Mathematics

Comprehensive Exam
Number 53

GUIDE

Secondary 5

June, 2003

Youth Sector General Education

1. GENERAL INFORMATION

1.1	Program	Mathematics, Secondary 5 (568-536)

1.2   Origin   Mathematics Coordinating Committee Examination, 2003

Computerization by Martine Sanscartier, BIM, Société GRICS

1.3   Time allotted   3 hours

Administration   This examination is to be given on June 12, A.M.

1.4   Number of questions 25 questions distributed as follows
                                   10 multiple-choice questions
                                    5 short-answer questions
                                   10 developed-response questions

1.5   Authorized material • Ruler, compass, set square, protractor
                            • Graph paper
                            • Scientific calculator with or without a graphic display

The calculator must be portable and designed primarily to perform mathematical calculations. Computers and calculators with a QWERTY keyboard, symbol manipulation capabilities or an electronic date book are not permitted. User guides, memory expansion features or any other calculator accessories are not permitted during the examination. Students may not share their calculators with other students. Communication links between calculators are also forbidden during the examination.

• Memory aid

The memory aid is **one** letter-size sheet of paper ($8\frac{1}{2} \times 11$") on which a student will have recorded information of his or her choice. Students are encouraged to work on and revise their memory aid throughout the year. Both sides of the sheet may be used. Any mechanical reproduction of this memory aid is forbidden. Students may not share their memory aids with any other students.

2. DESCRIPTION OF THE EXAM

The chart below shows the distribution of the items taking into account the relative importance given to the different components of the program.

Exam Specifications

Skills \ Themes	Algebra 64%	Geometry 24%	Statistics 12%
Mastery of Concepts 28%	2, 3, 10, 11	4, 8	7
Mastery of Application 36%	1, 6, 9, 12, 14, 19	5, 13	15
Mastery of Problem Solving Techniques 36%	16, 17, 18, 20, 21, 22	24, 25	23

Note The numbers in the centre of each box represent the question numbers in the examination.

Item Specifications

Question	Item	Objective	S	T	D
Part A					
1	2051	ALG.02.06	A	M	M
2	2052	ALG.02.04	C	M	M
3	2053	ALG.02.01	C	M	E
4	2054	GEO.01.07	C	M	E
5	2055	GEO.01.07	A	M	M
6	2056	ALG.03.01	A	M	M
7	2057	STA.01.07	C	M	E
8	2058	GEO.01.03	C	M	E
9	2059	ALG.02.05	A	M	M
10	2060	ALG.04.03	C	M	M
Part B					
11	2061	ALG.01.05	C	C	M
12	2062	ALG.03.03	A	C	M
13	2063	GEO.01.02	A	C	M
14	2064	ALG.03.03	A	C	M
15	2065	ALG.02	A	C	M
Part C					
16	2066	ALG.01	P	E	M
17	2067	ALG.02	P	E	M
18	2068	ALG.03.02	A	E	M
19	2069	ALG.04	P	E	M
20	2070	ALG.02	P	E	D
21	2071	ALG.04	P	E	D
22	2072	STA.01	P	E	M
23	2073	STA.01	P	E	M
24	2074	GEO.01	P	E	M
25	2075	GEO.01	P	E	D

Legend

S: Skill	A: Application
	C: Concept
	P: Problem solving

T: Type of items	C: Short-constructed answer
	E: Extended answer (developed response)
	M: Multiple choice

D: Level of Difficulty	E: Easy
	M: Medium
	D: Difficult

3.   INSTRUCTIONS FOR TEACHERS

- Ensure that each student has all the material needed.
- Hand out the Question Booklets and read the instructions aloud to the students.
- Collect all booklets at the end of the examination.

4.   CORRECTION KEY

Part A	
Questions 1 to 10	*4 marks or 0 marks*

1	D		**6**	B
2	C		**7**	D
3	C		**8**	A
4	B		**9**	D
5	D		**10**	B

Part B	
Questions 11 to 15	*4 marks each*

11 The ordered pairs are **(1, 10), (5, 8)** as well as   *2 marks*   /4
the ordered pair whose coordinates are **(3, 9)**.   *2 marks*

12 Rounded to the nearest hundredth, the value of *x* is **0.73**.   /4

Note: Do not penalize students who did not round their answer to the nearest hundredth.

13 To the nearest degree, the angle measure is **38°**.   /4

Note: Do not penalize students who did not round their answer.

14 The exact values of *x* are $\dfrac{\pi}{6}$ and $\dfrac{5\pi}{6}$.   /4

4 marks for two correct answers
2 marks for one correct answer

15 The number of hours elapsed is **5**.   /4

Marking scale for developed-response questions

1. Unless otherwise indicated, the marking scale on the following page will be used to grade questions 16 to 25, the developed-response questions in the examination. Adherence to the scale will help ensure equity for all students who write the examination.

2. Students' work will be analyzed carefully and then evaluated according to the criteria defined below.

3. **Information that includes graphs, and/or tables produced using a graphing calculator must be presented in the Answer Booklet**.

4. **Students who do not show their work will be given no marks for a correct final answer**.

Definition of the Terms Found in the Marking Scale

Appropriate method
   A logical procedure that makes it possible to solve the problem.

   A student's method is deemed appropriate if the steps presented could lead to the solution.

   A method may be deemed appropriate even if the final answer is incorrect. For instance, a student may make one or more mistakes in applying the relevant operations and relations, yet his or her method may still be considered appropriate.

   A method may be deemed appropriate even if some of the required steps are not fully shown. In this case, students lose marks because their written information is not clear.

Partially appropriate method
   A logical procedure that will not solve the problem, but which shows that the student has a partial understanding of the problem.

   A method may still be considered partially appropriate even if the student makes mistakes in applying operations and relations, or even if his or her written information is not very clear.

Inappropriate method
   A procedure that will not solve the problem and which shows no evidence that the student has any understanding of the problem. Students who do not show their work are deemed to have used an inappropriate method.

