NBCS
NORTHERN BEACHES CHRISTIAN SCHOOL

Love Learning

Student Name: _____

Mathematics

2022 Year 10 5.3/Year 9 Accelerated

Yearly Examination

General Instructions

- Reading time – 5 minutes
- Writing time – 90 minutes
- Write using black pen
- NESA approved calculators may be used
- A two-page handwritten A4 summary sheet is permitted

Total Marks: 65

Additional Instructions:

Section I – 20 marks (pages 2 – 9)

• Attempt Questions 1 – 20

• Allow about 30 minutes for this section

Section II – 45 marks (pages 10 – 19)

• Attempt Questions 21 – 35

• Allow about 60 minutes for this section

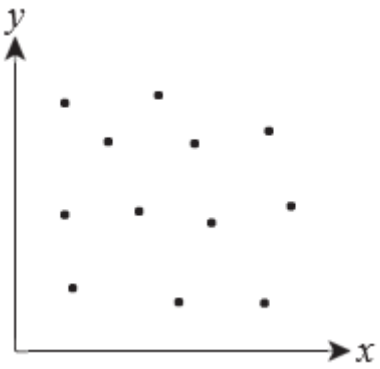
Section I

20 marks
Attempt Questions 1 – 20
Allow about 30 minutes for this section

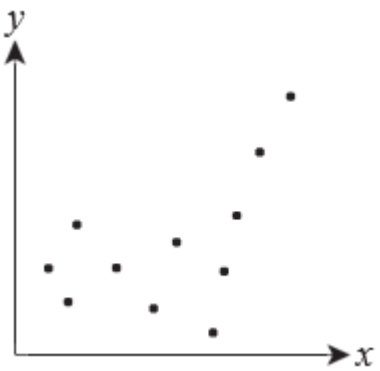
Use the multiple-choice answer sheet for Questions 1 – 20

1 Which of the following scatter plots demonstrates a moderate, negative, linear relationship?

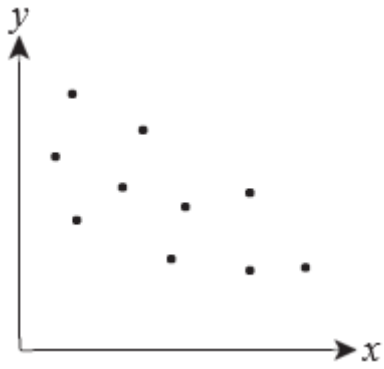
(A)



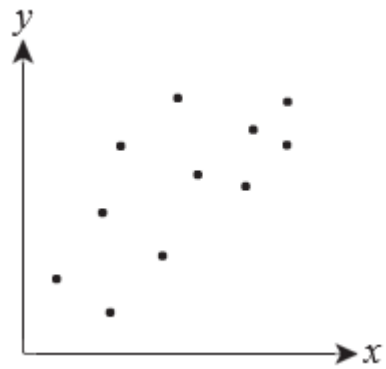
(B)



(C)



(D)



2 What is the gradient of the following linear relationship?

$$y = \frac{3x}{2} - 5$$

(A) $\frac{2}{3}$

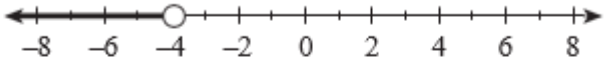
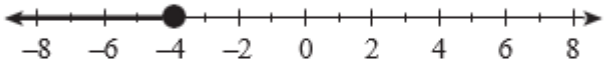
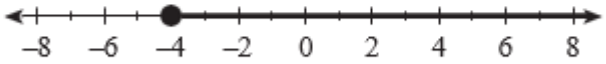
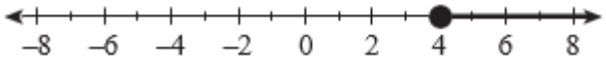
(B) $-\frac{2}{3}$

(C) $\frac{3}{2}$

(D) $-\frac{3}{2}$

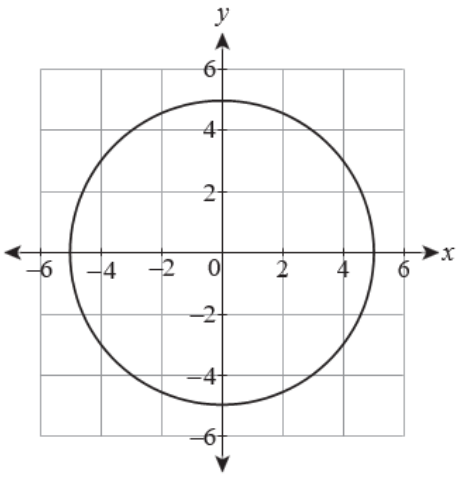
3 Which row of the table gives the solution and graph of the following inequality,

$$-2x - 4 \geq 4 \text{ ?}$$

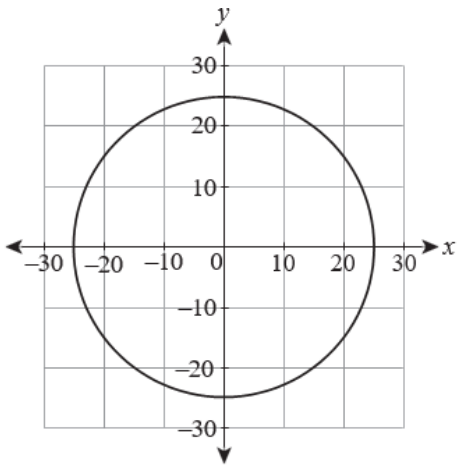
	Solution	Graph
(A)	$x \leq -4$	
(B)	$x \leq -4$	
(C)	$x \geq -4$	
(D)	$x \geq 4$	

4 Which of the following graphs represents the relationship $y^2 = 25 - x^2$?

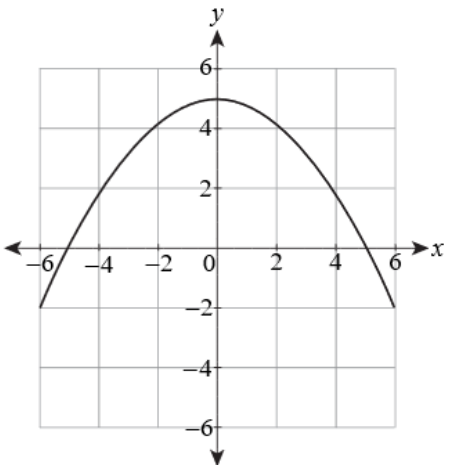
(A)



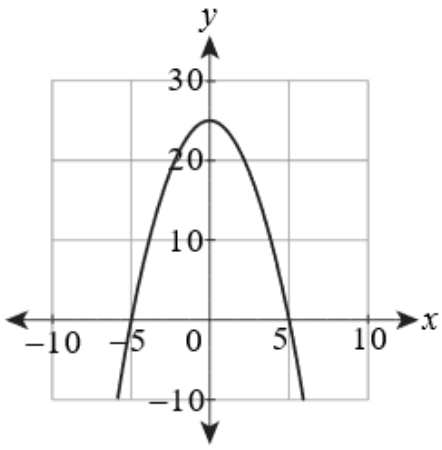
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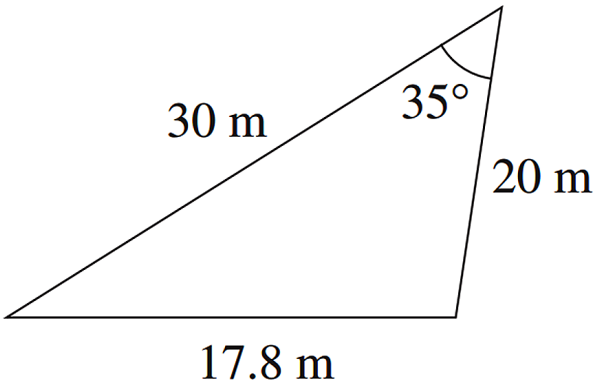
(C)



(D)



5 What is the area of the triangle to the nearest square metre?



NOT TO SCALE

(A) $102\ \text{m}^2$

(B) $153\ \text{m}^2$

(C) $172\ \text{m}^2$

(D) $178\ \text{m}^2$

6 What does the following expression simplify to?

$$\frac{x^2+5x+6}{x^2+4x+4}$$

(A) $\frac{(x-2)(x+3)}{(x+2)}$

(B) $\frac{(x+2)(x+3)}{(x+2)}$

(C) $\frac{x+3}{x+2}$

(D) $\frac{x+2}{x+3}$

7 What is the highest common factor of the terms $-27x^2y^3$ and $3x^5yz$?

(A) $-3xyz$

(B) $3x^2y$

(C) $3x^2y^3$

(D) x^2y

8 Consider the following dataset.

13 16 17 17 21 24

Which row of the table shows how the median and mean are affected when a score of 5 is added to the dataset?

