

School Name

Half Yearly Examination

2016

Year 10

Mathematics Course

Total Marks – 80

General Instructions

- Reading time: 5 minutes
- Working time: 2 hours
- There will be a short break between Section 1 and Section 2
- Write using black or blue pen
- You may use a pencil to draw or complete diagrams
- Attempt ALL questions
- Approved calculators may be used in Section 2.
- Write your Name and Teacher's Name in the spaces provided.
- A formula Sheet is on the reverse of this page and can be detached and used in all sections of the test.

Section 1

Non Calculator Section.

20 marks

Time allowed for this section is 30 minutes.

Write all answers in the spaces provided.

Section 2

Time allowed for this section is 1 hour and 30 minutes.

Part A

Multiple Choice Section.

Mark your answers on the separate answer sheet at the end of the examination.

40 marks

Part B

Longer Answer Section.

Write all answers in the spaces provided.

20 marks

Formula Sheet

Pythagoras' Theorem

$$c^2 = a^2 + b^2$$

c = hypotenuse

a and b are the shorter sides

Circumference of a circle

$$C = \pi d$$

d = diameter

Area of a circle

$$A = \pi r^2$$

r = radius

Area of a parallelogram

$$A = bh$$

b = base

h = perpendicular height

Area of a rhombus or kite

$$A = \frac{1}{2}xy$$

x and y are the diagonals

Area of a trapezium

$$A = \frac{1}{2}h(a + b)$$

h = perpendicular height

a and b are the parallel sides

Volume of a prism

$$V = Ah$$

A = area of base

h = perpendicular height

Volume of a pyramid

$$V = \frac{1}{3}Ah$$

A = area of base

h = perpendicular height

Volume of a cylinder

$$V = \pi r^2 h$$

r = radius

h = perpendicular height

Volume of a cone

$$V = \frac{1}{3}\pi r^2 h$$

Volume of a sphere

$$V = \frac{4}{3}\pi r^3$$

Surface Area of a Cylinder

$$SA = 2\pi r^2 + 2\pi r h$$

Surface Area of Cone

$$SA = \pi r^2 + \pi r l$$

r = radius

l = slant height

Surface Area of a sphere

$$V = 4\pi r^2$$

Trigonometric formulae for a triangle ABC.

Sine Rule

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

Cosine Rule

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

or

$$\cos A = \frac{c^2 + b^2 - a^2}{2bc}$$

Area of a triangle

$$\text{Area} = \frac{1}{2}ab \sin C$$

Simple interest

$$I = PRT$$

P = Principal

R = interest rate per time period as a decimal

T = number of time periods

Compound Interest

$$A = P(1 + r)^n$$

A = Final amount to which the investment grows

P = Principal

r = interest rate per compounding period as a decimal

n = number of compounding periods

Depreciation

$$SV = IV(1 - r)^n$$

SV = Salvage Value to which the initial value falls

IV = Initial Value

r = depreciation rate per compounding period as a decimal

n = number of compounding periods

Gradient of a line

$$m = \frac{\text{vertical rise}}{\text{horizontal run}}$$

$$= \frac{y_2 - y_1}{x_2 - x_1}$$

(x_1, y_1) and (x_2, y_2) are points on the line

m = gradient

Midpoint of a line segment

$$MP = \left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2} \right)$$

Length of a line segment

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Equation of a line

$$y = mx + b$$

or

$$y - y_1 = m(x - x_1)$$

b = y intercept

School Name
Half Yearly Examination
Mathematics Course
2016

Class/Teacher _____

Name _____

Section 1

20 marks

Time allowed for this section is 30 minutes

Answer Questions 1–20 in the spaces provided.

Calculators are **NOT** to be used in this section.

There will be a short break between Section 1 and Section 2.

Section 1

Non Calculator Section

Write all working and answers in the spaces provided on this test paper.

1. $(15 - 7) \times 4 = ?$

.....
.....

2. $\frac{19}{20} - \frac{3}{4} = ?$

.....
.....

3. What is 0.64 when written as a fraction in simplest form?

.....
.....

4. The temperature at Frosty Hill was -3°C at 4 pm and fell by 2°C every hour until 11 pm.
What was the temperature at 11 pm?

.....
.....

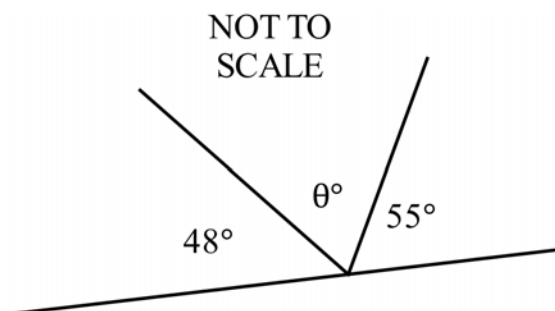
5. The Rev Heads Auto store offers a 30% discount on all stock.
What would you pay for seat covers normally priced at \$120.00?

.....
.....

6. A survey finds that the ratio of tourists to residents in a coastal town is 4 : 15.
If there were 600 residents, how many tourists were there?

.....
.....

7. Find the value of θ .



.....

.....

.....

.....

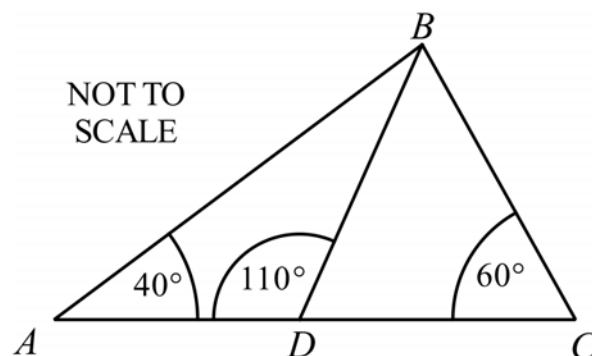
8. What is the size of $\angle CBD$?