Correct application of operations and relations
   The student made no mistakes in applying the chosen operations and relations.
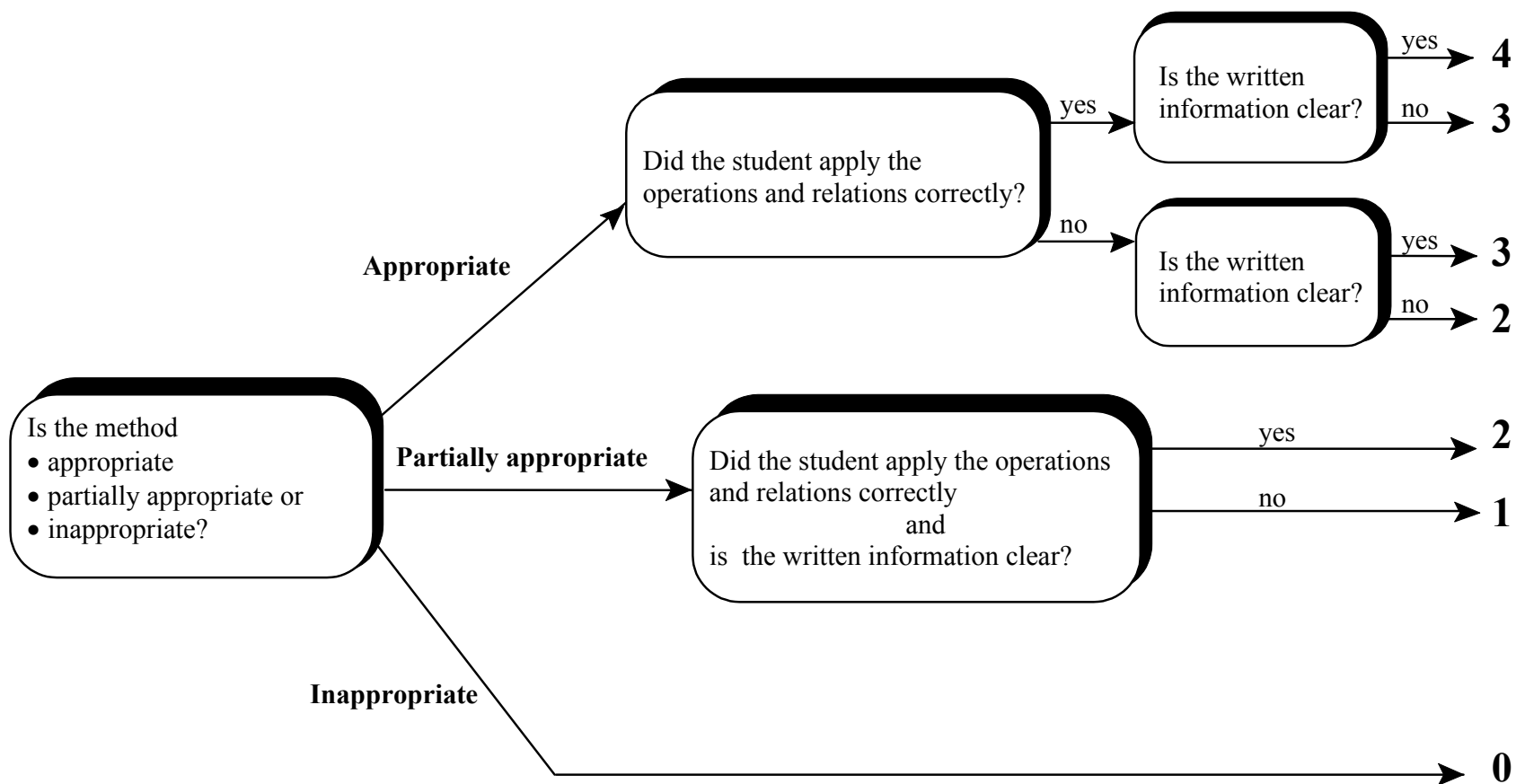
Clear written information
   The information is complete, legible and presented using correct language.

   The written information is clear when the scorer does not need to interpret the student's work.

   To help the scorer, some developed-response questions specify what constitutes a partially appropriate method.

MARKING SCALE

Mark(s)

Is the written information clear? → yes → **4**

Is the written information clear? → no → **3**

Did the student apply the operations and relations correctly? → yes

Did the student apply the operations and relations correctly? → no

Is the written information clear? → yes → **3**

Is the written information clear? → no → **2**

Is the method
- appropriate
- partially appropriate or
- inappropriate?

Appropriate

Partially appropriate

Did the student apply the operations and relations correctly

and

is the written information clear? → yes → **2**

Did the student apply the operations and relations correctly

and

is the written information clear? → no → **1**

Inappropriate → **0**

Part C

Questions 16 to 25   *4 marks each*
No marks are to be given if work is not shown. Examples of correct solutions are given.
However, other acceptable solutions are possible.

16   Example of an appropriate method   /4

Let   *x*: number of lobsters
         y: number of crabs

Constraints:
$$x \geq 0 \quad y \geq 0$$
$$y \geq 35$$
$$y \leq 60$$
$$x \leq 2y$$
$$x + y \leq 140$$

Objective Function: $R = 8.70x + 9.60y$

Graph:
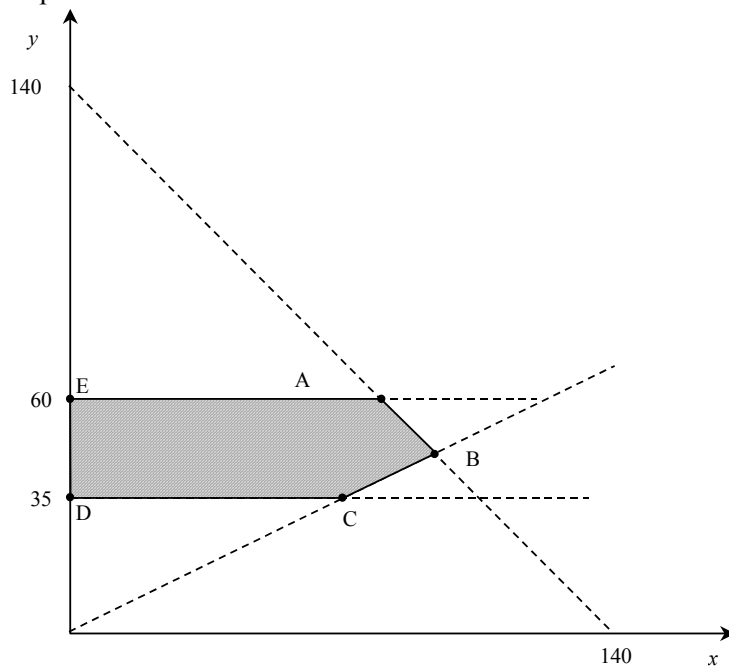
Vertex	R = 8.70x + 9.60y
A(80, 60)	1272 ← max
B(93.$\overline{3}$, 46.$\overline{6}$)	1259
C(70, 35)	945
D(0, 35)	336
E(0, 60)	576

Answer: The maximum revenue this fisherman can expect to make is **$1272**.

Note: Do not penalize students who did not include the non-negative constraints.
            Students who determined the constraints and graphed the polygon have shown a partial
            understanding of the problem.

17   Example of an appropriate method   /4

Find the rate

$$y = a \bullet b^x$$
$$y = 110 \bullet b^x$$
$$835 = 110 \bullet b^x$$
$$7.59 = b^5$$
$$1.5 = b$$

Find time that elapsed when 2000 victims have been infected

$$110 \times 1.5^t = 2000$$
$$1.5^t = 18.\overline{18}$$
$$t = \frac{\log 18.\overline{18}}{\log 1.5} \approx 7.15$$

Find the year the vaccine will be offered

$$1996 + 7.15 = 2003.15$$

Answer: The population will be offered the vaccine in the year **2003**.

Note: Students who have determined the rate have shown a partial understanding of the problem.

18   Example of an appropriate method   /4

$$\left. \begin{array}{c} \dfrac{1}{\sin x} - \sin x \\[2mm] \dfrac{1}{\sin x} - \dfrac{\sin^2 x}{\sin x} \\[2mm] \dfrac{1 - \sin^2 x}{\sin x} \end{array} \right\} \quad \text{1 mark}$$

$$\frac{\cos^2 x}{\sin x} \qquad \textit{1 mark}$$

$$\frac{\cos x}{\sin x} \bullet \frac{\cos x}{1} \qquad \textit{1 mark}$$

$$\cot x \bullet \cos x \qquad \textit{1 mark}$$

19 Example of an appropriate method /4

$a = 10$ $b = 8$

Find the equation of the semi-ellipse centre (0, 0) (Students may use other centres.)

$$\frac{x^2}{100} + \frac{y^2}{64} = 1$$

Find the value of y at $(7, y)$

$$\frac{49}{100} + \frac{y^2}{64} = 1$$

$$\frac{y^2}{64} = 1 - \frac{49}{100}$$

$$y^2 = 32.64$$

$$y \approx +5.71 \text{ (-5.71 is rejected)}$$

Answer: The cameras are **5.71 m** from the ground.

Note: Do not penalize students who did not round their answers to the nearest hundredth.

Students who determined the equation of the semi-ellipse have shown a partial understanding of the problem.

20   Example of an appropriate method   /4

Equation of the circle in standard form

$$x^2 + 6x + y^2 - 2y = 26$$
$$(x-3)^2 + (y-1)^2 = 26 + 9 + 1$$
$$(x-3)^2 + (y-1)^2 = 36$$

Each radius measures 6 units

Since the three circles are congruent, the border forms an equilateral triangle.

