Queen's College

Yearly Examination 2019 – 2020

MATHEMATICS

Secondary 2 **Date: July 2, 2020**

Time: 08:30 – 10:00

SECTION A(1)

(MULTIPLE-CHOICE QUESTIONS)

GENERAL INSTRUCTIONS

1. There are **THREE** sections, A(1), A(2) and B, in this paper. Section A(1) carries 20 marks, Section A(2) carries 20 marks and Section B carries 60 marks.
2. Section A(1) consists of multiple-choice questions in this question paper, while Section A(2) and Section B contain conventional questions printed separately in Question-Answer Book.
3. Answers to Section A(1) should be marked on the Multiple-choice Answer Sheet while answers to Sections A(2) and B should be written in the spaces provided in Question-Answer Book. **The Answer Sheet for Section A(1) and the Question-Answer Book for Sections A(2) and B will be collected separately at the end of the examination.**

INSTRUCTIONS FOR SECTION A(1) (MULTIPLE-CHOICE QUESTIONS)

1. Mark your answers for this section on the Multiple-choice Answer Sheet provided. Read the instructions on the Answer Sheet carefully. Write the subject name, your class and class number in the space provided. Shade the corresponding boxes of your class and class number.
2. When told to open this book, you should check that all the questions are there. Look for the words **'END OF SECTION A(1)'** after the last question.
3. This section carries 20 marks. All questions carry equal marks.
4. **Answer ALL questions.** You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answer clearly; otherwise you will receive no marks if the answers cannot be captured.
5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.
6. **The diagrams in this paper are not necessarily drawn to scale.**

Choose the best answer for each question.

1. The selling price of a bar of chocolate is \$12.8. If the price is rounded off correct to the nearest dollar, then what will be the percentage error of the price?

   A. 0.769 23% (cor. to 5 sig. fig.)

   B. 0.781 25%

   C. 1.5385% (cor. to 5 sig. fig.)

   D. 1.5625%

2. Consider a polynomial $x^2y - 2x + 5$ where x and y are variables. If a is the degree of the polynomial and b is the coefficient of x, then

   A. $a + b = 0$.

   B. $a + b = 1$.

   C. $a + b = 4$.

   D. $a + b = 5$.

3. Which of the following is an identity?

   A. $-(7 - u)^2 = (-7 + u)^2$

   B. $4^2 - x^2 = (-x + 4)(x + 4)$

   C. $(-5)^2 - w^2 = -(5^2 + w^2)$

   D. $-(6 + v)^2 = (6 - v)^2$

4. Make c the subject of the formula $\frac{c}{v} = \frac{1}{u} + c$.

   A. $c = \frac{v}{u(1-v)}$

   B. $c = \frac{v}{u(v-1)}$

   C. $c = \frac{v(v-1)}{u}$

   D. $c = \frac{v(1-v)}{u}$

5. If $\begin{cases} 2x+2y-1=0 \\ 9x-13y-10=0 \end{cases}$, then $x-y=$

A. 1.

B. 0.

C. –1.

D. –2.

6. Let $\sqrt{3}=a$ and $\sqrt{5}=b$. Express $\sqrt{45}+\sqrt{240}$ in terms of a and b.

A. $b(3+4a)$

B. $7ab$

C. $b(9+4a)$

D. $b(3+16b)$

7. In a frequency distribution table, if the class boundaries of the 4th class are 55.5 and 65.5, then

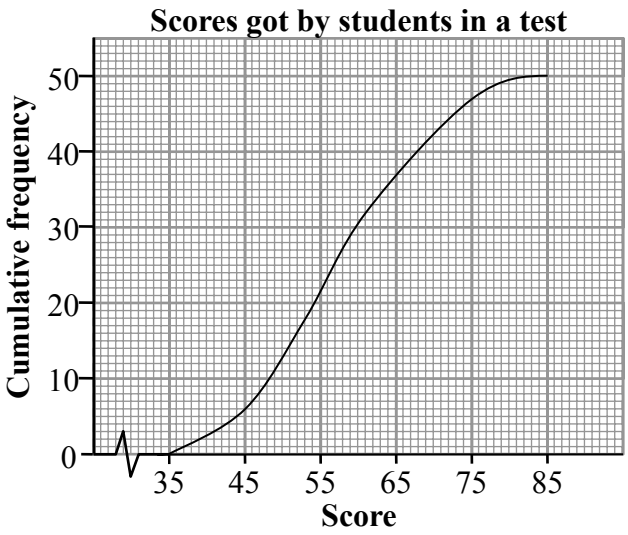
A. the class width is 10.

B. the class mark of the 4th class is 60.

C. the lower class limit of the 4th class is 55.

D. the upper class limit of the 4th class is 66.

8. The cumulative frequency curve below shows the scores got by students in a test.



The passing rate of the test is 36%. Among the students who pass the test, Cindy gets the lowest score. Find Cindy's lowest possible score.

A. 18

B. 32

C. 53

D. 61

9. John drives at a speed of 50 km/h for x hours and then at a speed of 60 km/h for y hours. If the average speed of the whole journey is 56 km/h, find $x : y$.

