

Examination Number			
-----------------------	--	--	--

Form 3

Mid-Year Examination 2015-2016

Mathematics

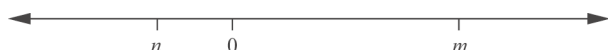
Paper II

INSTRUCTIONS

1. Write your examination number in the spaces 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 marks for that question.
6. No marks will be deducted for wrong answer.
7. The diagrams in this paper are not necessarily drawn to scale.

1. Factorize $x^2 - x - y + 2xy + y^2$.
- A. $(x + y)(x + y + 1)$ B. $(x + y)(x + y - 1)$
 C. $(x - y)(x + y - 1)$ D. Cannot be factorized.
2. $(-a^2 b^3 c)^4 \div (a^2 b^2 c) =$
- A. $a^6 b^{10} c^3$ B. $-a^6 b^{10} c^3$ C. $a^4 b^5 c^3$ D. $-a^4 b^5 c^3$
3. x and y are positive integers and $m \neq 0$. Which of the following are correct?
- I. $m^{x \cdot y} = m^x \div m^y$
 II. $m^{x+y} = m^x + m^y$
 III. $(m^x)^y = m^{xy}$
- A. I and II only B. I and III only C. II and III only D. I, II and III
4. If $3^{m-2} = 5$ and $9^n = 10$, then the value of 3^{m+2n} is
- A. 55. B. 150. C. 300. D. 450.
5. It is given that $x + x^{-1} = \sqrt{2} + 1$, $x^2 + x^{-2} =$
- A. 1. B. 3. C. $2\sqrt{2} + 1$. D. $(\sqrt{2} + 1)^2$.
6. $\sqrt{\frac{\sqrt{10}}{6} \times \frac{24}{\sqrt{5}} \div \frac{25}{\sqrt{2}}} =$
- A. 100 B. $\frac{2\sqrt{2}}{5}$ C. $\frac{5\sqrt{2}}{12}$ D. $\frac{\sqrt{10}}{60}$
7. The inner diameter of a water pipe is 20 cm. If the speed of the water flow is 1 m/s, how long does it take to fill a cylindrical water tank of base radius 0.8 m and height 0.5 m with water?
- A. 3.2 s B. 4 s C. 16 s D. 32 s
8. Convert the binary number $110100011010_{(2)}$ to a hexadecimal number.
- A. $89A_{(16)}$ B. $91A_{(16)}$ C. $C9A_{(16)}$ D. $D1A_{(16)}$
9. The point $A(2, -11)$ is translated 6 units upward and then rotated clockwise about the origin through θ to point $B(-2, 5)$. Find θ .
- A. 90° B. 180° C. 270° D. 360°
10. If $\begin{cases} x = 1 \\ y = -1 \end{cases}$ is the solution of the simultaneous equations $\begin{cases} ax + 2y = b \\ 4x - by = 2a - 1 \end{cases}$, then the values of a and b are
- A. $a = -3, b = -1$. B. $a = -3, b = 1$. C. $a = -1, b = 3$. D. $a = 3, b = 1$.

11. The relative positions of m and n on the number line are shown below.



The value of $(n + m)(n - m)$ is

- A. greater than 0. B. smaller than 0. C. equal to 0. D. undetermined.

12. If m is a negative number, which of the following is / are correct?

I. $\frac{6}{m} > \frac{4}{m}$

II. Error!< Error!

III. $\frac{-6}{m} > \frac{-4}{m}$

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

13. If $c < 0$ and $a > b$, then

- A. $ac > bc$. B. $ac < bc$. C. $ac < b$. D. $a < bc$.

14. Which of the following is/are the solution(s) of the equation $(x + 2)(x - 2) = 2x(x + 2)$?

I. -2

II. 0

III. $\frac{2}{3}$

IV. 2

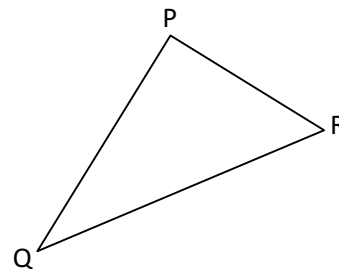
- A. I only B. I and IV only C. II and III only D. II and IV only

15. The perimeter of a rectangle is 14 cm and the diagonal is 1 cm longer than one of its sides. Find the area of the rectangle.

