HIBA Math Olympiad (HMO)

Sample Paper Grade 8

Pattern and Marking Scheme				
Grade	**Topic / Section**	**NO. of Questions**	**Marks Per Questions**	**Total Marks**
Grade 8	Practical Mathematics	40	1	40
	Achiever's Section	10	2	20
Grade Total		**50**		**60**

The total duration of the exam is 60 minutes. Grade 8 (Age 13–14)

Syllabus

Section 1: Rational Numbers, Squares and Square Roots, Cubes and Cube Roots, Exponents and Powers, Comparing Quantities, Algebraic Expressions and Identities, Linear Equations in One Variable, Understanding Quadrilaterals, Constructions, Mensuration, Visualizing Solid Shapes, Data Handling, Direct and Inverse Variations, Factorization, Introduction to Graphs, Playing with Numbers.

Achievers Section: Higher Order Thinking Questions - Syllabus as per Section 1

Each Question is 1 Mark

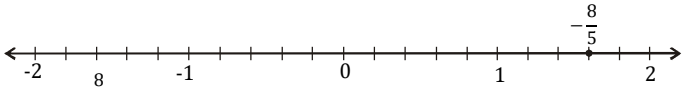
1. What is the multiplicative inverse of $3\frac{1}{4}$?

a. 4 b. $\frac{4}{3}$ c. $\frac{4}{13}$ d. None of these

2. What is the product of the additive inverse of –0.8 and the multiplicative inverse of 0.2?

a. 3 b. -5 c. -6 d. 4

3. Which number line correctly shows the rational number $-\frac{8}{5}$?

a.


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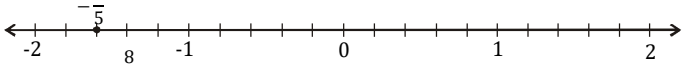

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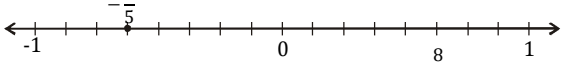

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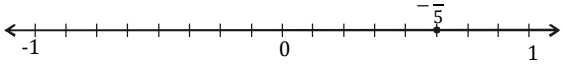


4. If we divide a positive integer by another positive integer, then what is the resulting number?

a. It is always a natural number
b. It is always an integer
c. It is always a rational number
d. It is an irrational number

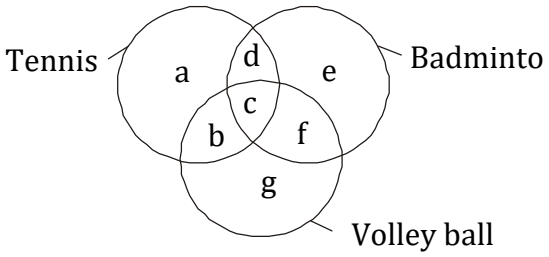
5. The sum of the digits of a two digit number is 9. If the digits are interchanged, then the resulting number is 9 less than the original number. What is the original number?

a. 72 b. 54 c. 63 d. 45

6. The sum of a number n and its reciprocal is 18. Then the equation showing the relation is

a. $n+\frac{1}{n}=18$ b. $n-\frac{1}{n}=18$ c. $n-18=\frac{1}{n}$ d. $n+18=\frac{1}{n}$

7. The figure given below consists of three intersecting circles which represent sets of students who play Tennis, Badminton and Volley Ball. Each region in the figure is represented by a small letter. On the basis of this figure, answer the following question



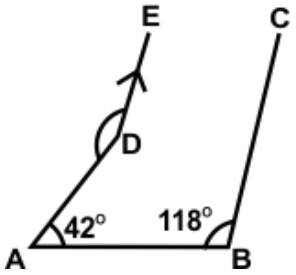
Which letter represents the set of persons who play Tennis and Badminton but not Volley Ball?

