Form 3

Mid-year Examination 2013-2014

Mathematics

Paper II

INSTRUCTIONS

1. Write your examination number in the space provided on this cover page.
2. Write down all required information on the Multiple Choice Answer Sheet.
3. Answer all questions. Answer should be marked on the **Multiple Choice Answer Sheet.**
4. Each question carries 2 marks. The total mark is 90.
5. You should mark only ONE answer for each multiple choice question. If you mark more than one answer, you will receive No mark for that question.
6. No mark will be deducted for wrong answer.
7. The diagrams in this paper are not necessarily drawn to scale.
8. This paper should be answered in English.

1. $a^2 + a(a + a) =$
    A. $3a^2$.
    B. $3a^3$.
    C. a^4.
    D. a^5.

2. How many significant figures does 0.0140 have?
    A. 2
    B. 3
    C. 4
    D. 5

3. $\dfrac{5^{3n}}{25^{n-1}} =$
    A. 5^{n-1}.
    B. 5^{n+1}.
    C. 5^{n+2}.
    D. 5^{5n-2}.

4. Amy sold a vase to Brian at a profit of 15%. Later, Brian sold the vase to Carmen for $6400 and gained $420. What was the cost price of the vase for Amy?
    A. $ 5200
    B. $ 5970
    C. $ 6877
    D. $ 7780

5. If the point $A(-3, 4)$ is rotated anti-clockwise about the origin through 180° to the point B, then the coordinates of B are
    A. $(3, -4)$.
    B. $(-4, 3)$.
    C. $(-3, -4)$.
    D. $(4, 3)$.

6. In the figure, $\cos x =$

    A. $\dfrac{3}{7}$.
    B. $\dfrac{5}{7}$.
    C. $\dfrac{3}{5}$.
    D. $\dfrac{4}{5}$.
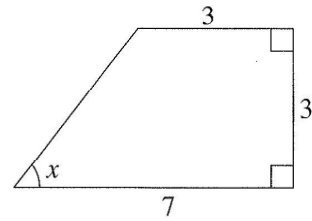
7. The frequency distribution table below shows the time (in hours) spent by a group of teenagers in using computers in a week. If $\dfrac{2}{9}$ of them spent 20 h – 24 h in using computers in a week, find the value of n.
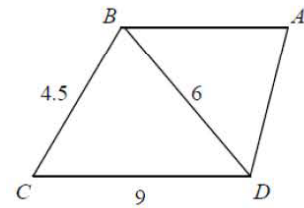
Time (h)	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30 – 34
Frequency	2	3	5	10	n	$n - 3$

    A. 14
    B. 15
    C. 16
    D. 17

8. If $(5x + P)^2 \equiv 25x^2 - 30x + Q$, then $Q =$
    A. 3.
    B. 9.
    C. 12.
    D. 36.

9. If $2x - 3y = x + 3 = 3x - y$, then $x =$
    A. 8.
    B. $\dfrac{24}{5}$.
    C. $\dfrac{6}{5}$.
    D. -2.

10. The ratio of the base radii of the two cylinders of equal height is 1 : 2. What is the ratio of the curved surface areas of the two cylinders?
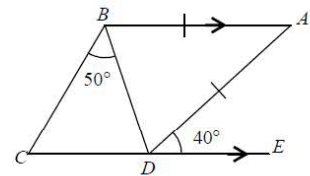
    A. 1 : 1   B. 1 : 2   C. 1 : 4   D. 1 : 8

11. In the figure, $\triangle BAD \sim \triangle DBC$, $BC = 4.5$, $BD = 6$ and $CD = 9$. Find AB.

    A. 3   B. 4   C. 5   D. 6

12. In the figure, CDE is a straight line, $AB = AD$, $AB \parallel CE$, $\angle ADE = 40°$ and $\angle CBD = 50°$. Find $\angle BCD$.

    A. 40°   B. 50°   C. 60°   D. 70°

13. It is given that S_1 is the sum of the interior angles of a convex polygon and S_2 is the sum of the exterior angles. If $S_1 + S_2 = 1080°$, find the number of sides of the polygon.

