

2 (A)



From the famus pythagorean theorem, the circumference of the circle = 13π

3 (D)

$3x + 6 = 2x + 9$

$x = 3$

4 (C)

$\because m\overset{\frown}{JLK} = 2(116°) = 232°$

$\therefore m\overset{\frown}{JK} = 360° - 232° = 128°$

5 (A)

$\because m\overset{\frown}{QS} = 360° - 238° = 122°$

$\therefore m\angle RQS = \frac{1}{2}(122°) = 61°$

6 (B)

$\because x + 1 = 5$

$\therefore x = 4$

We substitute of $x = 4$ in all sides which contains x, then the perimeter of the triangle equals 36 unit.

7 (C)

Since $ABCD$ is cyclic quadrilateral, then the two opposite angles are supplementry.

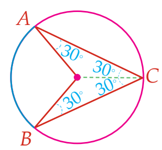
$(23x + 12)° + (21x - 8)° = 180°$

$(44x + 4)° = 180°$

$44x = 176$

$x = 4$

8 (D)



$\because m\overset{\frown}{AB} = 2\,(60°)$

$= 120°$

12 Parabola

1. The parabola whose equation $x^2 = 8(y - 4)$ is opened to:

   Ⓐ right Ⓑ left Ⓒ down Ⓓ up

2. The curve of the parabola and it's axis of symmetry are intersecting at:

   Ⓐ focus. Ⓑ vertex. Ⓒ directrix. Ⓓ not intersecting.

3. The distance between the vertex and the focus of the parabola whose equation $(y - 3)^2 = 8(x + 4)$ equals:

   Ⓐ 2 units Ⓑ 3 units Ⓒ 4 units Ⓓ 8 units

4. The vertex of the parabola whose equation $(y - 5)^2 = 12(x + 3)$ is:

   Ⓐ (-5, 3) Ⓑ (5, -3) Ⓒ (-3, 5) Ⓓ (3, -5)

5. Find the length of the latus rectum for the parabola whose equation $(x - 1)^2 = 10(y + 7)$?

   Ⓐ 4 Ⓑ 5 Ⓒ 6 Ⓓ 10

6. In the parabola $(y + 2)^2 = -16(x - 5)$, the equation of the axis of symmetry is:

   Ⓐ $y = -2$ Ⓑ $y = 2$ Ⓒ $x = 5$ Ⓓ $x = -5$

7. In the parabola: $(y + 5)^2 = -12(x - 2)$, the equation of the directrix is:

   Ⓐ $x = -5$ Ⓑ $x = 5$ Ⓒ $y = 2$ Ⓓ $y = -2$

8. Find the equation of the parabola whose vertex is (1, -4) and its focus is (3, -4)?

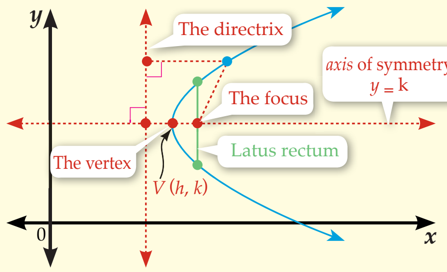
   Ⓐ $(x - 1)^2 = -4(y - 4)$ Ⓑ $(x - 1)^2 = 8(y + 4)$ Ⓒ $(y - 4)^2 = -6(x - 3)$ Ⓓ $(y + 4)^2 = 8(x - 1)$

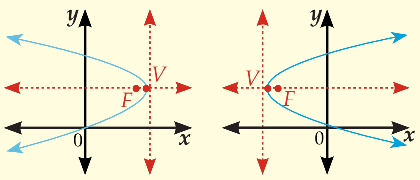
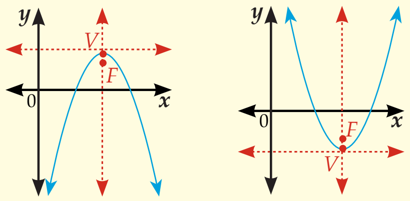
9. Determine the direction of opening of the parabola curve whose equation $y^2 = -8(x - 6)$

   Ⓐ Down. Ⓑ Up. Ⓒ Left. Ⓓ Right.