.....

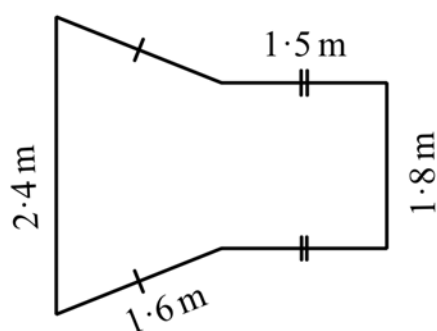
.....

.....

.....



9. Find the perimeter of this hexagon.



NOT TO SCALE

.....

.....

.....

.....

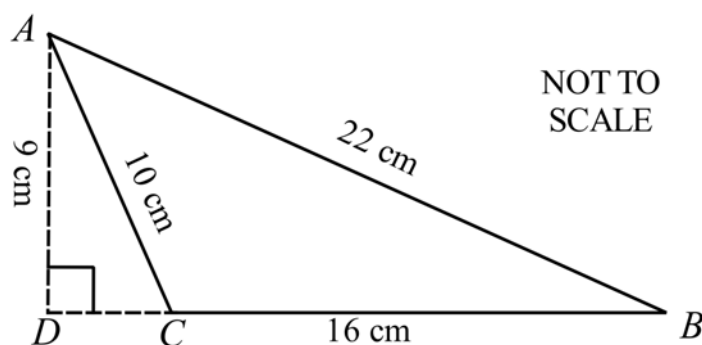
10. What is the area of triangle ABC ?

.....

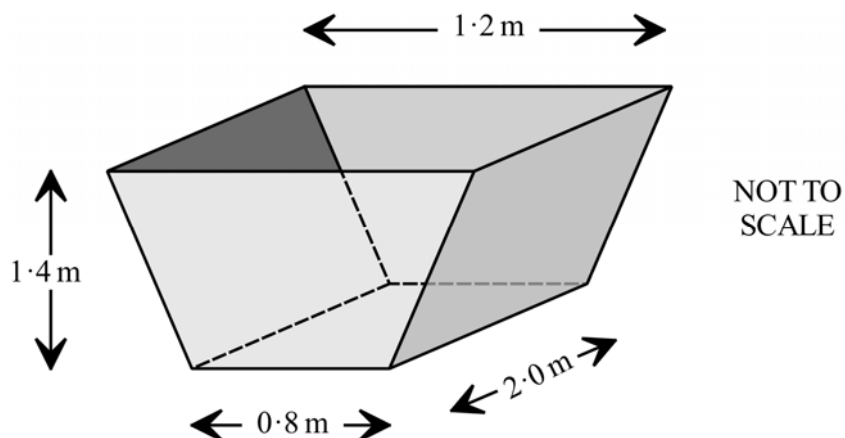
.....

.....

.....



11. Calculate the volume of the trapezoidal prism.



.....

.....

.....

12. Simplify the expression $2xy + 3x \times 4y$.

.....

.....

13. Simplify $\frac{24x^3y^4}{4x^3y}$.

.....

.....

14. Expand and simplify $10x^2 - 3x(2x - 4y)$

.....

.....

15. What are the coordinates of the midpoint of the interval joining $A(-6, 7)$ and $B(-10, -5)$?

.....

.....

16. The wavelength of green light is given as 5.5×10^{-7} metres.
Write this distance a normal decimal numeral, without using indices.

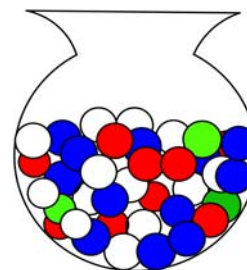
.....

17. Find the value of w if $7w + 1 = 2w - 16$.

.....

18. A vase holds 50 coloured balls. Twelve balls are red, eleven are white, seven are green and the rest are blue.

If one is chosen at random, what is the probability that it is blue?



.....

Questions 19 and 20 refer to the following:

0	3	4	5		
1	3	4	6	8	
2	1	2	5	6	8
3	3	6			
4	0	0	2	5	
5	0	7			

The stem and leaf plot shows the scores from throwing 20 darts at a dartboard.

19. What percentage of the scores are less than 20?

.....

20. What is the mean of the scores?

.....

End of Section 1

Section 2

60 marks

Time allowed for this section is
1 hour and 30 minutes

This section has TWO parts

Part A – Forty multiple-choice questions
worth 1 mark each.

Mark your answers on the
separate answer sheet provided
at the end of the examination.

Part B – Longer answer questions worth a
total of 20 marks.

Write all answers and working in
the spaces provided on this
examination paper.

Calculators may be used in this section.

Do not commence Section 2 until you are
instructed to do so.

Part A: Use the multiple choice answer sheet at the end of the paper to record your answers. Completely shade the bubble corresponding to the correct answer for each question.

21. Which of these decimals is greater than $\frac{2}{5}$ and less than $\frac{5}{8}$?

A. 0.325 B. 0.4 C. 0.475 D. 0.625

22. There are 24 faulty parts in a delivery of 250 parts.

What percentage of the parts were faulty?

A. 6.0% B. 9.6% C. 12.5% D. 90.4 %

23. A radio station plays 25 country tracks and 35 rock tracks in a four-hour program.

What is the ratio of country to rock tracks, in simplest form?