	Median	*Mean*
(A)	Changes	Changes
(B)	Stays the same	Stays the same
(C)	Changes	Stays the same
(D)	Stays the same	Changes

9 A soccer referee wrote down the number of goals scored in 8 different games during the season.

$\{1, 2, 2, 3, 5, 5, 7, __\}$

The last number has been omitted. The range of the data is 9.

What is the five-number summary for this data set?

(A) $1, 2, 4, 6, 10$

(B) $1, 2, 3, 5, 7$

(C) $1, 2, 4, 5, 10$

(D) $1, 2, 3, 5, 7$

10 Line M has the equation $2x + 3y = 4$.

Which row of the table gives the equations of a line that is parallel, and a line that is perpendicular to line M?

	Parallel to line M	**Perpendicular to line M**
(A)	$y = \frac{-2}{3}x + 3$	$y = \frac{-3}{2}x + 3$
(B)	$y = \frac{-3}{2}x + 3$	$y = \frac{2}{3}x + 3$
(C)	$y = \frac{2}{3}x + 3$	$y = \frac{-3}{2}x + 3$
(D)	$y = \frac{-2}{3}x + 3$	$y = \frac{3}{2}x + 3$

11 Some students wanted to do a survey about how many children per household in their local suburb.

Which of the following options would provide a fair and representative set of survey results?

(A) Surveying parents outside their local school

(B) Surveying people at the local park

(C) Surveying households selected randomly from their suburb

(D) Surveying households from one street only

12 What are the solutions of $4x^2 + 10x - 3 = 0$?

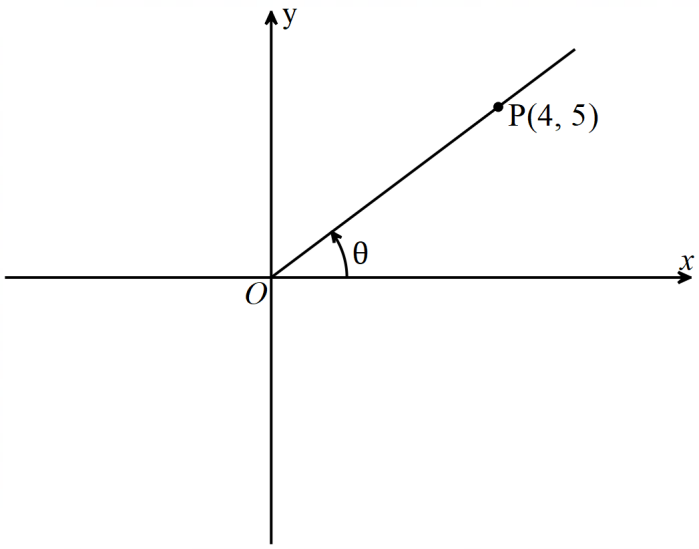
(A) $x = \frac{3}{4}$ and $x = -\frac{13}{4}$

(B) $x = \frac{-5 \pm 2\sqrt{37}}{4}$

(C) $x = \frac{-5 \pm 2\sqrt{58}}{4}$

(D) $x = \frac{-5 \pm \sqrt{37}}{4}$

13 The diagram shows the interval OP where O is the origin and P has coordinates $(4, 5)$.



NOT TO SCALE

What is the size (to the nearest degree) of the angle represented by θ in the diagram?

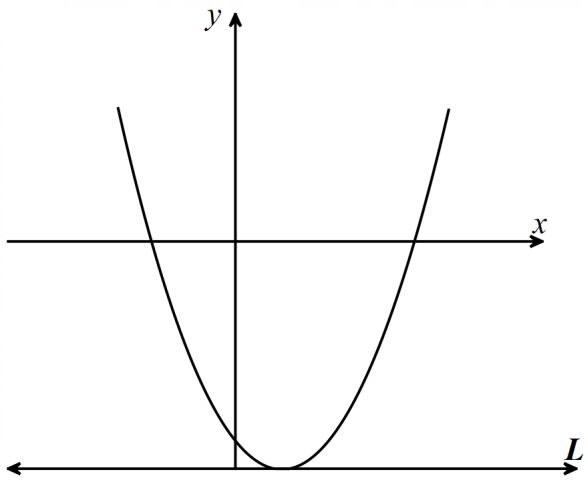
(A) 38°

(B) 39°

(C) 51°

(D) 52°

14 The parabola $y = x^2 - 2x - 6$ is shown below with the line L parallel to the x-axis and passing through the vertex of the parabola.



NOT TO SCALE

What is the equation of the line L?

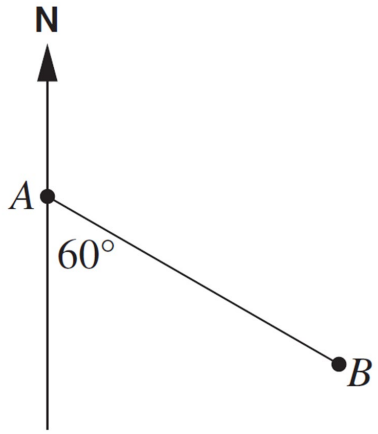
(A) $x = -4$

(B) $x = -7$

(C) $y = -3$

(D) $y = -7$

15 What is the bearing of A from B?



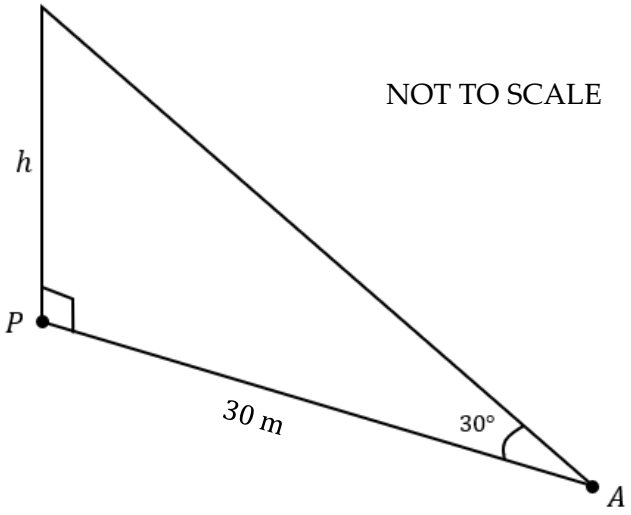
(A) 060°

(B) 120°

(C) 150°

(D) 300°

16 A point A is 30 m from point P, which is the base of a flagpole. If the top of the flagpole is at an angle of elevation of 30° from A, how tall is the flagpole?



(A) $30\sqrt{3}$

(B) $10\sqrt{3}$

(C) $\frac{10}{\sqrt{3}}$

(D) $15\sqrt{3}$

17 Two letters were randomly selected from the word ASSESSMENT, without replacement.

What is the probability of selecting an S first, then an E?

(A) $\frac{1}{90}$

(B) $\frac{3}{50}$

(C) $\frac{2}{25}$

(D) $\frac{4}{45}$

18 The mean of a set of ten scores is 15. Another two scores are included and the new mean is 17.

What is the mean of the two additional scores?

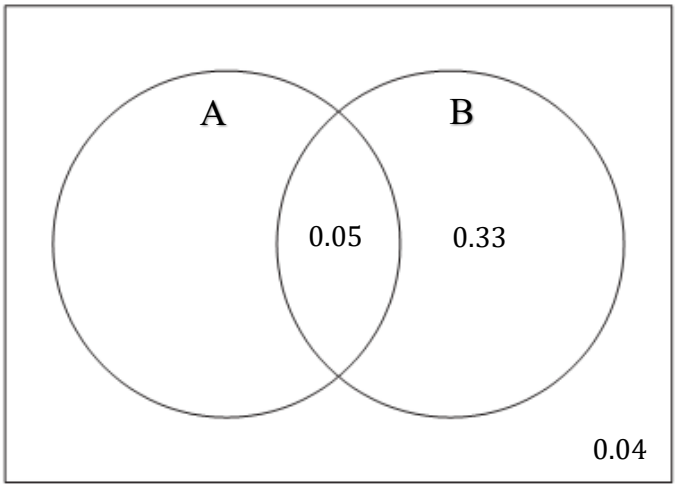
(A) 5

(B) 17

(C) 19

(D) 27

19 An incomplete Venn-diagram is shown below.



Find P(B')

(A) 0.37

(B) 0.38

(C) 0.58

(D) 0.62

20 What is the following expression when written with a rationalised denominator?

$$\frac{\sqrt{3}}{4-\sqrt{5}}$$

(A) $\frac{4\sqrt{3}+\sqrt{15}}{11}$

(B) $\frac{\sqrt{3}}{4}$

(C) $\frac{4-\sqrt{5}}{3}$

(D) $-4\sqrt{3}+\sqrt{15}$

END OF SECTION I

Section II

45 marks
Attempt Questions 21 – 35
Allow about 60 minutes for this section

Your responses should include relevant mathematical reasoning and/or calculations

21 Simplify the following algebraic expression. **2**

$$\frac{4x^2 + 16}{4} - \frac{4x}{2}$$

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22 Given that $g(x) = 2x^2 - 4x + 9$, find $g(-3)$. **1**

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23 Two points A and B have coordinates $(2, -2)$ and $(-8, 14)$. **2**

What is the midpoint of points A and B?