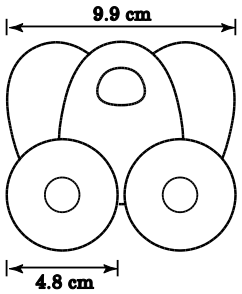
A. 2 : 3

B. 3 : 2

C. 3 : 4

D. 4 : 3

10. In the scale drawing shown, the length of the pumpkin cart is 9.9 cm and the diameter of its wheel is 4.8 cm. If the actual length of the cart is 3.3 m, find the actual diameter of the wheel.



A. 1.04 m

B. 1.4 m

C. 1.6 m

D. 1.8 m

11. The size of each interior angle of a regular n-sided polygon is 14 times the size of each exterior angle of the polygon. Find the value of n.

A. 16

B. 18

C. 24

D. 30

12. Which of the following polygons **cannot** tessellate a plane?

A. Equilateral triangle

B. Regular pentagon

C. Regular hexagon

D. Parallelogram

13. According to the following statements,

(i) Any parallelogram has two pairs of equal opposite sides.

(ii) Any rhombus is a parallelogram.

which of the following conclusions can be drawn from the above two statements using the deductive approach?

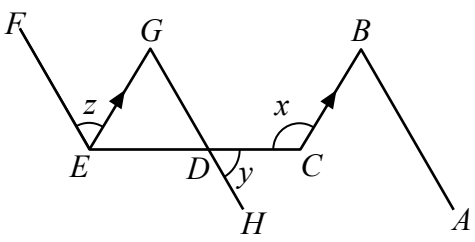
A. Any rhombus has four equal sides.

B. Any parallelogram is a rhombus.

C. Any rhombus has two pairs of equal opposite sides.

D. Any quadrilateral with two pairs of equal opposite sides is a rhombus.

14. In the figure, EDC and GDH are straight lines. It is given that $x = y + z$. Which of the following is/are true?



I. $GH \parallel FE$

II. $\triangle GED$ is an isosceles triangle.

III. If $BA \parallel FE$, then $\angle ABC = z$.

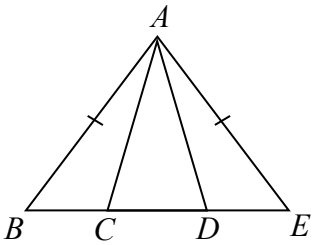
A. I only

B. I and II only

C. I and III only

D. II and III only

15. In the figure, $BCDE$ is a straight line. It is given that $AB = AE$ and $\angle BAC = \angle EAD$.



Which of the following must be true?

I. $\triangle ACD$ is an isosceles triangle.

II. $\angle ACB = \angle ADE$

III. $\triangle ABD \cong \triangle AEC$

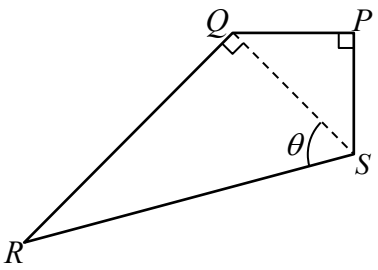
A. I only

B. I and II only

C. II and III only

D. I, II and III

16. In the figure, $PQ = PS = 1$ cm and $QR = 2\sqrt{2}$ cm. Find θ, correct to the nearest degree.



A. 27°

B. 45°

C. 60°

D. 63°

17. Simplify $\dfrac{1+\sin\theta}{1-\sin\theta} - \dfrac{1-\sin\theta}{1+\sin\theta}$.

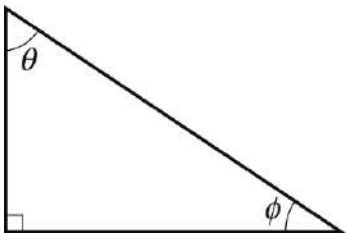
A. $\dfrac{\sin\theta}{2}$

B. $\dfrac{4\tan\theta}{\cos\theta}$

C. 0

D. 1

18. In the figure, $\sin^2 \theta + \cos^2 \phi =$



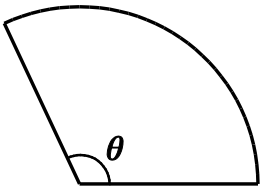
A. 1.

B. $2 \sin^2 \theta$.

C. $2 \sin^2 \phi$.

D. $1 + 2 \cos^2 \phi$.

19. The perimeter of the sector as shown in the figure is 4 times its radius. Find θ.



A. $\frac{180°}{\pi}$

B. 90°

C. $\frac{360°}{\pi}$

D. 120°

20. **Fig. A** shows a cylinder whose height is equal to its base diameter. It is cut into two cylinders as shown in **Fig. B**. Find the percentage increase in the total surface area.