A. 5 : 7 B. 5 : 12 C. 7 : 5 D. 7 : 12

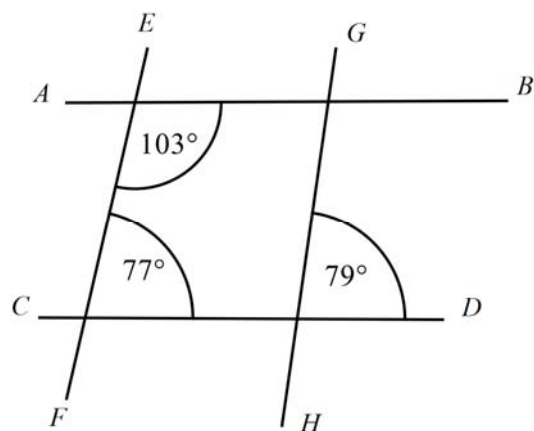
24. Dee loans her brother \$1 200 at 5.5% p.a. simple interest to be repaid in 3 years.

How much interest would her brother pay?

A. \$36.00 B. \$66.00 C. \$99.00 D. \$198.00

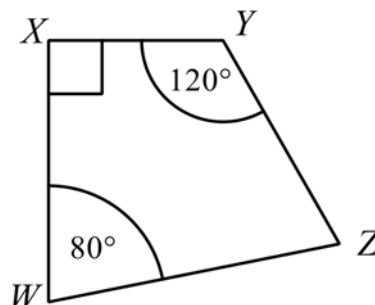
25. Which statement is true?

- A. $AB \parallel CD$ only.
B. $EF \parallel GH$ only.
C. $AB \parallel CD$ and $EF \parallel GH$.
D. No lines are parallel.



NOT TO
SCALE

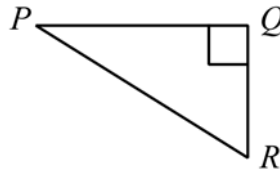
26. What is the size of $\angle Z$?



NOT TO
SCALE

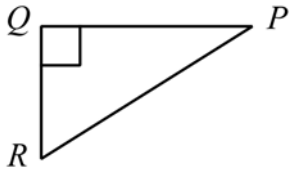
A. 20° B. 60° C. 70° D. 90°

27. Triangle PQR is shown below.

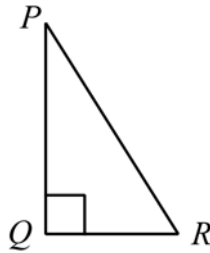


Which diagram shows the image after triangle PQR is rotated through 90° in a clockwise direction about P ?

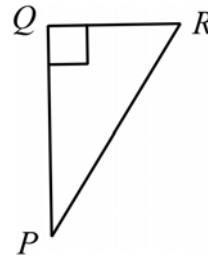
A.



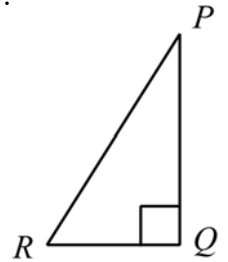
B.



C.



D.



28. A sporting field is in the shape shown.

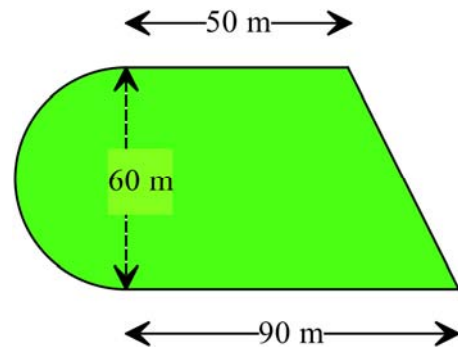
What is the area of the field to the nearest m^2 ?

A. 4 200 m^2

B. 5 614 m^2

C. 9 814 m^2

D. 9 855 m^2



29. The net of a square pyramid is shown below.

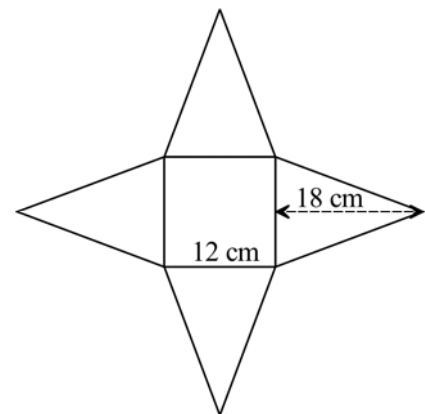
What is the surface area of the pyramid when formed?

A. 576 cm^2

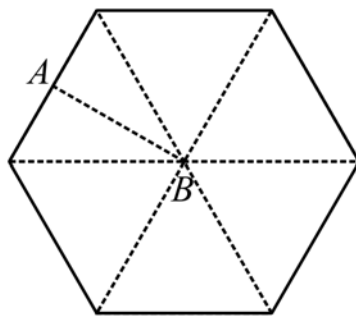
B. 648 cm^2

C. 864 cm^2

D. 1 008 cm^2



30. The concrete foundation slab for a building is to be in the shape of a hexagonal prism with the cross section shown below.



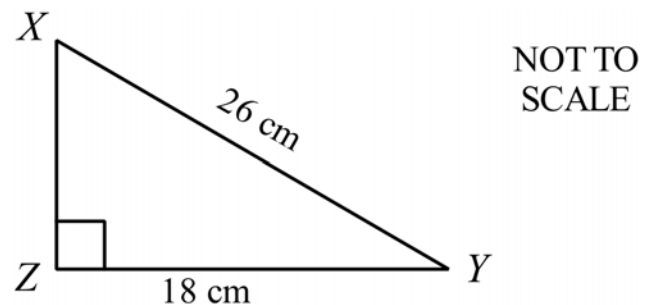
The edges of the hexagon are 3 metres, the distance AB is 2.6 metres and the slab is to be 0.4 metres thick.