According to the diagram on the right,
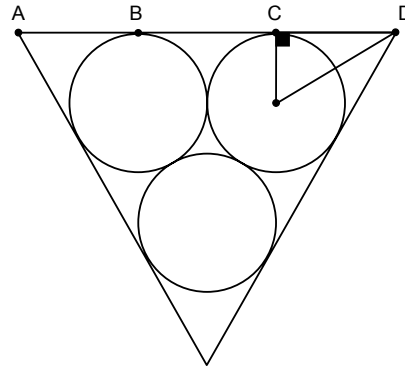
Note: Adjustments will have to be made for different labelling.

Δ COD is a right triangle, m $\overline{OC}$ = 6 units and m $\angle$ CDO = 30°

$$\tan 30° = \frac{m\ \overline{OC}}{m\ \overline{CD}} = \frac{6}{m\ \overline{CD}}$$

$$m\ \overline{CD} = 10.39$$
$$m\ \overline{AD} = m\ \overline{AB} + m\ \overline{BC} + m\ \overline{CD}$$
$$= 10.39 + 12 + 10.39$$
$$32.78$$

Perimeter: P = 3 • 32.78
$$= 98.34$$

Answer: To the nearest hundredth of a unit, the border measures **98.34**.

Note: Do not penalize students who did not round the answer.

Students who determined the radius of the circle have shown a partial understanding of the problem.

21 Example of an appropriate method /4

It is a parabola in the form of
$x^2 = 4p(y - k)$ (distance to the line (directrix) = distance to a point (focus))
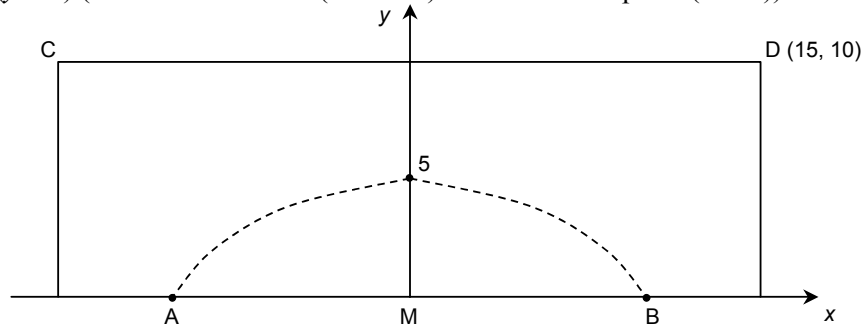
Focus: M(0, 0) Vertex (0, 5) p = 5

$$\text{Equation} : x^2 = -4p\,(y - 5)$$
$$x^2 = -20\,(y - 5)$$

a and b are the zeros of the function:
$$x^2 = -20\,(0 - 5)$$
$$x^2 = 100$$
$$x = \pm 10$$

Answer: Points A and B are **20 m** apart.

Note: Students who have determined the equation of the parabola have shown a partial understanding of the problem.

22 Examples of appropriate methods /4

Calculator: Algebraic:

$y = ax + b$ Having entered the 18 data   Using 2 of the 9 ordered pairs, 2(55, 88)&7(43,85)
$a = 0.4114$ values into
$b = 69.2581$ L_1 and L_2 of graphic $a = \dfrac{\Delta y}{\Delta x} = \dfrac{85 - 88}{43 - 55} = \dfrac{-3}{-12} = \dfrac{1}{4}$
$r = 0.4939$ calculator.

$y = \dfrac{1}{4}x + b; (43, 85) \Rightarrow 85 = \dfrac{1}{4}(43) + b$

$\therefore$ Equation of the regression line is: $b = 74.25$
$y = 0.4114x + 69.2581$
Number of expected wins is 82 (81.6)   Regression equation: $y = \dfrac{1}{4}x + 74.25$

If $x = 30$
Then $y = 81.75$

Answer: A team with a payroll of 30 million dollars can expect to win **82** games.

23 Example of an appropriate method /4

Solution: (both $x = 94$)

TEAM AI   TEAM OPTICS
$\bar{x}$ = 84.5 (85) $\bar{x}$ = 85.7 (86)
s = 6.13 (5.8)   s = 5.64 (5.4)

$$Z = \frac{x - \bar{x}}{s}$$ $$Z = \frac{x - \bar{x}}{s}$$

$$Z = \frac{x - 84.5}{6.13}$$ $$Z = \frac{x - 85.7}{5.64}$$

$$= 1.55$$ $$= 1.47$$

Answer: **Team Al** should advance to the provincial competition because it has the better z-score.

Note: Students have shown a partial understanding of the problem if they have:
- found the correct mean and standard deviation for each class
OR
- found the correct mean and compared the distances of the two teams' scores from their respective class means

24 Example of an appropriate method /4

$$m \overset{\frown}{BC} = 2 \times 22$$
$$= 44$$
$$m \overset{\frown}{CD} = 2 \times 40$$
$$= 80°$$
$$m \overset{\frown}{AD} = 180° - 80° = 100°$$
$$\frac{44°}{14} = \frac{100°}{x}$$
$$x = 31.81$$

Answer: To the nearest hundredth of a metre, the length of fence that needs to be replaced is **31.82 metres**.

Note: Do not penalize students who did not round their answers.

Students who determined the degree measure of arc AD have shown a partial understanding of the problem.

25   Example of an appropriate method   /4

Given that the radius is 7 cm

$$m \overline{AD} = 2$$

Segment BD

$$\frac{m \overline{BD}}{2} = \frac{12}{m \overline{BD}}$$

$$m \overline{BD} = \sqrt{24}$$

$$= 4.90$$

Segment AB

$$m \overline{AB} = \sqrt{\left(m \overline{BD}\right)^2 + \left(m \overline{AD}\right)^2}$$

$$= \sqrt{24 + 4}$$

$$= \sqrt{28}$$

$$= 5.29$$

Segment PE

$$m \overline{PE}^2 = m \overline{PA} \times m \overline{PB}$$

$$m \overline{PE}^2 = 8 \times 13.29$$

$$m \overline{PE} = 10.3$$

Answer: To the nearest tenth of a centimetre, the measure of tangent PE is **10.3** cm.

Note: Do not penalize students who did not round their answers.

            Students who found the measure of segment AB have shown a partial understanding of the problem.

Mathematics

Comprehensive Exam
Number 53

Question Booklet

Secondary 5

June 2003

Youth Sector General Education

INSTRUCTIONS

1.   Write the required information on the cover page of your Answer Booklet.

2.   Answer all 25 questions in the Answer Booklet.

3.   You have 3 hours to complete the exam.

4.   Each question is worth 4 marks.

5.   You may use a calculator (with or without graphing display), and a memory aid.

6.   The following materials are allowed: graph paper, ruler, compass, set square and protractor.

7.   The figures in this booklet have NOT been drawn to scale.

8.   At the end of the exam period, hand in the Question Booklet and Answer Booklet.

> **Part A**   **Questions 1 to 10**
>
> In the Answer Booklet, blacken the letter that corresponds to the answer chosen.

1 Given $f(x) = 4x + 1$ and $g(x) = -|x - 2| + 3$.

What is the range of $(g \circ f)(x)$?

A) $[3, \infty[$ C) $]-\infty, 14]$

B) $[14, \infty[$ D) $]-\infty, 3]$

2 A function is represented by the rule $f(x) = \dfrac{-6x + 1}{2x + 3}$.

Which of the following graphs represents $f^{-1}(x)$?

