Exam Number			

MID-YEAR EXAMINATION 2015-2016

Form 3 Mathematics Paper 1

Section A, B

Question – Answer Book

Instructions

1. Write your examination number in the spaces provided on this cover page.
2. In this paper, Section A carries 25 marks and Section B carries 35 marks.
3. Attempt ALL questions in the two sections.
4. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.
5. Supplementary answer sheets will be supplied on request. Write your Examination Number on each sheet and put them INSIDE this book.
6. All working must be clearly shown.
7. Unless otherwise specified, numerical answers should be either exact or correct to **3 significant figures**.
8. The diagrams in this paper are not necessarily drawn to scale.
7. Use of HKEAA approved calculator is allowed.

Page No.	Marks
1	(9)
2	(9)
3	(7)
Section A	**(25)**
Page No.	**Marks**
4	(7)
5	(8)
6	(9)
7	(11)
Section B	**(35)**
Supp. Sheet	

Total mark	**(60)**

Section A Foundation Questions [25 marks]

1. Tom's home is 1.8 km from his school. His average walking speed is 1.2 m/s. If he leaves home at 6:30 a.m., when will he arrive at his school? (3 marks)

2. Make n the subject of the formula $T = \dfrac{m+n}{1-mn}$. (3 marks)

3. Simplify $\left(\dfrac{-7a^{-3}}{b^2}\right)^{-2}$ and express your answer with positive indices. (3 marks)

Answers written in the margins will not be marked

Page Total

4. Solve $\begin{cases} 3x + 4y = 6 \\ 2x + 3y = 5 \end{cases}$. (3 marks)

5. Solve the inequality $\frac{2(x+1)}{3} > \frac{-(4-x)}{4}$ and represent the solution graphically.

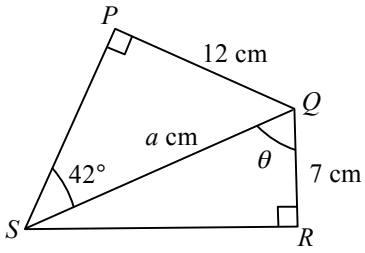
(3 marks)

6. Consider a set of data: 9, 16, 7, 26, 10, 17, 15 and 20
If two data are deleted, the new mean became 15. Find the new median. (3 marks)

Answers written in the margins will not be marked

Page Total

7. In the figure, $\triangle PQS$ and $\triangle QRS$ are two right-angled triangles. Given that PQ = 12 cm, QR = 7 cm and $\angle PSQ = 42°$, find a and θ. (3 marks)



8. The actual weights of 4 students are 48.6 kg, 47.1 kg, 38.9 kg and 42.5 kg. Find the relative error of their mean weight if it is rounded off to the nearest 0.1 kg. (4 marks)

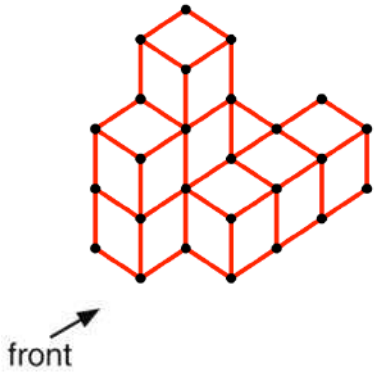
- End of Section A -

Answers written in the margins will not be marked

Page Total

Section B Short Questions [35 marks]

9. Draw the orthographic views of the following solid on grid paper. (3 marks)

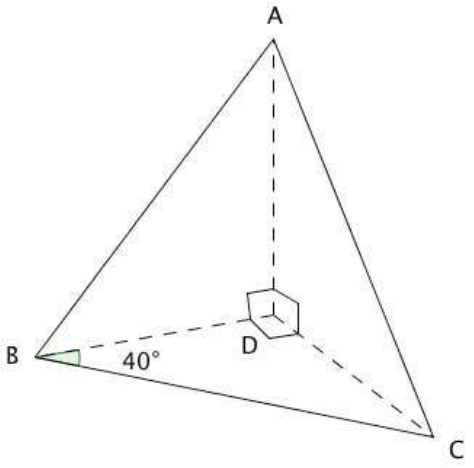


Front View Side View Top View

10. In the figure, $ABCD$ is a triangular pyramid, where

$\angle DBC = 40°$, $BD \perp CD$, $AD \perp BD$ and $AD \perp CD$.

(a) Name the projection of point B on plane ACD.
(b) Name the angle between BC and plane ACD.
(c) Find the angle between BC and plane ACD.
(d) Find the angle between planes BCD and ACD.
(4 marks)

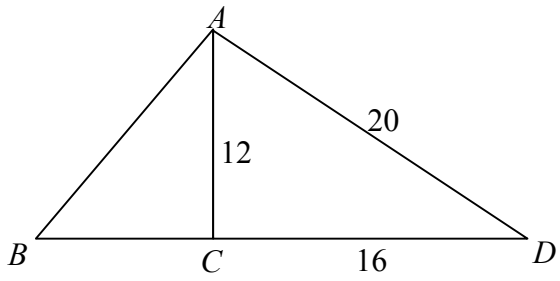


Answers written in the margins will not be marked

Page Total

11. It is given that the length of three line segments are x cm, $4x$ cm and 20 cm, where x is an integer. How many distinct triangles can be formed by the three line segments? (4 marks)

