PROVINCIAL EXAMINATION

NOVEMBER 2022

GRADE 10

MATHEMATICS

(PAPER 2)

TIME: **1 hour**

MARKS: **100**

9 pages + 1 information sheet and a special answer book of 14 pages

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions.
2. Answer ALL the questions in the ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. that you have used to determine the answers
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round-off answers to TWO decimal places, unless otherwise stated.
7. Diagrams are NOT necessarily drawn to scale.
8. Write neatly and legibly.

QUESTION 1

The heights of 18 grade 8 learners were recorded in cm as shown below. Use the data below to answer the questions that follow.

147	131	142	133	152	125
128	162	129	165	151	130
143	162	110	129	139	153

1.1 Represent the data on a stem and leaf diagram. (4)

1.2 Determine the:

1.2.1 Median (2)

1.2.2 Mode (1)

1.2.3 Lower quartile and the upper quartile (2)

1.2.4 Mean (2)

[11]

QUESTION 2

The figures in the table below are the ages, to the nearest year, of a random sample of 30 people negotiating a mortgage in a bank. Use the data below to answer the questions that follow.

29	**26**	**31**	**42**	**38**	**45**	**35**	**37**	**38**	**38**
36	**39**	**49**	**40**	**32**	**32**	**34**	**27**	**56**	**29**
33	**31**	**33**	**52**	**44**	**32**	**30**	**38**	**42**	**33**

2.1 Complete the frequency table on the diagram provided in your ANSWER BOOK. (4)

FREQUENCY TABLE

AGE INTERVALS	TALLY	FREQUENCY
$25 \leq x < 33$		
$33 \leq x < 41$		
$41 \leq x < 49$		
$49 \leq x < 57$		

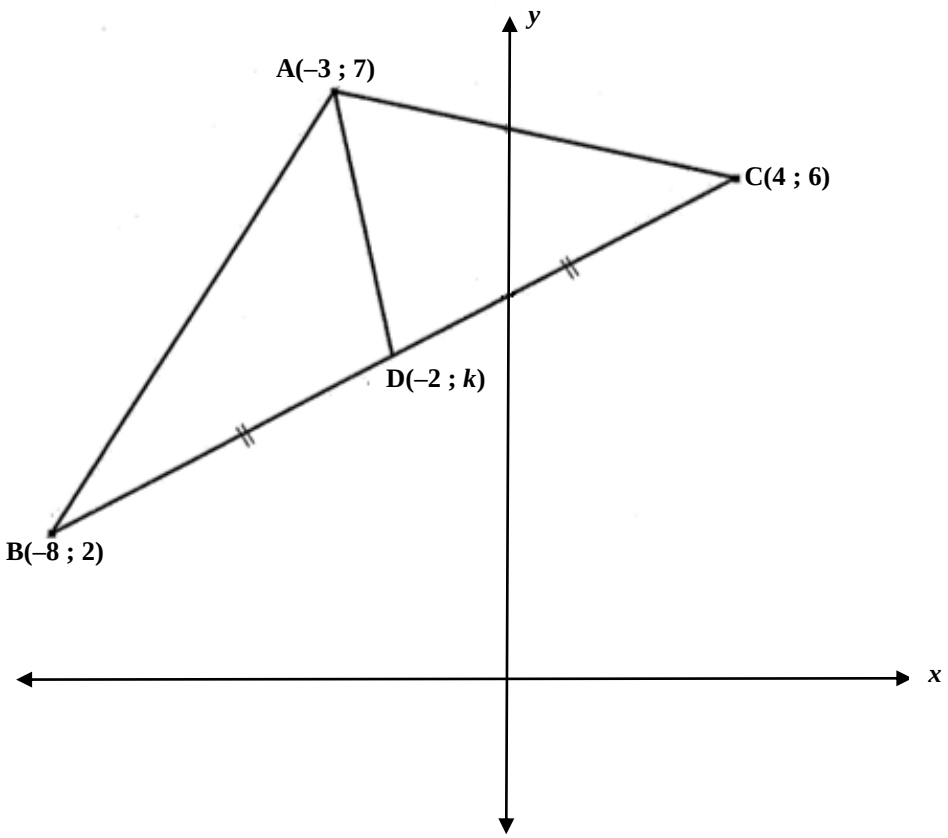
2.2 Use the information from the frequency table to draw a histogram on the grid provided in the SPECIAL ANSWER SHEET. (2)

2.3 Draw a frequency polygon on the grid provided in the SPECIAL ANSWER SHEET. (3)

[9]

QUESTION 3

In the diagram below A (–3;7), B (–8;2) and C (4;6) are the vertices of triangle ABC.
AD is drawn such that D (–2;k) is the midpoint of BC.