A)

C)

B)

D)

3

Given the standard form of the greatest integer function: $f(x) = a[b(x - h)] + k$ and the following graph.
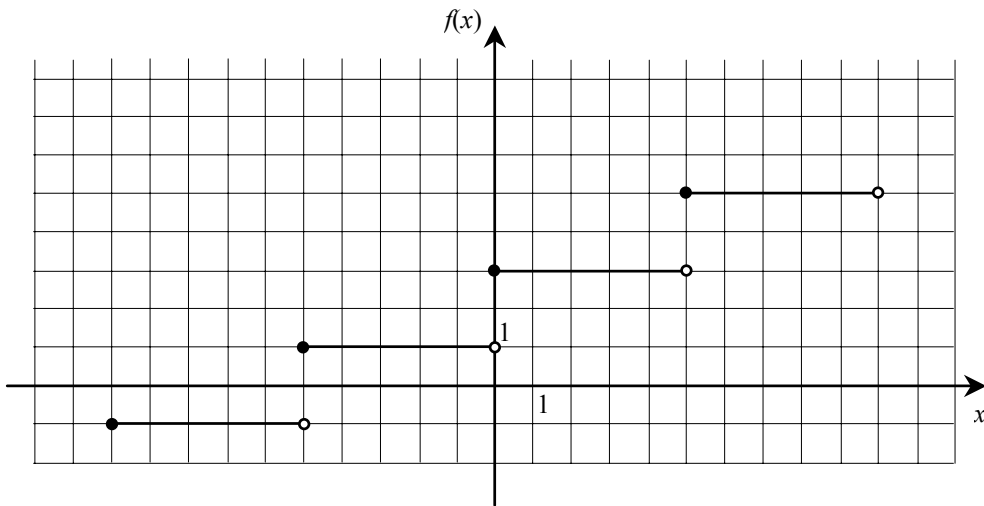
What are the respective values of parameters a and b?

A)　　$\dfrac{1}{2}$ and $\dfrac{1}{5}$

B)　　$\dfrac{1}{2}$ and 5

C)　　2 and $\dfrac{1}{5}$

D)　　2 and 5

4

In the diagram on the right, chord BD is perpendicular to diameter AC and intersects AC at point E. Triangle ABC is inscribed in the circle with centre O.
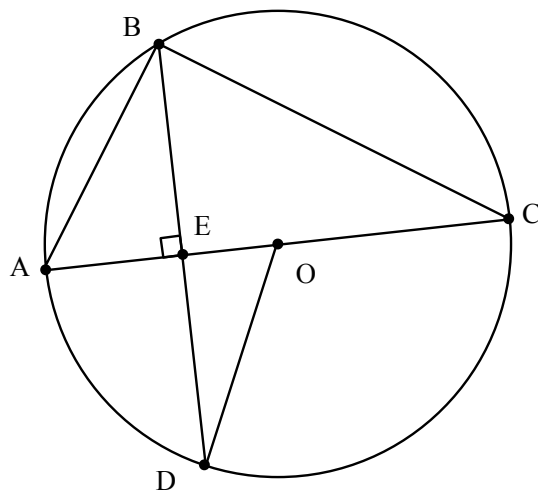
Which of the following statements is FALSE?

A)　　$m\,\overline{BE}^2 = m\,\overline{AE} \times m\,\overline{EC}$

B)　　$m\,\overline{OE} \times m\,\overline{EA} = m\,\overline{OC}^2$

C)　　$m\,\overline{OD}^2 = m\,\overline{OE}^2 + m\,\overline{ED}^2$

D)　　$m\,\overline{BE} \times m\,\overline{ED} = m\,\overline{AE} \times m\,\overline{CE}$

5

In the adjacent circle with centre O,

m ∠ AOB = 100°

m ∠ FDE = 55°

$\overline{DF}$ is tangent to the circle.

What is the measure of ∠ DFA?
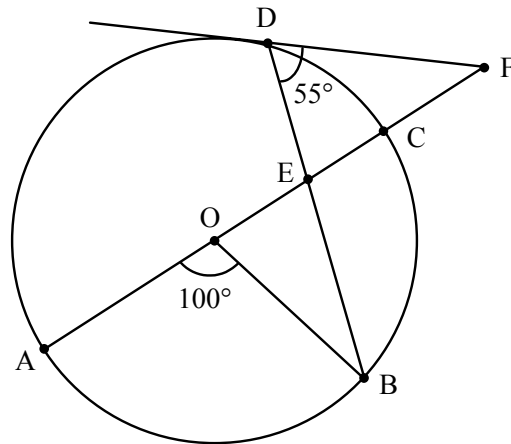
A)   10°

B)   30°

C)   35°

D)   60°

6

What is the simplified form of the following logarithmic expression?

$$3(\log a^2 - \log 2a) + 4\log a$$
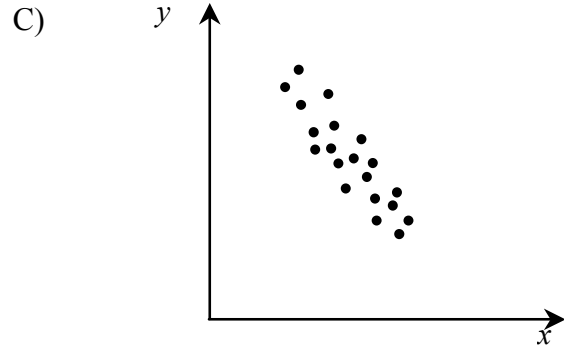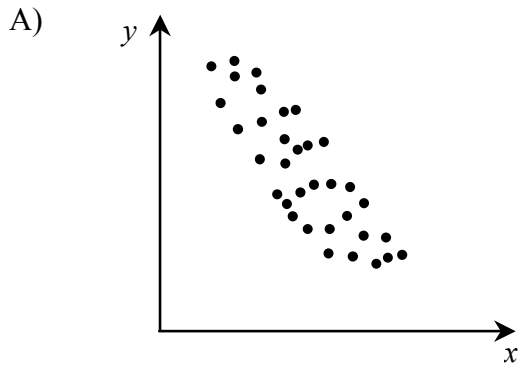
A) $\dfrac{\log a^7}{8}$

C) $\dfrac{\log a^7}{2}$

B) $\log\left(\dfrac{a^7}{8}\right)$

D) $\log\left(\dfrac{a^7}{2}\right)$

7 | **Which of the following graphs illustrates the weakest correlation between the variables?**

A)

C)

B)

D)
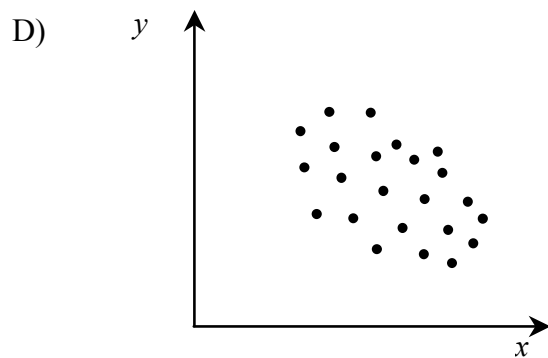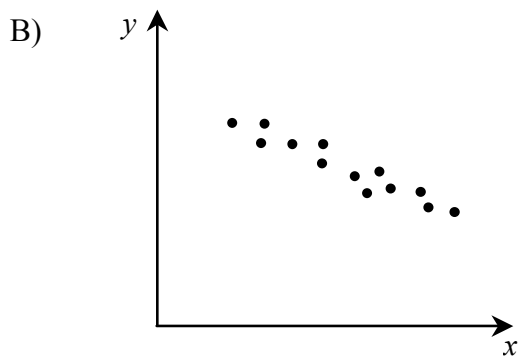
8 | Given $\vec{u} = (3, 2)$, and $\vec{v} = (1, -4)$

What are the components of the resultant of the following vector operation?