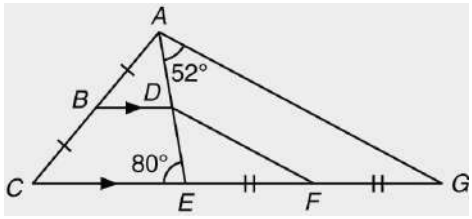
12. Referring to the figure, C is a point on the side BD of $\triangle ABD$, prove that AC is passing through orthocenter of $\triangle ABD$. (4 marks)



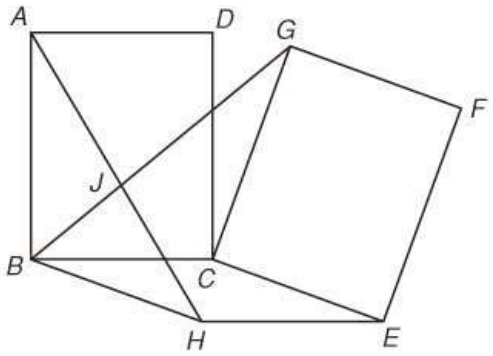
Answers written in the margins will not be marked

Page Total

13. In the figure, *ABC*, *ADE* and *CEFG* are straight lines. Find $\angle DFE$. (4 marks)



14. In the figure, *ABCD* and *GCEF* are two congruent rectangles. *BHEC* is a rhombus. *AH* and *BG* intersect at *J*. Prove that $\triangle ABH \cong \triangle GCB$. (5 marks)



Answers written in the margins will not be marked

Page Total

15. The sum of the squares of three consecutive negative odd integers is 683. Find the three integers. (5 marks)

16. It is given that $M = p^2q^3r^5$. Suppose both p and q are decreased by 25% and then increased by 10%, while r is decreased by 15% and then further decreased by 20%.

    (a) Find the percentage change in the value of M.

    (b) If the original value of M is 0.561^{-6}, express the new value of M in fraction.

(6 marks)

Answers written in the margins will not be marked

Page Total

Answers written in the margins will not be marked

Page Total

Supplementary Answer Sheet

Answers written in the margins will not be marked

- End of Section B -

Page Total

Exam Number			

LA SALLE COLLEGE
MID-YEAR EXAMINATION 2015-2016

Form 3 Mathematics
Paper 1

Section C

Question No.	Marks
1	(8)
2	(10)
3	(12)
4	(10)
Section C	
Total	**(40)**

Question – Answer Book

Instructions

1. Write your examination number in the spaces provided on this cover.
2. The total mark of this section is 40.
3. Attempt ALL questions in this section. Do not write in the margins. Answers written in the margins will not be marked.
4. Supplementary answer sheets will be supplied on request. Write your Examination Number on each sheet and put them INSIDE this book.
5. Unless otherwise specified, all working steps must be clearly shown.
6. Unless otherwise specified, numerical answers should either be exact or correct to 3 significant figures.
7. The diagrams in this paper are not necessarily drawn to scale.

Section C [40 marks]

1. Alan has \$500,000 to invest. He wants to deposit the sum of money in a bank. The interest rate is r% p.a. and the interest is compounded half-yearly.

(a) Given that the interest he will get after 2 years is \$20,300 (in nearest hundred), find the value of r, correct your answer to the nearest integer.

(3 marks)

(b) Alan thinks that the interest rate is very low; he considers buying a flat which costs \$3,500,000. In this case, he has to get a personal loan \$3,000,000 from a bank at 6% p.a. compounded monthly. Suppose that he will not make any repayment for the loan until he sells the flat 2 years after the purchase. Find the total interest he has to pay at the end of 2 years, correct the amount to the nearest hundred.

(2 marks)

Answers written in the margins will not be marked

Page Total

(c) It is expected that the value of the flat will increase by k% after 2 years, where k is an integer. Find the minimum value of k, if Alan wants to gain more by buying the flat than investing the money in the bank in two years time.

(3 marks)

Answers written in the margins will not be marked

Page Total

2. The following is a cumulative frequency polygon showing the salary of 50 employees in a company.

(a) Referring to the above cumulative frequency polygon, complete the following table.

(2 marks)

Staff Rank	A	B	C	D
Monthly Salary (thousand dollars)	11 – 15	16 – 20	21 – 25	26 – 30
Number of employees				

(b) Find the median and mean monthly salaries of these 50 employees. (3 marks)

Answers written in the margins will not be marked

Page Total

(c) The company decides to promote n employees next month. Some of these employees will be promoted from rank A to rank B and the rest will be promoted from rank B to rank C. As a result, the new mean monthly salary will be increased by at most 5%. Find the greatest value of n.

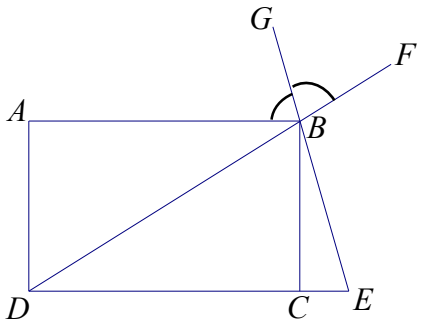
(3 marks)

(d) After the promotion in (c), where n takes the greatest value, the modal class of these 50 employees remains unchanged. If x is the number of employees promoted from rank B to rank C, find the possible values of x.