a. b b. c c. d d. None of these

8. If each interior angle of a regular polygon measures 150°, then the number of sides (n) is

a. 6 b. 12 c. 10 d. None of these

9. In the given figure, DE||BC, ∠ABC = 118^0, ∠DAB = 42^0, then find the value of ∠ADE.



a. 118º b. 42º
c. 138º d. 160º

10. What is the units digit of 4^{2003}?

a. 0 b. 2 c. 4 d. None of these

11. If 20x – 25 is expressed in the form a (4x + b), then the value of a + b is

a. – 20 b. – 10 c. 0 d. None of these

12. If n = 5 then the value of (7n – 5) (n2 – 5) (n3 + 5) is

a. 70000 b. 78000 c. 5000 d. None of these

13. Match the following:

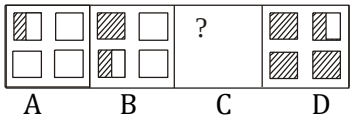
List I		List II	
P.	Add $x^5 + 8x^3 - 7x^2 + 12$ and $-3x^3 + 10x^2 + 8$	1.	$-x^3 - 3x^2 + 3x + 2$
Q.	Subtract $2x^2y + 4x^2y^2 + 3xy^2$ from $5x^2y + 7xy^2$	2.	$-x^3 + x^2 + 3x - 6$
R.	Subtract $2x^3 + 2x^2 - 4x - 4$ from $x^3 - x^2 - x - 2$	3.	$x^5 + 5x^3 + 3x^2 + 20$
S.	Add $x^3 - x^2 - x - 2$ and $2x^2 - 2x^3 + 4x - 4$	4.	$3x^2y + 4xy^2 - 4x^2y^2$

a. P-3, Q-2, R-1, S-4
b. P-3, Q-4, R-1, S-2
c. P-2, Q-4, R-3, S-1
d. P-2, Q-3, R-4, S-1

14. If $\frac{2x-3y}{x+2y} = 3$ then the numerical value of $\frac{2x+y}{3x+10y}$ is

a. 1 b. $\frac{1}{2}$ c. $\frac{2}{3}$ d. None of these

15. Choose the suitable figure, so that a series is formed by the figures A, B, C, D taken in order



a.  b.  c.  d. None of these

16. The value of $z^3 - 2z^2 - z + 2$ is

a. $(z-2)(z-1)(z+1)$
b. $(z-2)(z-1)^2$
c. $(z-2)(z^2+1)$
d. None of these

17. What will be the factor of the following expression? $625a^{12} - 81b^{12}$

a. $(5a^3 + 3b^3)^2 (5a^3 - 3b^3)^2$
b. $(25a^6 - 9b^6)^2$
c. $(5a^3 - 3b^3)^4$
d. $(25a^6 + 9b^6)(5a^3 - 3b^3)(5a^3 + 3b^3)$

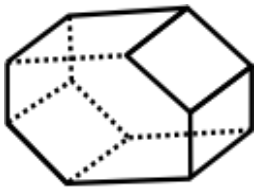
18. If 2x-1 + 2x+1 = 320, then find the value of x.

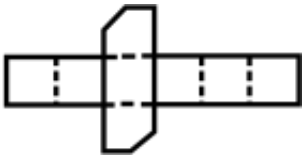
a. 4
b. 5
c. 6
d. 7

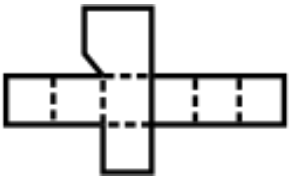
19. In a castle there is food for 63 soldiers to last for 27 days. After 7 days, 27 more soldiers joined them. For how many days will the food last now?

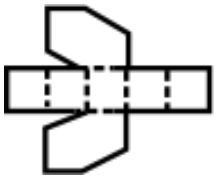
a. 12
b. 13
c. 14
d. 15

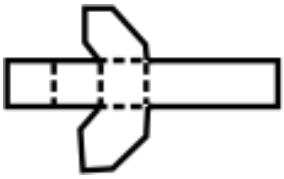
20. Which of the following pictures is the correct for the given net?



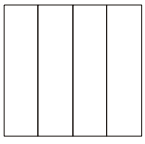
a. 

b. 

c. 

d. 

21. A square is divided into 4 identical rectangles as shown in the diagram. The perimeter of each of the four rectangles is 30 units. What is the perimeter of the square?