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24 a) Show that $\frac{2}{2-\sqrt{3}} + \frac{2}{2+\sqrt{3}} = 8$. **2**

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b) If $2p + q = 6$ and $3p - 2q = 2$, what is the value of $p + q$? **2**

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25 The equation $y = \frac{1}{x}$ underwent a series of transformations to become the following equation. **2**

$$y = \frac{1}{x+3} + 2$$

Describe the transformations that were used on the graph.

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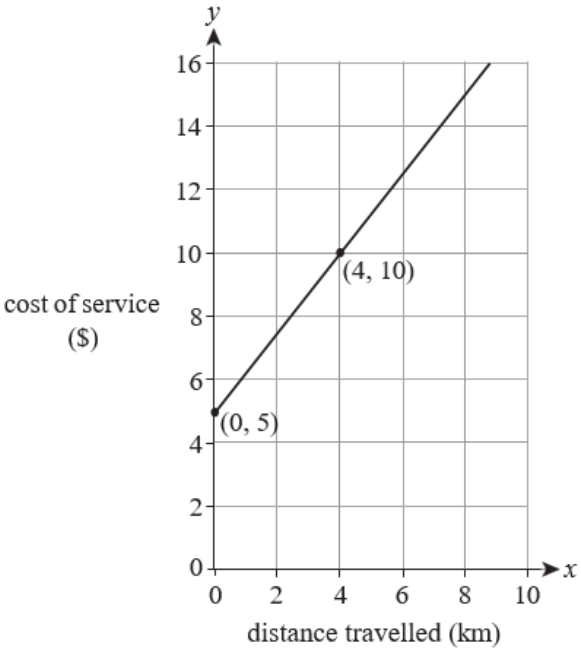
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26 Chen needs to make a trip using a taxi service. The graph below models the cost (in dollars) per distance travelled (in kilometres) for the taxi service.



Chen wants to compare the taxi service to a ride-share service. The ride-share service has an equation $y = 2 + 2x$.

a) Sketch the graph of the ride-share service on the axes above. **1**

b) Explain what is meant by the y-intercept for both the taxi and ride-share services. **1**

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c) Chen's destination is 8 km away. Deduce which service will cost the least for this journey and how much money will Chen save by choosing the cheaper service? **2**

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27 A triangle has an area of 14 m^2. Its height is 3 m greater than the length of the base of the triangle. **2**

Given that the area of a triangle is found using $A = \frac{bh}{2}$, find the length of the base and height of the triangle.

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28 For the graph $y = \frac{1}{3x+6}$,

a) State the domain and range. **2**

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b) Find the y-intercept.

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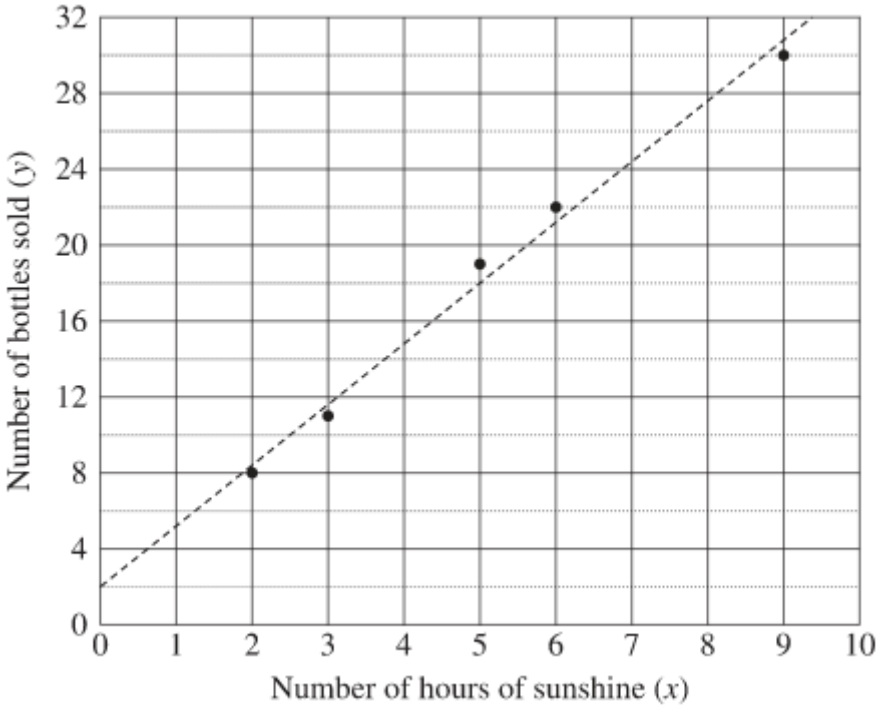
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29 A salesperson is interested in the relationship between the number of bottles of lemonade sold per day and the number of hours of sunshine on the day.

The diagram shows the dataset used in the investigation and the least-squares regression line.



a) Find the equation of the least-squares regression line relating to the dataset. **2**

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b) Suppose a sixth data point was collected on a day which had 10 hours of sunshine. On that day 45 bottles of lemonade were sold. **1**

What would happen to the gradient found in part (a)?

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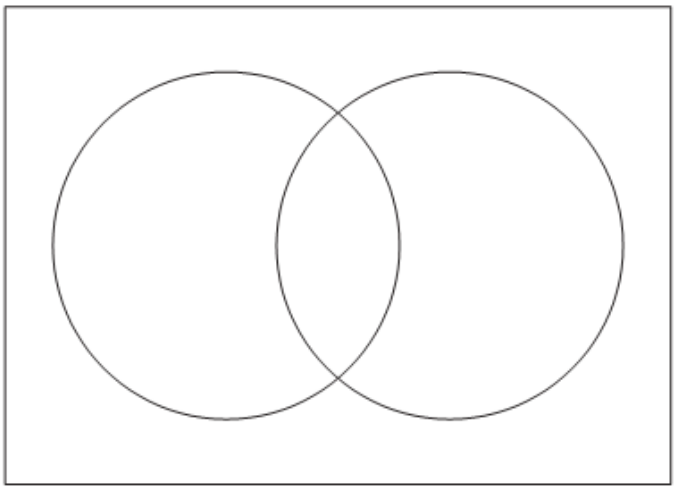
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30 A group of 35 dance students from a variety of dance classes were surveyed to see if they did ballet or jazz. Of those students, 25 did ballet, 11 did jazz and 6 did both.

Let J be the event that the student does jazz. Let B be the event that the student does ballet.

a) Represent this information in the Venn diagram below. **2**



b) Determine the probability of randomly selecting a student who does ballet, given that they also do jazz. **1**

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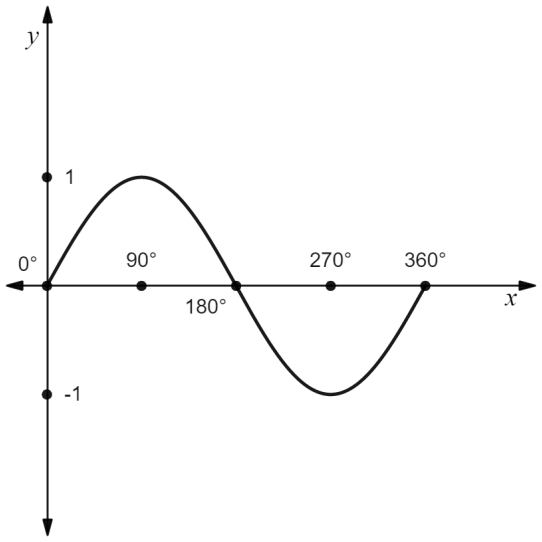
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31 The graph of $y = \sin x$ for $0° \leq x \leq 360°$ is provided below. **1**

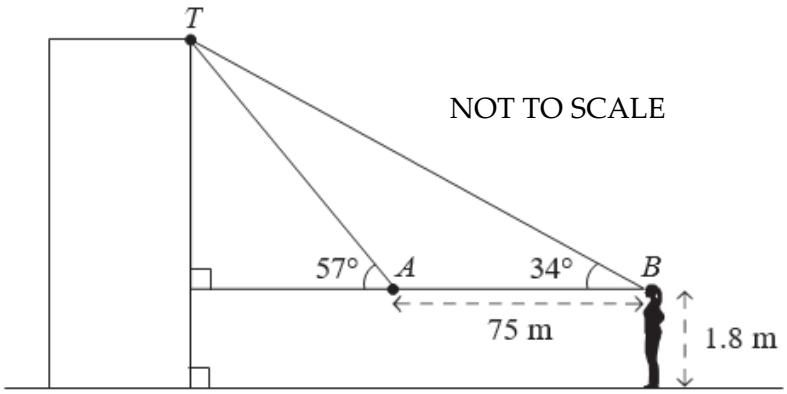
Between which values of x is $\sin x$ negative?