$$\vec{u} - 2\,\vec{v}$$

A) (1, 10)   C) (2, 6)

B) (1, -6)   D) (5, -6)

9 Jamie is practicing for a skateboard competition at the neighbourhood park. The ramp is in the shape of a sinusoidal function. The following graph represents the height, $f(x)$, of the ramp, in metres, as a function of the horizontal distance, x, in metres. The maximum and minimum points of the ramp are separated by 6 metres horizontally and 3.5 metres vertically. The minimum is 0.5 metres above ground level.
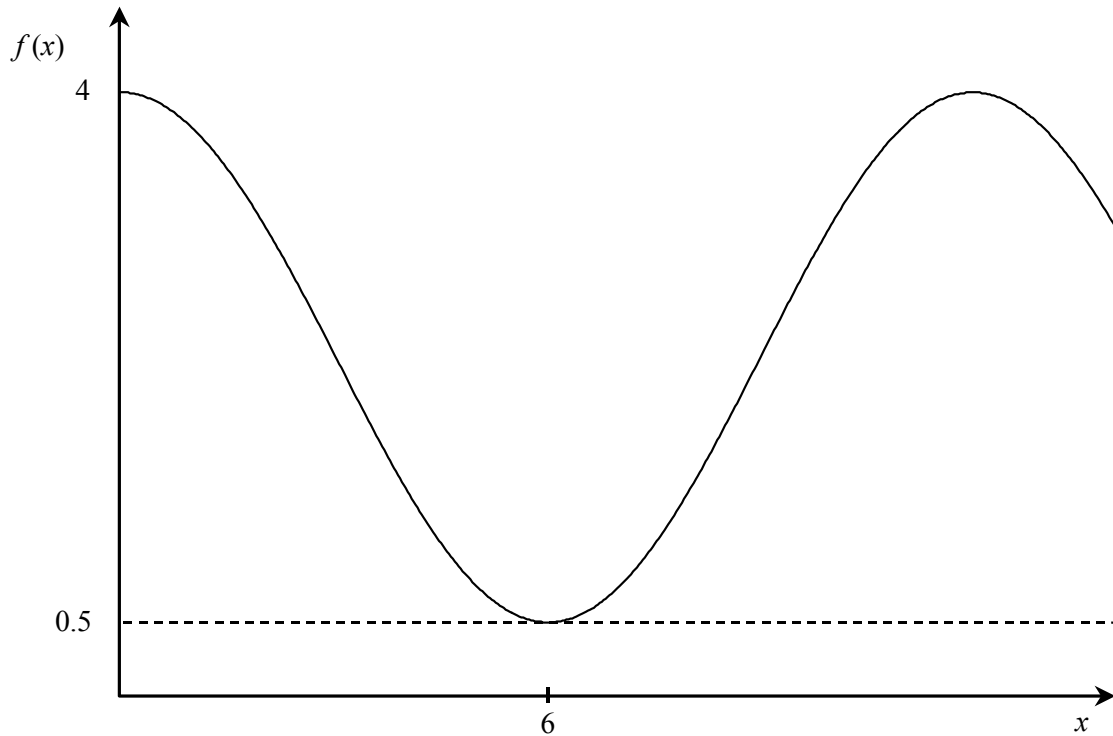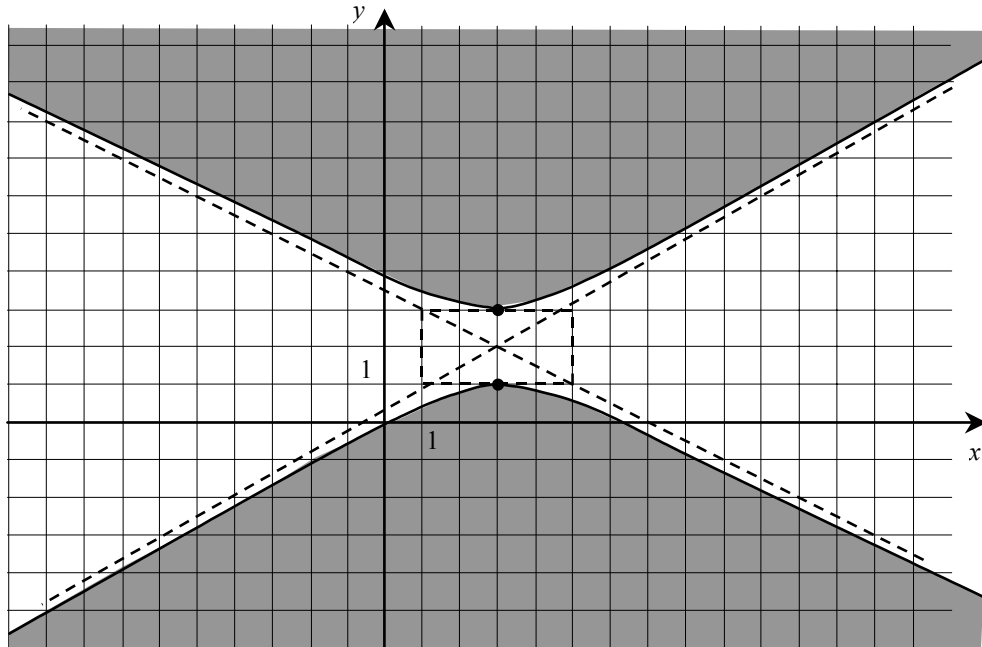

Which of the following rules represents the above situation?

A) $f(x) = 2 \cos\left(\dfrac{\pi}{6}x\right) + 0.5$

C) $f(x) = 1.75 \cos\left(\dfrac{\pi}{12}x\right) + 0.5$

B) $f(x) = 2 \cos\left(\dfrac{\pi}{12}x\right) + 2.25$

D) $f(x) = 1.75 \cos\left(\dfrac{\pi}{6}x\right) + 2.25$

10 **Which inequality represents the shaded region bounded by the conic section shown in the graph below?**

A) $\dfrac{(x-3)^2}{4} - \dfrac{(y-2)^2}{1} \geq 1$

B) $\dfrac{(x-3)^2}{4} - \dfrac{(y-2)^2}{1} \leq -1$

C) $\dfrac{(x-3)^2}{4} - \dfrac{(y-2)^2}{1} \leq 1$

D) $\dfrac{(x-3)^2}{4} - \dfrac{(y-2)^2}{1} \geq -1$

Part B   Questions 11 to 15

Write your answer in the space provided in the answer booklet.

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11 In order to raise funds for their graduation, the Secondary V students are selling T-shirts and mugs.

The expected profit per student is calculated according to the function:
$$P = 5x + 10y$$

where x represents the number of T-shirts sold per student
and y represents the number of mugs sold per student

These constraints are represented on the graph below.
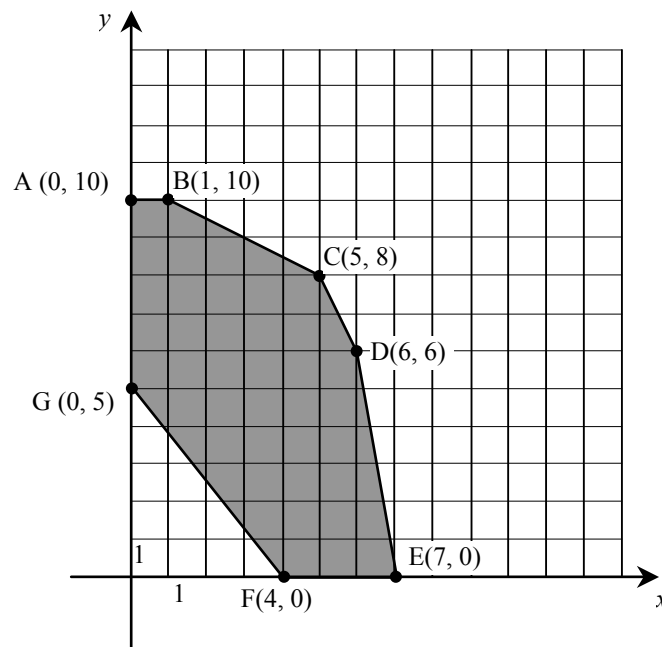
What are all the possible ordered pairs that yield a maximum profit?

