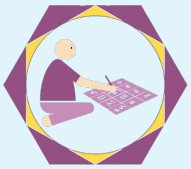


Maximum time: 20 *minutes*

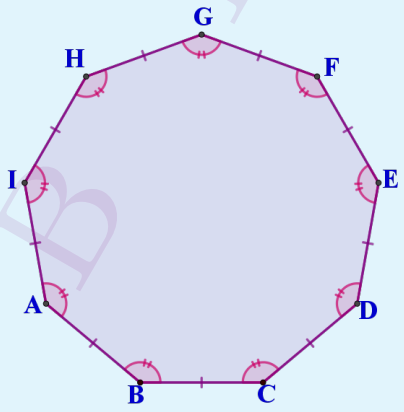
KEM4 - Foundation Maths for Std 7,8 together @ *ABIMS*

Try on your own ! Don't use calculators ! Think and Answer !

Name:_____ Standard:_____

I Answer the following questions accordingly !

1. In the given *figure*, $ABCDEFGHI$ is a *regular Nonagon*, with *all sides of equal length* and *all vertex angles of equal measure*.



Then the *measure* of *each vertex angle* of $ABCDEFGHI$ is _____ (*in degrees*).

2. The sum of all the interior angles of a concave polygon except one interior angle $y°$, is $170°$.

If the number of sides of the polygon is n, then the value of $(y - n)$ is _____.

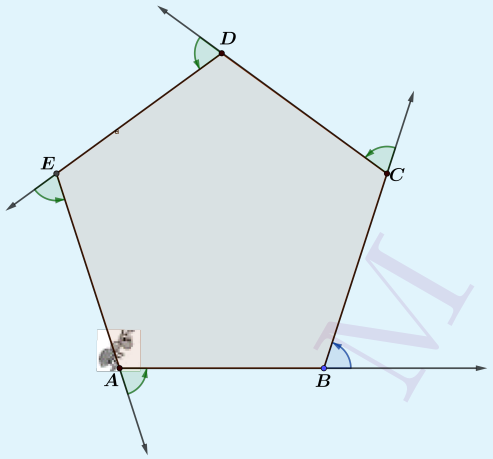
3. In triangle $\triangle ABC$ $\angle A - \angle B = \angle C$. Then $\triangle ABC$

A. must be an acute angled triangle. B. must be a right angled triangle.

C. must be an obtuse angled triangle. D. none of these.

4. In quadrilateral $ABCD$, $\angle A = \angle B + 20° = \angle C - 30° = \angle D - 50°$, then the measure of $\angle D$ is _____ (*in degrees*).

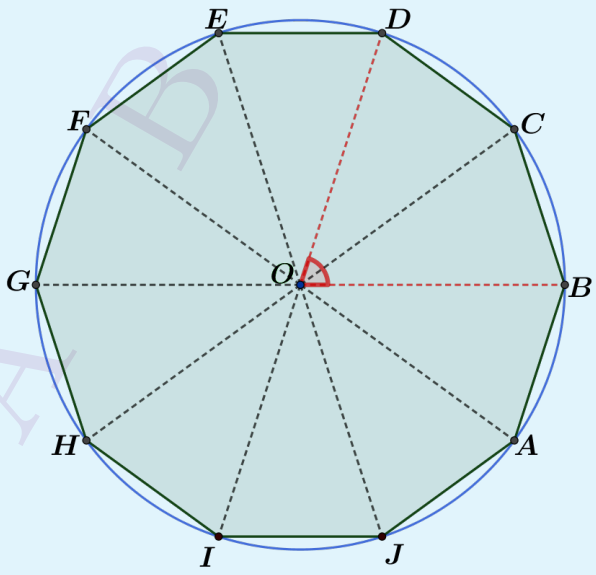
5. Ant is initially placed at A of a *pentagon* and it *travels one complete round along the boundary* $A \to B$; $B \to C$; $C \to D$; $D \to E$; $E \to A$; *making turns at every corner*, as shown.



The *ant finally stops* at A *after turning towards the direction* $A \to B$.

The *sum of the all the turn angular measures (exterior angles of pentagon)* is _____ (*in degrees*).