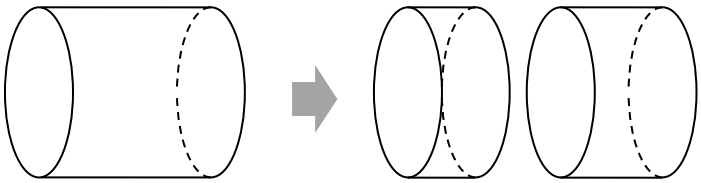


Fig. A **Fig. B**

A. $16\frac{2}{3}\%$

B. 25%

C. $33\frac{1}{3}\%$

D. 50%

END OF SECTION A(1)

ROUGH WORK SHEET

Queen's College
Yearly Examination 2019 – 2020
MATHEMATICS

Secondary 2

SECTION A(1) (MULTIPLE-CHOICE)

ANSWER KEY

1.	D	11.	D
2.	B	12.	B
3.	B	13.	C
4.	A	14.	C
5.	A	15.	D
6.	A	16.	D
7.	A	17.	B
8.	D	18.	B
9.	A	19.	C
10.	C	20.	C

QUEEN'S COLLEGE

Yearly Examination, 2019-2020

MATHEMATICS

Section A(2) and Section B

Question-Answer Book

Secondary 2

Date: July 2, 2020
Time: 08:30 – 10:00

INSTRUCTIONS FOR SECTION A(2) and SECTION B:

1. Write your class and class number in the spaces provided on this cover.
2. This Question-Answer Book consists of TWO sections A(2) and B. Section A(2) carries 20 marks. Section B carries 60 marks.
3. Attempts ALL questions in this paper. Write your answer in the spaces provided in this Question-Answer Book. Do not write in the margins.
4. Supplementary answer sheets will be supplied on request. Write your class and class number on each sheet and put them inside this book.
5. Unless otherwise specified, all working must be clearly shown.
6. Unless otherwise specified, numerical answers should be exact or correct to 3 significant figures.
7. The diagrams in this paper are not necessarily drawn to scale.

Class	2
Class Number	

	Teacher's Use Only	
	Max. Mark	Marks
Section A(2) Question No.	20	
1 – 11	13	
12 – 15	7	
Section B Question No.	60	
16	6	
17	6	
18	7	
19	9	
20	10	
21	10	
22	12	
Total	80	

SECTION A(2) **(20 marks)**

In this section, write the answers in the spaces provided. **NO working step** is required.

Answer

1. Simplify $\dfrac{(2xy)^3}{x^2y^4}$. **1.** _____ (1)

2. Simplify $\dfrac{a}{a-1}-\dfrac{1}{a+1}$. **2.** _____ (1)

3. If $a+b=10$ and $4a+3b=20$, find the value of $\dfrac{a}{b}$. **3.** $\dfrac{a}{b}=$ _____ (1)

4. If $(2x-5)^2-(Ax-B)\equiv Cx^2-5x-2$, find the values of A and B. **4.** $A=$ _____ (1)

$B=$ _____ (1)

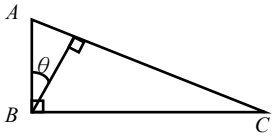
5. The interior angles of a hexagon are $2x°$, $(x-1)°$, $(3x-3)°$, $(4x-16)°$, $(3x+20)°$ and $3x°$.

(a) Find x. **5.** **(a)** $x=$ _____ (1)

(b) Find the smallest exterior angle of the hexagon. **(b)** _____ (1)

6. Find the greatest value of $\dfrac{2\sin^2\theta+2\cos^2\theta}{\cos\theta+1}$, where $0°\le\theta\le 90°$. **6.** _____ (1)

7. In the figure, $BC = 36$ and $AB = 20$. Find θ.



7. $\theta=$ _____ (1)

8. Let a, b and c be non-zero numbers. If $3a = 4b$ and $3b = 5c$, find $a : b : c$. **8.** _____ (1)

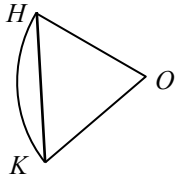
9. The actual circumference of a circular pond is 48π m. If the radius of pond on a plan is 4 cm, find the scale of the plan. **9.** _____ (1)

10. The angle of a sector is 100° and its area is 360π cm^2. Find its radius. **10.** _____ (1)

11. A cylindrical pot of internal diameter 260 mm contains some water. If 100 identical solid sphereical metals with volume $\frac{32\pi}{3}\text{cm}^3$ each are totally immersed in the water, find the rise in water level correct to 1 decimal place.

11. _____ (1)

12. Given OHK is a sector and $OH = HK$. If $\overset{\frown}{HK} = 2\pi$ cm, find the area of the sector.
(*Give the answer in terms of π.*)



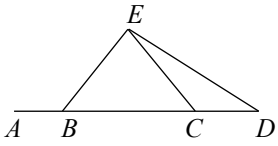
12. _____ (1)

13. Refer to the figure, if $BC = BE$, $CE = CD$ and $\angle ABE = 120°$,

(a) use appropriate symbols and mark the above information in the figure;

(b) find $\angle EDC$.

13. (a)



_____ (1)

(b) _____ (1)

14. Given $\cos Y = \frac{b}{29}$, where $0° \le Y \le 90°$,

(a) express $\sin Y$ in terms of b.

(b) If $b = 21$, find the exact value of tan Y.

14.

(a) _____ (1)

(b) _____ (1)

15. Given ΔXYZ is a right-angled triangle. If $XY = \sqrt{23}$ cm and $YZ = 6$ cm. Find all possible lengths of XZ.
(Leave the radical sign " $\sqrt{\ }$ " in the answer if necessary.)

15.

_____ (2)

End of Section A(2)

Section B: **(60 marks)**

In this section, working steps must be clearly shown.