3.1 Determine the gradient of BC. (2)

3.2 Calculate the length of BC. (2)

3.3 Determine the value of k. (2)

3.4 Is AD ⊥ BC? Show all your calculations. (3)
[9]

QUESTION 4

4.1 If $x = 66{,}4°$ and $y = 114{,}7°$, evaluate the following correct to TWO decimal places.

4.1.1 $\cos(x + y)$ (2)

4.1.2 $2\sin x$ (2)

4.1.3 $\text{cosec } x$ (2)

4.2 Determine the value of θ correct to ONE decimal place.

4.2.1 $\sin\theta + 0{,}38 = 1$ (2)

4.2.2 $2\cot 2\theta = 3$ (3)

4.2.3 $2\cos(3\theta - 60°) = 1{,}71$ (4)

[15]

QUESTION 5

5.1 Given that $\sin\theta = \frac{4}{5}$ and $\tan\theta < 0$. Determine with the aid of a diagram and WITHOUT the use of a calculator:

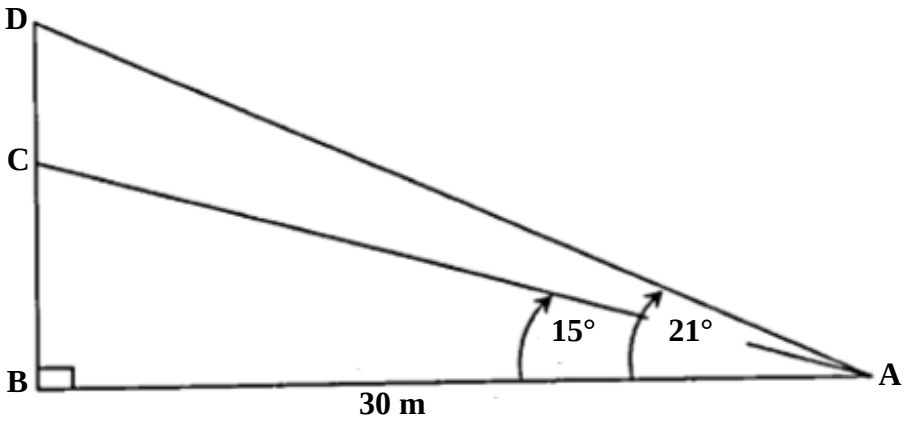
5.1.1 $\tan\theta$ (4)

5.1.2 $2\cos^2\theta - 1$ (2)

5.2 Simplify the following expression WITHOUT using a calculator.

$\cos 0° + \sin^2 60° + \sqrt{2} \cdot \sec 45°$ (4)

5.3 In the diagram below, a person is standing at point A which is 30 m away from point B. Point A and point B are on the same horizontal plane. The angle of elevation of a first storey window at point C from point A is 15°. The angle of elevation of the second storey window at point D from point A is 21°.

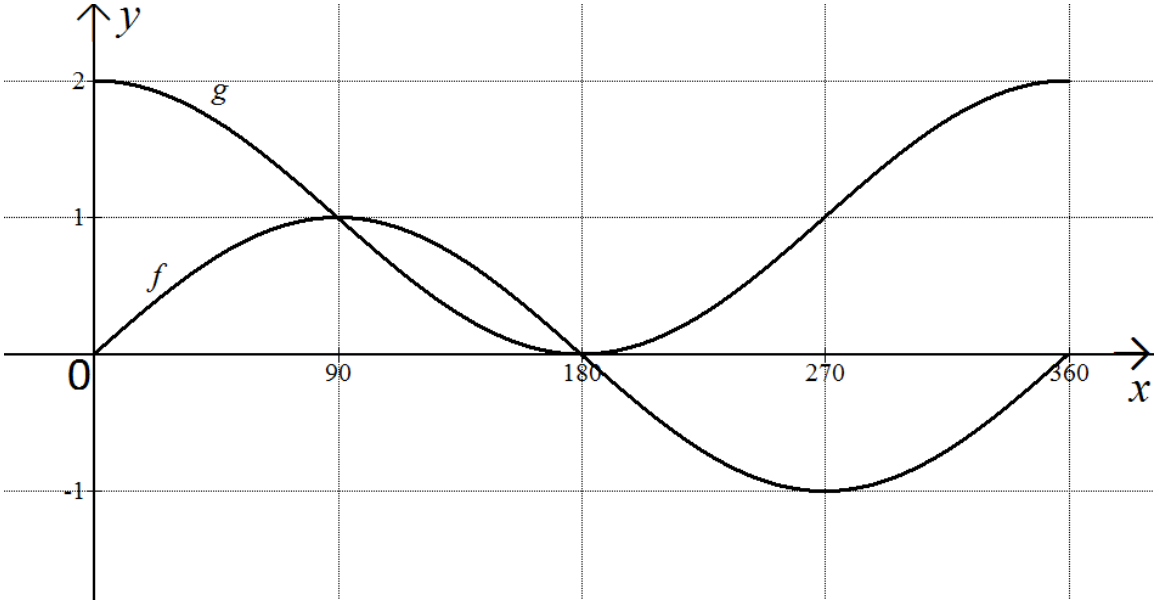


Determine the distance between the two windows. (6)