6. A *regular decagon* $ABCDEFGHIJ$ is *inscribed in a circle* whose centre is O, as shown.



The *smaller measure* of $\angle BOD =$

A. 72° B. 75° C. 60° D. none of these

Maximum time: 80 *minutes*

Basics from previous standards, Squares and Square roots, Exponents and Powers
Lines and Angles, Shapes and Properties of Polygons

KEM4 - Foundation Maths for Std 7,8 together @ *ABIMS*

Try on your own ! Don't use calculators ! Think and Answer !

Name:_____ Standard:_____

I Answer the following questions accordingly !

I.I Section - A : Questions on *Concepts*

1. A *ray* has

   A. *position* but no *direction* B. *direction* but no *position*

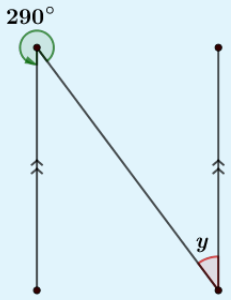
   C. *position* and *direction* D. none of these

2. Which of the following is $FALSE$?

   A. 0.9 is the square of 0.3 B. $\pm\frac{1}{2}$ is the square root of $\frac{1}{4}$

   C. Negative square root of square of $\frac{2}{3}$ is $\frac{-2}{3}$ D. none of these

3. In the given *figure* with *marked notations and angles*, the *measure* of y is ___.



   A. 290°. B. 30°. C. 50°. D. 70°.

4. Which of the following is $TRUE$?

   A. Any two angles equal in measure, are corresponding angles.

   B. Any two linear pair angles are equal in measure.

   C. The sum of two acute angles must be an obtuse angle.

   D. none of these

5. In the *multiplication process* of 29×83, the *product of digits* $2, 3$ should be *assigned* to the *result* in

   A. its *ten's place value*

   B. its *unit's place value*

   C. its *hundred's place value*

   D. none of these

6. Which of the following *statements* is definitely *true* ?

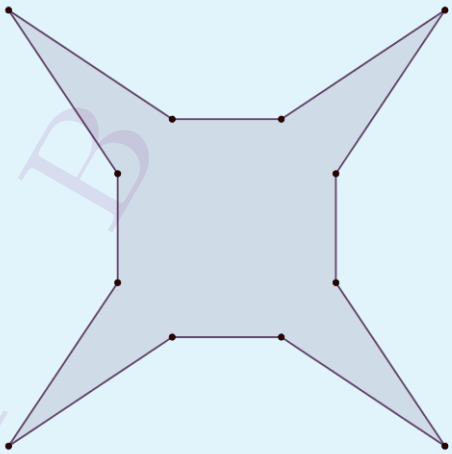
   A. The *angle* with *measure more than* $90°$ is *an obtuse angle.*

   B. The *angle* with *measure less than* $180°$ is *a reflex angle.*

   C. The *angle* with *measure less than* $180°$ is *an obtuse angle.*

   D. The *angle* with *measure between* $90°$ and $180°$ is *an obtuse angle.*

7. Here you *observe a polygon* with few *interior angles of reflex measures.*



   It is

   A. *a concave hexagon.*

   B. *a concave octagon.*

   C. *a concave decagon.*

   D. *a concave dodecagon.*

   Note: Hexagon, Octagon, Decagon, Dodecagon are $6, 8, 10, 12$- sided polygons respectively.

8. A straight angle is divided exactly into 10 congruent parts.

   Then, the measure of each angular part is _____ (*in degrees*).

   A. $20°$. B. $15°$. C. $30°$. D. $18°$.

9. Which of the following statements is *FALSE* ?

   A. The *quadrilateral* with all sides equal is defined as *a square*.

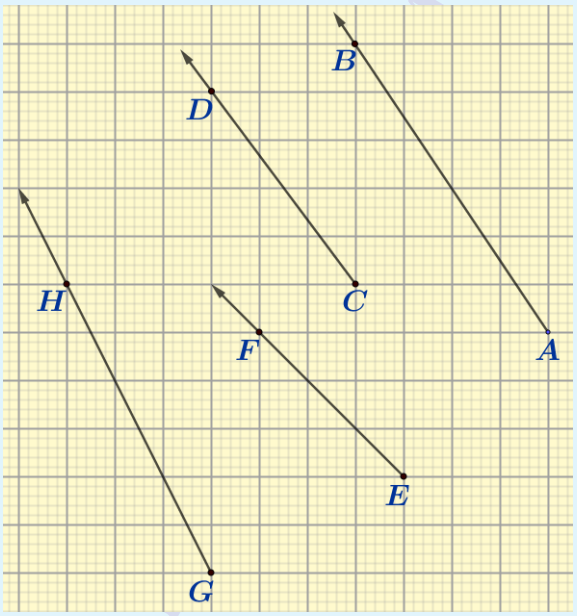
   B. The *quadrilateral* with all sides equal is defined as *a rhombus*.