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32 Jo is standing at point A looking at the top of her apartment block, point T. At point A, the angle of elevation to T is 57°. Jo turns and walks 75 m away from the building to point B. At point B, the angle of elevation to point T is 34°. This is shown in the diagram below.



a) Find the distance from point A to point T. Give your answer correct to the nearest metre. **3**

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b) Jo is 1.8 m tall. **2**

Use your answer from part a) to find the height of the building. Give your answer correct to two decimal places.

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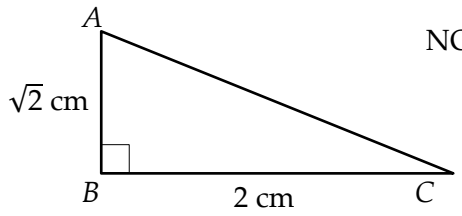
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33 Two of the sides of a right-angled triangle have lengths $\sqrt{2}$ cm and 2 cm, as shown.



NOT TO SCALE

a) What is the length of AC? Answer in exact form. **1**

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b) Show that $\cos A = \frac{\sqrt{3}}{3}$. **1**

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c) Show that $\sin^2 A + \cos^2 A = 1$. **2**

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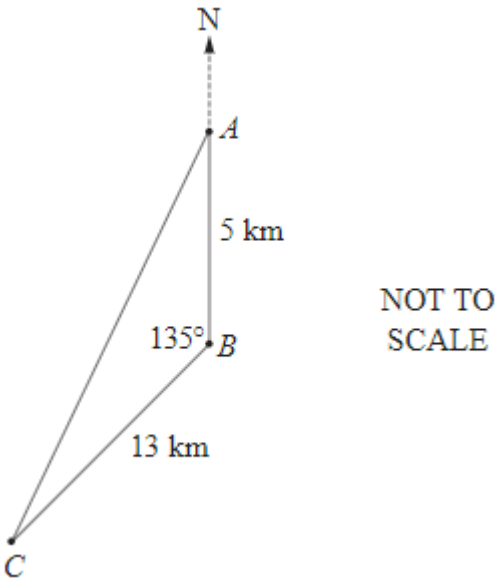
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34 The diagram shows the location of three schools. School A is 5 km due north of school B, school C is 13 km from school B and $\angle ABC$ is 135°.



a) Show that the shortest distance from school A to school C is 17 km, rounded to the nearest kilometre. **2**

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b) Hence, determine the bearing of school C from school A, to the nearest degree. **3**

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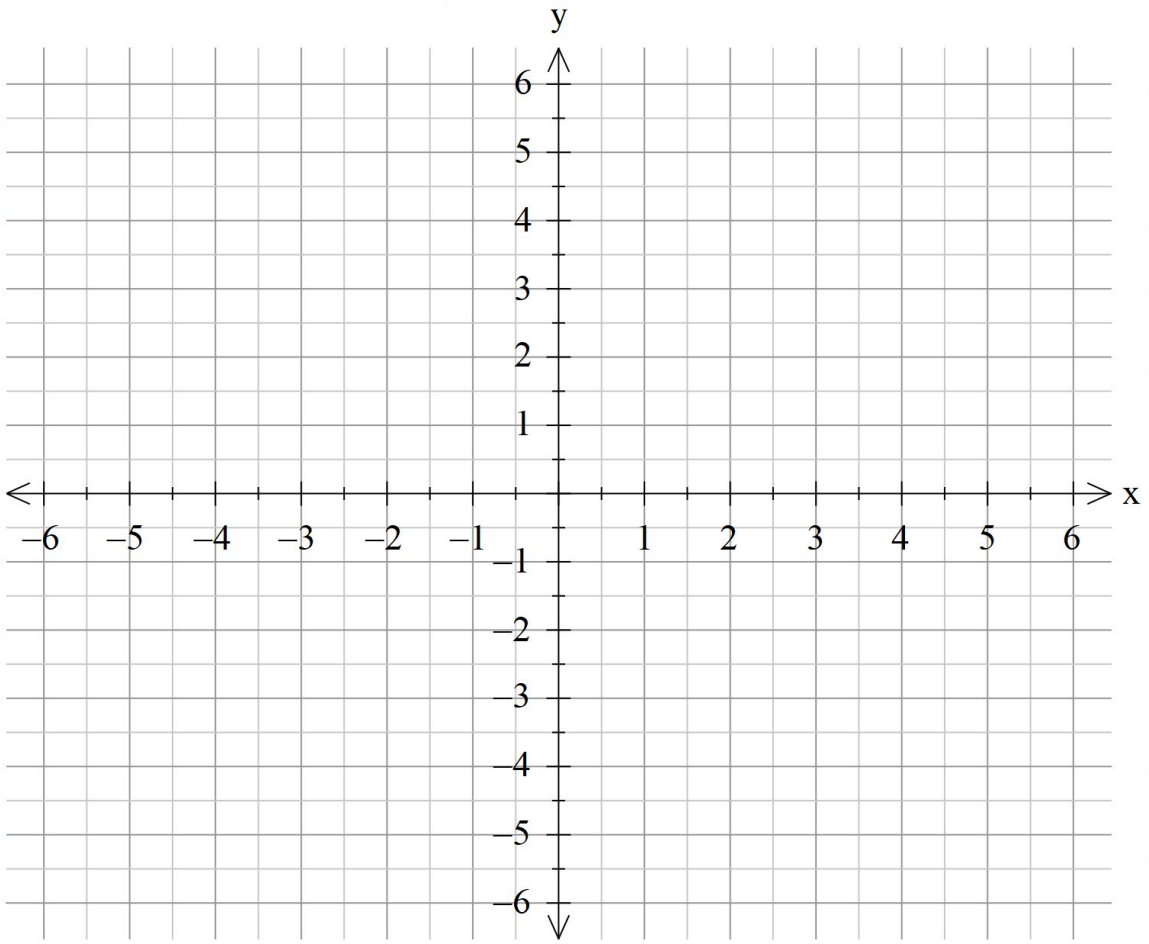
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35 Sketch the graph of $y = 2^{x+2} - 2$. **4**

In your sketch, label the following:

- asymptote(s).
- y-intercept.
- one other point.



END OF EXAMINATION

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NBCS
NORTHERN BEACHES CHRISTIAN SCHOOL

Love Learning

Student Name: Solutions

Mathematics

2022 Year 10 5.3/Year 9 Accelerated

Yearly Examination

General Instructions

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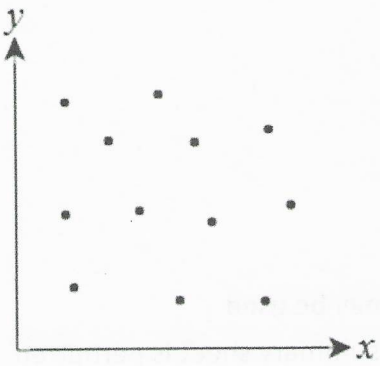
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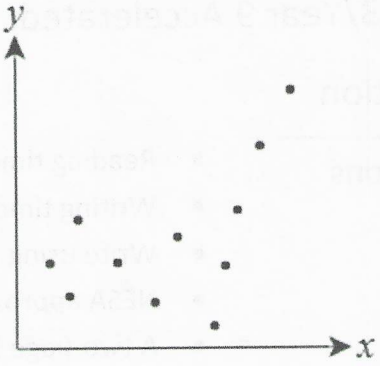
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1 Which of the following scatter plots demonstrates a moderate, negative, linear relationship?