- A. 10 cm^2 B. 12 cm^2 C. 14 cm^2 D. 48 cm^2

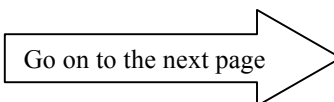
16. The figure shows $\triangle PQR$. Which of the following is correct?

- A. The perimeter of $\triangle PQR$ is greater than $2(PR + QR)$.
 B. The perimeter of $\triangle PQR$ is smaller than $2PR$.
 C. The perimeter of $\triangle PQR$ is smaller than $2QR$.
 D. The perimeter of $\triangle PQR$ is smaller than $2(PQ + QR)$.



17. How many non-negative integral solutions does the inequality $\frac{15 - 2y}{4} \geq 0$ have?

- A. 6 B. 7 C. 8 D. 9



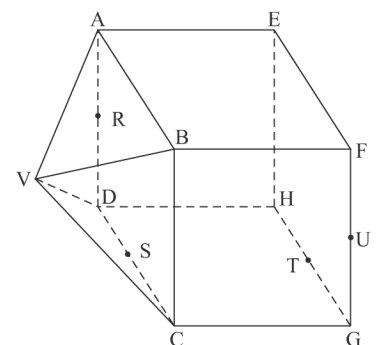
18. If a number is increased by 25% and then decreased by 10%, it becomes 99. Find the number.
A. 72 **B.** 82.5 **C.** 88 **D.** 120
19. Tommy deposits \$5 000 in a bank. If the interest is compounded quarterly at an annual interest rate of 8%, what will be the amount after 1.5 year? (Give the answer correct to the nearest dollar.)
A. \$5 600 **B.** \$5 612 **C.** \$5 624 **D.** \$5 631
20. Refer to the following table:

Progressive rates in the year 2014/15	
Net chargeable income	Tax rate
On the first \$30 000	2%
On the next \$30 000	8%
On the next \$30 000	14%
Remainder	20%

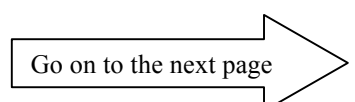
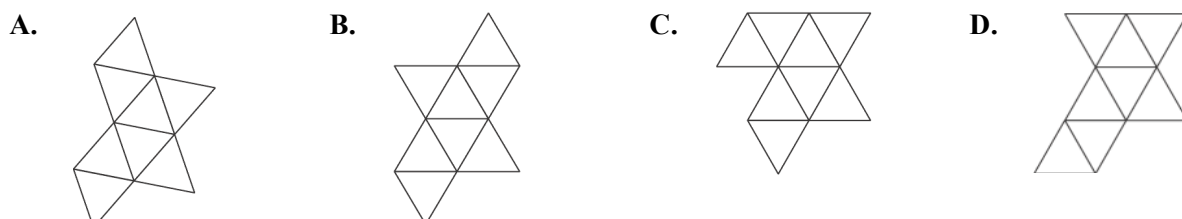
The net chargeable income of William in 2014/15 was \$68 000. Find the salaries tax paid by him.

- A.** \$3 000 **B.** \$4 120 **C.** \$5 920 **D.** \$9 520
21. The annual interest rate of a bank is 5%. Jenny puts two deposits of the same amount in the bank. If the compound interest of one deposit compounded annually for 2 years is \$10 more than the simple interest of the other deposit for 2 years, how much is each deposit?
A. \$600 **B.** \$1 200 **C.** \$4 000 **D.** \$10 000
22. In Brazil, the cost of coffee bean produced in city A is \$0.22/kg and that of coffee bean produced in city B is \$0.31/kg. If the two kinds of coffee beans are mixed to produce a new brand of coffee powder with the expected cost of \$0.29/kg, in what ratio should the two kinds of coffee beans be mixed together?
A. 2 : 5 **B.** 2 : 7 **C.** 2 : 9 **D.** 3 : 4

23. In the figure, the solid is composed of cube ABCDEFGH and regular quadrilateral pyramid VABCD. R, S, T and U are the mid-points of AD, DC, GH and GF respectively. $\angle VRU$ is the angle between plane VAD and
A. plane BCGF. **B.** plane RUGS.
C. plane VFG. **D.** plane ADGF.