    A. 5   B. 6   C. 7   D. 8

14. Given that $y = \frac{1}{3}(x - 4)$. If $y < 2$, find the range of values of x.

    A. $x < 10$ B. $x < 2$ C. $x > 2$ D. $x > 10$

15. a and b are any numbers such that $a < b$. If k is a positive integer, which of the following must be true?
I. $a + k < b + k$
II. $-ka < -kb$
III. $a^k < b^k$

    A. I only   B. I and II only   C. I and III only   D. II and III only

16. If $\frac{2x + 1}{3} - \frac{3 - 2x}{2} > x$, then

    A. $x > \frac{4}{7}$.   B. $x > \frac{7}{4}$.   C. $x < \frac{4}{7}$.   D. $x < \frac{7}{4}$.

17. If P is less than Q by 10% and Q is greater than R by 10%, then
    A. P is less than R by 10%.   B. P is less than R by 1%.
    C. P is greater than R by 1%.   D. P is greater than R by 10%.

18. The cost of a shirt is \$30, where 40% is for raw materials and 60% is for wages.   If the cost for raw materials is increased by 40% and that of wages is decreased by 40%, the percentage change of the cost of the shirt is
    A. –8%.   B. –5%.   C. 0%.   D. 5%.

19. Daniel borrowed \$10 000 from a bank and the interest was compounded half-yearly.   If the interest rate is 4% p.a., find, correct to the nearest integer, the interest after 2 years.
    A. \$404   B. \$816   C. \$824   D. \$1699

20. Harry owns a flat with rateable value of \$80 000 a year.   The tax rate for rates is 5% per annum.   If the rates for the first half of the year are exempted, what are the rates that he should pay for that year?
    A. \$800 000   B. \$8 000   C. \$4 000   D. \$2 000

21. $110_{10} - 110_2 + 110_{16} =$
    I. $101\,111\,000_2$
    II. $101\,111\,001_2$
    III. 376_{10}
    IV. 178_{16}
    A. I only   B. I and II only   C. II and III only   D. I, III and IV only

22. If the sides of a triangle are 5, 9 and x, find the number of possible integral values of x.
    A. 7   B. 9   C. 11   D. 13

23. A number is first decreased by k% and then increased by k%.   If the final number is $\dfrac{5}{9}$ of the original number, find the value of k.
    A. $\dfrac{4}{9}$ B. $\dfrac{2}{3}$ C. $33\dfrac{1}{3}$ D. $66\dfrac{2}{3}$

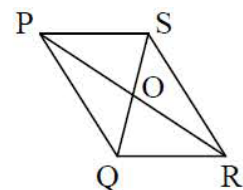24. Which of the following conditions can be used to determine that $ABCD$ is a parallelogram?
    A. $\angle A = \angle B$, $\angle C = \angle D$ B. $AB = AD$, $BC = CD$
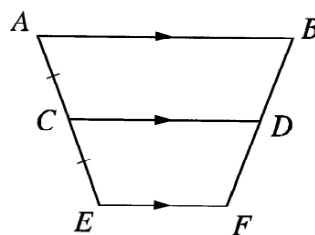   C. $AD \parallel BC$, $AD = BC$ D. $AB \parallel DC$, $\angle B = \angle C$

25. In the figure, $PQRS$ is a parallelogram. PR and SQ intersect at O.   How many pairs of congruent triangles are there?