(2 marks)

Page Total

3. In the figure, $ABCD$ is a rectangle. D, C and E lie on the same straight line. The lines DF and EG intersect at the point B. It is given that EG is the angle bisector of $\angle ABF$.



(a) Prove that $DB = DE$. (3 marks)

(b) Given that $BC = 2x + 3$, $DC = 4x$ and $CE = x$.

(i) Find the value of x. (4 marks)

(ii) Given that DH is the altitude of ΔBDE, prove that $\Delta DHE \sim \Delta BCE$. (2 marks)

(iii) Hence or otherwise, find the length of DH. (3 marks)

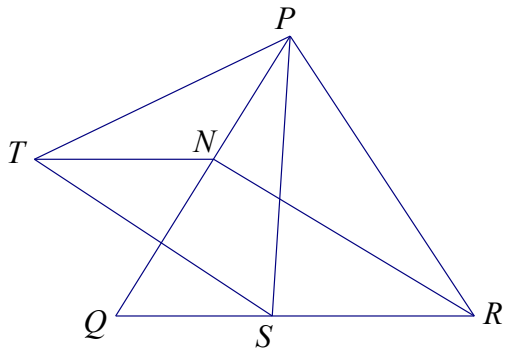
Answers written in the margins will not be marked

Page Total

Answers written in the margins will not be marked

Page Total

4. In the figure, ΔPQR and ΔPTS are equilateral triangles. N and S lie on PQ and QR respectively such that $NQ = SR$.



(a) (i) Prove that $\Delta NQR \cong \Delta SRP$. (3 marks)

(ii) Hence, deduce that $NR = TS$. (2 marks)

Answers written in the margins will not be marked

Page Total

(b) Prove that $\angle TSQ = \angle SPR$. (2 marks)

(c) Using the above results or otherwise, prove that *TNRS* is a parallelogram. (3 marks)

Answers written in the margins will not be marked

Page Total

Supplementary Answer Sheet

- End of Section C -

Answers written in the margins will not be marked

Page Total

La Salle College
Mid-year Exam 2015-2016
Mathematics
Suggested Answer

Paper I

Section A

1. Time taken $= \dfrac{1.8\times 1000}{1.2}$ sec

$= 1500$ sec

$= 25$ min

$\therefore$ Tom will arrive school at 6:55 a.m.

2. $T = \dfrac{m+n}{1-mn}$

$T - Tmn = m + n$

$T - m = n + Tmn$

$T - m = n(1 + Tm)$

$n = \dfrac{T-m}{1+Tm}$

3. $\left(\dfrac{-7a^{-3}}{b^2}\right)^{-2} = \left(\dfrac{-7}{b^2a^3}\right)^{-2}$

$= \left(\dfrac{b^2a^3}{-7}\right)^{2}$

$= \dfrac{b^4a^6}{49}$

4. $\begin{cases} 3x+4y=6 \\ 2x+3y=5 \end{cases}$

$\begin{cases} 6x+8y=12 \\ 6x+9y=15 \end{cases}$

$(6x+9y)-(6x+8y) = 15-12$

$\therefore \quad y = 3$

$2x + 3(3) = 5$

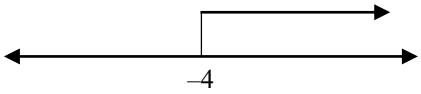
$\therefore \quad x = -2$

5. $\dfrac{2(x+1)}{3} > \dfrac{-(4-x)}{4}$

$8x + 8 > 3x - 12$

$5x > -20$

$x > -4$



6. Original mean $= \dfrac{9+16+7+26+10+17+15+20}{8} = 15$

New mean $= 15$ (given)

$\therefore$ The sum of the two data deleted $= 15 \times 2 = 30$

$\therefore$ 10 and 20 are deleted

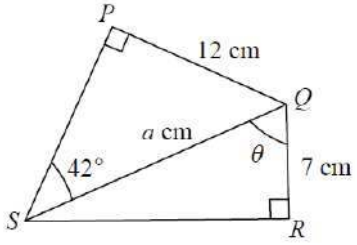
Data left: 7, 9, 15, 16, 17, 26

$\therefore$ The new median $= \dfrac{15+16}{2} = 15.5$

7. $a = \dfrac{12}{\sin 42°} \approx 17.9$

$\cos\theta = \dfrac{7}{17.934}$

$\theta \approx 67.0°$



8. Actual weights: 48.6 kg, 47.1 kg, 38.9 kg, 42.5 kg

Actual mean $= \dfrac{48.6+47.1+38.9+42.5}{4} = 44.275$ kg

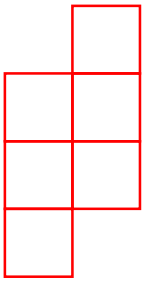
Rounded mean $= 44.3$ kg (rounded off to the nearest 0.1 kg)

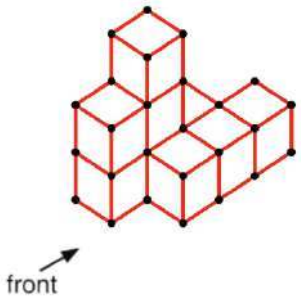
Relative error $= \dfrac{44.3-44.275}{44.275} \times 100\% = 0.0565\%$

Section B

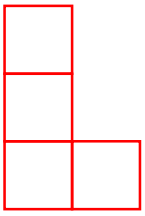
9.