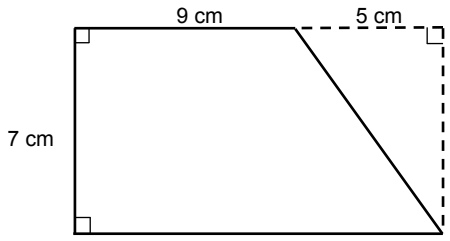
16. (a) Expand $(2x-3)(2x+3)$ and $(5x+2)(2x-3)$. (3 marks)

(b) Hence make x as the subject of the formula $y=\dfrac{4x^2-9}{10x^2-11x-6}$. (3 marks)

Answers written in the margins will not be marked

17. A softball bat and a softball glove together cost $1380 before discount. A discount of 20% on the softball bat and 40% on the softball glove reduces the total cost to $972. Find the original price of the bat and the discount of the glove. (6 marks)

18. In the figure, a trapezium is formed by removing a triangle from a rectangle, where all the measurements are correct to the nearest cm.



(a) Write down the maximum absolute error of the measurements. (1 mark)

(b) Find the least possible area of the trapezium. (3 marks)

(c) Princess claims that the actual area of the trapezium can be 90 cm^2.
Do you agree with her? Explain your answer. (3 marks)

Answers written in the margins will not be marked

19. In the diagram, triangles *ABC* and *EFD* are similar right-angled triangles. Δ*BEF* is an isosceles right-angled triangle where *BE* = *BF*. It is given that *AC* = 15cm , *FE* = 35cm and ∠*EDF* = 70°.

(a) Use suitable symbols, mark the following information in the given diagram.

(i) ∠*FDE and* ∠*DEF;*

(ii) *BE* = *BF* and the length of *EF.*

(2 marks)

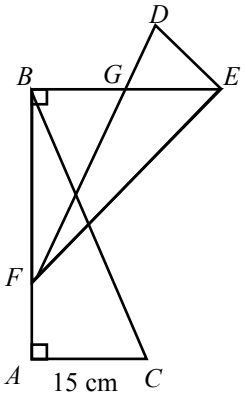
(b) Find

(i) the length of *AF;*

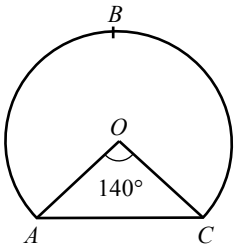
(ii) ∠*FGE*; and

(iii) the length of *FG.*

(7 marks)



20. In the figure, $OABC$ is a sector with centre O. $\overset{\frown}{ABC} = 22\pi$ cm and $\angle AOC = 140°$.



(a) Find OA. (3 marks)

(b) Find the distance between point O and AC. Peter claims that the area of segment ABC = 726 cm^2, correct to 3 sig.fig.. Do you agree? Explain briefly. (7 marks)

Answers written in the margins will not be marked

21 The weights of a batch of iron bars produced are listed in the following table.

Weight (kg)	10.5 - 19.5	20.5 - 29.5	30.5 - 39.5	40.5 - 49.5	50.5 - 59.5	60.5 - 69.5
Frequency	7	6	10	5	4	4

(a) Complete the cumulative frequency table, ***Table 1***, including the column heading in first column of the table. (2 marks)

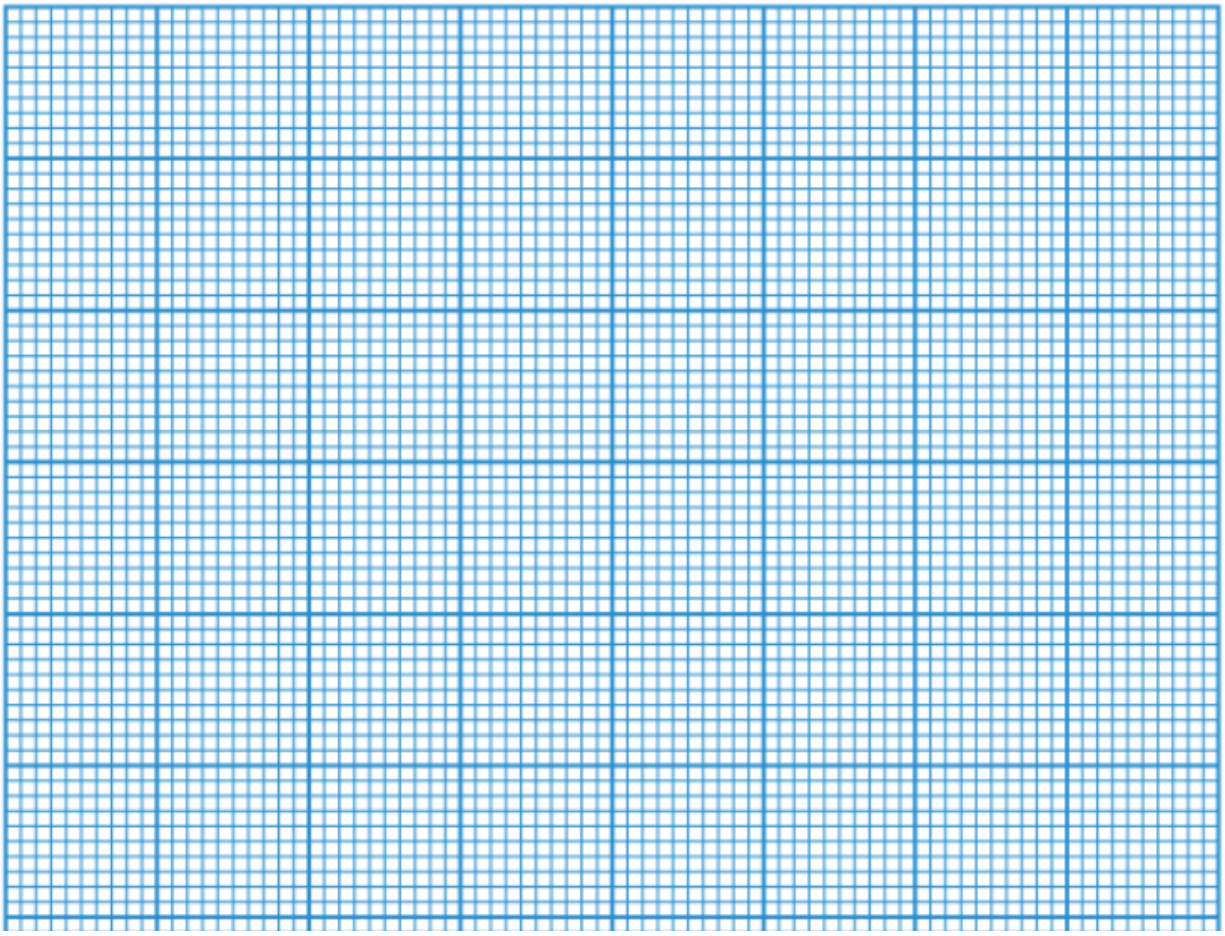
(b) Construct a cumulative frequency polygon to represent the weights of iron bars in ***Graph 2***. (5 marks)