[16]

QUESTION 6

The graphs of $f(x) = a \sin x$ and $g(x) \cos x + 1$ for $x \in [0°; 360°]$.



6.1 Write down the value of a. (1)

6.2 Determine the range of g. (2)

6.3 Determine the amplitude of g. (1)

6.4 For which value(s) of x will $f(x) \geq g(x)$. (2)

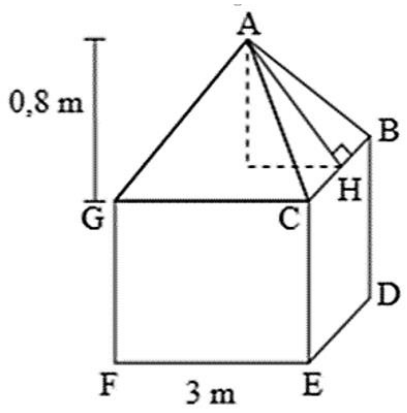
6.5 For which value(s) of x will $g(x) - f(x) = 2$. (3)

6.6 The graph of f is reflected across the x-axis. Write down the equation of the new graph h. (1)

[10]

QUESTION 7

7.1 The roof of a canvas tent is in the shape of a right pyramid having a perpendicular height of 0,8 meters on a square base. The length of one side of the base is 3 metres.



7.1.1 Calculate the length of AH. (2)

7.1.2 Calculate the surface area of the roof. (2)

7.1.3 If the height of the walls of the tent is 2,1 metres, calculate the total amount of canvas required to make the tent if the floor is excluded. (2)

7.2 A metal ball has a radius of 8 millimetres.

Volume of sphere = $\frac{4}{3}\pi r^3$

7.2. 1 Calculate the volume of metal used to make this ball. Give your answer correct to TWO decimal places. (2)

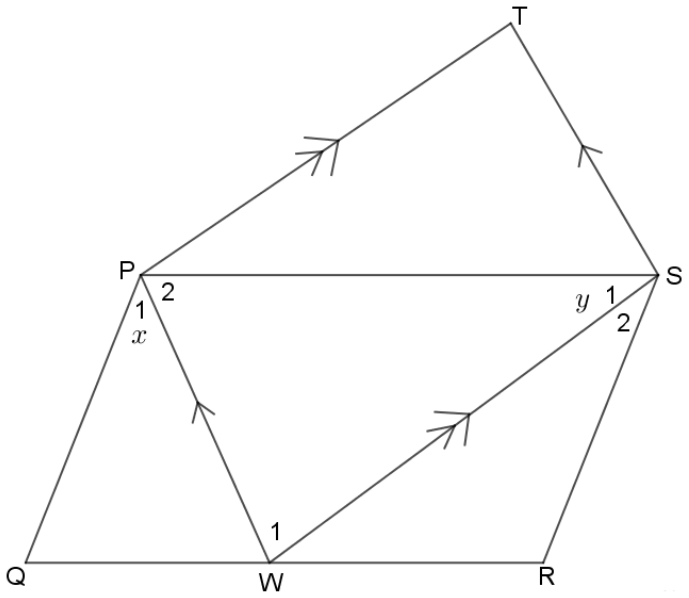
7.2.2 If the radius of the ball is doubled, write down the ratio of the new volume : the original volume. (2)

7.2.3 You would like this ball to be silver plated to a thickness of 1 millimetre. What is the volume of silver required? Give your answer correct to TWO decimal places. (2)

[12]

QUESTION 8

In parallelogram PQRS, PW bisects $\hat{QPS}$ and SW bisects $\hat{PSR}$. PW // ST and PT // WS.