What volume of concrete would be needed for the slab (to the nearest tenth of a m^3) ?

- A. 3.9 m^3 B. 6.2 m^2 C. 9.4 m^2 D. 23.4 m^3

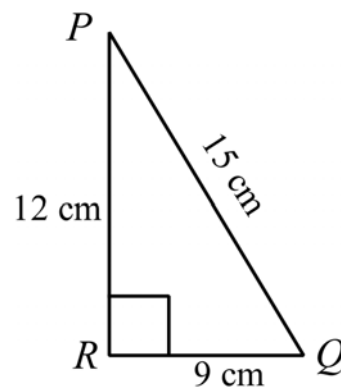
31. What is the length of XZ in the triangle shown?

- A. 15.3 cm
B. 18.8 cm
C. 22.0 cm
D. 31.6 cm



32. What is the value of $\cos Q$?

- A. 0.6
B. 0.75
C. 0.8
D. 1.33



33. Magnus substitutes the values $m = 3.2$ and $n = 21$ into the formula $K = \frac{m(n-6)}{4}$.

What value should he get for K ?

- A. 1.175 B. 1.2 C. 4.55 D. 12

34. Which expression is not a factor of $2ab^2 - 4a^2b$?

A. ab

B. $2ab$

C. $b - 2a$

D. a^2b^2

35. The line shown on the number plane passes through the point $P(4, 2)$ and crosses the y -axis at 4.

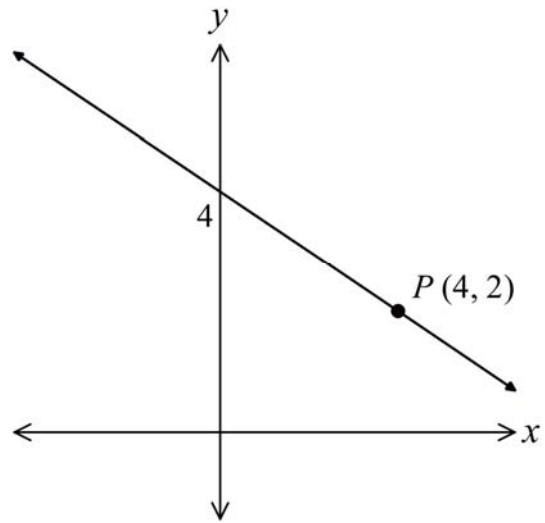
What is the gradient of the line?

A. -4

B. -2

C. $-\frac{1}{2}$

D. $-\frac{1}{4}$



36. Oscar solves the equation $2(x - 4) + 3x = 20$.

Part of his working is shown below.

$$2(x - 4) + 3x = 20$$

$$2x - 6 + 3x = 20 \quad \text{Line 1}$$

$$5x - 6 = 20 \quad \text{Line 2}$$

$$5x = 26 \quad \text{Line 3}$$

$$x = \frac{26}{5} = 5.2 \quad \text{Line 4}$$

In which line did he first make an error?

A. Line 1

B. Line 2

C. Line 3

D. Line 4

Question 37 and 38 refer to the following:

The back-to-back stem and leaf plot compares the number of minutes spent with each customer at two hair salons on a particular day.

Splendid Snips							Cute Cuts					
		9	8	7	5	1	6					
9	9	8	7	5	3	2	2	6				
	8	7	4	2	0	3	1	3	5	6	7	
			9	7	6	4	0	3	5	9	9	9
				6	3	5	3	4	5	7	9	
					4	6	4	8				
					1	7	4					

37. Which statement best describes the shape of the two distributions?

- A. Both distributions are skewed.
- B. Neither distribution is skewed.
- C. Only Cute Cuts has a skewed distribution.
- D. Only Splendid Snips has a skewed distribution.

38. What is the difference in the median times spent with customers for the two salons?

- A. 2 minutes
- B. 9 minutes
- C. 16 minutes
- D. 20 minutes

39. The table shows results of a survey on the number of people who live in the dwellings in suburb.

Number of People Living in Dwelling	Frequency
1	4
2	7
3	3
4	6
5	6
6	4

What is the mean number of people in each dwelling?

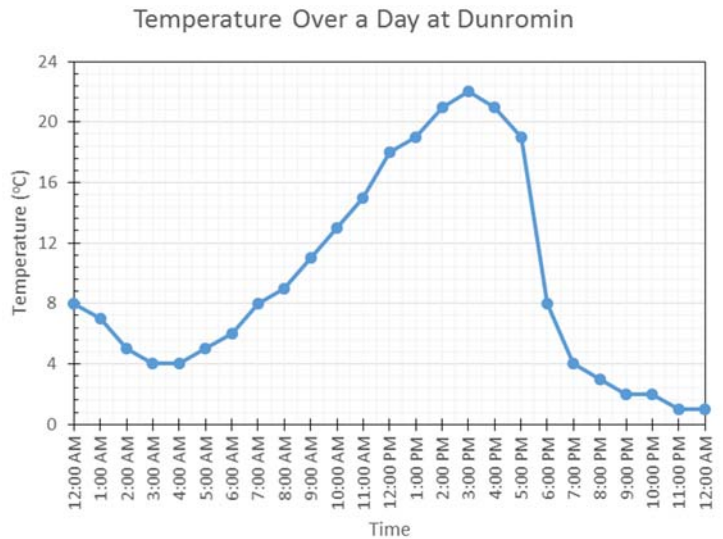
- A. 2.0
- B. 3.5
- C. 4.0
- D. 4.5

40. The temperatures were recorded over a 24-hour period at Dunromin.

The results are shown on the graph.