Parabola:

A parabola is the set of all points (x,y) in a plane that are the same distance from a fixed line, called the directrix, and a fixed point (the focus) not on the directrix.



The shape of the curve	The length latus rectum	Axis of symmetry equation	The directrix equation	Focus coordinates	The direction	The vertex	The equation
 $c<0$ $c>0$	$\lvert 4c\rvert$	$y = k$	$x = h - c$	$(h + c, k)$	The parabola curve is opened horizontally	(h, k)	$(y-k)^2 = 4c\,(x-h)$
 $c<0$ $c>0$	$\lvert 4c\rvert$	$x = h$	$y = k - c$	$(h, k + c)$	The parabola curve is opened vertically	(h, k)	$(x-h)^2 = 4c\,(y-k)$

- The vertex is the midpoint between focus and directrix.
- The distance between the focus and the directrix is $= 2c$
- The openning of the parabola always directed from the vertex to the focus

1 D

The standard equation of the curve of the parabola whose axis is vertical is

$(x - h)^2 = 4c\,(y - k)$

since $c > 0$

Then it opens upwards.

2 B

The curve of the parabola and its axis of symmetry are intersecting at the vertex.

3 A

$\because (y - 3)^2 = 8(x + 4)$

$\therefore |4c| = 8 \implies c = 2$

4 C

$\because (y - 5)^2 = 12(x + 3)$

$\therefore (h, k) = (-3, 5)$

5 D

The length of the latus rectum $\leftarrow 4c = 10$

6 A

$\because$ The parabola

$(y + 2)^2 = -16(x - 5)$

its axis is horizontal.

$\therefore$ The equation of axis of symmetry: $y = k = -2$

7 B

$\because$ the parabola

$(y + 5)^2 = -12(x - 2)$

its axis is horizontal.

$\therefore$ then the equation of the directrix: $x = h - c$

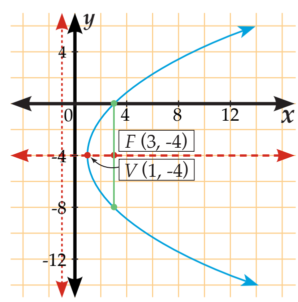
$\because 4c = -12 \implies c = -3$

$\therefore x = 2 - (-3) = 5$

8 D

from the figure: we get that the axis of the parabola is horizontal, $c > 0$

$(y - k)^2 = 4c\,(x - h)$, $(y + 4)^2 = 8\,(x - 1)$



9 C

The parabola $y^2 = -8(x - 6)$

its axis is horizontal.

$\because c < 0$

$\therefore$ the opening of the parabola is directed to the left.

1 Trigonometric Functions in Right Triangles

1 Suppose that θ is an angle in the standard position such that $\cos\theta > 0$, in which quadrant the terminal side of the angle θ lies?

- (A) The first or the second quadrant.
- (B) The second or the third quadrant.
- (C) The first or the third quadrant.
- (D) The first or the fourth quadrant.

2 What is the exact value of $\sin\theta$ if $\cos\theta = -\frac{3}{5}$, $90° < \theta < 180°$?

(A) $\frac{-4}{5}$ (B) $\frac{\sqrt{34}}{8}$ (C) $\frac{4}{5}$ (D) $\frac{5}{4}$

3 If $\angle B$ is an acute angle in the right angled triangle and $\sin B = \frac{5}{13}$, then find the value of $\tan B$?

(A) $\frac{5}{12}$ (B) $\frac{12}{13}$ (C) $\frac{5}{6}$ (D) $\frac{25}{12}$

4 which of the following is equivalent to the expression: $\frac{\cos\theta}{1-\sin^2\theta}$?