    A. 2   B. 3   C. 4   D. 5

26. In the figure, *AB // CD // EF* and *AC = CE*.   Which of the following must be true?

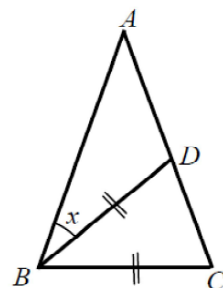   I. $\dfrac{BD}{DF} = 1$

   II. $\dfrac{EF}{CD} = \dfrac{1}{2}$
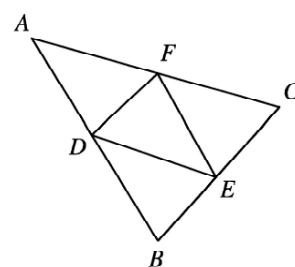
   III. $CD = \dfrac{AB + EF}{2}$

   A. I and II only   B. I and III only   C. II and III only   D. I, II and III

27. In the figure, *ADC* is a straight line and *BD* is the angle bisector of ∠*ABC*.   If *AB = AC* and *BD = BC*, then *x* =
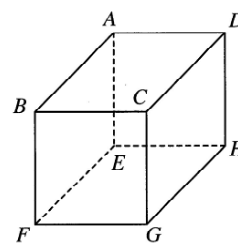
   A. 28°.   B. 32°.   C. 36°.   D. 40°.

28. In the figure, *D*, *E* and *F* are the mid-points of the *AB*, *BC* and *CA* of Δ*ABC* respectively.   If the area of Δ*DEF* = 10 cm², then the area of Δ*ABC* is

   A. 20 cm².   B. 30 cm².   C. 40 cm².   D. 80 cm².

29. The figure shows a cube *ABCDEFGH*.   Name the angle that the line *AG* makes with the plance *CDHG*.

   A. ∠*ACG*   B. ∠*AGE*   C. ∠*DAG*   D. ∠*AGD*

30. Solve the compound inequality $\begin{cases} 5(x-2) \le -15 \\ 2(6-x) \ge 8 \end{cases}$.

   A. $x \le -1$ B. $x \le 2$ C. $2 \le x \le -1$ D. No solution

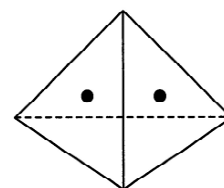31. Solve $(x+2)=(x-3)(x+2)$.

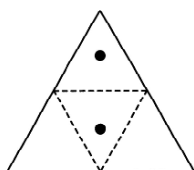   A. $x = 3$ B. $x = 4$ C. $x = -2$ or $x = 3$ D. $x = -2$ or $x = 4$
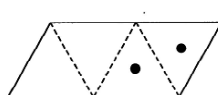
32. The figure shows a regular tetrahedron in which dots are drawn on two of its faces. Which of the following is not its possible net?
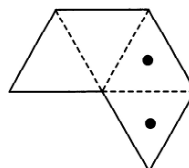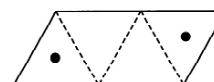

    A.   B.   C.   D.
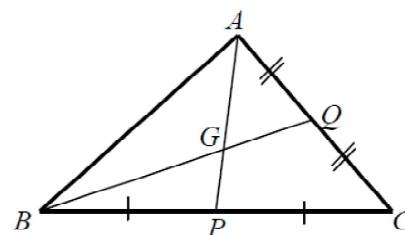

33. In the figure, if $AQ = CQ$, $BP = CP$ and $AP = 12$ cm, then $AG =$
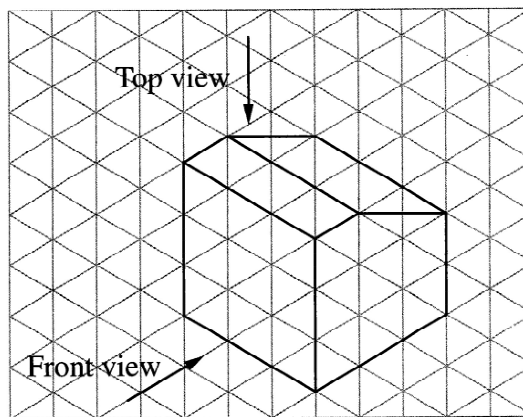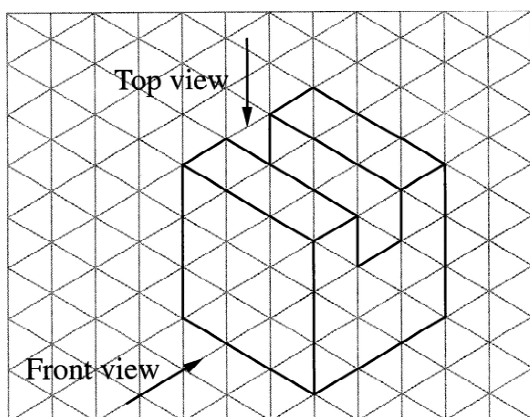

    A. 4 cm.   B. 6 cm.   C. 8 cm.   D. 10 cm.

34.