(c) Any iron bar with the weight less than 35 kg will be failed to meet the standard of product. Prince claims that there are at least 60% of iron bars meet the standard. Do you agree? Explain briefly. (3 marks)

(a) ***Table 1***

	Cumulative Frequency
10	
20	
30	
40	
50	
60	
70	

(b) ***Graph 2***



Answers written in the margins will not be marked

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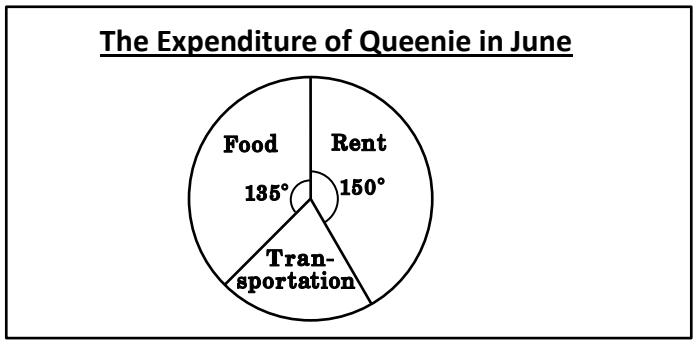
22. Queenie spends only on food, transportation and rent every month. In May, the ratio of the expenditure

on food to that on rent were 2 : 3, and the expenditure on transportation was 87.5% of that on food.

(a) **(i)** Find the ratio expenditure on food : expenditure on transportation : expenditure on rent in May.

(ii) Construct a pie chart to show the expenditure of Queenie in May. (7 marks)

(b) The expenditure of Queenie in June is given below.



(i) Queenie studied the given pie chart and the pie chart in **(a)(ii)**. She found that the corresponding angles of expenditures on food and transportation in **(a)(ii)** are larger than that in the given pie chart. Then she claimed that she spent more money in May. Do you agree? Explain briefly.

(ii) Assume that the rent is the same every month. In which month, May or June, did Queenie spend more money? Explain briefly. (5 marks)

END OF PAPER

QUEEN'S COLLEGE

Yearly Examination, 2019-2020

MATHEMATICS

Section A(2) and Section B

SUGGESTED SOLUTION

Secondary 2

Date: July 2, 2020
Time: 08:30 – 10:00

INSTRUCTIONS FOR SECTION A(2) and SECTION B:

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Class	2
Class Number	

	Teacher's Use Only	
	Max. Mark	Marks
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12 – 15	7	
Section B Question No.	60	
16	6	
17	6	
18	7	
19	9	
20	10	
21	10	
22	12	
Total	80	

SECTION A(2) **(20 marks)**

In this section, write the answers in the spaces provided. **NO working step** is required.

1. Simplify $\frac{(2xy)^3}{x^2y^4}$.

2. Simplify $\frac{a}{a-1}-\frac{1}{a+1}$.

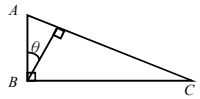
3. If $a+b=10$ and $4a+3b=20$, find the value of $\frac{a}{b}$.

4. If $(2x-5)^2-(Ax-B)\equiv Cx^2-5x-2$, find the values of A and B.

5. The interior angles of a hexagon are $2x°$, $(x-1)°$, $(3x-3)°$, $(4x-16)°$, $(3x+20)°$ and $3x°$.
(a) Find x.
(b) Find the smallest exterior angle of the hexagon.