   C. A *square* has all sides of equal length.

   D. A *rhombus* has all sides of equal length.

10. AB, CD, EF, GH are *directions* indicated in the following *grid*:

Use the grid for getting the right directions.



Which of the following is *true*?

A. $AB \parallel CD$ B. $AB \parallel EF$ C. $AB \parallel GH$ D. none of these

11. What is the *meaning* of the *expression* 3^{-3} ?

   A. From 1, the *integer* 3 is *repeatedly divided* 3 *times*.

   B. From 1, the *integer* -3 is *repeatedly divided* 3 *times*.

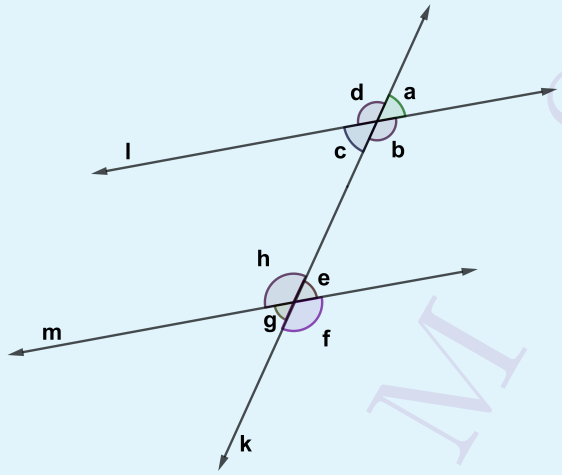
   C. From 1, the *integer* 3 is *repeatedly multiplied* 3 *times*.

   D. From 1, the *integer* -3 is *repeatedly multiplied* 3 *times*.

12. The value of $-\sqrt{(-3)^2}$ is

A. $+3$ B. -3 C. -9 D. $+9$

13. *Lines* $\overleftrightarrow{k}, \overleftrightarrow{l}, \overleftrightarrow{m}$ are in the *same plane* where lines $\overleftrightarrow{l}, \overleftrightarrow{m}$ are *parallel*, with *angles* as indicated.



A. a, f are *corresponding angles of equal measure.*

B. d, g are *corresponding angles of equal measure.*

C. c, g are *corresponding angles of equal measure.*

D. b, h are *corresponding angles of equal measure.*

14. Which of the following *statements* is *true*?

A. There cannot be more than two *corresponding angles.*

B. If *angle measures* are equal, then the *angles* must be *corresponding angles.*

C. If p, q, r are *directions* such that $angle(p, q) = angle(p, r)$, then q, r must have same *direction.*

D. none of these

15. How many of the following statements are definitely true?

- All rectangles are squares.
- All rhombuses are parallelograms
- If diagonals of a quadrilateral are perpendicular, then it is rhombus.
- The diagonals of a parallelogram are equal.
- The diagonals of a kite are perpendicular.
- All diagonals of a regular pentagon are equal.
- Only one of the interior angles of a polygon is reflex measure.The polygon must be a quadrilateral.
- In a parallelogram, all sides are equal.

A. 3 B. 4 C. 2 D. none of these

16. What is the *half* of 4^{20}?

A. 2^5 B. 4^5 C. 2^{39} D. none of these

17. Which of the following is $TRUE$?

A. $\underbrace{4^2+4^2+4^2+4^2+\cdots+4^2+4^2}_{16\ times}=4^{32}$ B. $4^{16}+4^{16}=4^{32}$

C. $\underbrace{4^{30}+4^{30}+4^{30}+4^{30}+\cdots+4^{30}+4^{30}}_{16\ times}=4^{32}$ D. none of these

18. The sum of all the interior angles of a 12-sided polygon is

A. $12\times 180°$. B. $10\times 180°$. C. $14\times 180°$. D. none of these

19. Which of the following is *positive* ?

A. $\left(\frac{-1}{2}\right)^{-1}$ B. $\left(\frac{-1}{2}\right)^{-2}$ C. $\left(\frac{-1}{2}\right)^{-3}$ D. none of these