(A) $\cos\theta$ (B) $\sec\theta$ (C) $\tan\theta$ (D) $\csc\theta$

5 Find the exact value of $\cos 135°$?

(A) $\sqrt{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $-\frac{\sqrt{2}}{2}$ (D) $-\sqrt{2}$

6 What is the exact value of $\sin 240$

(A) $-\frac{\sqrt{3}}{2}$ (B) $-\frac{1}{2}$ (C) $\frac{\sqrt{2}}{3}$ (D) $\frac{\sqrt{3}}{2}$

7 The reference angle for the angle with measure 150° equals:

(A) 15° (B) 30° (C) 45° (D) 60°

8 Find the degree measure of the angle with radian measure $\frac{3\pi}{2}$?

(A) 120° (B) 180° (C) 245° (D) 270°

9 The angle 60° in radian equals:

(A) π (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{6}$

10 Find the length of the arc in a circle of radius $7cm$, if you know that the measure of the angle of its sector is 90° ?

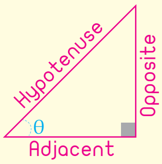
(A) $11cm$ (B) $12cm$ (C) $13cm$ (D) $14cm$

Trigonometric functions:

$\sin\theta = \dfrac{\text{opposite}}{\text{Hypotenuse}}$ "$\sin\theta$"

$\cos\theta = \dfrac{\text{Adjacent}}{\text{Hypotenuse}}$ "Cosine θ"

$\tan\theta = \dfrac{\text{opposite}}{\text{Adjacent}} = \dfrac{\sin\theta}{\cos\theta}$ "Tangent θ"



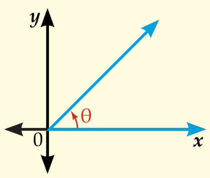
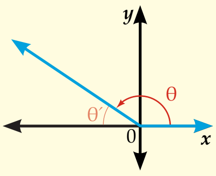
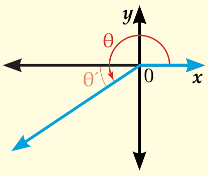
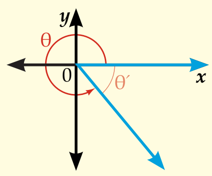
Reciprocal identities:

$\dfrac{1}{\sin\theta} = \csc\theta \qquad \dfrac{1}{\cos\theta} = \sec\theta \qquad \dfrac{1}{\tan\theta} = \cot\theta$

Converting from degree to radian measure:

$\dfrac{\theta^\circ}{180^\circ} = \dfrac{r}{\pi}$ Where θ° is the degree measure, r is the radian measure.

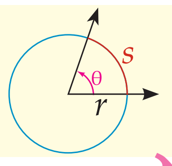
Refernce angles:

First quadrant (1)	second quadrant (2)	Third quadrant (3)	Fourth quadrant (4)
			
$\theta = \theta'$	$\theta' = 180^\circ - \theta$ $\theta' = \pi - \theta$	$\theta' = \theta - 180^\circ$ $\theta' = \theta - \pi$	$\theta' = 360^\circ - \theta$ $\theta' = 2\pi - \theta$

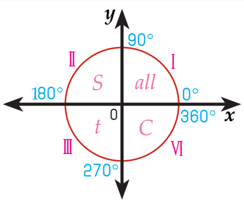
The length of the arc:

Where S is The length of the arc, r is the radius, θ is the angle of the circle sector by radian measure known that $\left(\pi = 3.14 \text{ or } \dfrac{22}{7}\right)$

$S = r\theta$



1 (D)



$\because \cos\theta > 0$

as shown in the figure, $\cos\theta > 0$ in the first or the fourth quadrant

2 (C)

$\because \sin^2\theta + \cos^2\theta = 1$

$\therefore \sin^2\theta + \left(-\dfrac{3}{5}\right)^2 = 1$

$\sin^2\theta = 1 - \dfrac{9}{25} = \dfrac{16}{25}$

$\therefore \sin\theta = \pm\sqrt{\dfrac{16}{25}} = \pm\dfrac{4}{5}$

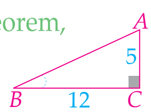
but $90^\circ < \theta < 180^\circ$

($\sin\theta$ is positire in the second quadrant)

$\therefore \sin\theta = \dfrac{4}{5}$

3 (A)

From pythagores theorem, the length of the hypotenuse is 13



$\therefore \tan B = \dfrac{\text{opposite}}{\text{adjacent}} = \dfrac{5}{12}$

4 (B)