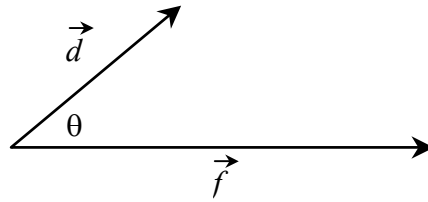**12** **Solve the following equation:**

$$2^x = 3^{2x-1}$$

Round your answer to the nearest hundredth.

---

13 The scalar product of vectors *d* and *f* is 138. Their respective magnitudes are 7 and 25 units.

What is the measure of angle θ between vectors *d* and *f*?

Round your answer to the nearest degree.

14 Given the following trigonometric equation:

$$2 \sin^2 x + 5 \sin x - 3 = 0, x \in [0, 2\pi]$$

What are the exact values of *x* that satisfy this equation?

15 On a given day, the market value, $V(t)$, of *Bio Tech* stock shares fluctuated in relation to the time elapsed in hours, *t*, from the opening of the day's trading session, according to an absolute value function.

At the opening of trading, *Bio Tech* stock was worth $6. Three hours later, it reached its maximum value of $9.

How many hours had elapsed from the time the share first reached $8 until it decreased to $5?

Part C **Questions 16 to 25**

▸ Show all your **work** as well as your **answer**. The work shown is taken into consideration when marks are awarded.

▸ Your written information must be legible, complete, and clearly stated in correct language so the marker understands exactly what you have done.

Even if your answer is correct, no marks will be given unless acceptable work is shown.

16 A fisherman has to separate his daily catch of shellfish into two categories before he can sell them. Lobsters are sold for $8.70 each and crabs are sold for $9.60 each.

On an average day, the fisherman can expect to catch a minimum of 35 crabs and a maximum of 60. By experience, there are at most twice as many lobsters as crabs in a daily catch and never has the fisherman caught more than 140 shellfish in a single day.

Using a polygon of constraints, determine the maximum revenue that this fisherman can expect to make.

17 A virus appeared in South America in the middle of the last decade. Scientists knew that the number of people infected with this virus would increase according to a specific exponential function.

At the beginning of 1996, authorities found 110 infected people. Five years later, the number had grown to 835. Wide-scale inoculation began once 2000 people had been infected with the virus.
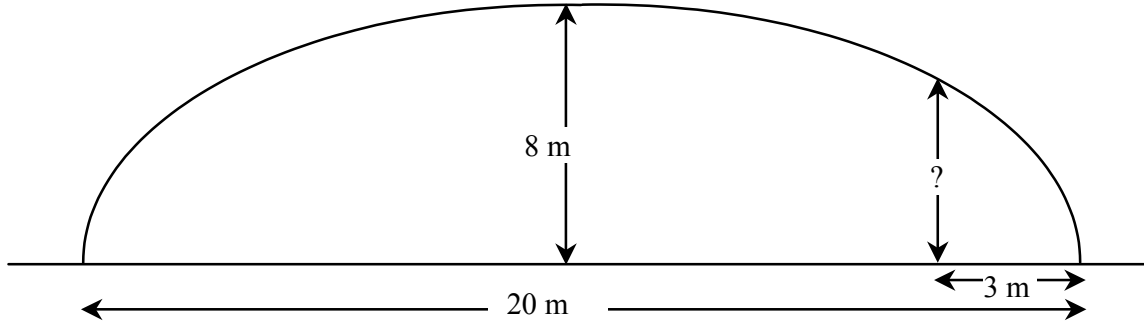
In what year did these inoculations begin?

18 **Prove the following trigonometric identity.**

$$\frac{1}{\sin x} - \sin x = \cot x \cos x$$

19 A dome, in the shape of a semi-ellipse, protects a tennis court, as shown below.


8 m

?

20 m

3 m

The height of the dome at the centre is 8 m and its span is 20 m. Cameras must be fixed to the roof of the dome at a horizontal distance of 3 meters from its edges.

At what height are the cameras from the ground?
(Round your answer off to the nearest hundredth.)

20 Strange geometric formations, known as crop circles, have appeared in fields around the world. The creators of the crop circle shown below would like to surround their design with a border, in the shape of an equilateral triangle.
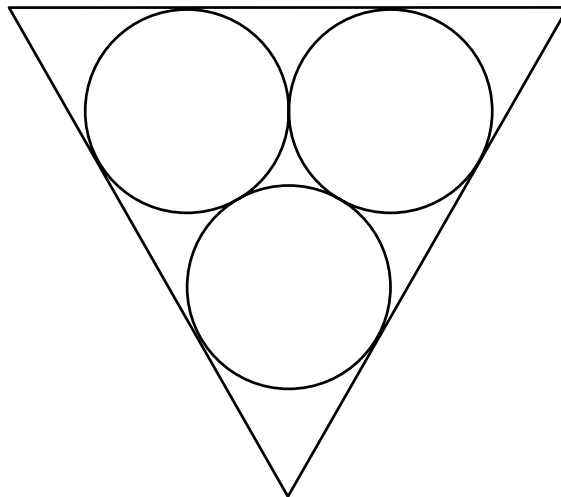
The circles that were used to make the design are congruent to the circle whose equation is:
$$x^2 + y^2 - 6x - 2y - 26 = 0$$

The circles are externally tangent to one another and tangent to the border.

What is the length of the border?
Round your answer to the nearest hundredth of a unit.

21 A museum has been selected to exhibit Leonardo Da Vinci's *Mona Lisa*. The floor plan of the exhibition room, measuring 30 m by 10 m is shown below.

To prevent visitors from touching the *Mona Lisa*, a fence has been installed such that every point along the fence is equidistant from the *Mona Lisa* (M) and wall $\overline{CD}$ of the exhibition room.

The fence is attached to the wall on which the *Mona Lisa* is displayed, at points A and B.
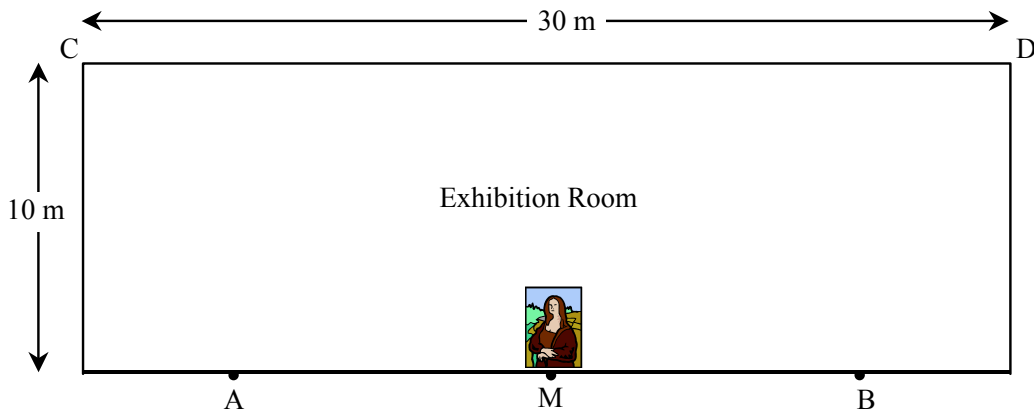
How far apart are points A and B?

22 In 1996, a study was conducted on the relationship between the annual payrolls of major league baseball teams and the number of wins each recorded in a given season. The number of wins for the teams with the nine highest payrolls is listed in the table below.