20. Two interior angles of a triangle are equal in measure. The third interior angle is greater than each of the other vertex angles by 51°. Then, the triangle

A. must be an acute angled triangle.

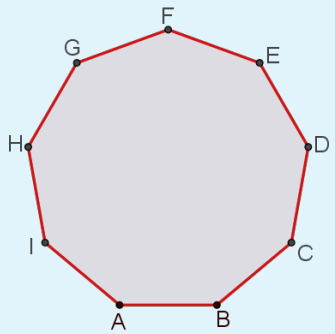
B. must be an obtuse angled triangle.

C. must be a right angled triangle.

D. must be an equilateral triangle.

I.II Section - B : Questions on *Applications*

21. Here, you observe a 9-*sided regular polygon* !



The *measure* of <u>each</u> *vertex angle* is

A. 140° B. 135° C. 156° D. none of these

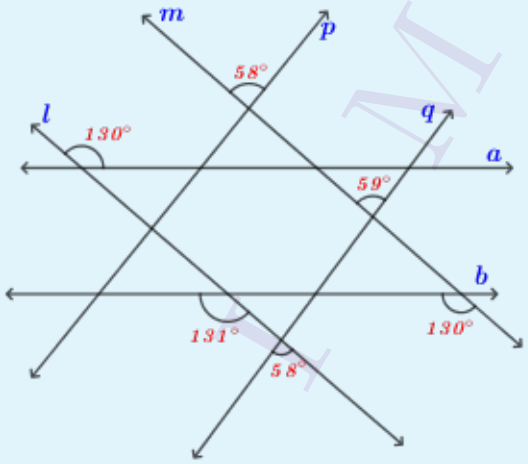
22. $x^y=16$ where x, y are integers.How many pairs (x, y) are there satisfying the given equation?

A. 0 B. 5 C. 4 D. 2

23. What is the least two digit natural number that should be multiplied by 80, to get a five digit perfect square?

A. 125 B. 80 C. 45 D. 20

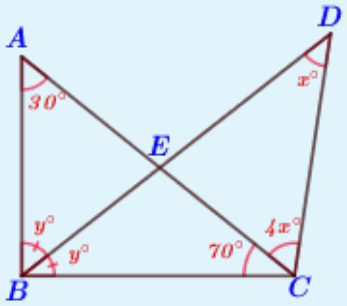
24. $\overleftrightarrow{l}, \overleftrightarrow{m}, \overleftrightarrow{p}, \overleftrightarrow{q}, \overleftrightarrow{a}, \overleftrightarrow{b}$ are lines on the same plane such that the angles made by lines $(\overleftrightarrow{l}, \overleftrightarrow{a}), (\overleftrightarrow{l}, \overleftrightarrow{b}), (\overleftrightarrow{l}, \overleftrightarrow{q}), (\overleftrightarrow{m}, \overleftrightarrow{b}), (\overleftrightarrow{m}, \overleftrightarrow{q}), (\overleftrightarrow{m}, \overleftrightarrow{p})$ are respectively $130°, 131°, 58°, 130°$, $59°$ and $58°$, as shown.



Which of the following is $TRUE$?

A. $\overleftrightarrow{l} \parallel \overleftrightarrow{m}$ B. $\overleftrightarrow{p} \parallel \overleftrightarrow{q}$ C. $\overleftrightarrow{a} \parallel \overleftrightarrow{b}$ D. none of these

25. $\triangle ABC$ and $\triangle DBC$ overlap each other at $\triangle EBC$, as shown.

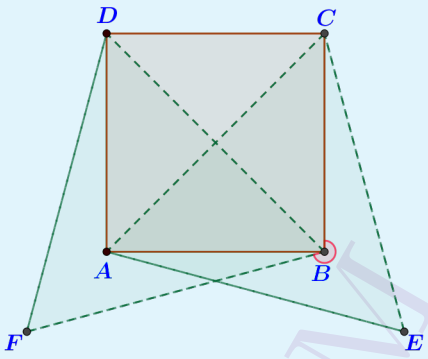


$\angle BAC = 30°; \angle ABC = 2y°; \angle BCA = 70°; \angle BDC = x°; \angle ECD = 4x°; \angle ABE = \angle EBC = y°.$

Then, the value of x is

A. 12 B. 15 C. 9 D. 14

26. $ABCD$ is a square. E, F are points in the same plane of the square such that $\triangle ACE, \triangle BDF$ are equilateral triangles, as shown.