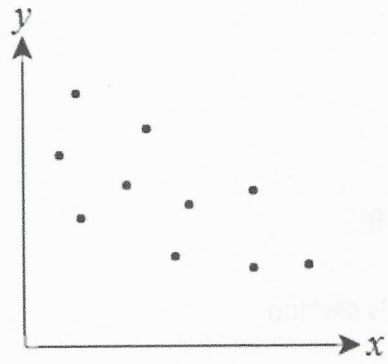
(A)



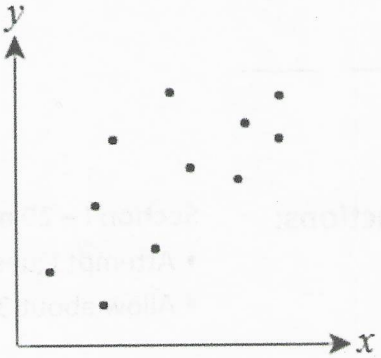
(B)



(C)



(D)



2 What is the gradient of the following linear relationship?

$$y = \frac{3x}{2} - 5$$

(A) $\frac{2}{3}$

(B) $-\frac{2}{3}$

(C) $\frac{3}{2}$

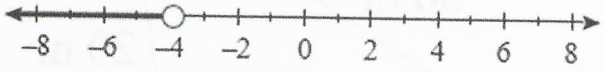
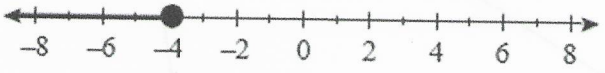
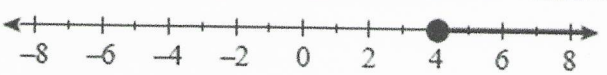
(D) $-\frac{3}{2}$

3 Which row of the table gives the solution and graph of the following inequality,

$$-2x - 4 \geq 4\ ?$$

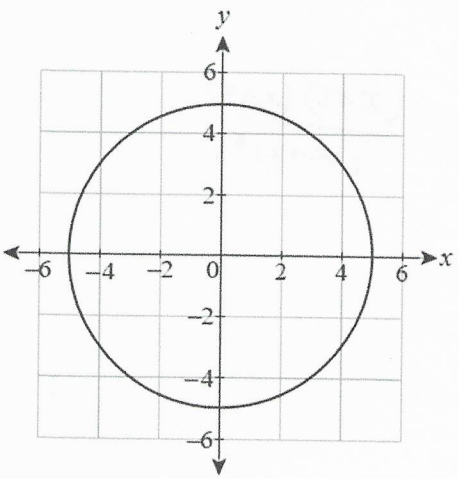
$-2x \geq 8$

$x \leq -4$

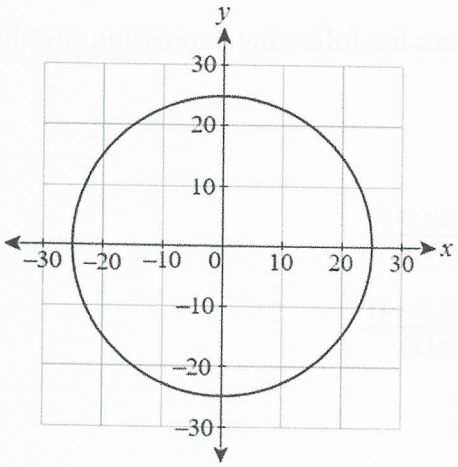
	Solution	Graph
(A)	$x \leq -4$	
(B)	$x \leq -4$	
(C)	$x \geq -4$	
(D)	$x \geq 4$	

4 Which of the following graphs represents the relationship $y^2 = 25 - x^2$?

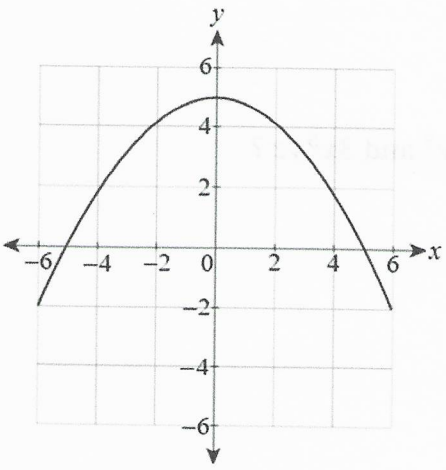
(A)



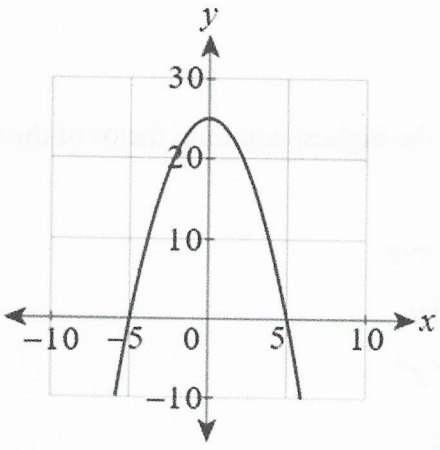
(B)



(C)



(D)

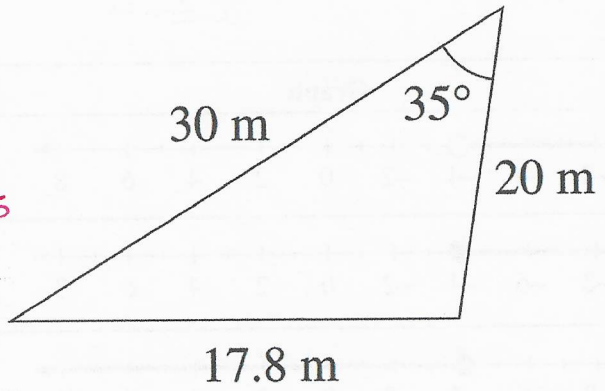


5 What is the area of the triangle to the nearest square metre?

$A = \frac{1}{2}ab\sin C$

$= \frac{1}{2}(30)(20)\sin 35$

$= 172.0..$



NOT TO SCALE

(A) 102 m^2

(B) 153 m^2

(C) 172 m^2

(D) 178 m^2

6 What does the following expression simplify to?

$$\frac{x^2+5x+6}{x^2+4x+4}$$

$\frac{(x+2)(x+3)}{(x+2)^2}$

(A) $\frac{(x-2)(x+3)}{(x+2)}$

(B) $\frac{(x+2)(x+3)}{(x+2)}$

(C) $\frac{x+3}{x+2}$

(D) $\frac{x+2}{x+3}$

7 What is the highest common factor of the terms $-27x^2y^3$ and $3x^5yz$?

(A) $-3xyz$

(B) $3x^2y$

(C) $3x^2y^3$

(D) x^2y

8 Consider the following dataset.

5 13 16 17 17 21 24

Which row of the table shows how the median and mean are affected when a score of 5 is added to the dataset?

	Median	*Mean*
(A)	Changes	Changes
(B)	Stays the same	Stays the same
(C)	Changes	Stays the same
(D)	Stays the same	Changes

9 A soccer referee wrote down the number of goals scored in 8 different games during the season.

$\{1, 2, 2, 3, 5, 5, 7, \underline{\ }\}$

The last number has been omitted. The range of the data is 9.

What is the five-number summary for this data set?

(A) 1, 2, 4, 6, 10

(B) 1, 2, 3, 5, 7

(C) 1, 2, 4, 5, 10

(D) 1, 2, 3, 5, 7

10 Line M has the equation $2x + 3y = 4$.

$3y = 4 - 2x$

$y = \frac{4}{3} - \frac{2}{3}x$

Which row of the table gives the equations of a line that is parallel, and a line that is perpendicular to line M?

	Parallel to line M	**Perpendicular to line M**
(A)	$y = \frac{-2}{3}x + 3$	$y = \frac{-3}{2}x + 3$
(B)	$y = \frac{-3}{2}x + 3$	$y = \frac{2}{3}x + 3$
(C)	$y = \frac{2}{3}x + 3$	$y = \frac{-3}{2}x + 3$
(D)	$y = \frac{-2}{3}x + 3$	$y = \frac{3}{2}x + 3$

11 Some students wanted to do a survey about how many children per household in their local suburb.

Which of the following options would provide a fair and representative set of survey results?

(A) Surveying parents outside their local school

(B) Surveying people at the local park

(C) Surveying households selected randomly from their suburb

(D) Surveying households from one street only

12 What are the solutions of $4x^2 + 10x - 3 = 0$?

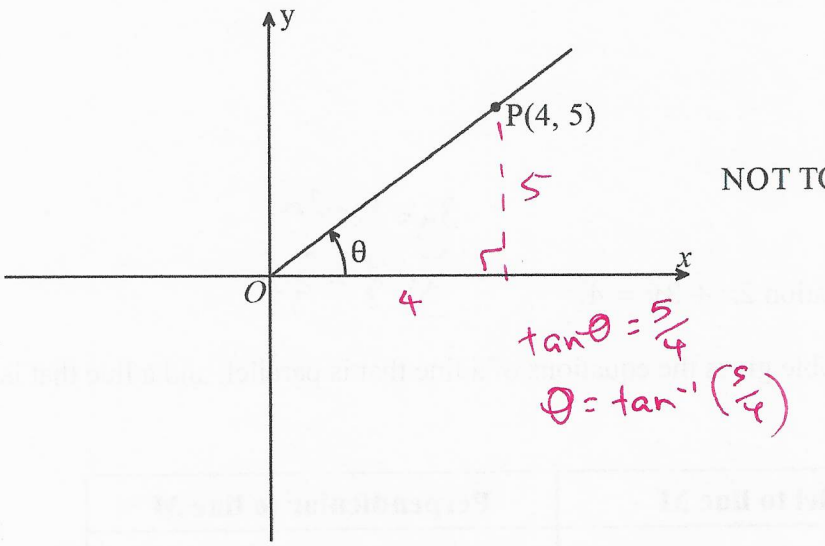
(A) $x = \frac{3}{4}$ and $x = -\frac{13}{4}$

(B) $x = \frac{-5 \pm 2\sqrt{37}}{4}$

(C) $x = \frac{-5 \pm 2\sqrt{58}}{4}$

(D) $x = \frac{-5 \pm \sqrt{37}}{4}$

13 The diagram shows the interval OP where O is the origin and P has coordinates $(4, 5)$.



NOT TO SCALE

What is the size (to the nearest degree) of the angle represented by θ in the diagram?