$\because \sin^2\theta + \cos^2\theta = 1$

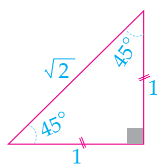
$\therefore \cos^2\theta = 1 - \sin^2\theta$

$\therefore \dfrac{\cos^2\theta}{1 - \sin^2\theta} = \dfrac{\cos\theta}{\cos^2\theta}$

by dividing both sides by $(\cos\theta)$

$= \dfrac{1}{\cos\theta} = \sec\theta$

5 (C)



$\because \cos 135^\circ = -\cos(180^\circ - 135^\circ) = -\cos 45^\circ$

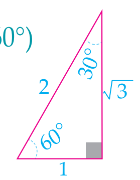
$= -\dfrac{1}{\sqrt{2}} = -\dfrac{1}{\sqrt{2}}\,\dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{-\sqrt{2}}{2}$

6 (A)

$\because \sin 240^\circ = \sin(180^\circ + 60^\circ)$

$= -\sin 60$

$= -\dfrac{\sqrt{3}}{2}$



7 (B)

$\because$(reference angle) $\theta' = 180^\circ - \theta$

$= 180^\circ - 150^\circ$

$= 30^\circ$

8 (D)

$\because \dfrac{\theta^\circ}{180^\circ} = \dfrac{r}{\pi}$

$\therefore \dfrac{\theta^\circ}{180^\circ} = \dfrac{\frac{3\pi}{2}}{\pi}$

$\theta^\circ = \overset{90}{\cancel{180^\circ}}\left(\dfrac{3}{\cancel{2}_1}\right) = 270^\circ$

9 (C)

$\because \dfrac{\theta^\circ}{180^\circ} = \dfrac{r}{\pi}$

$\therefore \dfrac{\cancel{60^\circ}^1}{\cancel{180^\circ}_3} = \dfrac{r}{\pi}$

$\therefore r = \dfrac{\pi}{3}$

10 (A)

$\because 90^\circ = \dfrac{\pi}{2}$

$\because S = r\theta = \dfrac{\overset{1}{\cancel{7}}\left(\frac{22}{\cancel{7}_1}\right)}{2} = \dfrac{22}{2} = 11cm$