Teams	Payroll (in millions of $)	Number of wins
New York Yankees	61	92
Baltimore Orioles	55	88
Atlanta Braves	53	96
Cleveland Indians	47	99
Chicago White Sox	44	85
Cincinnati Reds	43	81
Seattle Mariners	43	85
Texas Rangers	41	90
Colorado Rockies	40	83

How many games could a team with a payroll of 30 million dollars expect to win?

23 Only one Secondary V Science Fair team from Central High can advance to the provincial competition.

According to the results below, both Team Al and Team Optics have the identical highest score in their respective classes.

<table>
<tr><td colspan="2" align="center">**CENTRAL HIGH**</td></tr>
<tr><td>**Chemistry classes**</td><td>**Scores**</td></tr>
<tr><td>Team Pb</td><td>86</td></tr>
<tr><td>Team Al</td><td>94</td></tr>
<tr><td>Team Ag</td><td>81</td></tr>
<tr><td>Team He</td><td>78</td></tr>
<tr><td>Team Xe</td><td>83</td></tr>
<tr><td>Team H</td><td>79</td></tr>
<tr><td>Team Kr</td><td>90</td></tr>
<tr><td>Team Zn</td><td>84</td></tr>
<tr><td>Team Hg</td><td>93</td></tr>
<tr><td>Team Au</td><td>77</td></tr>
</table>

<table>
<tr><td colspan="2" align="center">**CENTRAL HIGH**</td></tr>
<tr><td>**Physics classes**</td><td>**Scores**</td></tr>
<tr><td>The Accelerators</td><td>89</td></tr>
<tr><td>The Vectors</td><td>93</td></tr>
<tr><td>The Amps</td><td>85</td></tr>
<tr><td>Team Velocity</td><td>81</td></tr>
<tr><td>The Projectiles</td><td>88</td></tr>
<tr><td>Team Gravity</td><td>84</td></tr>
<tr><td>Team Concave</td><td>79</td></tr>
<tr><td>The Lenses</td><td>87</td></tr>
<tr><td>The Reflectors</td><td>77</td></tr>
<tr><td>Team Optics</td><td>94</td></tr>
</table>

Which of the two teams should advance to the provincial competition?
Justify your reasoning.

24 A fence surrounding a field is represented by the circle with centre O, shown below. Points A, B, C, and D represent several fence posts. The section of the fence represented by arc AD must be replaced.
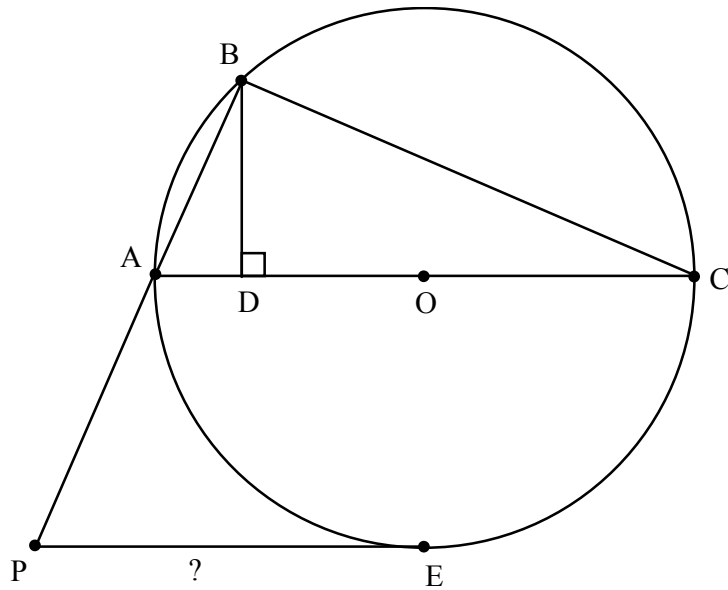
Given the information in the diagram, calculate the length of the fence that needs to be replaced. Round your answer to the nearest hundredth of a metre.
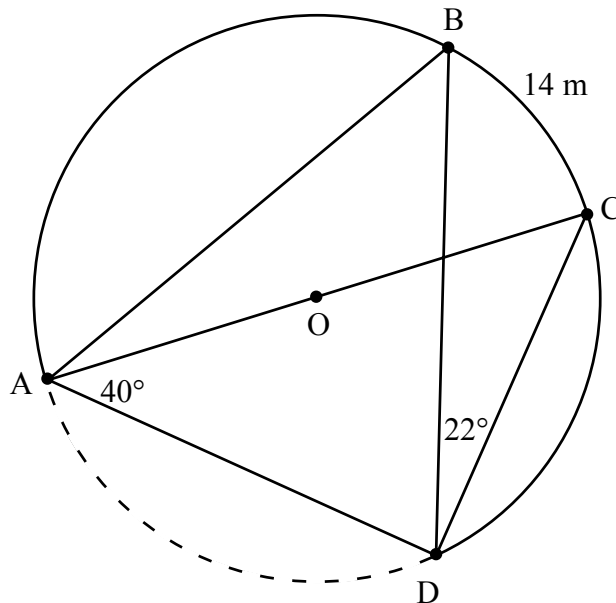
25

In the adjacent circle with centre O, the radius measures 7 cm and point D is located 5 cm from the centre.

PAB forms a secant and $\overline{\text{PA}}$ measures 8 cm.

B

A

D   O

C

P   ?   E

What is the measure of tangent PE?

Round your answer to the nearest tenth of a centimetre.

GRICS

Mathematics

Comprehensive Exam
Number 53

Answer Booklet

Secondary 5

June 2003

Student's Name

Group	Date

Youth Sector General Education

Part A   **Questions 1 to 10**

Blacken the letter that corresponds to the answer chosen.

Each question is worth 4 marks.

---

1 [A] [B] [C] [D]   **6** [A] [B] [C] [D]

2 [A] [B] [C] [D]   **7** [A] [B] [C] [D]

3 [A] [B] [C] [D]   **8** [A] [B] [C] [D]

4 [A] [B] [C] [D]   **9** [A] [B] [C] [D]

5 [A] [B] [C] [D]   **10** [A] [B] [C] [D]

Part B   **Questions 11 to 15**

Write your answer in the space provided.

---

11 The ordered pairs are: _____. | 4 | 2 | 0 |

12 Rounded to the nearest hundredth, the value of x is _____. | 4 | 0 |

13 To the nearest degree, the angle measure is _____°. | 4 | 0 |

14 The exact values of x are _____ and _____. | 4 | 2 | 0 |

15 The number of hours elapsed is _____. | 4 | 0 |

Part C **Questions 16 to 25**

▸ Show all your **work** as well as your **answer**. The work shown is taken into consideration when marks are awarded.

▸ Your written information must be legible, complete, and clearly stated in correct language so the marker understands exactly what you have done.