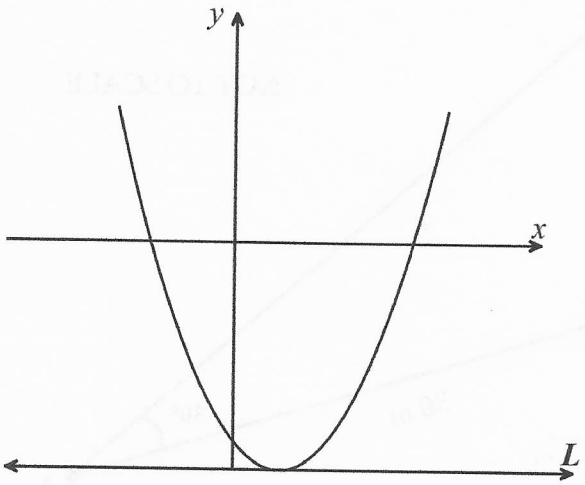
(A) 38°

(B) 39°

(C) 51°

(D) 52°

14 The parabola $y = x^2 - 2x - 6$ is shown below with the line L parallel to the x-axis and passing through the vertex of the parabola.



NOT TO SCALE

$x = \frac{-b}{2a}$

$= \frac{-(-2)}{2(1)}$

$= \frac{2}{2}$

$= 1$

$y = (1)^2 - 2(1) - 6$

$= -7$

What is the equation of the line L?

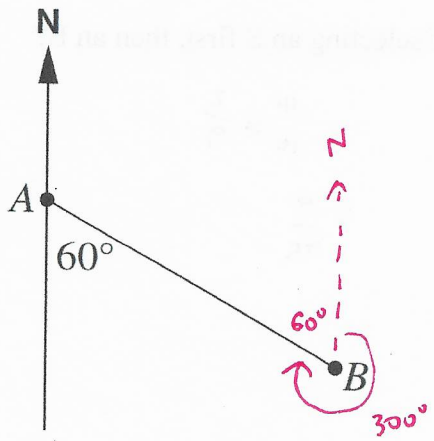
(A) $x = -4$

(B) $x = -7$

(C) $y = -3$

(D) $y = -7$

15 What is the bearing of A from B?



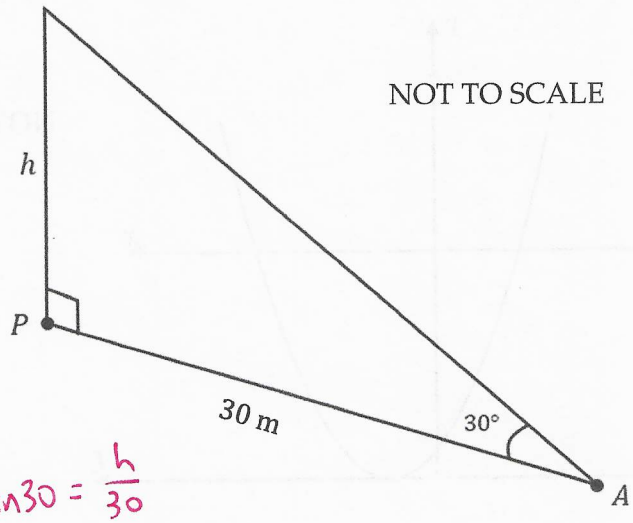
(A) 060°

(B) 120°

(C) 150°

(D) 300°

16 A point A is 30 m from point P, which is the base of a flagpole. If the top of the flagpole is at an angle of elevation of 30° from A, how tall is the flagpole?



$\tan 30 = \frac{h}{30}$

$\frac{1}{\sqrt{3}} = \frac{h}{30}$

$\frac{30}{\sqrt{3}} = h$

$\frac{30}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{30\sqrt{3}}{3}^{10}$

$= 10\sqrt{3}$

(A) $30\sqrt{3}$

(B) $10\sqrt{3}$

(C) $\frac{10}{\sqrt{3}}$

(D) $15\sqrt{3}$

17 Two letters were randomly selected from the word ASSESSMENT, without replacement.

What is the probability of selecting an S first, then an E?

$= \frac{4}{10} \times \frac{2}{9}$

$= \frac{4}{45}$

(A) $\frac{1}{90}$

(B) $\frac{3}{50}$

(C) $\frac{2}{25}$

(D) $\frac{4}{45}$

18 The mean of a set of ten scores is 15. Another two scores are included and the new mean is 17.

What is the mean of the two additional scores?

$10 \times 15 = 150$

$12 \times 17 = 204$

$204 - 150 = 54$

$\frac{54}{2} = 27$

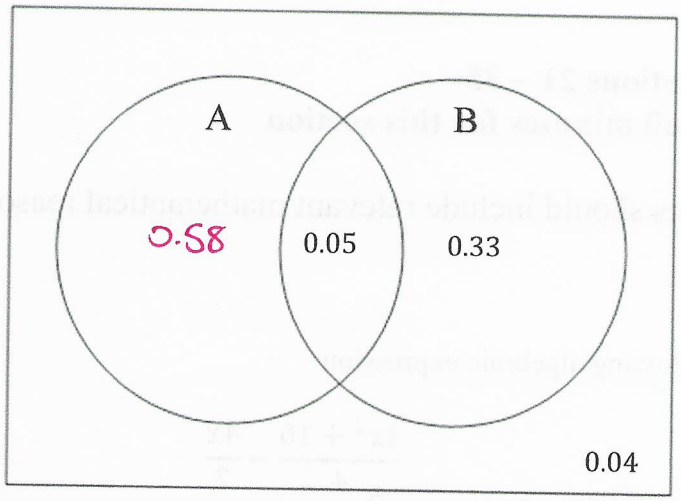
(A) 5

(B) 17

(C) 19

(D) 27

19 An incomplete Venn-diagram is shown below.



$1 - 0.05 - 0.33 - 0.04 = 0.58$

Find $P(B')$

$P(B') = 0.58 + 0.04$

$= 0.62$

(A) 0.37

(B) 0.38

(C) 0.58

(D) 0.62

20 What is the following expression when written with a rationalised denominator?

$$\frac{\sqrt{3}}{4-\sqrt{5}} \times \frac{4+\sqrt{5}}{4+\sqrt{5}}$$

$$= \frac{4\sqrt{3} + \sqrt{15}}{16 - 5}$$

$$= \frac{4\sqrt{3} + \sqrt{15}}{11}$$

(A) $\frac{4\sqrt{3}+\sqrt{15}}{11}$

(B) $\frac{\sqrt{3}}{4}$

(C) $\frac{4-\sqrt{5}}{3}$

(D) $-4\sqrt{3} + \sqrt{15}$

END OF SECTION I

Section II

45 marks
Attempt Questions 21 – 35
Allow about 60 minutes for this section

Your responses should include relevant mathematical reasoning and/or calculations

21 Simplify the following algebraic expression **2**

$$\frac{4x^2+16}{4}-\frac{4x}{2}$$

$= \frac{4x^2+16}{4} - \frac{8x}{4}$

(1) progress

$= \frac{4x^2-8x+16}{4}$

$= \frac{4(x^2-2x+4)}{4}$

$= x^2-2x+4$ (1) soln

22 Given that $g(x) = 2x^2 - 4x + 9$, find $g(-3)$ **1**

$g(-3) = 2(-3)^2-4(-3)+9$

$= 39$

23 Two points A and B have coordinates $(2, -2)$ and $(-8, 14)$. **2**

What is the midpoint of points A and B?