Which of these temperatures occurred at three separate times?

- A. 2°C .
 B. 6°C .
 C. 10°C .
 D. 14°C .



41. Jake is paid a normal rate of \$48.00 / hour for a 36 hour week, and time-and-a-half for all overtime. What would Jake be paid for a week where he worked 40 hours?

- A. \$1 920 B. \$1 968 C. \$2 016 D. \$2 880

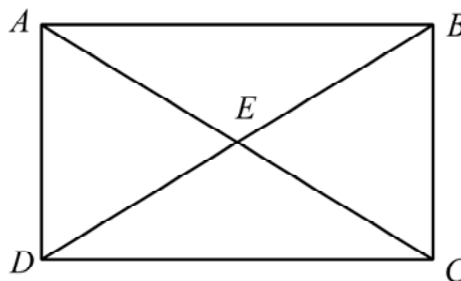
42. Andrew buys a lounge valued at \$960, on time payments. He pays a deposit of \$120 and makes monthly payments of \$45.00 for two years. How much interest does he pay?

- A. \$120 B. \$240 C. \$960 D. \$1080

43. A plane flies at a speed of 640 km/h relative to the ground. How long would a flight which is 2 400 km take?

- A. $3\frac{1}{2}$ hours B. 3 hours and 35 minutes
 C. 3 hours and 40 minutes D. 3 hours and 45 minutes

44. $ABCD$ is a rectangle and its diagonals intersect at E .



Which triangle is congruent to $\triangle ABC$?

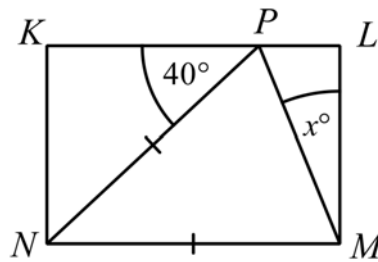
- A. $\triangle ABE$. B. $\triangle ADE$. C. $\triangle ABD$. D. $\triangle AED$.

45. In the diagram below, $KLMN$ is a rectangle and P is a point on KL , such that $PN = NM$.

$$\angle KPN = 40^\circ \text{ and } \angle PML = x^\circ.$$

What is the value of x ?

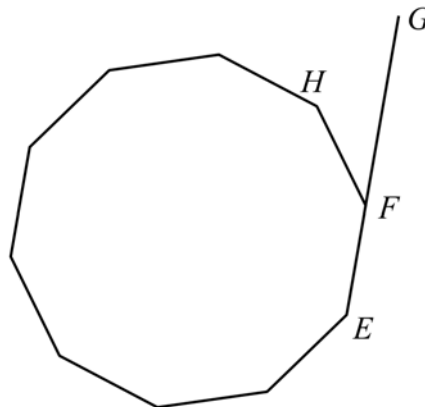
- A. 20°
- B. 40°
- C. 50°
- D. 70°



46. The side EF of a regular decagon is produced to a point G .

What is the size of $\angle HFG$?

- A. 18°
- B. 24°
- C. 36°
- D. 72°



47. This can of beans has a diameter of 8 cm and a height of 12 cm.

What capacity should the manufacturer print on the label of the can?

- A. 450 ml
- B. 600 ml
- C. 750 ml
- D. 2.4 litres

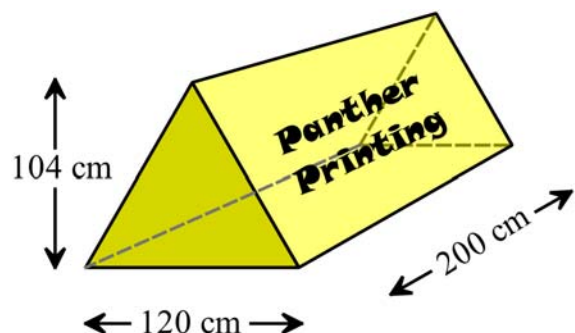


48. This sign is a prism, with an equilateral triangle as its cross section.

It is hollow and built from sheets of plywood.

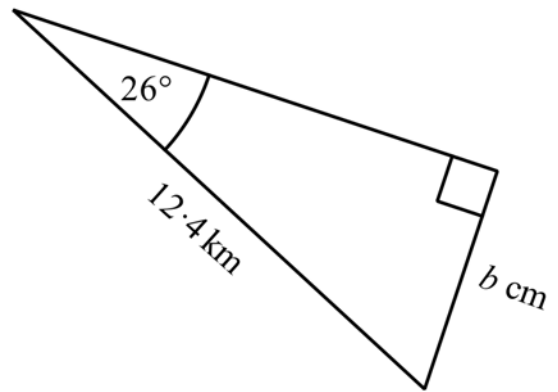
What area of plywood is used to make the sign?

- A. 7.2 m^2
- B. 7.8 m^2
- C. 8.0 m^2
- D. 8.4 m^2



49. What is the value of b ?

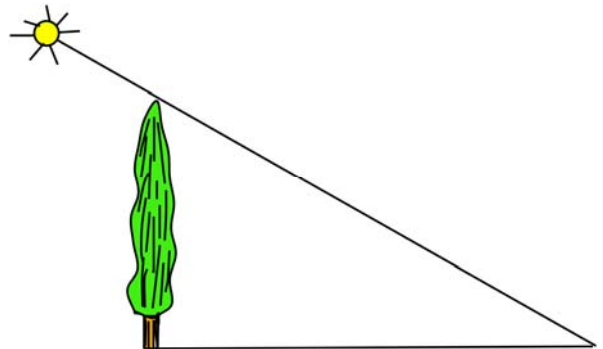
- A. 5.4 km
- B. 6.0 km
- C. 11.1 km
- D. 25.4 km



50. A 15 m high tree casts a shadow which is 24 m long.

What is the angle of elevation of the sun at the time?