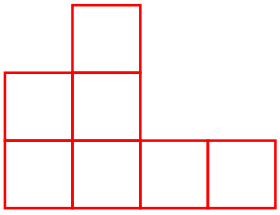
Top view





Front view





Right view

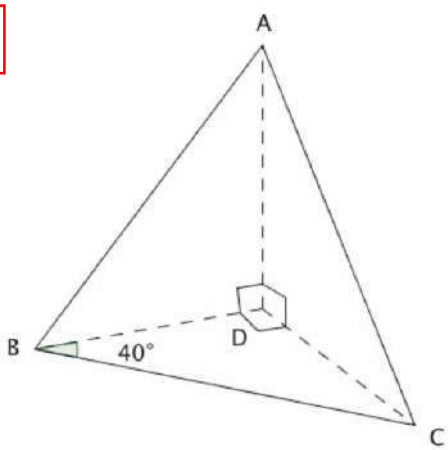
10. (a) The projection of point B on plane ACD is D.

(b) The angle between BC and plane ACD is $\angle BCD$.

(c) $\angle BCD = 180° - 90° - 40° = 50°$

(d) The angle between planes BCD and ACD is $\angle ADB$.

$\angle ADB = 90°$



11. By Triangular Inequality, $x+4x>20$ and $x+20>4x$ and $4x+20>x$.

$\therefore\ x>4$ and $x<\dfrac{20}{3}$

$\therefore\ 4<x<6\dfrac{2}{3}$

$x=5$ or $x=6$

$\therefore$ Two distinct triangles can be formed.

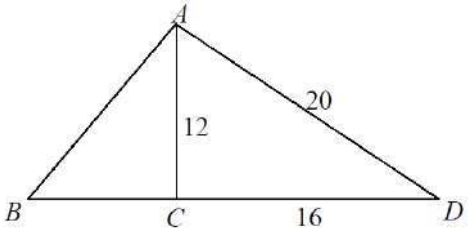
12. $AD^2=20^2=400$

$AC^2+CD^2=12^2+16^2=400$

$\therefore\ AD^2=AC^2+CD^2$

$\therefore\ \angle ACD=90°$ (Inverse of Pyth. Thm.)

$\therefore$ AC is passing through orthocenter of ΔABD.



13. $AB=BC$ and $BD\,//\,CE$ (given)

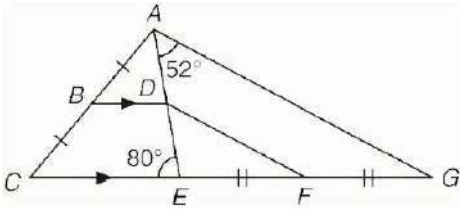
$\therefore\ AD=DE$ (Intercept Thm.)

$AD=DE$ and $EF=FG$

$\therefore\ DF\,//\,AG$ (Mid-point Thm.)

$\therefore\ \angle FDE=\angle GAE=52°$ (Corres. $\angle$s, $DF\,//\,AG$)

$\therefore\ \angle DFE=\angle DEC-\angle FDE=80°-52°=28°$



14. $ABCD\cong GCEF$ (given)

$\therefore\ AB=GC$ (Rectangle properties)

$\angle ABC=\angle DCB=\angle GCE=90°$ (Rectangle properties)

$\angle BCE+\angle GCE+\angle GCD+\angle DCB=360°$ ($\angle$s at a point)

$\therefore\ \angle BCE=180°-\angle GCD$

$\angle BCE=180°-\angle CBH$ (int. $\angle$s, $BH\,//\,CE$)

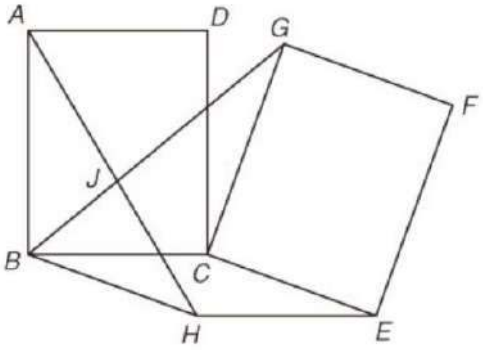
$\therefore\ \angle CBH=\angle GCD$

$\angle CBH+\angle ABC=\angle GCD+\angle DCB$

$\angle ABH=\angle GCB$

$BH=CB$ (Rhombus properties)

$\therefore\ \Delta CBH\cong\Delta GCD$ (SAS)



15. Let the three consecutive negative odd integers be $n-2$, n and $n+2$.

$(n-2)^2+n^2+(n+2)^2=683$ (given)

$n^2-4n+4+n^2+n^2+4n+4=683$

$3n^2=675$

$n^2=225$

$n=15$ (rejected) or $n=-15$

$\therefore$ The three consecutive negative odd integers are –17, –15 and –13

16. (a) Let M_1, p_1, q_1, r_1 be the initial value.

Let M_2, p_2, q_2, r_2 be the intermediate value.

Let M_3, p_3, q_3, r_3 be the final value.