The reflex angle measure of $\angle FBC$ is _____ *(in degrees)*.

A. 270 B. 255 C. 240 D. none of these

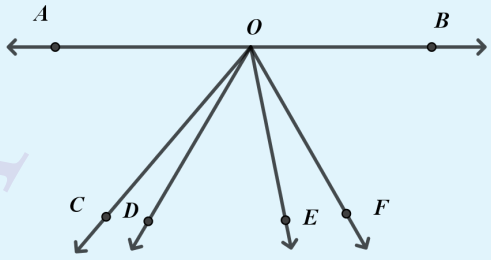
27. The product of 5^x and 5^y is 125. The sum of $(x+y)$ is equal to

A. 3 B. 4 C. 5 D. none of these

28. The value of $\sqrt{\frac{50}{98}}$ is

A. $\frac{5}{7}$ B. $\frac{25}{49}$ C. $\frac{4}{11}$ D. none of these

29. $\overleftrightarrow{AOB}$ is a straight line with $\overrightarrow{OC}, \overrightarrow{OD}, \overrightarrow{OE}, \overrightarrow{OF}$ being rays on the same plane, as shown.



If $\angle AOC = \angle COE = 50°$ and $\angle BOF = \angle FOD = 60°$, then $\angle DOE =$

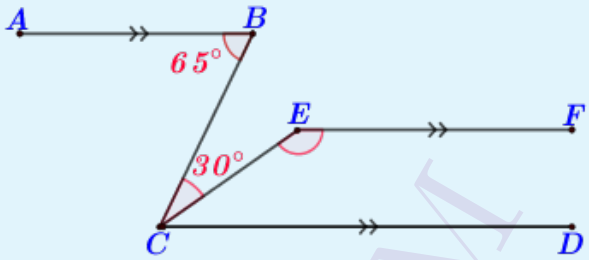
A. 30° B. 20° C. 40° D. None of these

30. Which of the following is much *closer* to $\sqrt{42}$?

A. 6.2 B. 6.4 C. 6.6 D. 6.8

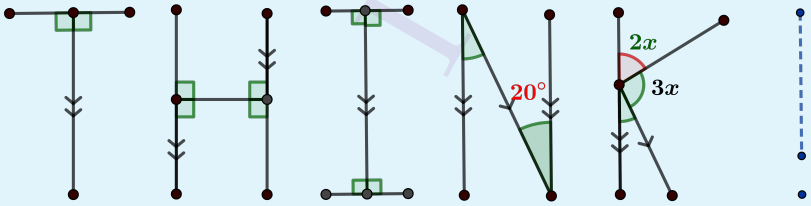
I.III Section - C : Questions on *Applications*

31. A, B, C, D, E, F are mid points on the same plane such that $\angle ABC = 65°, \angle BCE = 30°$ and $AB \parallel CD \parallel EF$, as shown.



Then, measure of $\angle CEF =$ _____ (*in degrees*).

32. Here, you observe *an interesting figure* where *directions are notated and angles are marked* !



The *measure* of x is _____ (*in degrees*).

33. What is the simplified value of $\dfrac{\underbrace{81+81+81+81+....+81+81}_{81 \text{ times}}}{\underbrace{27+27+27+27+...+27+27}_{27 \text{ times}}}$? _____ .

34. The simplified value of $\left(\frac{1}{1}\right)^{0} + \left(\frac{1}{2}\right)^{-1} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-3}$ is _____.

35. The *square* of 41 is _____ more than the square of 40.

36. The simplified *value* of $\left(\frac{1}{64}\right)^{-5/3}$ is _____.

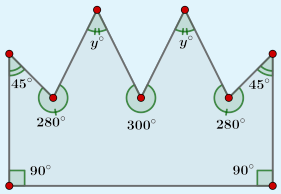
37. A perfect square ends with digit 1. It lies between 1524 and 2024.