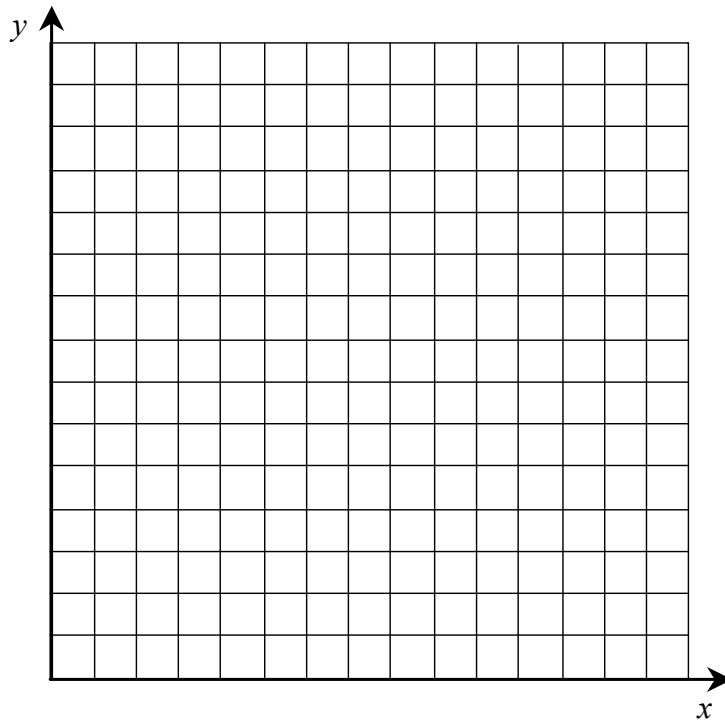**Even if your answer is correct, no marks will be given unless acceptable work is shown.**

16

4	3	2	1	0

Show all your work.

Let   *x*: number of lobsters
y: number of crabs

Graph:

Answer: The maximum revenue this fisherman can expect to make is _____.

17

4 3 2 1 0

Show all your work.

Answer: The inoculations began in the year _____.

18 | 4 | 3 | 2 | 1 | 0 |

Show all your work.

$$\frac{1}{\sin x} - \sin x = \cot x \cos x$$

19

4	3	2	1	0

Show all your work.
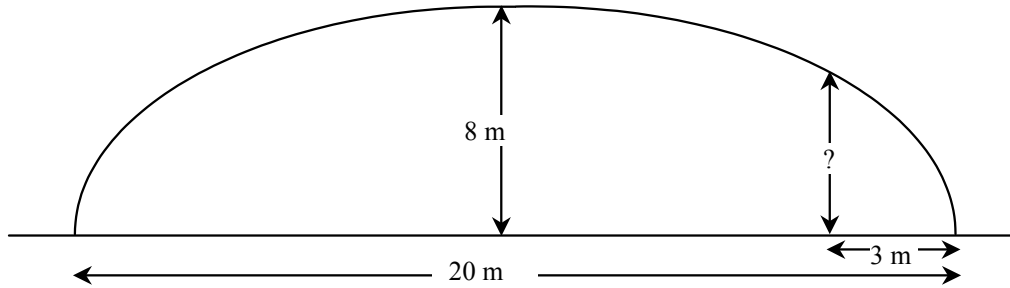
Answer: The cameras are _____ m from the ground.

20

4	3	2	1	0

Show all your work.
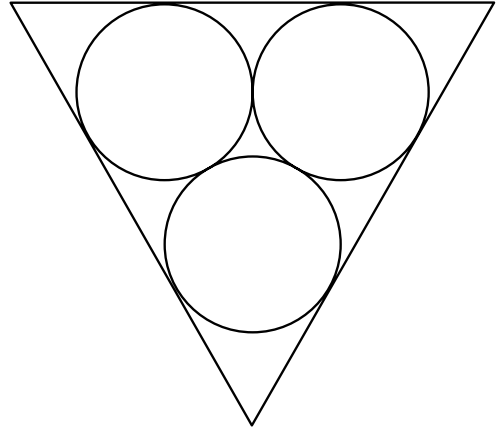
Answer: To the nearest hundredth of a unit, the border measures _____.

21

4	3	2	1	0

Show all your work.

C ←————————————— 30 m —————————————→ D

10 m

Exhibition Room

A   M   B
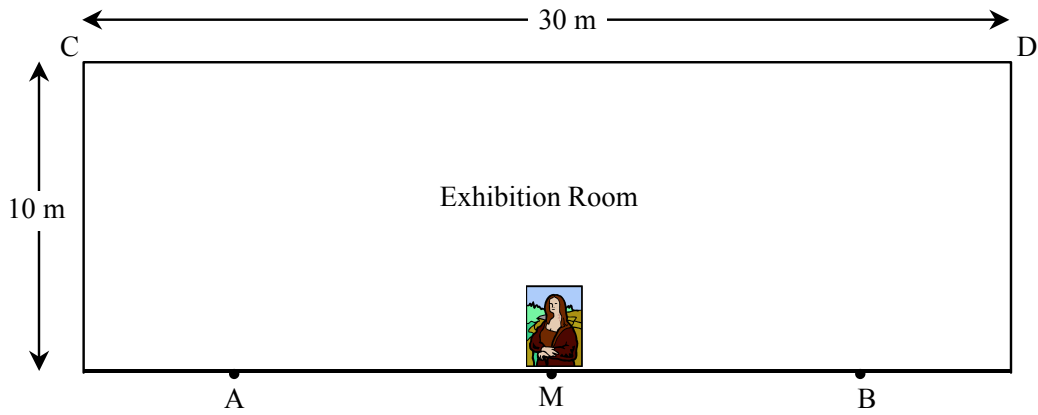
Answer: Points A and B are _____ m apart.

22

4	3	2	1	0

Show all your work.

Answer: A team with a payroll of 30 million dollars can expect to win _____ games.

23

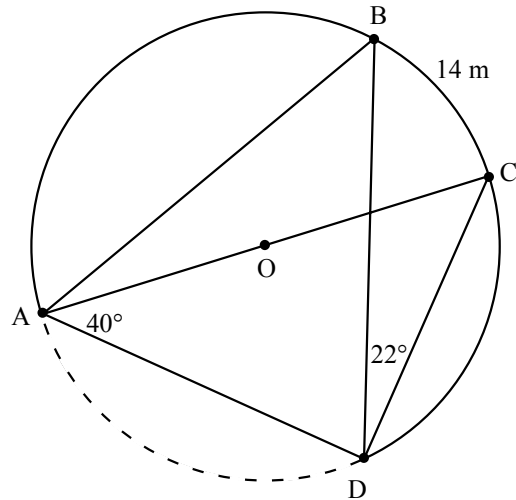| 4	3	2	1	0

Show all your work.

Answer:　　Team _____ should advance to the provincial competition
because _____.

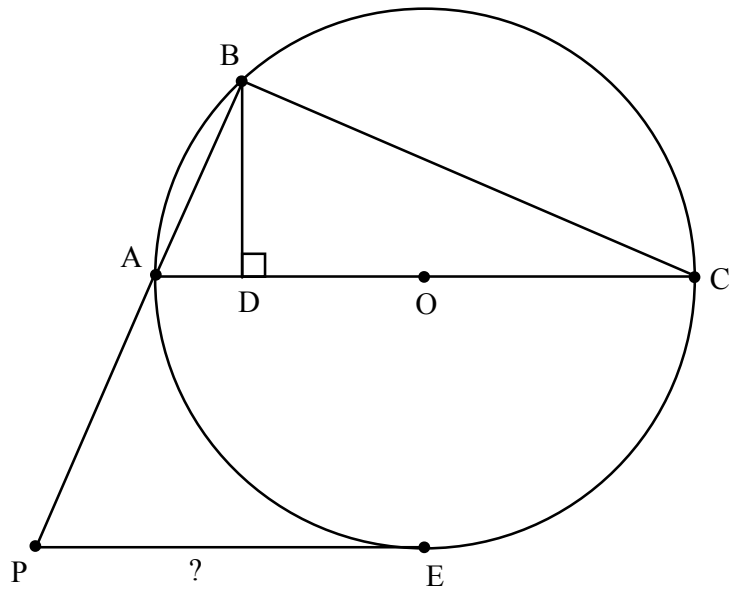**24** | 4 | 3 | 2 | 1 | 0 |

Show all your work.

Answer: To the nearest hundredth of a metre, the length of fence that needs to be replaced is _____ m.

25

4	3	2	1	0

Show all your work.

Answer: To the nearest tenth of centimetre, the measure of tangent PE is _____ cm.