- A. 32°
- B. 39°
- C. 51°
- D. 59°



51. The table shows the genres of books on Dean's bookshelf.

A book is chosen at random.

What is the probability that it's genre is either Crime or Thriller?

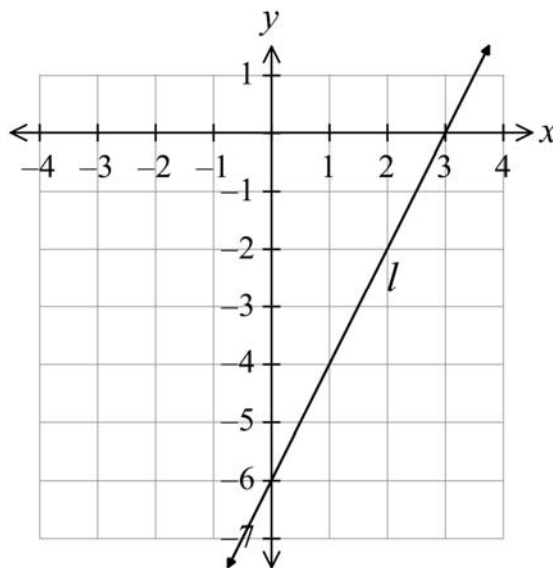
- A. $\frac{17}{80}$
- B. $\frac{17}{40}$
- C. $\frac{1}{2}$
- D. $\frac{17}{23}$

Book Genre	Frequency
Crime	23
Thriller	17
Comedy	18
Biography	8
Self Help	14

52. Which is the correct and complete factorisation of $12m^2n^3 - 16m^2n$?

- A. $2m^2(6n^3 - 8n)$
- B. $4m^2n(3n^2 - 4)$
- C. $4m^2(3n^3 - 4n)$
- D. $12m^2n(n^2 - 4)$

Questions 53 and 54 refer to the following:



A line l has been drawn on the number plane above.

53. What is the equation of the line l ?

- A. $y = \frac{1}{2}x - 3$
- B. $y = \frac{1}{2}x - 6$
- C. $y = 2x - 3$
- D. $y = 2x - 6$

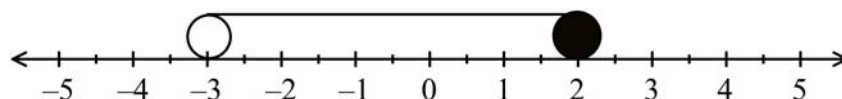
54. What is the point of intersection between the line l and the line $y = -x - 3$?

- A. $(0, -6)$
- B. $(1, -4)$
- C. $(2, -2)$
- D. $(3, 0)$

55. $(2x^3y^{-2})^3 =$

- A. $\frac{6x^6}{y}$
- B. $\frac{8x^9}{y^6}$
- C. $\frac{8y^6}{x^9}$
- D. $8x^6y$

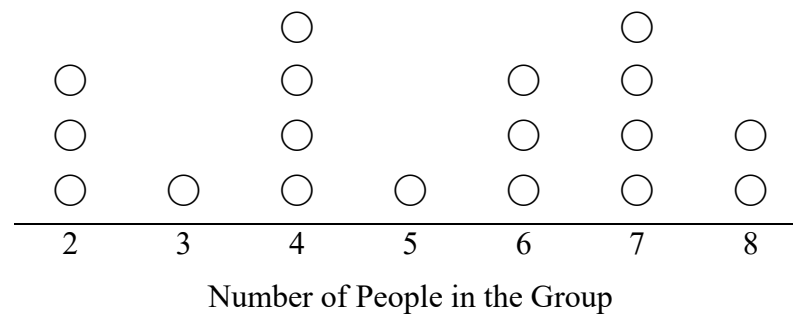
56. Which inequation describes the number line graph below?



- A. $-3 < x \leq 2$
- B. $-3 \leq x \leq 2$
- C. $-3 \leq x < 2$
- D. $-3 < x < 2$

Question 57 – 59 refer to the following:

The dot plot was constructed by a researcher observing the size of groups at tables in a restaurant.



57. Which description could be applied to the distribution?

- A. It is bimodal.
- B. It is negatively skewed.
- C. It is positively skewed.
- D. It is symmetrical.

58. The restaurant wishes to use the data in its advertising.

Which statement drawn from the data is misleading or inaccurate?

- A. The average size of groups at our restaurant is approximately 5.
- B. The median size of groups at our restaurant is over 5.
- C. Group sizes range from couples to groups of 8 at our restaurant.
- D. The most common group size at our restaurant is 7 people.

59. The researcher draws a sector graph from the data she has collected.

What angle would she use for the sector which represents groups of 4 people.

- A. 40°
- B. 60°
- C. 75°
- D. 80°

60. A class has 24 students and they all collected clothing for a charity drive and brought them in to school.

The number of pieces brought in by each child was recorded.

The following statistics were calculated when 22 of the students had brought in their pieces of clothing.

The least that any child brought was 9 pieces of clothing and three students brought 14 pieces.

Measure	Value
Mean	12.5
Median	11
Mode	14
Range	6

On the next day, the other two students brought in 16 pieces of clothing each.

Which of the measures above would not change when the extra two students are included?

- A. The mean.
- B. The median.
- C. The mode.
- D. The range.