$\therefore$ $M_1 = p_1^{\,2} q_1^{\,3} r_1^{\,5}$ and $M_2 = p_2^{\,2} q_2^{\,3} r_2^{\,5}$ and $M_3 = p_3^{\,2} q_3^{\,3} r_3^{\,5}$

$$\frac{M_2}{M_1} = \frac{p_2^{\,2} q_2^{\,3} r_2^{\,5}}{p_1^{\,2} q_1^{\,3} r_1^{\,5}} \quad \text{and} \quad \frac{M_3}{M_2} = \frac{p_3^{\,2} q_3^{\,3} r_3^{\,5}}{p_2^{\,2} q_2^{\,3} r_2^{\,5}}$$

$$\frac{M_2}{M_1} = \left(\frac{p_2}{p_1}\right)^2 \left(\frac{q_2}{q_1}\right)^3 \left(\frac{r_2}{r_1}\right)^5 \quad \text{and} \quad \frac{M_3}{M_2} = \left(\frac{p_3}{p_2}\right)^2 \left(\frac{q_3}{q_2}\right)^3 \left(\frac{r_3}{r_2}\right)^5$$

$$\frac{M_2}{M_1} = (1-25\%)^2 (1-25\%)^3 (1-15\%)^5 \quad \text{and} \quad \frac{M_3}{M_2} = (1+10\%)^2 (1+10\%)^3 (1-20\%)^5$$

$$\frac{M_2}{M_1} = \left(\frac{51}{80}\right)^5 \approx 0.1053 \quad \text{and} \quad \frac{M_3}{M_2} = \left(\frac{22}{25}\right)^5 \approx 0.5277$$

$$\frac{M_2}{M_1} = 1 - 89.47\% \quad \text{and} \quad \frac{M_3}{M_2} = 1 - 47.23\%$$

$\therefore$ M is decreased by 89.47% and then further decreased by 47.23%.

$$\frac{M_3}{M_1} = \left(\frac{51}{80}\right)^5 \times \left(\frac{22}{25}\right)^5 = 0.561^5 \approx 0.0556 = 1 - 94.44\%$$

$\therefore$ M is decreased by 94.44% finally.

(b) If the original value is 0.561^{-6}, then the new value is $M_3 = 0.561^{-6} \times 0.561^5 = 0.561^{-1} \approx 1.783$.

Section C

1. (a) $\text{Compound interest} = \$500000 \times \left(1 + \frac{r\%}{2}\right)^4 - \$500000 = \$20300$ (given)

$$\left(1 + \frac{r\%}{2}\right)^4 = \frac{520300}{500000}$$

$$1 + \frac{r\%}{2} = 1.01$$

$$r = 2$$

(b) $\text{Interest has to pay} = \$3000000 \times \left(1 + \frac{6\%}{12}\right)^{24} - \$3000000 \approx \$381500$.

(c) If Alan wants to gain more by buying the flat than investing the money in the bank, then

$$\$3500000 \times k\% > \$381500 + \$20300$$

$$k\% > \frac{401800}{3500000}$$

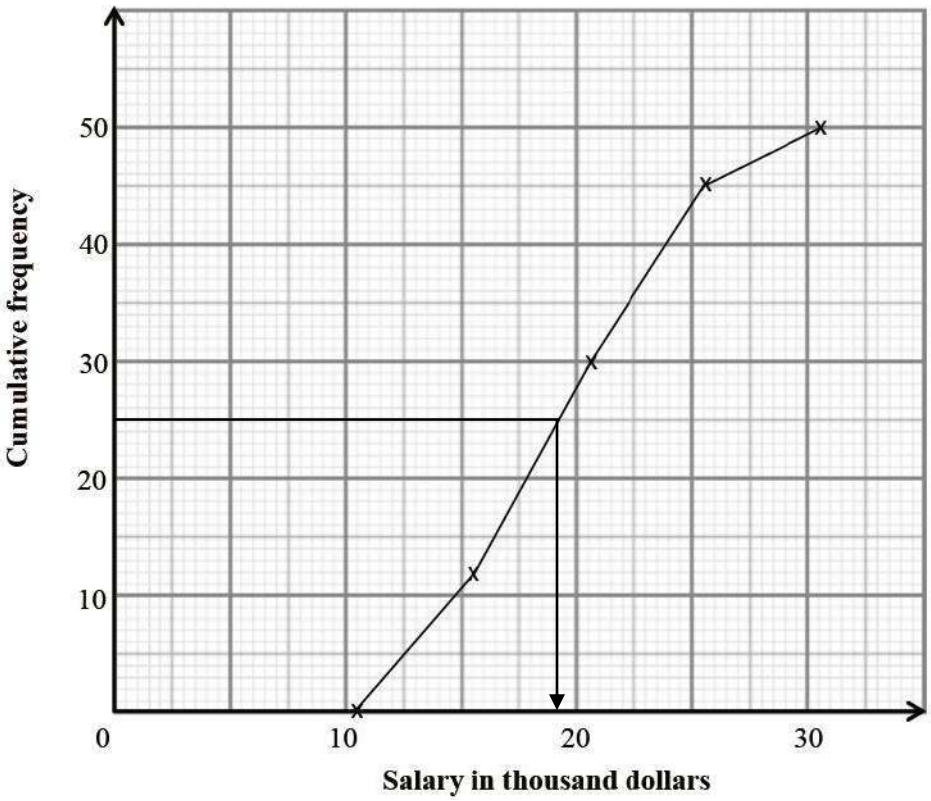
$$k > 11.48$$

$\therefore$ The minimum value of k is 12.