$= \left(\frac{2+-8}{2}, \frac{-2+14}{2}\right)$ (1) correct substitution

$= (-3, 6)$ (1) soln

24 a) Show that $\frac{2}{2-\sqrt{3}}+\frac{2}{2+\sqrt{3}}=8$ **2**

$LHS = \frac{2}{2-\sqrt{3}} + \frac{2}{2+\sqrt{3}}$

$= \frac{4+2\sqrt{3}+4-2\sqrt{3}}{4-3}$ ① progress

$= \frac{8}{1}$ ① correct show

$= 8$

$= RHS$

b) If $2p+q=6$ and $3p-2q=2$, what is the value of $p+q$? **2**

① $q = 6-2p$

② $3p-2q=2$

sub ① into ②

$3p-2(6-2p)=2$

$3p-12+4p=2$

$7p=14$

$p=2$

sub $p=2$ into ①

$q=6-2(2)$

$\therefore q=2$

$\therefore p+q = 2+2$

$= 4$

① find p and q

① find p+q

check ecf

25 The equation $y=\frac{1}{x}$ underwent a series of transformations to become the following equation **2**

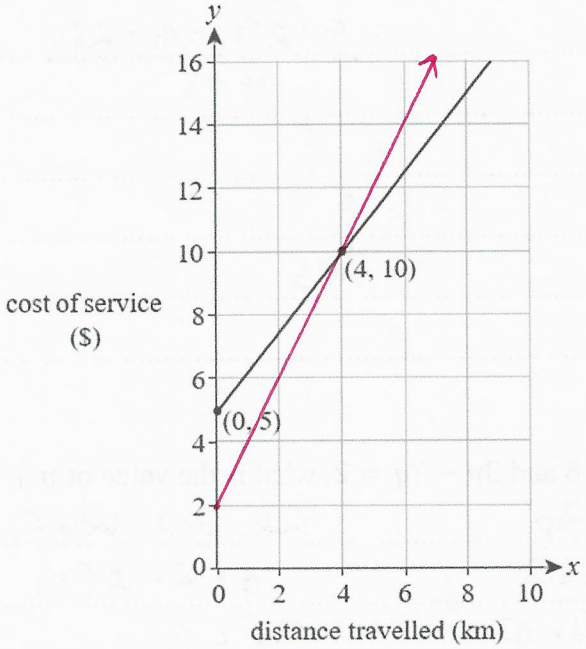
$$y=\frac{1}{x+3}+2$$

Describe the transformations that were used on the graph.

horizontal translation 3 units to the left ①

vertical translation 2 units up ①

26 Chen needs to make a trip using a taxi service. The graph below models the cost (in dollars) per distance travelled (in kilometres) for the taxi service.



Chen wants to compare the taxi service to a ride-share service. The ride-share service has an equation $y = 2 + 2x$

a) Sketch the graph of the ride-share service on the axes above. **1**

b) Explain what is meant by the y-intercept for both the taxi and ride-share services. **1**

the fixed cost for running the services

c) Chen's destination is 8 km away. Deduce which service will cost the least for this journey and how much money will Chen save by choosing the cheaper service? **2**

$y = 2 + 2(8)$ $y = 5 + \frac{5}{4}(8)$

$= \$18$ $= \$15$

taxi service is \$3 cheaper

(1) finds both costs

(1) statement of saving

27 A triangle has an area of 14 m^2. Its height is 3 m greater than the length of the base of the triangle. **2**

Given that the area of a triangle is found using $A = \frac{bh}{2}$, find the length of the base and height of the triangle.

$14 = \frac{x(x+3)}{2}$

$28 = x^2 + 3x$

$0 = x^2 + 3x - 28$ (1)

$0 = (x-4)(x+7)$

$x = 4$ and ~~$x = -7$~~ length can't be negative

$\therefore$ height $= 7$

base $= 4$ (1)

28 For the graph $y = \frac{1}{3x+6}$

a) State the domain and range **2**

domain : $(-\infty, -2) \cup (-2, \infty)$ (1)

range : $(-\infty, 0) \cup (0, \infty)$ (1)

look for marks here if student use incorrect notation

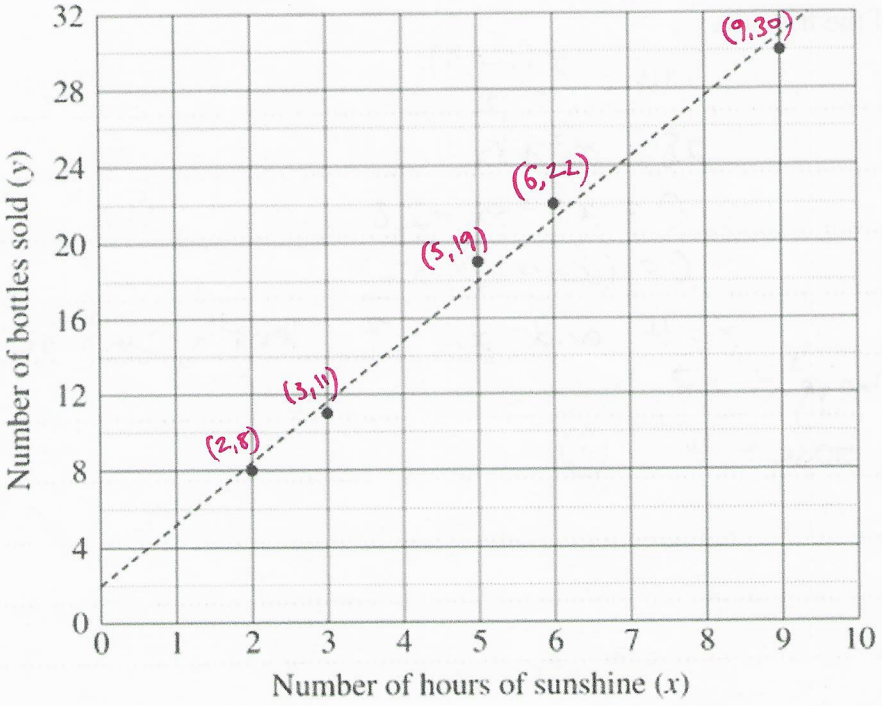
b) Find the y-intercept **1**

$y = \frac{1}{3(0)+6}$

$= \frac{1}{6}$

29 A salesperson is interested in the relationship between the number of bottles of lemonade sold per day and the number of hours of sunshine on the day.

The diagram shows the dataset used in the investigation and the least-squares regression line.



a) Find the equation of the least-squares regression line relating to the dataset. **2**

$y = A + Bx$ ① progress

$= 2 + 3.2x$ ① solution

students can either find dotted line or use data points to calc. **1**

b) Suppose a sixth data point was collected on a day which had 10 hours of sunshine. On that day 45 bottles of lemonade were sold.

What would happen to the gradient found in part (a)?

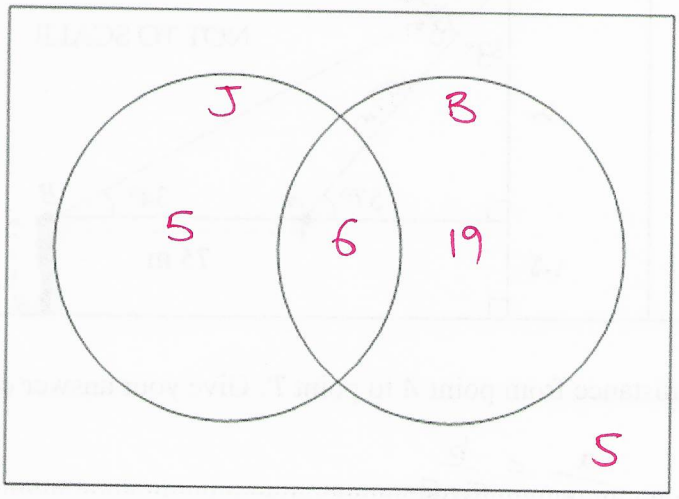
gradient would increase

students do not need to calc gradient to earn the mark

30 A group of 35 dance students from a variety of dance classes were surveyed to see if they did ballet or jazz. Of those students, 25 did ballet, 11 did jazz and 6 did both.

Let J be the event that the student does jazz. Let B be the event that the student does ballet.

a) Represent this information in the Venn diagram below. **2**



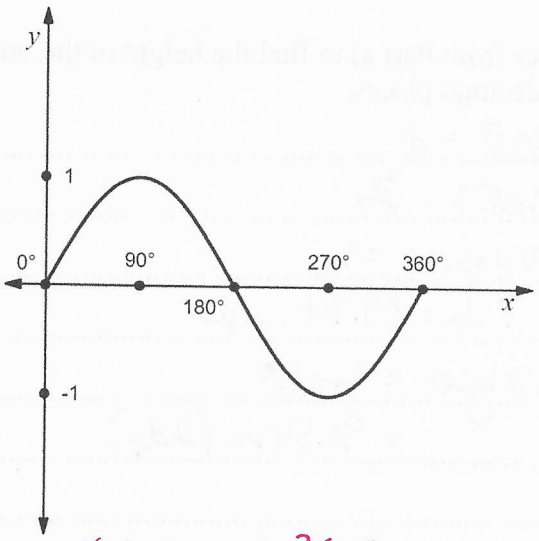
① some correct
① all correct

b) Determine the probability of randomly selecting a student who does ballet, given that they also do jazz. **1**

6/11

31 The graph of $y = \sin x$ for $0° \leq x \leq 360°$ is provided below. **1**

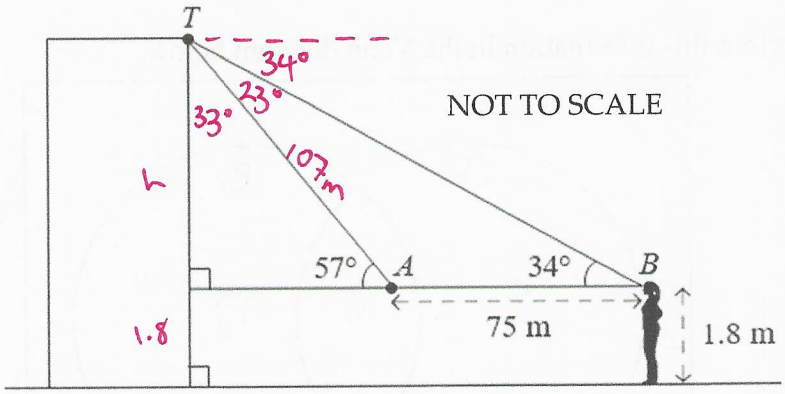
Between which values of x is $\sin x$ negative?