End of Section 2

Part A

Section 2
Part B

Longer Answer Section

Name : _____

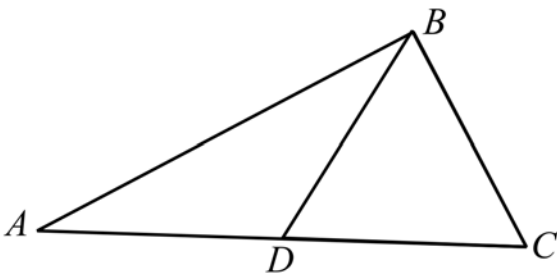
Class/Teacher_____

Write all working and answers in the spaces provided on this examination paper.
Calculators are allowed for this section.

Marks

61. $\triangle ABC$ is right angled at B .
 $\triangle BCD$ is an equilateral triangle.

2



Prove that $\triangle ABD$ is an isosceles triangle.

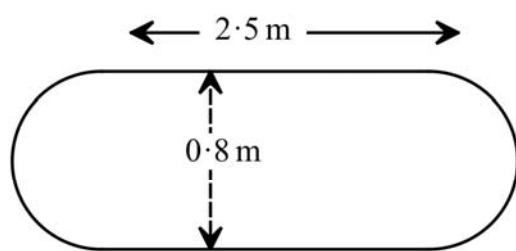
.....

.....

.....

.....

62. A water tank is a 1.8 metre high prism with the cross section shown.



Cross Section

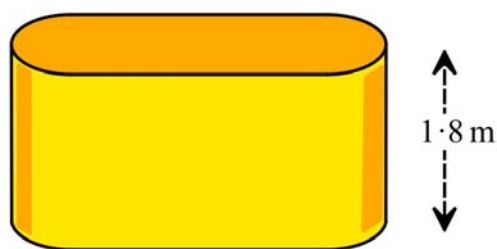


Diagram of Tank

- (a) Calculate the area of the cross section of the tank.

1

Answer to the nearest tenth of a m^2 .

.....

.....

.....

- (b) How many litres of water would the tank hold (to the nearest litre)?

1

(1 cubic metre holds a kilolitre)

.....

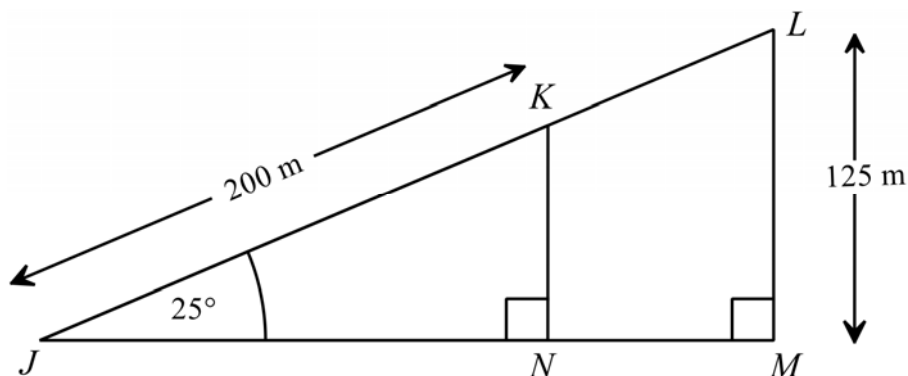
.....

.....

.....

63. In the diagram below, $\triangle JLM$ is a right triangle and K and N are points on JL and JM , respectively, such that KN is perpendicular to JM .

$JK = 200$ m and $LM = 125$ m.



- (a) Calculate the distance JN .

1

.....

.....

.....

.....

- (b) Find the distance NM .

2

.....

.....

.....

.....

64. The table below records the views of 60 people who watched a preview of a movie.

Views on Movie	Male	Female	Totals
Recommend	18	22	40
Not recommend	6	14	20
Totals	24	36	60

One of the people who watched the preview is chosen at random.

(a) What is the probability that the person would recommend the movie?

1

.....
.....

(b) What is the probability that the person is a male who would not recommend the movie?

1

.....
.....

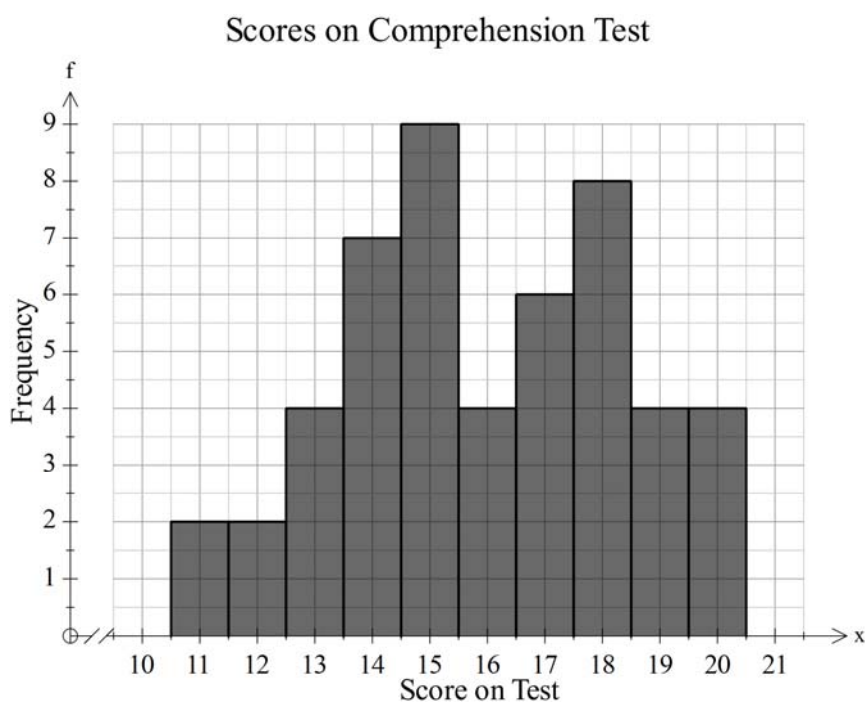
(c) Would a male or a female be more likely to recommend the movie?