2. (a)

Staff Rank	A	B	C	D
Monthly Salary (thousand dollars)	11 – 15	16 – 20	21 – 25	26 – 30
Number of employees	12	18	15	5

(b)



$\text{median} = 19$ thousand dollars

$\text{mean} = \dfrac{13\times12+18\times18+23\times15+28\times5}{50} = 19.3$ thousand dollars

(c) The mean monthly salary is increased by at most 5%. (given)

The sum of monthly salaries is also increased by at most 5%.

Total of salaries increased $\le 19.3\times50\times5\% = 48.25$ thousand dollars.

No matter the staff is promoted from rank A to rank B or from rank B to rank C, his salary will be increased 5 thousand dollars in average. Therefore, less than 10 staff can be promoted.

$\therefore$ The greatest value of n is 9.

(d) The original modal class is rank B.

To make the modal class unchanged, $x = 1, 2, 3, 4, 5$

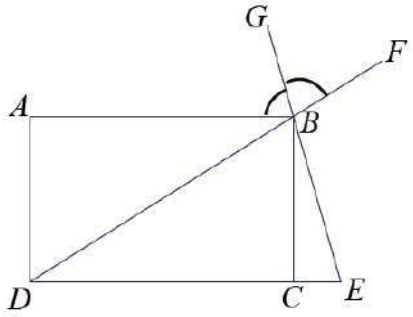
3. (a) $\angle GBF = \angle GBA$ (given)

$\angle BED = \angle GBA$ (corr. $\angle$s, AB // DE)

$\angle DBE = \angle GBF$ (vert. opp. $\angle$s)

$\therefore\ \angle DBE = \angle BED$

$\therefore\ DB = DE$ (sides opp. equal $\angle$s)



(b) (i) $\angle BCD = 90°$ (Rectangle properties)

$DB = DE$ (by (a))

$DB^2 = DE^2$

$BC^2 + CD^2 = (DC + CE)^2$

$(2x+3)^2 + (4x)^2 = (4x + x)^2$

$5x^2 - 12x - 9 = 0$

$x = \dfrac{-3}{5}$ (rejected) or $x = 3$

(ii) $\angle DHE = 90°$ (given)

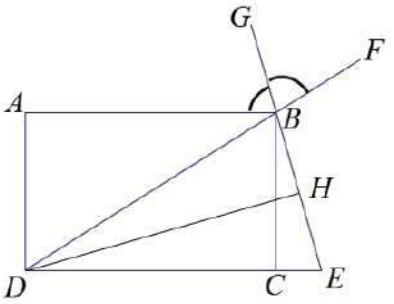
$\angle BCD = 90°$ (Rectangle properties)

$\angle BCE = 180° - \angle BCD = 90°$ (adj. $\angle$s on st. line)

$\therefore\ \angle DHE = \angle BCE$

$\angle DEH = \angle BEC$ (common $\angle$)

$\therefore\ \Delta DHE \sim \Delta BCE$ (AA)



(iii) $\dfrac{EH}{DE} = \dfrac{EC}{BE}$ (corr. $\angle$s, ~Δs)

$\dfrac{EH}{15} = \dfrac{3}{2EH}$ (ΔDBE is iso.)

$2EH^2 = 45$

$DH^2 = DE^2 - EH^2 = 15^2 - \dfrac{45}{2}$ (Pyth.Thm.)

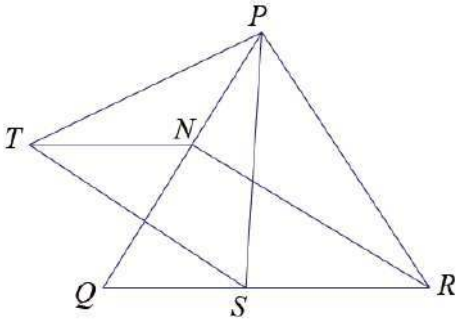
$DH \approx 14.2$

4. (a) (i) $NQ = SR$ (given)

$\angle NQR = \angle SRP = 60°$ (Eq. Δ propeties)

$QR = RP$ (Eq. Δ propeties)

$\therefore\ \Delta NQR \cong \Delta SRP$ (SAS)



(ii) $SP = TS$ (Eq. Δ propeties)

$NR = SP$ (corr. side, cong. Δs)

$\therefore\ NR = TS$

(b) $\angle PSQ = \angle TSQ + \angle PST$

$\angle PSQ = \angle SPR + \angle PRS$ (Δ ext. $\angle$)

$\therefore\ \angle TSQ + 60° = \angle SPR + 60°$ (Eq. Δ propeties)

$\angle TSQ = \angle SPR$

(c) $\angle NRQ = \angle SPR$ (by (a)(i))

$\therefore\ \angle NRQ = \angle TSQ$ (by (b))

$\therefore\ NR$ // TS (same corr. $\angle$s)

$NR = TS$ (proved)

$\therefore\ TNRS$ is a parallelogram. (two sides equal and parallel)

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. $m^{x-y} = m^x \div m^y$

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. $\frac{2}{3}$

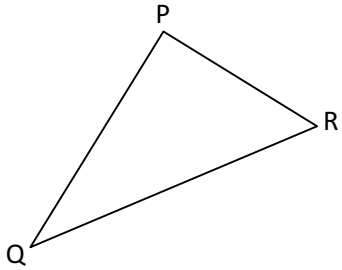
IV. 2

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 ΔPQR. Which of the following is correct?