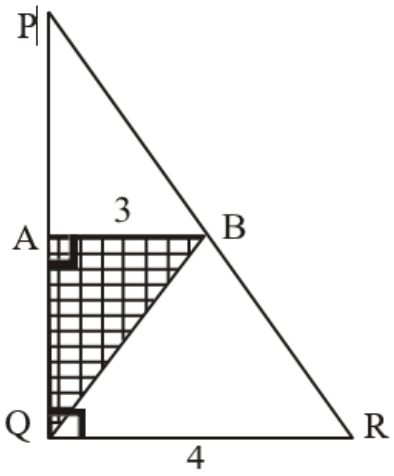


a. 36
b. 40
c. 48
d. None of these

22. If each interior angle of a regular polygon measures 150°, then the number of sides (n) is

a. 6 b. 12 c. 10 d. None of these

23. The area of the shaded triangle is $4\frac{1}{2}\ cm^2$. Angles *PQR* and *QAB* are right angles. $QR = 4$ and $AB = 3$. then $\angle ABQ$ is



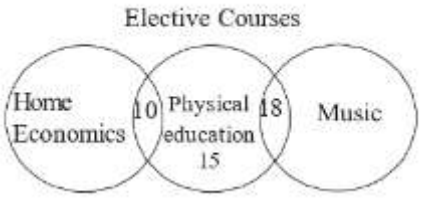
a. 15^o b. 30^o c. 45^o d. None of these

24. A counsellor at Learnium Middle School collected the following data about students taking elective courses.

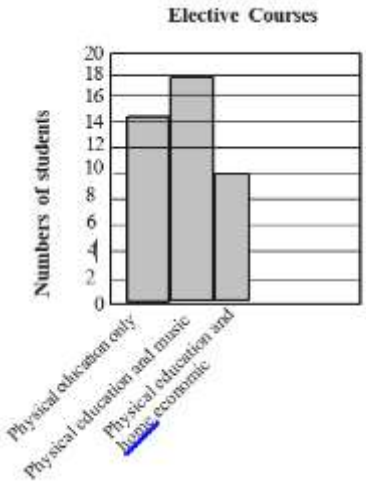
Courses	Number of Students
Physical education only	15
Physical education and music	18
Physical education and home economics	10

Which graph best represents these data?

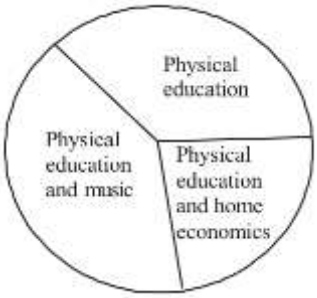
a.



b.



c.

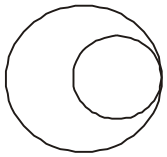


d. None of these

25. For a positive integer x, if $\sqrt{x}+\frac{42}{\sqrt{x}}=\sqrt{289}$ then which of the following can be the value of x?

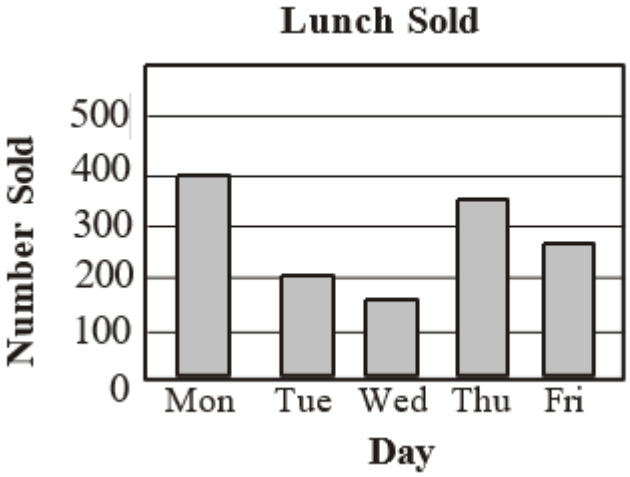
a. 9
b. 4
c. 49
d. 36

26. In the figure the diameter of the smaller circles is the radius of the bigger circle. The ratio of the area of the bigger circle to the area of the smaller circle equals



a. $\pi : 2\pi$ b. $3 : 2$ c. $4 : 1$ d. None of these

27. Following graph shows the number of lunches sold during a week



What was the daily average (mean) number of lunches sold during the week?

a. 270 b. 250 c. 225 d. None of these

28. Which of the following statements is correct?

a. The number 111,111,111,111 is divisible by 9 and 11.
b. The number 111,111,111,111 is divisible by 5 and 11.
c. The number 111,111,111,111 is divisible by 3 and 9.
d. The number 111,111,111,111 is divisible by 3 and 11.