1 Limits

1. Find the value: $\lim\limits_{x \to 3} \frac{2x+4}{x-1}$

Ⓐ $\frac{1}{3}$ Ⓑ $\frac{1}{2}$ Ⓒ 3 Ⓓ 5

2. What is the value: $\lim\limits_{x \to 4} \frac{\sqrt{2x+1} - \sqrt{7}}{x-3}$?

Ⓐ $3+\sqrt{7}$ Ⓑ $3-\sqrt{7}$ Ⓒ $\sqrt{7}-3$ Ⓓ 3

3. Find the value: $\lim\limits_{x \to -1} \frac{4-\sqrt{x^2+x+16}}{x^3-1}$?

Ⓐ 0 Ⓑ -1 Ⓒ -2 Ⓓ -3

4. Find the value: $\lim\limits_{x \to 4} \frac{x^2-16}{x-4}$?

Ⓐ -4 Ⓑ 6 Ⓒ 8 Ⓓ 16

5. Find the value: $\lim\limits_{x \to 3} \frac{x^2-8x+15}{x-3}$?

Ⓐ 5 Ⓑ 0 Ⓒ -1 Ⓓ -2

6. The value of: $\lim\limits_{x \to -4} \sqrt{x+3}$ equals:

Ⓐ 2 Ⓑ 1 Ⓒ -1 Ⓓ Does not exist

7. The value of: $\lim\limits_{x \to \infty} \frac{10x^3-12x}{5+3x^2-2x^3}$ is:

Ⓐ -5 Ⓑ -2 Ⓒ 0 Ⓓ ∞

8. Find the value: $\lim\limits_{x \to \infty} \frac{2x^2-5x}{7-3x^3}$?

Ⓐ $\frac{2}{-3}$ Ⓑ $\frac{-3}{2}$ Ⓒ 0 Ⓓ ∞

9. $\lim\limits_{x \to \infty} \frac{3x^4-2x+7}{5x^2+9x} = \dots\dots\dots$

Ⓐ ∞ Ⓑ 3 Ⓒ $\frac{1}{3}$ Ⓓ 0

10. Evaluate the limit: $\lim\limits_{x \to -\infty} (x^3-2x^2+5x-1)$?

Ⓐ 1 Ⓑ ∞ Ⓒ $-\infty$ Ⓓ Does not exist

11. Find: $\lim\limits_{x \to -\infty} (5x^4-3x)$?

Ⓐ 5 Ⓑ ∞ Ⓒ $-\infty$ Ⓓ Does not exist

The area under the curve:

The area of the region bounded by the curve of the function and the x-*axis* in the interval $[a\,,b]$ is expressed by $\int_a^b f(x)\,dx$.

In definite integral:

The indefinite integral to the function f is given by the formula $\int f(x)\,dx = F(x) + C$, where $F(x)$ is an original function for $f(x)$ and C is a constant.

$$\int x^n\,dx = \frac{x^{n+1}}{n+1}\ ,\quad n \neq -1$$

The fundamental theorem of calculus:

If $F(x)$ is and original function to the continuous $f(x)$, then $\int_a^b f(x)\,dx = F(b) - F(a)$

The original functions:

The function $f(x)$ is one of the original functions for the function $g(x)$ if $f'(x) = g(x)$

1 (B)

$$\because \int (2x^2 - 4)\,dx = \frac{3x^3}{3} - 4x + C = x^3 - 4x + C$$

2 (C)

$$\because \int (9x^2 + 3x^{-4} + 1)\,dx = \frac{9x^3}{3} + \frac{3x^{-3}}{-3} + x + C$$
$$= 3x^3 - x^{-3} + x + C$$

3 (A)

$$\int (3x^2 - 1)\,dx = \frac{3x^3}{3} - x + C = x^3 - x + C$$

4 (D)

$$\int (8t^3 - 12t^2 + 20t - 11)\,dx = \frac{8t^4}{4} - \frac{12t^3}{3} + \frac{20t^2}{2} - 11t + C$$
$$= 2t^4 - 4t^3 + 10t^2 - 11t + C$$

5 (D)

$$\because \int_1^4 2x\,dx = \left[\frac{2x^2}{2}\right]_1^4$$
$$= [x^2]_1^4$$
$$= 4^2 - 1^2$$
$$= 16 - 1$$
$$= 15$$

6 (A)

$$\because \int_1^3 (3x^2 + 2)\,dx = \left[\frac{3x^3}{3} + 2x\right]_1^3$$
$$= (27 + 6) - (1 + 2)$$
$$= 33 - 3$$
$$= 30$$

7 (C)

$$\int_0^4 (x + k)\,dx = \left[\frac{x^2}{2} + kx\right]_0^4 = \left(\frac{16}{2} + 4k\right) - 0$$

$\therefore\ 8 + 4k = 20 \qquad 4k = 12\ (\div 4) \qquad k = 3$

8 (B)

$$\int_1^n 4x^3\,dx = \left[\frac{4x^4}{4}\right]_1^n = [x^4]_1^n = 15$$
$$\therefore\ n^4 - 1^4 = 15$$
$$n^4 = 15 + 1 = 16$$
$$\therefore\ n^4 = 2^4$$
$$\therefore\ n = 2$$

9 (C)

$$\int_2^6 \left(\frac{x^2}{x^2 - 1} - \frac{1}{x^2 - 1} + \frac{1}{2}\right) dx$$
$$= \int_2^6 \left(\frac{x^2 - 1}{x^2 - 1} + \frac{1}{2}\right) dx$$
$$= \int_2^6 \left(1 + \frac{1}{2}\right) dx$$
$$= \int_2^6 \left(\frac{3}{2}\right) dx = \left[\frac{3}{2}x\right]_2^6$$
$$= \left(\frac{3}{2}(6)\right) - \left(\frac{3}{2}(2)\right)$$
$$= 9 - 3 = 6$$

10 (A)

$$\int_1^3 (4x^3)\,dx = \left[\frac{4x^4}{4}\right]_1^3 = [x^4]_1^3 = 3^4 - 1^4 = 81 - 1 = 80$$

1 Counting Principle, Permutations and Combinations

1. The menu in a restaurant has 5 types of main course, 4 types of soups and 3 types of sweets. How many different requests can be made if one chooses one main course, one kind of soup, and one sweet ?