The perfect square is _____

38. What is the smallest number that should be added to 13, to get a perfect square? _____.

39. The value of $-\sqrt{100+\sqrt{400+\sqrt{1600+9^2}}}$ is _____

40. In the given *figure*, we observe a *nonagon* in the *shape* of a *crown* with *interior angles*, as shown.



Two of the unknown interior angles are equal to y°. The *value* of $y =$ ____.

CONVENTION- by Sadagopan Rajesh

What is *convention*?

Sometimes if you allow everyone to present / interpret in their own way, it may result in different outputs leading to confusion.

Here is an illustration:

Consider the arithmetic expression $\mathbf{2 + 3 \times 6}$

One may evaluate the expression as follows:

$$\mathbf{2 + 3 \times 6}$$
$$\mathbf{= 5 \times 6}$$
$$\mathbf{= 30}$$

Here, *Addition* is performed first.
Multiplication is performed next.

Other may evaluate the expression as follows:

$$\mathbf{2 + 3 \times 6}$$
$$\mathbf{= 2 + 18}$$
$$\mathbf{= 20}$$

Here, *Multiplication* is performed first.
Addition is performed next.

The same expression with just two operations yielded different results for the simple reason, the order of operations evaluated are different.

Imagine the number of results of an expression with more number of operations !

To avoid confusion with so many results by allowing each of them to interpret to be correct in their own way, a standard rule is needed for everyone to follow the same way to get an unique result.

This standard rule is called convention!

This is how the humans at primitive stage arrived at a decision of operating *arithmetic expressions* with a *rule*, based on a similar experience.

Let us guess how the meeting of humans, say A,B,C… in ancient times took place in formulating the *rule of arithmetic operations*.

A: " Let us give precedence to certain arithmetic operations to get a standard evaluation."
B: "Fine. Which operations can we use for precedence?"
C: "Let *multiplication or division* take precedence (ahead) of *addition or subtraction*."

B: "Do you mean that *multiplication* is ahead of *addition*?"

C: " Yes! *multiplication* is ahead of *addition*, wherever it is present in the expression."

A: *"Fine!* Since *division* is one form of *multiplication.* And *subtraction* is one form of *addition,* we may say that the rule of operations is as follows:

Rule:

- *Multiplication* is ahead of *Addition.*
- *Multiplication* is ahead of *Subtraction.*
- *Division* is ahead of *Addition.*
- *Division* is ahead of *Subtraction.*

B: "What about the precedence between *multiplication* and *division; addition* and *subtraction*?

C: " There is no specific precedence between *multiplication or division.*
Between *multiplication or division* in the expression, whichever comes first from left to right, should be performed in that order.
Similarly, there is no specific precedence between *addition or subtraction.*
Between *addition or subtraction* in the expression, whichever comes first from left to right, should be performed in that order.

A: *"Fine!* We may shortly say this as
Rule: DM AS or MD AS or MD SA or DM SA
D stand for Division; M stand for Multiplication; A stand for Addition;
S stand for Subtraction.
The underline indicates the order of evaluation.
The 1st underline operations D or M precedes the 2nd underline operations A or S."

B: "What if someone need to add first before multiplying? Then the *DM AS* rule cannot force an evaluation against the requirement. What is the remedy for it?"

C: " Excellent question! Let us take some time to work out a solution for it."

A: *"Agreed!*"

A,B and C worked out a while and finally got a remedy solution for the problem proposed by B.

They have decided to introduce a pair of brackets, useful to change the precedence !

Thus, B DM AS rule was established for a standard evaluation of expressions.

Here are few illustrations of application of **B DM AS** *also termed as* **B o DM AS**

$1 + 2 + 3 \times 6 + 7$ **B DM AS**	$1 + (2 + 3) \times 6 + 7$ **B DM AS**
$= 1 + 2 + 18 + 7$ **B DM AS**	$= 1 + 5 \times 6 + 7$ **B DM AS**
$= 3 + 18 + 7$ **B DM AS**	$= 1 + 30 + 7$ **B DM AS**
$= 21 + 7$ **B DM AS**	$= 31 + 7$ **B DM AS**
$= 28$	$= 38$