Compare the two prisms in the above figure, which are the following is/are true?

I. They have the same front view.

II. They have the same top view.

III. They have the same volume.

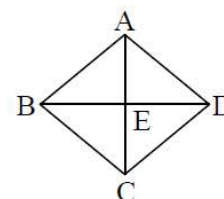   A. I only   B. I and III only   C. II and III only   D. I, II and III

35. How many planes of reflection are there in a regular octahedron?

    A. 5   B. 6   C. 8   D. 9

36. In the figure, $ABCD$ is a rhombus. AC and BD intersect at E. If $AD = (x - 2)$ cm, $AC = (2x - 12)$ cm and $BD = (2x - 8)$ cm, then the perimeter of rhombus $ABCD$ is

    A. 30 cm.   B. 32 cm.   C. 36 cm.   D. 40 cm.

37. If the mode of the seven numbers 8, 6, 1, 2, 6, a and b is 8, then the median of the seven numbers is

    A. 3.   B. 6.   C. 7.   D. 8.

38. Susan and Jane applied for the same post. Their scores in different categories and the weight assigned to each category are as follows:

	Education	Work experience	Typing	Speaking
Susan	82	65	53	72
Jane	85	x	76	68
Weight	4	3	2	1

If they got the same weighted mean, find the value of x.

    A. 43   B. 45   C. 46   D. 47

39. The mean of a group of n numbers is m. If the numbers 2, 3 and 4 are removed from the group, the mean of the remaining $n - 3$ numbers remains unchanged. Find the value of m.

    A. 1   B. 2   C. 3   D. $n - 3$

40. Which of the following is not true for a cube?

	Order of rotational symmetry	Corresponding number of axes of rotational symmetry
A.	2	6
B.	3	4
C.	4	3
D.	6	2

41. It is known that the mean, median and mode of 9 data are 28, 26 and 18 respectively.
    After deleting the datum 32, which of the following must be true?
    I. The mean will decrease.
    II. The median will decrease.
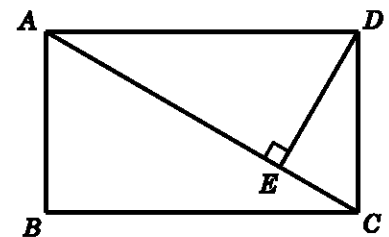   III. The mode will decrease.
    A. I only   B. I and II only   C. I and III only   D. II and III only

42. The following figure shows the net of a polyhedron.
    All the faces are regular pentagons.   The number of
    vertices of the polyhedron is
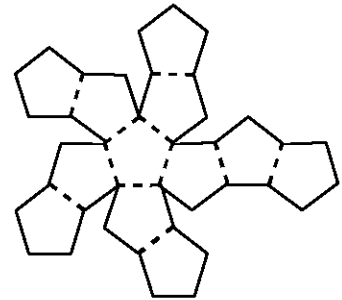
    A. 12.   B. 18.   C. 20.   D. 30.

43. In the figure, AC is a diagonal of rectangle $ABCD$ and
    $DE \perp AC$. If $AC = 4$ cm, $DC = 2$ cm, then $DE =$

    A. 1 cm.   B. $\sqrt{3}$ cm.   C. 2 cm.   D. $\sqrt{12}$ cm.

44. When every datum in a set of data is decreased by 3, which of the following will also
    decrease by 3?
    I. Mean
    II. Median
    III. Mode
    A. I only   B. I and II only   C. II and III only   D. I, II and III

45. Let O be the origin.   If the coordinates of the points A and B are (–4, 4) and (–8, 0)
    respectively, which of the following gives the coordinates of the circumcentre and orthocentre
    of $\triangle OAB$?

	Circumcentre	Orthocentre
A.	(–4, 0)	(–4, 4)
B.	(–4, 0)	(–4, 2)
C.	(–4, 4)	(–4, 2)
D.	(–4, 4)	(–4, 0)

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