6. Find the greatest value of $\frac{2\sin^2\theta+2\cos^2\theta}{\cos\theta+1}$, where $0°\le\theta\le 90°$.

7. In the figure, $BC = 36$ and $AB = 20$. Find θ.



8. Let a, b and c be non-zero numbers. If $3a = 4b$ and $3b = 5c$, find $a : b : c$.

9. The actual circumference of a circular pond is 48π m. If the radius of pond on a plan is 4 cm, find the scale of the plan.

10. The angle of a sector is 100° and its area is 360π cm^2. Find its radius.

Answer

1. $\frac{8x}{y}$ (1)

2. $\frac{a^2+1}{(a+1)(a-1)}$ (1)

3. $\frac{a}{b} = -\frac{1}{2}$ (1)

4. $A = -15$ (1)

$B = -27$ (1)

5.

(a) $x = 45$ (1)

(b) 16 ° (1)

6. 2 (1)

7. $\theta = 29.1$ ° (1)

8. 20 : 15 : 9 (1)

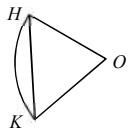
9. 1 : 600 (1)

10. 36 cm (1)

11. A cylindrical pot of internal diameter 260 mm contains some water. If 100 identical solid sphereical metals with volume $\frac{32\pi}{3}$ cm^3 each are totally immersed in water, find the rise in water level correct to 1 decimal place.

11. **6.3 cm** (1)

12. Given OHK is a sector and $OH = HK$. If $\overset{\frown}{HK} = 2\pi$ cm, find the area of the sector.
(Give the answer in terms of π.)



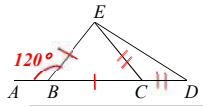
12. **6π cm²** (1)

13. Refer to the figure, if $BC = BE$, $CE = CD$ and $\angle ABE = 120°$,

(a) use appropriate symbols and mark the above information in the figure;

(b) find $\angle EDC$.

13. (a)



(1)

(b) **30°** (1)

14. Given $\cos Y = \frac{b}{29}$, where $0° \le Y \le 90°$,

(a) express $\sin Y$ in terms of b.

(b) If $b = 21$, find the exact value of tan Y.

14.

(a) $\frac{\sqrt{841 - b^2}}{29}$ (1)

(b) $\frac{20}{21}$ (1)

15. Given ΔXYZ is a right-angled triangle. If $XY = \sqrt{23}$ cm and $YZ = 6$ cm. Find all possible lengths of XZ.
(Leave the radical sign " $\sqrt{\ }$ " in the answer if necessary.)

15. **$\sqrt{13}$ cm or $\sqrt{59}$ cm** (2)

End of Section A(2)

Section B: Structural Questions **(60 marks)**

In this section, working steps must be clearly shown.

16. (a) Expand $(2x-3)(2x+3)$ and $(5x+2)(2x-3)$. (3 marks)

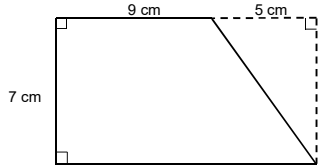
(b) Hence make x as the subject of the formula $y = \frac{4x^2 - 9}{10x^2 - 11x - 6}$. (3 marks)

16(a)	$(2x-3)(2x+3) = (2x)^2 - (3)^2$ $= 4x^2 - 9$ $(5x+2)(2x-3) = 5x(2x-3) + 2(2x-3)$ $= 10x^2 - 11x - 6$
(b)	$y = \frac{4x^2 - 9}{10x^2 - 11x - 6}$ $y = \frac{(2x-3)(2x+3)}{(5x+2)(2x-3)}$ $y = \frac{2x+3}{5x+2}$ $5xy + 2y = 2x + 3$ $5xy - 2x = 3 - 2y$ $x(5y-2) = 3 - 2y$ $x = \frac{3-2y}{5y-2}$

17. A softball bat and a softball glove together cost \$1380 before discount. A discount of 20% on the softball bat and 40% on the softball glove reduces the total cost to \$972. Find the original price of the bat and the discount of the glove. (6 marks)

17	Let \$b be the original price of a bat and \$g be the original price of a glove $b + g = 1380$ (i) $(1 - 20\%)b + (1 - 40\%)g = 972$ (ii) $b + g = 1380$ (i) $0.8b + 0.6g = 972$ (ii) (i)x0.8 – (ii) 0.2g=132 g= 660 Put g=660 into (i) b + 660 =1380 b= 720 b=720 g=660 The original price of the bat =\$720 The discount of the glove =40%g = 0.4 (660) = \$264

18. In the figure, a trapezium is formed by removing a triangle from a rectangle, where all the measurements are correct to the nearest cm.



(a) Write down the maximum absolute error of the measurements. (1 mark)

(b) Find the least possible area of the trapezium. (3 mark)

(c) Princess claims that the actual area of the trapezium can be 90 cm^2.
Do you agree with her? Explain your answer. (3 mark)

18(a)	The maximum absolute error = $\frac{1}{2} \times 1cm$ = 0.5 cm
(b)	The least possible area of trapezium $= \frac{1}{2} \times \{(9 - 0.5) + [(9 - 0.5) + (5 - 0.5)]\} \times (7 - 0.5)$ $= \frac{1}{2} \times \{(8.5) + [(8.5) + (4.5)]\} \times (6.5)$ =69.875 cm^2
(c)	The upper limit of the area of trapezium $= \frac{1}{2} \times \{(9 + 0.5) + [(9 + 0.5) + (5 + 0.5)]\} \times (7 + 0.5)$ $= \frac{1}{2} \times \{(9.5) + [(9.5) + (5.5)]\} \times (7.5)$ =91.875 cm^2 Possible range is 69.875 $cm^2 \leq$ area < 91.875 cm^2 90 cm^2 is within the possible range Princess claim was agreed .