24. Which of the following is not the net of a regular octahedron?



25. Suppose letters E , F and V represent the number of edges, faces and vertices of a polyhedron respectively. Which of the following must NOT give a polyhedron?

- A. $E = 36$, $F = 20$, $V = 18$. B. $E = 44$ $F = 26$, $V = 20$.
 C. $E = 18$, $F = 38$, $V = 22$. D. $E = 56$, $F = 32$, $V = 26$.

26. Simon pours a box of drink into a cup of 450 mL. He finds that the empty space in the cup is about $\frac{1}{6}$ of the capacity of the cup. If he pours the box of drink into a bottle of 500 mL, the empty space in the bottle occupies

- A. $\frac{1}{10}$ the capacity of the bottle. B. $\frac{1}{8}$ the capacity of the bottle.
 C. $\frac{1}{4}$ the capacity of the bottle. D. $\frac{1}{2}$ the capacity of the bottle.

27. Find the relationship of the magnitude between the mean, median and mode of 10, 20, 20, 70, 40, 55 and 30.

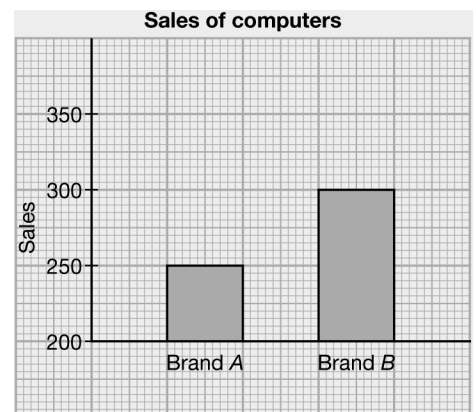
- A. mode = median = mean B. mode < median < mean
 C. mean < median < mode D. median < mode < mean

28. The bar chart shows the sales of two brands of computers.

Which of the following must be true?

- I. The sales of A is less than the sales of B .
 II. The sales of B is double that of the sales of A .
 III. The sales of B is 20% more than the sales of A .

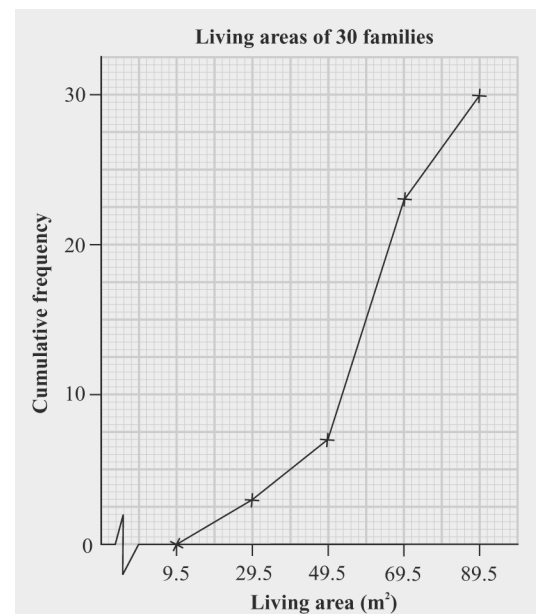
- A. I and II only B. I and III only
 C. II and III only D. I, II and III



29. The figure below shows the cumulative frequency polygon of living areas (in m^2) of 30 families.

Find the median of the living areas.

- A. $40 m^2$
 B. $49.5 m^2$
 C. $59.5 m^2$
 D. “ $49.5 m^2 - 69.5 m^2$ ”



30. Consider the data set:

10, 11, x , 13, y , 17

If the mean is 13 and the median is 12.5, find x and y , where $x \leq y$.

- A. $x = 11, y = 14$. B. $x = 11, y = 16$. C. $x = 12, y = 15$. D. $x = 12, y = 16$.