A. The perimeter of ΔPQR is greater than 2(PR + QR).
B. The perimeter of ΔPQR is smaller than 2PR.
C. The perimeter of ΔPQR is smaller than 2QR.
D. The perimeter of ΔPQR 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

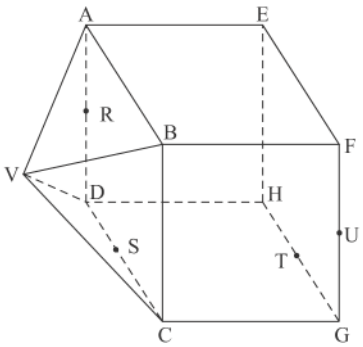
21. The annual interest rate of a bank is 5%. Jenny puts two deposits of the same amount in the bank. If the compound interest of one deposit compounded annually for 2 years is $10 more than the simple interest of the other deposit for 2 years, how much is each deposit?

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

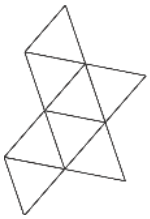
23. In the figure, the solid is composed of cube ABCDEFGH and regular quadrilateral pyramid VABCD. R, S, T and U are the mid-points of AD, DC, GH and GF respectively. ∠VRU is the angle between plane VAD and

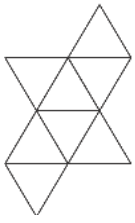


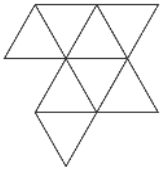
A. plane BCGF. **B.** plane RUGS.

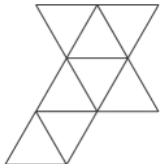
C. plane VFG. **D.** plane ADGF.

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

A. 

B. 

C. 

D. 

Go on to the next page

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. $E = 36,\quad F = 20,\quad V = 18.$ **B**. $E = 44\quad F = 26,\quad V = 20.$

C. $E = 18,\quad F = 38,\quad V = 22.$ **D**. $E = 56,\quad F = 32,\quad V = 26.$

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.

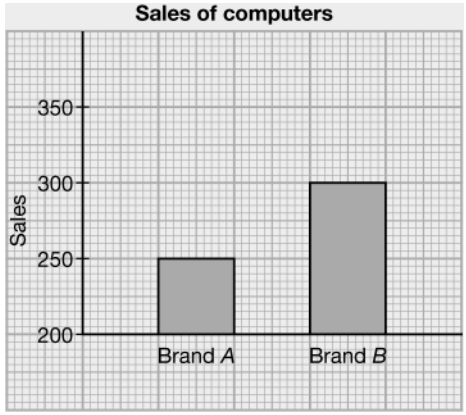
C. $\frac{1}{4}$ the capacity of the bottle. **D.** $\frac{1}{2}$ the capacity of the bottle.

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.

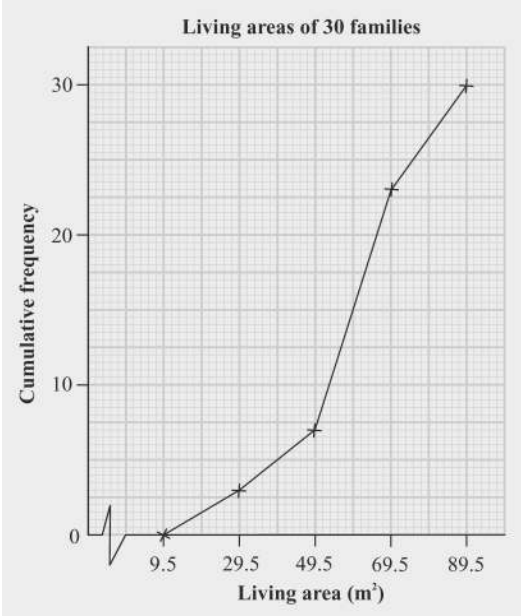
II. The sales of B is double that of the sales of A.

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

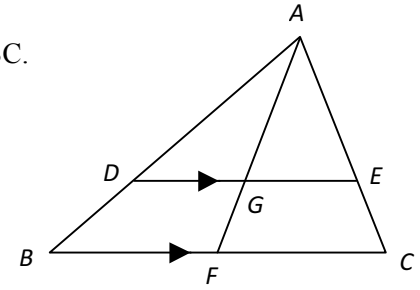
If the mean is 13 and the median is 12.5, find x and y, where $x \leq y$.

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 ΔABC. If DE = 4 cm, then BC is equal to



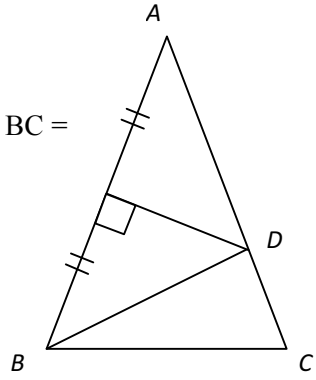
A. 6 cm.