$1 + (2 + 3) \times (6 + 7)$ **B DM AS**	$50 - (10 + 2 \times (6 - 3 + 7))$ **B DM AS**
$= 1 + 5 \times 13$ **B DM AS**	$= 50 - (10 + 2 \times 10)$ **B DM AS**
$= 1 + 65$ **B DM AS**	$= 50 - (10 + 20)$ **B DM AS**
$= 66$	$= 50 - 30 = 20$

Therefore, the order of operations in **B o DM AS** rule, is as follows:

- **BRACKET** (*innermost to the outermost*)
- **DIVISION or MULTIPLICATION** (*whichever comes first from left to right*)
- **ADDITION or SUBTRACTION** (*whichever comes first from left to right*)

Note that each of the exponent forms such as 3^5, 2^6, etc …is a bracket of repeated multiplication.

Evaluate the Following under the principle of BO DM AS step by step as illustrated.

1) $6 + 7 \times 3$ 2) $(5 + 7) \times 3$ 3) $10 - 4 \times 2$ 4) $(10 - 4) \times 2$

5) $40 \div 10 \div 2$ 6) $40 \div (10 \div 2)$ 7) $40 \div 2 \times 5$ 8) $40 \div (2 \times 5)$

9) $2014 - 10 + 4$ 10) $2014 - (10 + 4)$

11) $10 \div (15 + 5) \times 8 - 4$ 12) $10 \div 15 + 5 \times 8 - 4$

Insert Pair(s) of Brackets at the appropriate places to make the equations true.

1) $500 - 400 - 300 - 200 = 200.$ 2) $400 - 120 \div 3 \times 4 + 6 = 3600$

3) $2 + 4 \times 3 - 5 \div 6 - 7 = 10.$ 4) $1 + 2 \div 3 \times 4 + 5 \div 6 \times 7 = \frac{91}{12}.$

Remove unnecessary Pair(s) of Brackets in each of the given expressions, if any.

1) $1 + ((2 + 30) - (5 + 7) + (6 \times 8) - (20 \div 4))$

2) $(1+2)\times 3 - (4 \div \{5 + (6 \times 7 - 8) + [9 \times 10]\})$

3) $(((((((((1 \div 2) \div 3) \div 4) \div 5) \div 6) \div 7) \div 8) \div 9))$

4) $((1+2) - (3-4) + (5 \times 6)) \div (7+8) + 9$

Insert the Brackets at the appropriate places to make the expressions attain maximum value.

1) $1 + 2 \times 3 - 4 \div 5 + 6 \times 7$

2) $200 \div 4 \times 10 + 2 - 5 \times 6 - 7$

3) $32 - 16 \div 8 - 4 \div 2 - 1$

4) $1 + 2 \times 3 - 4 \times 5 + 6 - 7 \div 8$

Replace *s by proper arithmetic operators to make the equations true.

1) $20 * (4 - 2) \times 2 * 5 = 15.$ 2) $(80 * (12 * 3) + 4) * 6 = 144.$

3) $10 * (8 * (6 * (4 * 2))) = 12.$ 4) $50 * (25 * (10 * (5 * 1))) = 10.$

*Note: Each * may represent a different arithmetic operator.*

ALL THE BEST

PROBLEMS & SOLUTIONS - by Sadagopan Rajesh

Evaluate the Following under the principle of BO DM AS step by step as illustrated.

1) $6 + 7 \times 3$ 2) $(5 + 7) \times 3$ 3) $10 - 4 \times 2$ 4) $(10 - 4) \times 2$

5) $40 \div 10 \div 2$ 6) $40 \div (10 \div 2)$ 7) $40 \div 2 \times 5$ 8) $40 \div (2 \times 5)$

9) $2014 - 10 + 4$ 10) $2014 - (10 + 4)$

11) $10 \div (15 + 5) \times 8 - 4$ 12) $10 \div 15 + 5 \times 8 - 4$

Solutions:

	$6 + 7 \times 3$	B DM AS	$(5 + 7) \times 3$	B DM AS
:	$= 6 + 21$	B DM AS	$= 12 \times 3$	B DM AS
	$= 27$		$= 36$	

	$10 - 4 \times 2$	B DM AS	$(10 - 4) \times 2$	B DM AS
:	$= 10 - 8$	B DM AS	$= 6 \times 2$	B DM AS
	$= 2$		$= 12$	