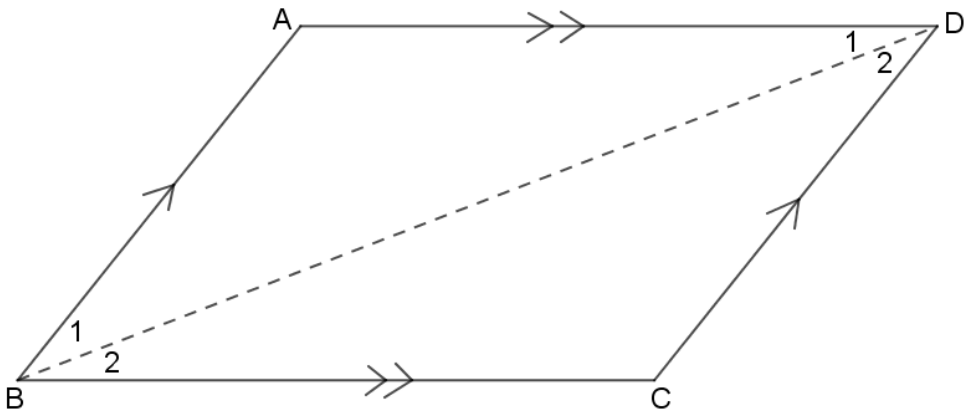
8.1 Prove that x + y = 90°. (4)

8.2 Prove that PWST is a rectangle. (4)

[8]

QUESTION 9

ABCD is a parallelogram with AD // BC and BA // CD.

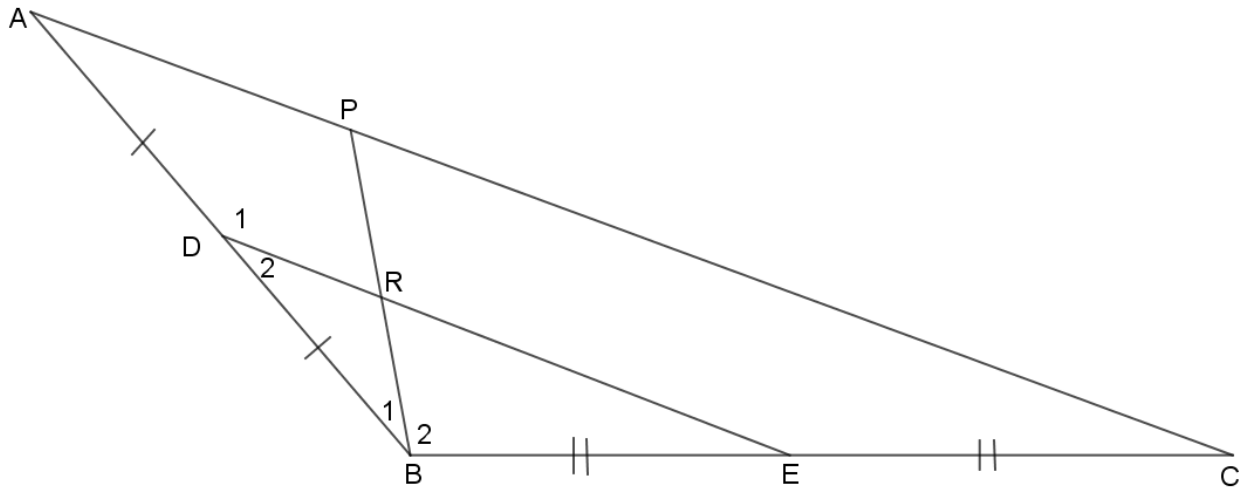


Using the diagram above, prove the theorem that states that the opposite sides of a parallelogram are equal.

[5]

QUESTION 10

In the diagram below, D and E are midpoints of sides AB and BC of ΔABC. Point P is on BC such that PA = PB. PB cuts DE at R.



Prove that ΔRDB is isosceles.

[5]

TOTAL: 100

END

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INFORMATION SHEET

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1+ni) \qquad A = P(1-ni) \qquad A = P(1-i)^n \qquad A = P(1+i)^n$$

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}\left[2a + (n-1)d\right]$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a\left(r^n - 1\right)}{r-1} \;;\; r \neq 1 \qquad S_\infty = \frac{a}{1-r} \;;\; -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{i} \qquad P = \frac{x[1-(1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad \mathrm{M}\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$

InΔABC: $\dfrac{a}{\sin \mathrm{A}} = \dfrac{b}{\sin \mathrm{B}} = \dfrac{c}{\sin \mathrm{C}}$

$$a^2 = b^2 + c^2 - 2bc.\cos A$$

$$area\ \Delta\mathrm{ABC} = \frac{1}{2}\ ab.\sin \mathrm{C}$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$\bar{x} = \frac{\sum x}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n}$$

$$\mathrm{P(A)} = \frac{n(\mathrm{A})}{n(\mathrm{S})}$$

P(A or B) = P(A) + P(B) – P(A and B)

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$