1

Justify your answer by calculating probabilities.

.....
.....
.....
.....

65. The employees at a call centre are given a comprehension test to determine the extent to which they attend to caller's requests.
The results are shown in the histogram below.
The maximum possible score was 25.



- (a) Calculate the mean score on the test.

1

.....

.....

.....

- (b) What is the median score on the test?

1

.....

.....

- (c) Draw a frequency polygon on the graph above.

1

66. (a) Simplify $\frac{2x}{5} + \frac{3x}{10}$. 1

.....

.....

.....

.....

- (b) Simplify $\frac{a^2 + 2a}{4a + 8}$. 1

.....

.....

.....

.....

67. Solve, showing all lines of reasoning: 2

$$\frac{3x}{2} - 5 = 4 - 3(x + 3)$$

.....

.....

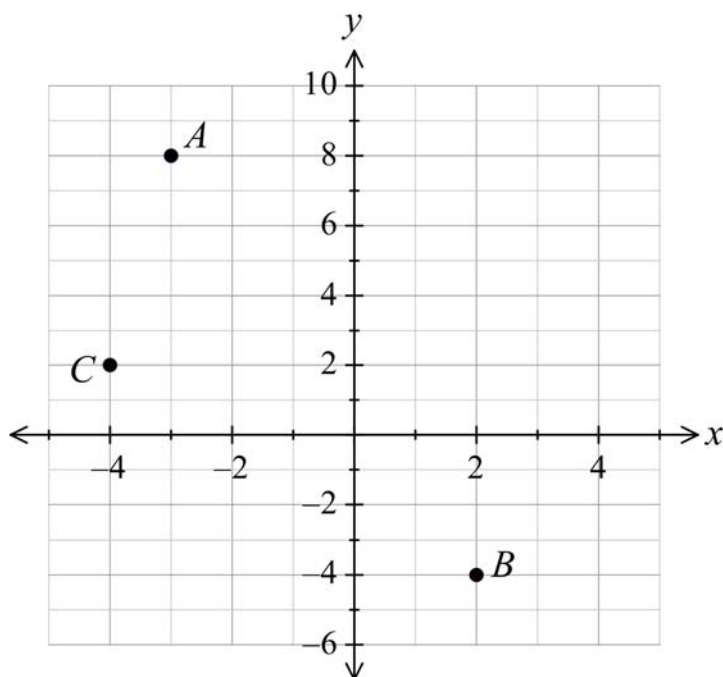
.....

.....

.....

.....

68. The points $A(-3, 8)$, $B(2, -4)$ and $C(-4, 2)$ are shown on the number plane below.



(a) Calculate the distance AB .

1

.....

.....

.....

.....

(b) Find the equation of the line which passes through C and B .

2

.....

.....

.....

.....

End of Exam

School Name
Year 10 Half Yearly Examination
Mathematics Course 2016
Multiple Choice Section Answer Sheet

Name _____ Teacher _____

Completely fill the response oval representing the most correct answer.
Use a black or blue pen or 2B pencil.

21. A ☐ B ☐ C ☐ D ☐
22. A ☐ B ☐ C ☐ D ☐
23. A ☐ B ☐ C ☐ D ☐
24. A ☐ B ☐ C ☐ D ☐
25. A ☐ B ☐ C ☐ D ☐
26. A ☐ B ☐ C ☐ D ☐
27. A ☐ B ☐ C ☐ D ☐
28. A ☐ B ☐ C ☐ D ☐
29. A ☐ B ☐ C ☐ D ☐
30. A ☐ B ☐ C ☐ D ☐
31. A ☐ B ☐ C ☐ D ☐
32. A ☐ B ☐ C ☐ D ☐
33. A ☐ B ☐ C ☐ D ☐
34. A ☐ B ☐ C ☐ D ☐
35. A ☐ B ☐ C ☐ D ☐
36. A ☐ B ☐ C ☐ D ☐
37. A ☐ B ☐ C ☐ D ☐
38. A ☐ B ☐ C ☐ D ☐
39. A ☐ B ☐ C ☐ D ☐
40. A ☐ B ☐ C ☐ D ☐

41. A ☐ B ☐ C ☐ D ☐
42. A ☐ B ☐ C ☐ D ☐
43. A ☐ B ☐ C ☐ D ☐
44. A ☐ B ☐ C ☐ D ☐
45. A ☐ B ☐ C ☐ D ☐
46. A ☐ B ☐ C ☐ D ☐
47. A ☐ B ☐ C ☐ D ☐
48. A ☐ B ☐ C ☐ D ☐
49. A ☐ B ☐ C ☐ D ☐
50. A ☐ B ☐ C ☐ D ☐
51. A ☐ B ☐ C ☐ D ☐
52. A ☐ B ☐ C ☐ D ☐
53. A ☐ B ☐ C ☐ D ☐
54. A ☐ B ☐ C ☐ D ☐
55. A ☐ B ☐ C ☐ D ☐
56. A ☐ B ☐ C ☐ D ☐
57. A ☐ B ☐ C ☐ D ☐
58. A ☐ B ☐ C ☐ D ☐
59. A ☐ B ☐ C ☐ D ☐
60. A ☐ B ☐ C ☐ D ☐