	$40 \div 10 \div 2$	B DM AS	$40 \div (10 \div 2)$	B DM AS
:	$= 4 \div 2$	B DM AS	$= 40 \div 5$	B DM AS
	$= 2$		$= 8$	

$40 \div 2 \times 5$ B DM AS

$= 20 \times 5$ B DM AS

$= 100$

$40 \div (2 \times 5)$ B DM AS

$= 40 \div 10$ B DM AS

$= 4$

$2014 - 10 + 4$ B DM AS

$= 2004 + 4$ B DM AS

$= 2008$

$2014 - (10 + 4)$ B DM AS

$= 2014 - 14$ B DM AS

$= 2000$

$10 \div (15 + 5) \times 8 - 4$ B DM AS

$= 10 \div 20 \times 8 - 4$ B DM AS

$= \frac{1}{2} \times 8 - 4$ B DM AS

$= 4 - 4$ B DM AS

$= 0$

$10 \div 15 + 5 \times 8 - 4$ B DM AS

$= \frac{2}{3} + 5 \times 8 - 4$ B DM AS

$= \frac{2}{3} + 40 - 4$ B DM AS

$= 40\frac{2}{3} - 4$ B DM AS

$= 36\frac{2}{3}$

Insert Pair(s) of Brackets at the appropriate places to make the equations true.

1) $500 - 400 - 300 - 200 = 200.$

2) $400 - 120 \div 3 \times 4 + 6 = 3600$

3) $2 + 4 \times 3 - 5 \div 6 - 7 = 10.$

4) $1 + 2 \div 3 \times 4 + 5 \div 6 \times 7 = \frac{91}{12}.$

Solutions: $500 - (400 - (300 - 200)) = 200.$

$500 - (400 - 300) - 200 = 200.$

$(400 - 120 \div 3) \times (4 + 6) = 3600.$

$2 + 4 \times (3 - 5) \div (6 - 7) = 10.$

$2 + 4 \times [(3 - 5) \div (6 - 7)] = 10.$

$((1 + 2) \div (3 \times 4) + 5 \div 6) \times 7 = \frac{91}{12}.$

Remove unnecessary Pair(s) of Brackets in each of the given expressions, if any.

1) $1 + ((2 + 30) - (5 + 7) + (6 \times 8) - (20 \div 4))$
2) $(1+2)\times 3 - (4 \div \{5 + (6 \times 7 - 8) + [9 \times 10]\})$
3) $(((((((((1 \div 2) \div 3) \div 4) \div 5) \div 6) \div 7) \div 8) \div 9))$
4) $((1+2) - (3-4) + (5 \times 6)) \div (7+8) + 9$

Solutions: $1 + 2 + 30 - (5 + 7) + 6 \times 8 - 20 \div 4$

$(1+2)\times 3 - 4 \div \{5 + 6 \times 7 - 8 + 9 \times 10\}$

$1 \div 2 \div 3 \div 4 \div 5 \div 6 \div 7 \div 8 \div 9$

$(1 + 2 - (3 - 4) + 5 \times 6) \div (7 + 8) + 9$

Insert the Brackets at the appropriate places to make the expressions attain maximum value.

1) $1 + 2 \times 3 - 4 \div 5 + 6 \times 7$
2) $200 \div 4 \times 10 + 2 - 5 \times 6 - 7$
3) $32 - 16 \div 8 - 4 \div 2 - 1$
4) $1 + 2 \times 3 - 4 \times 5 + 6 - 7 \div 8$

Solutions: $(1+2)\times(3-4\div5+6)\times7$

$(200\div4\times(10+2)-5)\times6-7$

$32-(16\div8-4\div2-1)$

$((1+2)\times3-4)\times(5+6-7\div8)$

Replace *s by proper arithmetic operators to make the equations true.

1) $20*(4-2)\times2*5=15.$ 2) $(80*(12*3)+4)*6=144.$

3) $10*(8*(6*(4*2)))=12.$ 4) $50*(25*(10*(5*1)))=10.$

*Note: Each * may represent a different arithmetic operator.*

Solutions: $20\div(4-2)\times2-5=15.$

$(80\div(12\div3)+4)\times6=144.$

$10+(8\div(6-(4-2)))=12.$

$10+(8\div(6-(4\div2)))=12.$

$50\div(25\div(10-(5\div1)))=10.$

ALL THE BEST