19. In the diagram, triangles ABC and EFD are similar right-angled triangles. ΔBEF is an isosceles right-angled triangle where $BE = BF$. It is given that $AC = 15\text{cm}$, $FE = 35\text{cm}$ and $\angle EDF = 70°$.

(a) Use suitable symbols, mark the following information in the given diagram.

(i) $\angle FDE$ *and* $\angle DEF$;

(ii) $BE = BF$ and the length of EF.

(2 marks)

(b) Find

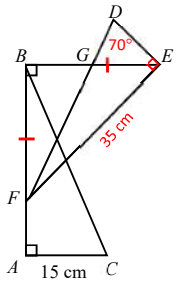
(i) the length of AF;

(ii) $\angle FGE$; and

(iii) the length of FG.

(7 marks)

19(a)



19(b)(i)

For $\angle ACB$, $\because \Delta ABC \sim \Delta EFD$

$\therefore \angle ACB = \angle EDF$ (corr. $\angle$s, ~Δs)

$= 70°$

For AB, $\tan \angle ACB = \frac{AB}{AC}$

$\tan 70° = \frac{AB}{15}$

$AB = 15\tan 70°$ cm (41.212)

For BF and BE, $\because$ BE = BF (given)

$(BF)^2 + (BE)^2 = (EF)^2$ (Pyth. theorem)

..... $(BF)^2 + (BF)^2 = (35)^2$

$BF = \sqrt{612.5}$ cm

i.e. $BE = BF = \sqrt{612.5}$ cm (24.7487)

For AF, $AF = AB - BF$

$= 15\tan 70° - \sqrt{612.5}$

$= 16.5$ cm (corr. to 3 sig. fig.)

19(b)(ii)

For $\angle BEF$, $\sin \angle BEF = \frac{BF}{EF}$

$\sin \angle BEF = \frac{\sqrt{612.5}}{35}$

$\angle BEF = 45°$

For $\angle FGE$, In ΔDEG,

$\angle FGE = \angle FDE + \angle DEG$ (ext. $\angle$ of Δ)

$= \angle FDE + (\angle DEF - \angle BEF)$

$= 70° + (90° - 45°)$

$= 115°$

(biii)

For $\angle BGF$,

$\angle BGF + \angle FGE = 180°$ (adj. $\angle$s on st. line)

$\angle BGF + 115° = 180°$

$\angle BGF = 65°$

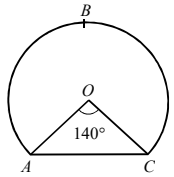
For FG , In ΔBGF,

$\sin \angle BGF = \frac{BF}{FG}$

$\sin 65° = \frac{\sqrt{612.5}}{FG}$

FG = 27.3 cm (corr. to 3 sig. fig.)

20. In the figure, $OABC$ is a sector with centre O. $\overset{\frown}{ABC} = 22\pi$ cm and $\angle AOC = 140°$.



(a) Find OA. (3 marks)

(b) Find the distance between point O and AC. Peter claims that the area of segment $ABC = 726$ cm^2, correct to 3 sig.fig.. Do you agree? Explain briefly. (7 marks)

20(a)	Reflex ∠AOC + ∠AOC =360° (∠s at a pt.) Reflex ∠AOC + 140° =360° Reflex ∠AOC = 220° $\because \overset{\frown}{ABC} = 22\pi\ cm$ $\therefore \frac{reflex\angle AOC}{360°} \times 2\pi(OA) = 22\pi$ $\therefore \frac{220°}{360°} \times 2\pi(OA) = 22\pi$ OA = 18 cm
(b)	Let OH be the distance between point O and AC $\because$ OA=OC radius and OH⊥AC $\therefore \angle AOH = \frac{1}{2} \times \angle AOC$ (property of isos. Δ) $= \frac{1}{2} \times 140°$ = 70° For OH, $\cos\angle AOH = \frac{OH}{OA}$ $\cos 70° = \frac{OH}{18}$ $OH = 18\cos 70°$ $\therefore OH$ = 6.16 cm (corr. to 3 sig. fig.) The distance between point O and AC =6.16cm For AC, $\sin\angle AOH = \frac{AH}{OA}$ $\sin 70° = \frac{AH}{18}$ AH = 18 sin 70° cm

Con't 20b	$\because$ OA=OC radius and OH⊥AC $\therefore$ AH = $\frac{1}{2}AC$ (property of isos. Δ) AC = 2AH AC = 36 sin 70° cm Area of segment ABC = Area of sector OABC + area of ΔOAC $= \frac{reflex\angle AOC}{360°} \times \pi(OA)^2 + \frac{1}{2}(OH)(AC)$ $= \frac{220°}{360°} \times \pi(18)^2 + \frac{1}{2}(18\cos 70°)(36\sin 70°)$ = 726 cm^2 (corr to 3 sig.fig.) Peter's claim is agreed.