$180° < x < 360°$

give mark even if they use ≤

32 Jo is standing at point A looking at the top of her apartment block, point T. At point A, the angle of elevation to T is 57^o. Jo turns and walks 75 m away from the building to point B. At point B, the angle of elevation to point T is 34^o. This is shown in the diagram below.



a) Find the distance from point A to point T. Give your answer correct to the nearest metre. **3**

$\frac{a}{\sin A} = \frac{b}{\sin B}$

① $\angle ATB = 23°$

① sine rule sub

$\frac{AT}{\sin 34} = \frac{75}{\sin 23}$

① correct solution

$AT = \frac{75\sin 34}{\sin 23}$

$= 107\text{m}$

don't mark down for no rounding

b) Jo is 1.8 m tall. **2**

Use your answer from Part a) to find the height of the building. Give your answer correct to two decimal places.

$\sin\theta = \frac{o}{H}$

$\sin 57 = \frac{h}{107}$

$107\sin 57 = h$

$\therefore h = 89.74\ldots\text{m}$

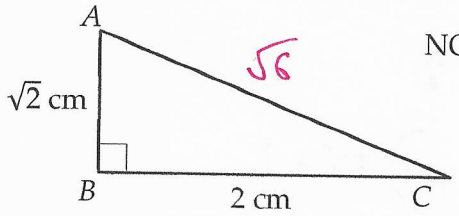
① find h

total height $= h + 1.8$

$= 91.54\text{m}$ (2dp)

① add $h + 1.8$

33 Two of the sides of a right-angled triangle have lengths $\sqrt{2}$ cm and 2 cm, as shown.



NOT TO SCALE

a) What is the length of AC? Answer in exact form. **1**

$AC^2 = (\sqrt{2})^2 + (2)^2$

$AC^2 = 2 + 4$

$AC^2 = 6$

$\therefore AC = \sqrt{6}$

b) Show that $\cos A = \frac{\sqrt{3}}{3}$ **1**

$\cos A = \frac{A}{H}$

$\cos A = \frac{\sqrt{2}}{\sqrt{6}}$

$= \frac{\sqrt{2}}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}}$

$= \frac{\sqrt{12}}{6}$

$= \frac{2\sqrt{3}}{6}^{3}$

$= \frac{\sqrt{3}}{3}$

c) Show that $\sin^2 A + \cos^2 A = 1$ **2**

$LHS = \left(\frac{2}{\sqrt{6}}\right)^2 + \left(\frac{\sqrt{3}}{3}\right)^2$ ① substitution

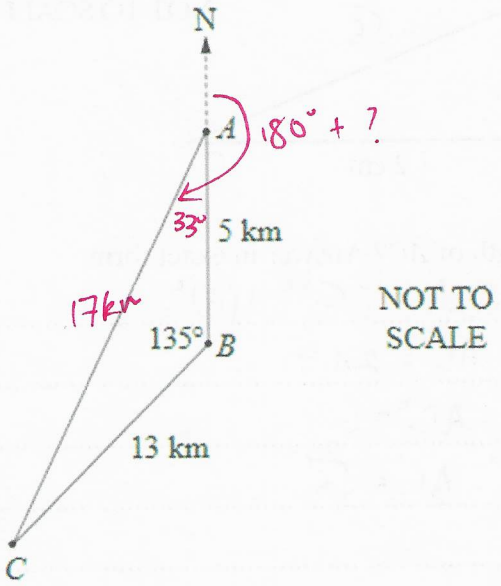
$= \frac{4}{6} + \frac{3}{9}$

$= \frac{2}{3} + \frac{1}{3}$

$= 1$ ① correct process

$= RHS$

34 The diagram shows the location of three schools. School A is 5 km due north of school B, school C is 13 km from school B and $\angle ABC$ is 135°.



a) Calculate the shortest distance from school A to school C, to the nearest kilometre. **2**

$c^2 = a^2 + b^2 - 2ab\cos C$

$AC^2 = 13^2 + 5^2 - 2(13)(5)\cos 135$ (1) correct sub

$AC = \sqrt{285.92...}$

$\therefore AC = 17$ km

b) Determine the bearing of school C from school A, to the nearest degree. **3**

$\frac{\sin A}{a} = \frac{\sin B}{b}$

$\frac{\sin A}{13} = \frac{\sin 135}{17}$

$\sin A = \frac{13\sin 135}{17}$

$A = \sin^{-1}\left(\frac{13\sin 135}{17}\right)$

$A = 32°43'...$

$\therefore A = 33°$

$\therefore$ bearing $= 180° + 33$

$= 212°$

(1) sine rule sub

(1) $\angle BAC$

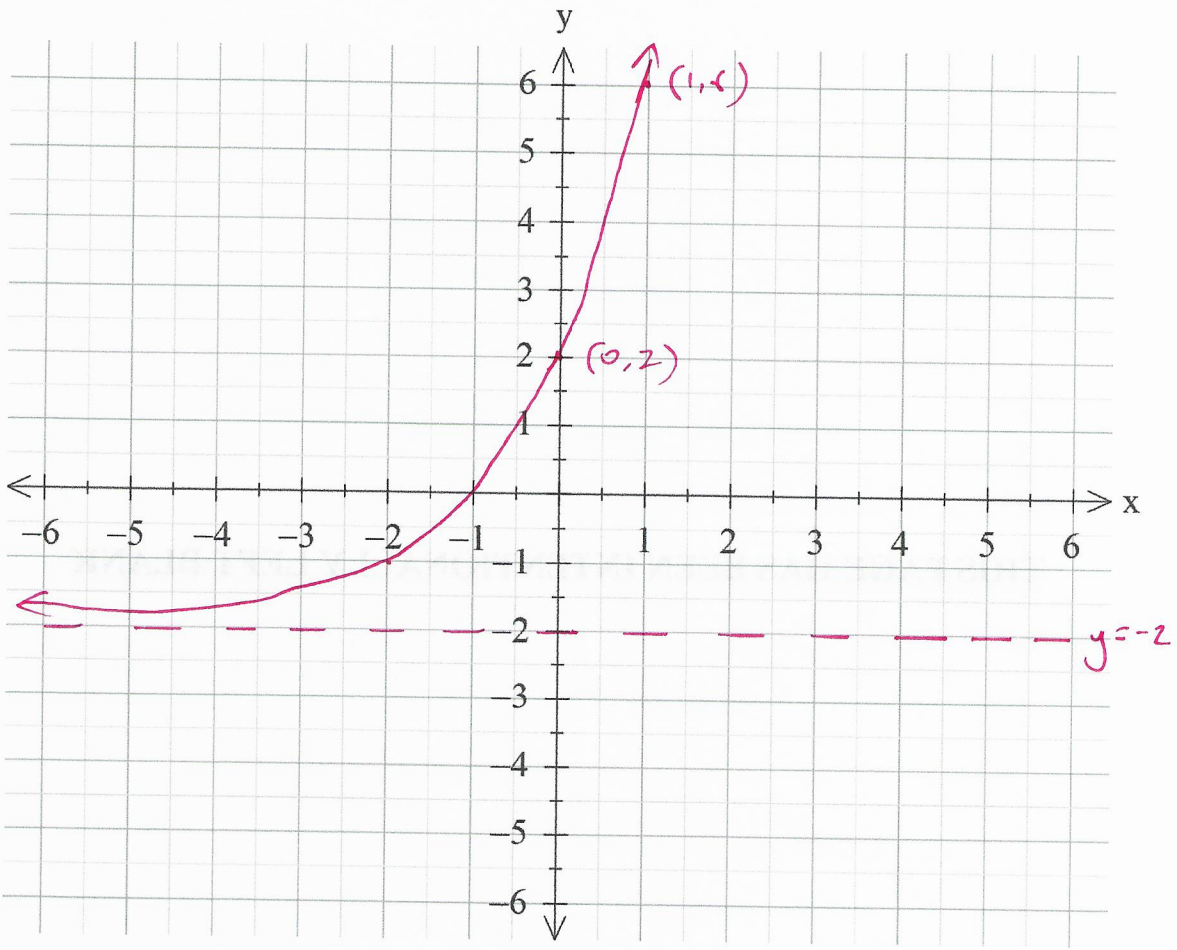
(1) bearing

35 Sketch the graph of $y = 2^{x+2} - 2$ **4**

In your sketch, label the following:

- asymptote(s) (1)
- y-intercept (1)
- one other point (1)

(1) shape



END OF EXAMINATION