   (A) 12 (B) 35 (C) 60 (D) infinite number

2. Nayef Can invite two of his friends to have dinner with him, if he has four friends, by how many ways he can choose them?

   (A) 4 (B) 6 (C) 8 (D) 9

3. How many ways can a person enter a mosque which has five doors and exit from a different door?

   (A) 120 (B) 60 (C) 25 (D) 20

4. A car dealer shipped four types of cars, three different colors and two categories, in how many ways can a person choose a car of them?

   (A) 24 (B) 18 (C) 12 (D) 9

5. How many ways can 4 people sit a round table?

   (A) 24 (B) 12 (C) 9 (D) 6

6. The number of ways 6 people can sit a round table provided that someone sitting next to the window equal ....

   (A) 36 (B) 120 (C) 720 (D) 750

7. If $n! = 120$, then $(n - 1)! =$ ....

   (A) 16 (B) 24 (C) 36 (D) 90

8. The board of directors of a company consists of 10 members. If Faisal, Mohamed and Muhannad are members of the board, what is the probabilily of selecting three as president, vice president and secretary, respectively, knowing that the selection is random?

   (A) $\frac{1}{720}$ (B) $\frac{1}{120}$ (C) $\frac{1}{60}$ (D) $\frac{1}{30}$

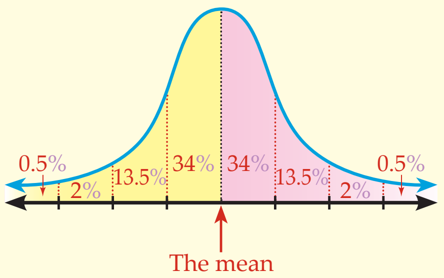
9. What is the number of sample elements for selecting two cards with replacement, from a set of numbered cards from 1 to 8?

   (A) 36 (B) 45 (C) 56 (D) 64

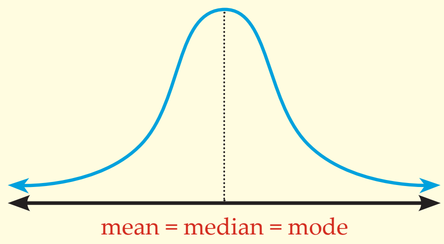
10. Khalid has a math test that asked him to answer 10 questions out of 12 questions, by how many ways can he choose the questions?

    (A) 50 (B) 66 (C) 70 (D) 100

The probability value under normal distribution curve:



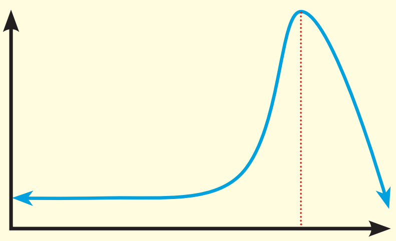
Normal distribution:



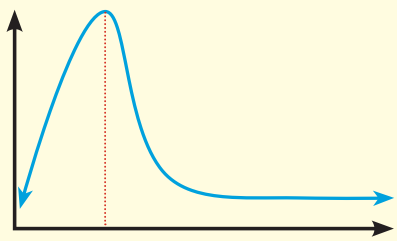
Its graphic repesentation is a curve like a bell, and is symmetrical about the vertical straight line which passes through the mean.