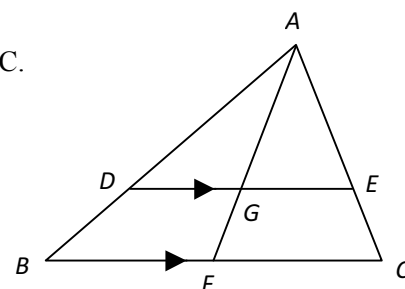
31. If the mean of x, y and z is 16, then the mean of $x - 5, y + 2$ and $z + 4$ is

- A. 16. B. $16\frac{1}{3}$. C. $17\frac{1}{3}$. D. 18.

32. In the figure, DE is parallel to BC and passes through the centroid G of $\triangle ABC$.

If $DE = 4$ cm, then BC is equal to

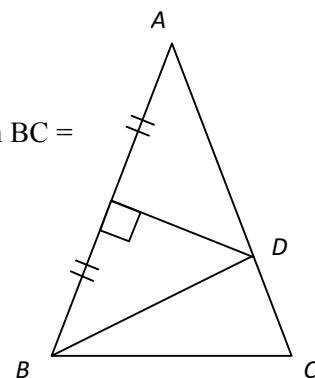
- A. 6 cm.
B. 6.5 cm.
C. 8 cm.
D. 9 cm.



33. AB and AC are the equal sides of the isosceles triangle ABC, and $AB = 10$ cm. The

perpendicular bisector of AB meets AC at D, and the perimeter of $\triangle BCD$ is 17 cm, then $BC =$

- A. 6 cm.
B. 7 cm.
C. 8 cm.
D. 10 cm.



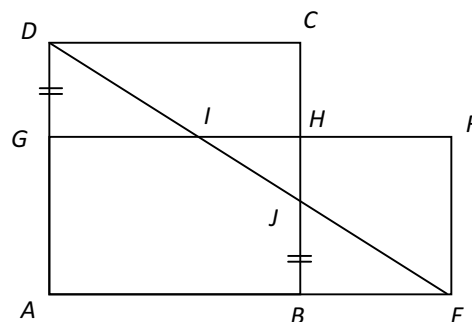
34. If the lengths of two sides of an isosceles triangle are 5 cm and 10 cm respectively, then the length of the remaining side is

- A. 1 cm. B. 5 cm. C. 10 cm. D. 15 cm.

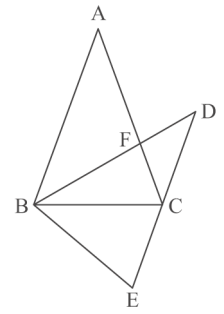
35. In the figure, ABCD is a square and AIEFG is a rectangle. If

$BJ = GD$ and $AB = 2$ cm, find the area of AIEFG.

- A. $2\sqrt{2}$ cm²
B. 4 cm²
C. 8 cm²
D. Cannot be determined



36. In $\triangle ABC$, $AB = AC$ and $\angle A = 40^\circ$. Rotating $\triangle ABC$ about B clockwise, another triangle DBE is obtained, where DCE is a straight line (as shown in the figure). How many isosceles triangles are there in the figure?



- A. 4
B. 5
C. 6
D. 7

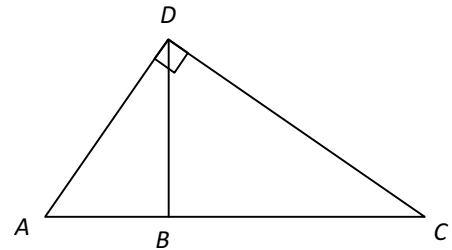
37. In $\triangle ABC$, if D, E and F are the mid-points BC, CA and AB respectively, then the perimeter of the quadrilateral AFDE is

- A. $AD + BC$. B. $AB + AC$. C. $\frac{1}{2}(AB + AC + BC)$. D. $BC + AC$.

38. In the figure, ABC is a straight line, $\angle ADC = 90^\circ$.

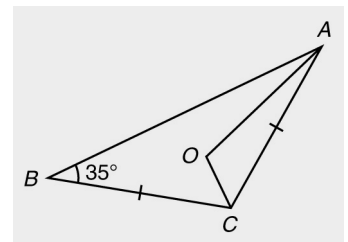
If DB is an altitude of $\triangle ACD$, then

- A. $AD \times DC = AC^2$.
B. $AB \times BD = CD^2$.
C. $AB \times BC = BD^2$.
D. $AD \times BD = BC^2$.