21 The weights of a batch of iron bars produced are listed in the following table.

Weight (kg)	10.5 - 19.5	20.5 - 29.5	30.5 - 39.5	40.5 - 49.5	50.5 - 59.5	60.5 - 69.5
Frequency	7	6	10	5	4	4

(a) Complete the cumulative frequency table, ***Table 1***, including the column heading in first column of the table. (2 marks)

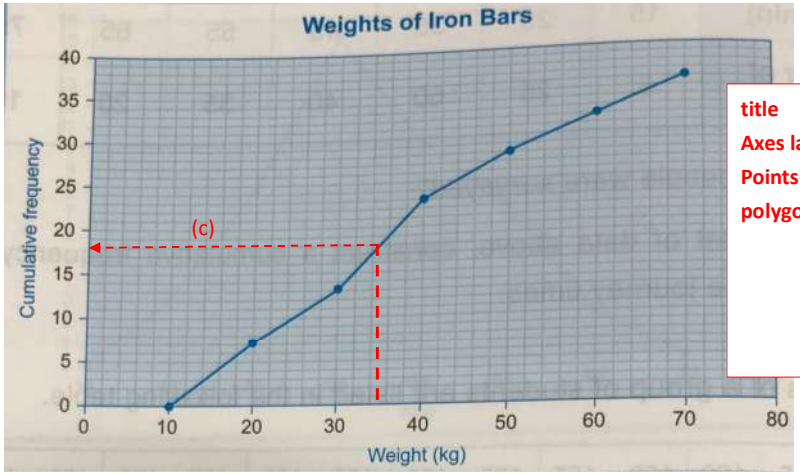
(b) Construct a cumulative frequency polygon to represent the weights of iron bars in ***Graph 2***. (5 marks)

(c) Any iron bar with the weight less than 35 kg will be failed to meet the standard of product. Prince claims that there are at least 60% of iron bars meet the standard. Do you agree? Explain briefly. (3 marks)

21(a) ***Table 1***

Weight less than (kg)	Cumulative Frequency
10	0
20	7
30	13
40	23
50	28
60	32
70	36

(b) ***Graph 2***



title
Axes labelling + scale
Points
polygon

21(c)	From the graph, Amount of iron bar that **do not meet** the quality =18 Percentage of iron bar that **meet the quality** $= \frac{36-18}{36} \times 100\%$ =50% <60% Smaller than 60% and his claim was disagreed.

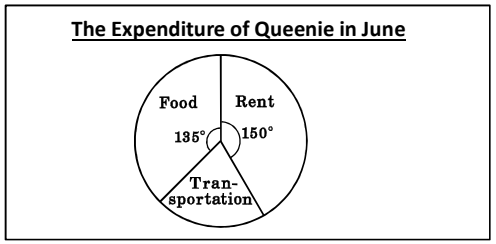
22. Queenie spends only on food, transportation and rent every month. In May, the ratio of the expenditure on food to that on rent were 2 : 3, and the expenditure on transportation was 87.5% of that on food.

(a) **(i)** Find the ratio expenditure on food : expenditure on transportation : expenditure on rent in May.

(ii) Construct a pie chart to show the expenditure of Queenie in May.

(7 marks)

(b) The expenditure of Queenie in June is given below.



(i) Queenie studied the given pie chart and the pie chart in **(a)(ii)**. She found that the corresponding angles of expenditures on food and transportation in **(a)(ii)** are larger than that in the given pie chart. Then she claimed that she spent more money in May. Do you agree? Explain briefly.

(ii) Assume that the rent is the same every month. In which month, May or June, did Queenie spend more money? Explain briefly. (5 marks)

22(ai) Let $f be the expenditure on food

$t be the expenditure on transportation

$r be the expenditure on rent

f : r = 2 : 3 (given)

t = 87.5 % f (given)

∴ t : f = 7: 8

t : f = 7 : 8

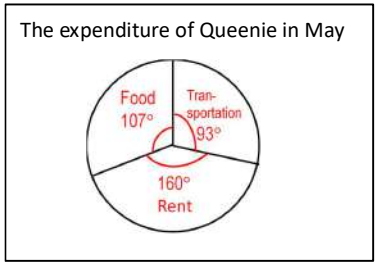
f : r = 2 : 3

t : f : r = 7 : 8 : 12

expenditure on food : expenditure on transportation : expenditure on rent

= 8 : 7 : 12

(aii)



22(bi) If the **total expenditures in that 2 months are not known**, we cannot conclude that greater the percentage (angle) may not leads to more expenditure. So there is **insufficient information** for Queenie to draw the conclusion. Her claim is disagreed.

(bii) Rent in May = $\frac{160}{360} \times total\ \ expenditure\ \ in\ \ May$

Rent in June = $\frac{150}{360} \times total\ \ expenditure\ \ in\ \ June$

∵ rent in May = rent in June

$\frac{total\ \ expenditure\ \ in\ \ June}{total\ \ expenditure\ \ in\ \ May} = \frac{160}{150}$

> 1

∴ Total expenditure in June is higher.

∴ Queenie spent more in June.

END OF PAPER