Skewed distributions

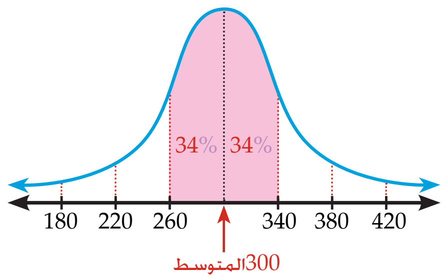
Negative skewness (skewed to left)



Positive skewness (skewed to right)



1 (D)



Throught the bell curve for the normal distribution then:

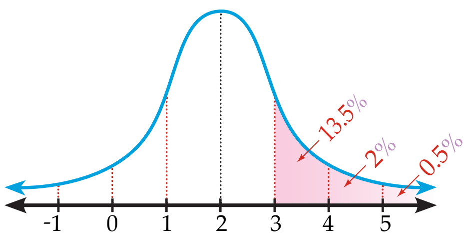
$P(260 < x < 340) = (34 + 34)\% = 68\%$

$\frac{68}{100}(10000) = 6800$

2 (B)

Since most of the data is concentrated in the left and a few in the right, then the distribution is positively skewed.

3 (C)

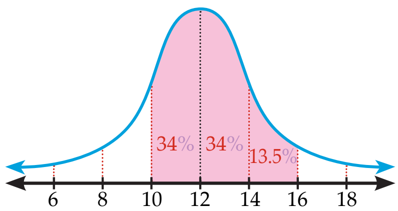


$P(x > 3) = (13.5 + 2 + 0.5)\% = 16\%$

4 (A)

Since most of the data is concentrated in the right and a few in the left, then the distribution is negatively skewed.

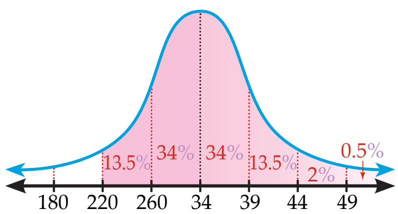
5 (C)



From the bell curve for the normal gistribution then:

$f(10 < x < 16) = (34 + 34 + 13.5)\% = 81.5\%$

6 (A)

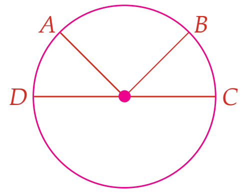


$P(x > 24) = (13.5 + 34 + 34 + 13.5 + 2 + 0.5)\%$
$= 97.5\%$

7 (D)

Normal distribution.

9 In the opposite figure: If $m(\overset{\frown}{AB}) = 2m(\overset{\frown}{BC})$ and $\overset{\frown}{BC} \equiv \overset{\frown}{AD}$ then what is the measure of the arc $\overset{\frown}{BC}$?



Ⓐ 45° Ⓑ 90° Ⓒ 60° Ⓓ 120°

10 The limit $\lim\limits_{x \to 4}(4x - 1)$ equals:

Ⓐ 4 Ⓑ 8 Ⓒ 12 Ⓓ 15

11 If the length of the shadow of the mosque lighthouse is 15m and the height of the mosque is 2.5m and the length of its shadow is 1.5m, then what is the height of the light house?

Ⓐ 9 Ⓑ 15 Ⓒ 25 Ⓓ 40

12 If the radius of a circle is 4 units, and the coordinates of its centre is (-4, 0), then which of the following points lie on the circle?

Ⓐ (4, 0) Ⓑ (0, 4) Ⓒ (4, 3) Ⓓ (-4, 4)

5 If the points: $A(-2, 3)$, $B(3, 5)$, $C(4, 1)$ and $D(x, y)$ represent verticies of the parallelogram $ABCD$, then what is the coordinates of the point D?

Ⓐ (-3, 7) Ⓑ (7, -3) Ⓒ (-1, -1) Ⓓ (-1, 3)