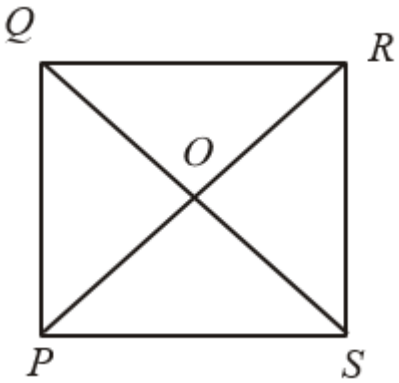
29. The length of a rectangle is 3 times its breadth. If the length is decreased by 3 cm and the breadth is increased by 5 cm, the area of the rectangle is increased by 57 cm2. The perimeter of the rectangle is:

a. 18 cm
b. 48 cm
c. 24 cm
d. 20 cm

30. If Dennis is $1/3^{rd}$ the age of his father Keith now and was $1/4^{th}$ the age of his father 5 years ago, then how old will his father Keith be 5 years from now?

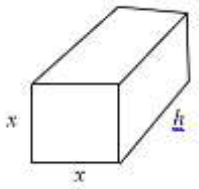
a. 20 years
b. 45 years
c. 40 years
d. 50 years

31. The diagonals of square *PQRS* intersect at O. Triangle SOR has area The length of *PQ* is



a. 2 b. 8 c. 6 d. None of these

32. A rectangular right prism has the dimensions x cm by x cm by h cm The surface area of the prism is $14x^2$ cm^2



Find h in terms of x.

a. $3x$ b. $\frac{x}{2}$ c. $4x$ d. None of these

33. The average number of runs scored by a batsman in eight innings is x. The batsman scored an average of 45 runs in the remaining two innings, thus increasing his average

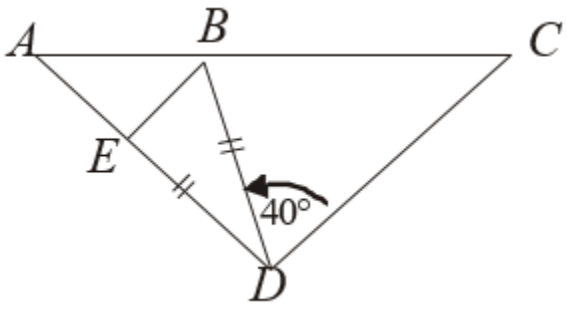
score for ten innings by 4.5 runs. What was his average score for the first eight innings that he played?

a. 22.5 runs
b. 40.5 runs
c. 25 runs
d. None of these

34. Which one of the following is an even number?

a. $2007^3 + 4$ b. $2008^3 + 5$ c. $2009^3 + 7$ d. None of these

35. In the figure given below, $AD = DC$; $ED = BD$ and $\angle BDC = 40°$. Find $\angle ABE$.



a. 10^o b. 20^o c. 30^o d. 40^o

36. In the first four papers each of 100 marks, Ronaldo got 95, 72, 73 and 83 marks. If he wants an average of greater than or equal to 75 marks and less than 80 marks, find the range of marks he should score in the fifth paper.

a. $52 < x < 77$
b. $25 < x < 75$
c. $75 < x < 80$
d. $73 < x < 100$

37. A sheet is in the form of a rhombus whose diagonals are 10 m and 8 m. Find the cost of painting both of its surfaces at the rate of \$70 per m^2

a. \$5,600
b. \$4,000
c. \$2,800
d. \$2,000

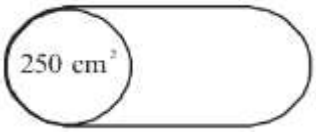
38. A graph that displays data that changes continuously over periods of time is called:

a. Bar graph
b. Pie chart
c. Line graph
d. Histogram

39. If $\frac{5m}{6} + \frac{3m}{4} = \frac{9}{12}$ then the value of m is

a. -1 b. -2 c. 1 d. 2

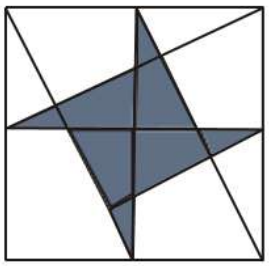
40. The area of the cross-section of a pipe is 250 cm^2. Water flows through the pipe at a rate of 3 litres per second



a. 15 b. 12 c. 18 d. None of these

Each Question is 2 Mark

41. In the diagram a corner of the shaded star is at the midpoint of each side of the large square. The fraction of the large square covered by the star is



a. $\frac{1}{5}$ b. $\frac{1}{4}$ c. $\frac{1}{3}$ d. None of these

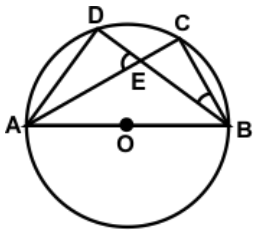
42. Consider the following statements:

A number $a_1\ a_2\ a_3\ a_4\ a_5\ a_6$ is divisible by 11 if

a. $(a_1 + a_3 + a_5) - (a_2 + a_4 + a_6) = 0$
b. $(a_1 + a_3 + a_5) - (a_2 + a_4 + a_6)$ is divisible by 11 Which of these statements is/are correct?

a. 1 alone
b. 2 alone
c. Both 1 and 2
d. Neither 1 nor 2

43. In the given figure, O is the centre of the circle, $\angle CBE = 25^0$ and $\angle DEA = 60^0$. Find the measure of $\angle ADB$

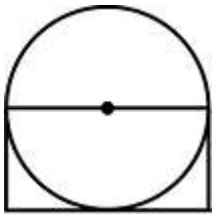


a. 90º
b. 85º
c. 95º
d. 120º

44. If $b = 3a$ and $c = 2b$, then $a + b + c$ is equal to

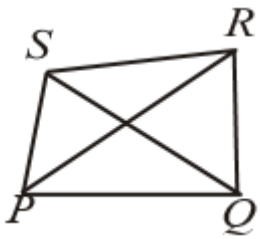
a. $6a$
b. $8a$
c. $10a$
d. $5a$

45. The area of the circle is 616 cm^2. What is the area of the rectangle?



a. 784 cm^2
b. 196 cm^2
c. 392 cm^2
d. Cannot be determined

46. If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a



a. Rhombus b. Parallelogram c. Trapezium d. None of these

47. A boy is running at a speed of p km/h to cover a distance of 1 km. But, due to slippery ground, his speed is reduced by q km/h (p > q). If he takes r hours to cover the distance, then which of the following is the correct relation between time, speed and distance?

a. 1/r = (p - q)
b. r = (p - q)
c. 1/r = (p + q)
d. r = (p + q)

48. A person standing on a railway platform noticed that a train took 21 seconds to completely pass through the platform which was 84 m long and it took 9 seconds to pass him. Find the speed of the train.

a. 25.2 km/hour
b. 32.4 km/hour
c. 50.4 km/hour
d. 75.6 km/hour

49. A sum of money amounts to $9800 after 5 years and $12005 after 8 years at the same rate of simple interest. Find the rate of interest per annum.

a. 5%
b. 8%
c. 12%
d. 15%

50. Match the statements of Column A with those of Column B:

Column A		Column B	
1.	The geometric point of a triangle which always lies inside the triangle	a.	In centre
2.	The geometric point of a triangle which always lies outside the triangle	b.	Orthocentre
3.	The geometric point of a triangle which always lies on two sides of the triangle	c.	Circumcentre
4.	The geometric point of a triangle which lies only on the longest side of the triangle	d.	Excentre

a. 1 - (a), 2 - (d), 3 - (b), 4 - (c)
b. 1 - (d), 4 - (c), 3 - (b), 2 - (a)
c. 1 - (a), 2 - (b), 3 - (c), 4 - (d)
d. 1 - (d), 2 - (c), 3 - (b), 4 - (a)

Answer Key

1.	c	2.	d	3.	b	4.	c	5.	b	6.	a	7.	c
8.	b	9.	d	10.	c	11.	c	12.	b	13.	b	14.	a
15.	b	16.	a	17.	d	18.	d	19.	c	20.	d	21.	c
22.	b	23.	c	24.	a	25.	a	26.	c	27.	a	28.	d
29.	b	30.	d	31.	b	32.	a	33.	a	34.	c	35.	b
36.	a	37.	a	38.	c	39.	c	40.	b	41.	b	42.	c
43.	c	44.	c	45.	c	46.	b	47.	a	48.	a	49.	c
50.	a												