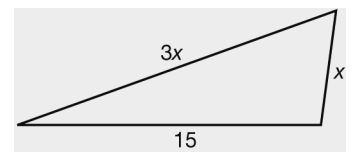
39. In the figure, O is the incentre of $\triangle ABC$. Find $\angle AOC$.

- A. 107.5°
B. 108°
C. 109.5°
D. 110°



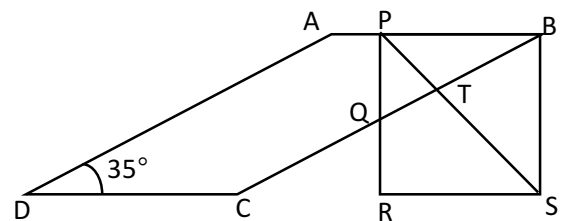
40. In the figure, the sides of a triangle are x , $3x$ and 15. Suppose x is an integer. How many different triangles can be formed?

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



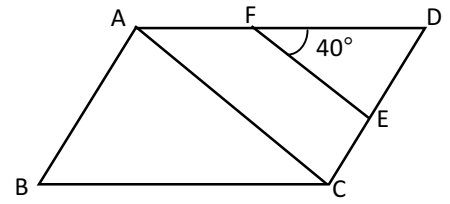
41. In the figure, ABCD is a parallelogram and PBSR is a square. If $\angle ADC = 35^\circ$, then $\angle PTQ =$

- A. 55° .
B. 80° .
C. 90° .
D. 125° .



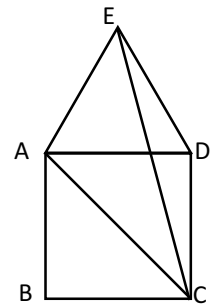
42. In the figure, ABCD is a parallelogram with AB = 6 cm and BC = 9 cm.
If DE = 4 cm, DF = 6 cm and $\angle DFE = 40^\circ$, find $\angle ACB$.

- A. 20°
- B. 30°
- C. 40°
- D. 50°



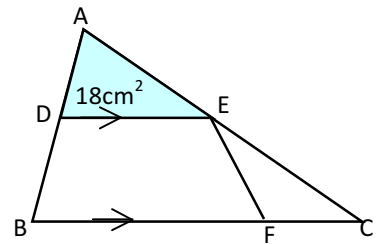
43. In the figure, ABCD is a square and $\triangle ADE$ is an equilateral triangle. Find $\angle ACE$.

- A. 15°
- B. 20°
- C. 25°
- D. 30°



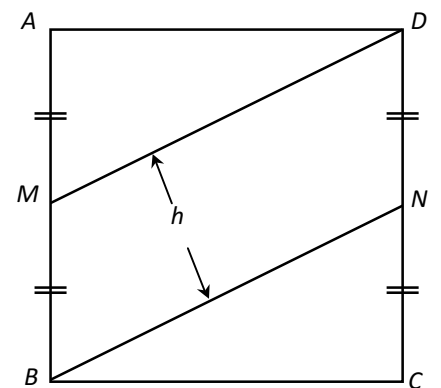
44. In the figure, D is the mid-point of AB, $BF : FC = 2 : 1$ and $DE \parallel BC$.
If the area of $\triangle ADE = 18 \text{ cm}^2$, find the area of the quadrilateral BDEF.

- A. 27 cm^2
- B. 36 cm^2
- C. 42 cm^2
- D. 45 cm^2



45. In the figure, ABCD is a square of side $2a$. M and N are the mid-points of AB and CD respectively. h is the height of the parallelogram MBND. Find h .

- A. $\frac{a}{2}$
- B. $\frac{2a}{\sqrt{5}}$
- C. $\frac{5a}{2\sqrt{5}}$
- D. $\frac{2a}{\sqrt{3}}$



~~~End of Paper~~~