6 If $Log_x 32 = 5$ then what is the value of x?

Ⓐ 1 Ⓑ 2 Ⓒ 5 Ⓓ 32

7 What is the measure of the angle between the two vectors $<2, 0>$, $<3, 3>$?

Ⓐ 45° Ⓑ 60° Ⓒ 90° Ⓓ 180°

8 What is the derivative of the function: $f(x) = 3x^2 - 5x + 12$?

Ⓐ $6x^2 - 5$ Ⓑ $6x^2 - 5x$ Ⓒ $6x^3 - 5$ Ⓓ $6x - 5$

9 If y varies driectly with x, and $y = 24$ when $x = 8$ then what is the value of x when $y = 48$?

Ⓐ 12 Ⓑ 16 Ⓒ 20 Ⓓ 24

1 Answers of the first experimental test

Q	A			
1	A	**B**	C	D
2	**A**	B	C	D
3	A	**B**	C	D
4	A	B	C	**D**
5	A	B	**C**	D
6	A	**B**	C	D
7	A	B	C	**D**
8	**A**	B	C	D
9	**A**	B	C	D
10	A	B	C	**D**
11	A	B	**C**	D
12	A	B	C	**D**
13	A	B	C	**D**
14	**A**	B	C	D
15	A	**B**	C	D
16	A	**B**	C	D
17	**A**	B	C	D
18	A	B	**C**	D
19	A	B	**C**	D
20	A	B	**C**	D
21	A	**B**	C	D
22	**A**	B	C	D
23	**A**	B	C	D
24	A	B	C	**D**
25	A	B	**C**	D

Algebra
Geometry
Trigonometry
Limits
Statistcs
Tests
Answers

1 (B)

$$\because S = \frac{a_1}{1 - r} = \frac{25}{1 - \frac{1}{2}} = \frac{25}{\frac{1}{2}} = 50$$

2 (B)

$$\frac{1}{2}\left(\frac{x-1}{x-5}\right)\left(\frac{2x-2}{x-1}\right) = 5$$

$$\frac{1}{2}\left(\frac{1}{x-5}\right)\left(\frac{2(x-1)}{1}\right) = 5$$

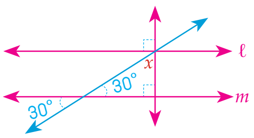
$$\frac{x-1}{x-5} = \frac{5}{1}$$

$$5x - 25 = x - 1$$

$$4x = 24 \quad (\div 4)$$

$$x = 6$$

3 (C)



$$x^\circ = 60^\circ$$

4 (A)

$$\left|\begin{array}{ccc|cc} i & j & k & i & j \\ 1 & -2 & 0 & 1 & -2 \\ 2 & 0 & -1 & 2 & 0 \end{array}\right.$$

$$= (2i + 0 + 0) - (-j - 4k + 0)$$

$$= 2i + j + 4k$$

5 (D)

$\overline{AE}$ represents a height of the triangle.

6 (D)

$$\frac{x-1}{x+1} = \frac{6}{5}$$

$$\because 6x + 6 = 5x - 5$$

$$\therefore x = -5 - 6 = -11$$

7 (C)

2	2	-9	13	-6
	↓	4	-10	6
	2	-5	3	0

The quotiet is $2x^2 - 5x + 3$

8 (D)

The equation of the parabola
$x^2 = 8(y + 3)$
opens upwards.

9 (A)

$$\because f(x) = \frac{3x-5}{2}$$

$$\therefore \frac{y}{1} = \frac{3x-5}{2}$$

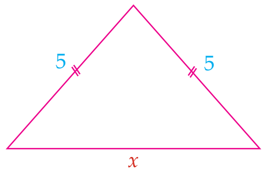
$$3x - 5 = 2y$$

$$3x = 2y + 5 \quad (\div 3)$$

$$x = \frac{2y+5}{3}$$

$$\therefore f^{-1}(x) = \frac{2x+5}{3}$$

10 (A)



difference $< x <$ sum

$$5 - 5 < x < 5 + 5$$

$$0 < x < 10$$

11 (D)

If we let $n = 1$ and $m = 3$ (as example)

then $(n + m)^2 = (1 + 3)^2 = 16$ (divisible by 4)

and $n^2 + m^2 = 1 + 9 = 10$ (even)

hence, III is true, I is true but II is not true

12 (B)

$$n! = 4! = 4 \cdot 3 \cdot 2 \cdot 1 = 24$$

13 (D)

The image of the point (-1, 3) by reflection in the line $y = x$ is: (3, -1)

14 (A)

$$E(3, 1) \xrightarrow[y+4]{x-3} F(0, 5).$$