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 ΔBCD is 17 cm, then BC =



A. 6 cm.

B. 7 cm.

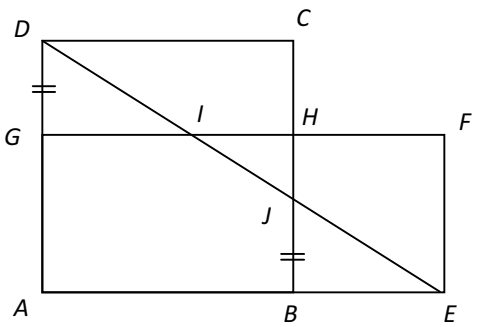
C. 8 cm.

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 AEFG is a rectangle. If BJ = GD and AB = 2 cm, find the area of AEFG.



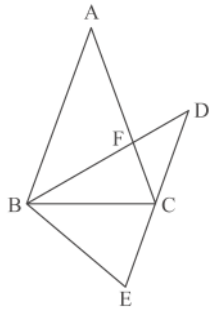
A. $2\sqrt{2}$ cm^2

B. 4 cm^2

C. 8 cm^2

D. Cannot be determined

36. In ΔABC, $AB = AC$ and $\angle A = 40^\circ$. Rotating ΔABC 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

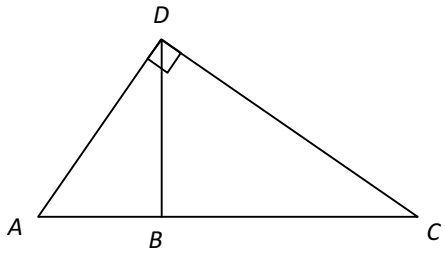
C. 6

D. 7

37. In ΔABC, 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, $\angle ADC = 90°$.
If DB is an altitude of $\triangle ACD$, then



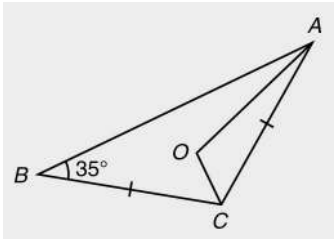
A. $AD \times DC = AC^2$.

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 $\angle AOC$.



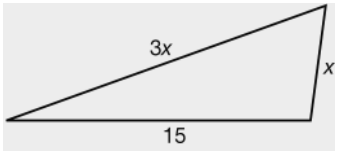
A. 107.5°

B. 108°

C. 109.5°

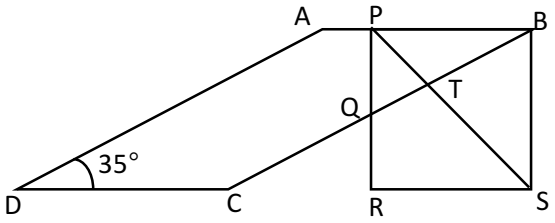
D. 110°

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 $\angle ADC = 35°$, then $\angle PTQ =$



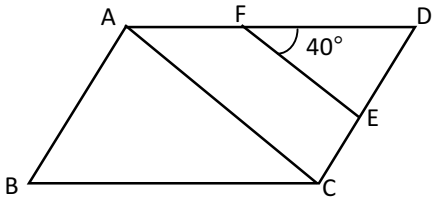
A. 55°.

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 ∠DFE = 40°, find ∠ACB.



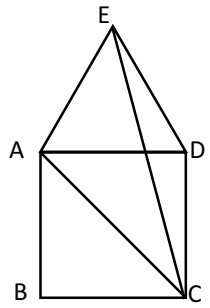
A. 20°

B. 30°

C. 40°

D. 50°

43. In the figure, ABCD is a square and ΔADE is an equilateral triangle. Find ∠ACE.



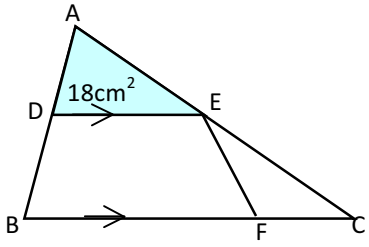
A. 15°

B. 20°

C. 25°

D. 30°

44. In the figure, D is the mid-point of AB, BF : FC = 2 : 1 and DE // BC. If the area of ΔADE = 18 cm^2, find the area of the quadrilateral BDEF.



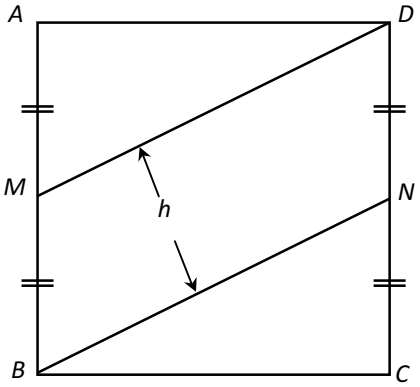
A. 27 cm^2

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~~~

Paper II

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	B	A	B	D	C	B	D	D	B	D	B	B	B	A	B

Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	D	C	C	D	B	C	B	D	C	C	C	B	B	C	C

Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	B	A	B	C	B	B	B	C	A	B	B	C	D	C	B